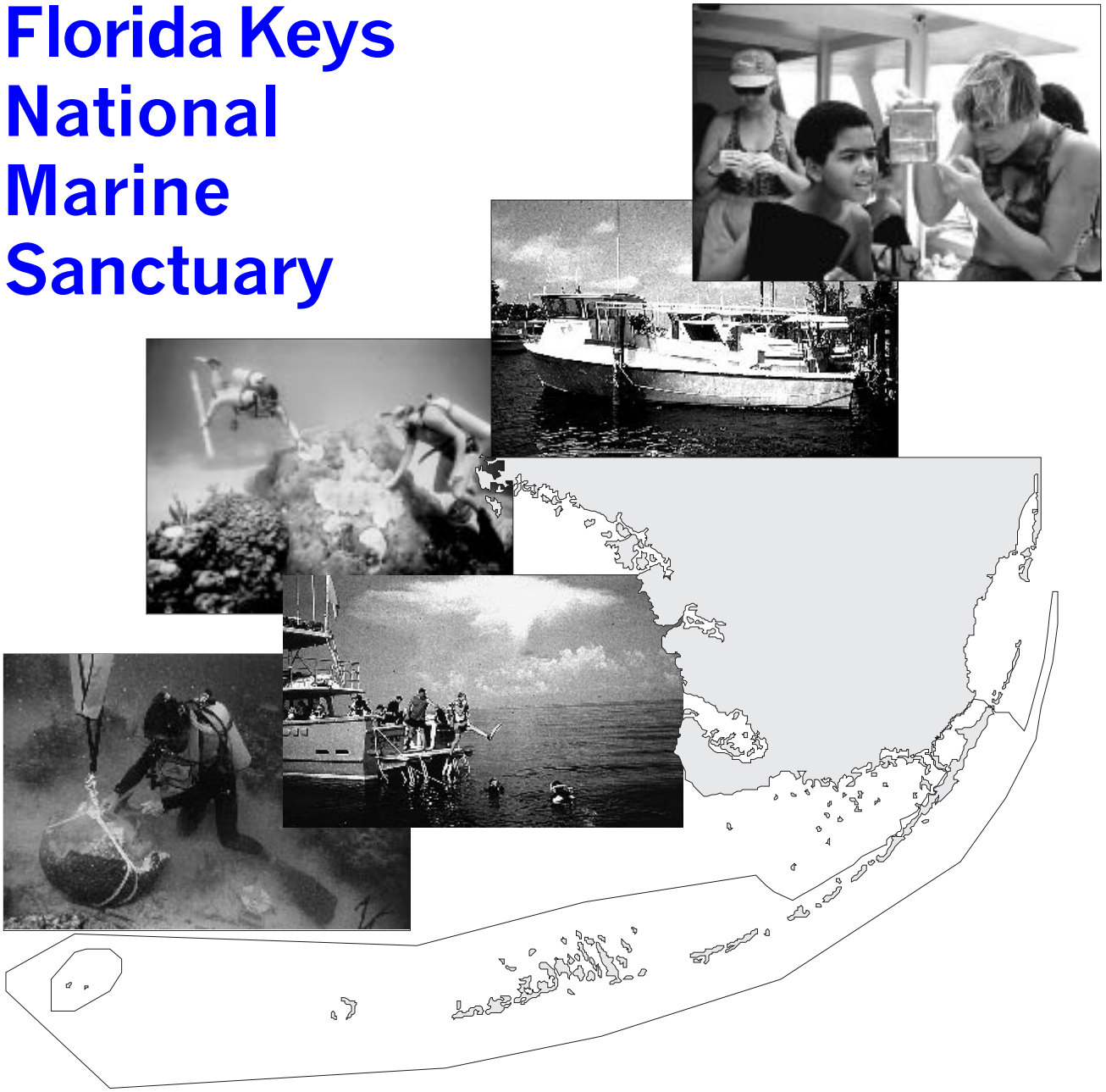
Strategy for Stewardship

Florida Keys National Marine Sanctuary



U.S. Department of Commerce

National Oceanic and Atmospheric Administration

National Ocean Service

Office of Ocean and Coastal Resource Management

Sanctuaries and Reserves Division

Final Management Plan/Environmental Impact Statement

Volume I of III
Management Plan

This final management plan and environmental impact statement is dedicated to the memories of Secretary Ron Brown and George Barley. Their dedicated work furthered the goals of the National Marine Sanctuary Program and specifically the Florida Keys National Marine Sanctuary.

"We must continue to work together - inspired by the delight in a child's eye when a harbor seal or a gray whale is sighted, or the wrinkled grin of a fisherman when the catch is good. We must honor the tradition of this land's earliest caretakers who approached nature's gifts with appreciation and deep respect. And we must keep our promise to protect nature's legacy for future generations."

- Secretary Ron Brown
  Olympic Coast dedication ceremony, July 16, 1994

"The Everglades and Florida Bay will be our legacy to our children and to our Nation."

- George Barley
  Sanctuary Advisory Council Chairperson

Cover Photos: Marine Educator--Heather Dine, Upper Keys Regional Office; Lobster Boats--Billy Causey, Sanctuary Superintendent; Divers--Harold Hudson, Upper Keys Regional Office; Dive Charter--Paige Gill, Upper Keys Regional Office; Coral Restoration--Mike White, NOAA Corps.

Florida Keys National Marine Sanctuary

Final Management Plan/Environmental Impact Statement (FMP/EIS)

Volume I
The Management Plan

1996

National Oceanic and Atmospheric Administration

Acknowledgments

In 1955, renowned naturalist and marine biologist Rachel Carson described the Florida Keys this way in her book *The Edge of the Sea:*

> "I doubt that anyone can travel the length of the Florida Keys without having communicated to his mind a sense of the uniqueness of this land of sky and water and scattered mangrove-covered islands. The atmosphere of the Keys is strongly and peculiarly their own. This world of the Keys has no counterpart elsewhere in the United States, and indeed few coasts of the Earth are like it."

This unique environment is the reason for the existence of the Florida Keys National Marine Sanctuary, and the reason why so many people have contributed so much of their time and energy to making the Management Plan as comprehensive and fair as possible.

Since 1989, numerous environmental organizations and individuals have worked long and hard to provide input into the legislation designating the Sanctuary and into developing the Final Management Plan/Environmental Impact Statement (FMP/EIS). They provided useful and objective comments at numerous workshops, Advisory Council meetings, and other public forums held during the planning process. The contributions of each of these individuals, and the organizations they represent, is appreciated.

The National Marine Sanctuary Program staff wish to thank everyone who has participated in the development of this plan, especially members of the public who gave of their time to offer objective and useful input during the many public comment periods offered during the planning process.

Special thanks go to the members of the Sanctuary Advisory Council for their major contribution to the planning process. Their diligent work and sacrifice of time and expenses will be remembered as the key to the success of developing a comprehensive management plan. With the leadership of their chairman and vice-chairman, they navigated waters never before charted for a National Marine Sanctuary or, for that matter, any marine protected area in the United States. Their role was crucial in this planning process, especially the leadership they exhibited in developing the Sanctuary's final plan. Never before has such a comprehensive plan been assembled by such a diverse interest group to solve complex problems in one of the Nation’s most ecologically diverse regions.

In addition, Program staff would like to thank our local, State, and Federal agency planning partners for their assistance during the development of this plan. Those individuals who worked diligently for over four years on the plan sacrificed an enormous amount of time and effort to assist in this project. Dozens of agency scientists, managers, and planners have devoted time to this planning process, especially during the various workshops and strategy assessment planning sessions, extended review sessions, and deliberations on the compact agreement. The National Marine Sanctuary Program staff is grateful to all of you.

Also, special thanks to all of those individuals who reviewed various portions of the document, especially sections of the Description of the Affected Environment. Your thorough review has served to make this section an important reference for future use.

We also extend our appreciation to the Sanctuary Volunteers and staff and students of Indiana University who have helped assess some shipwrecks identified in the management plan.

Particularly, the Program owes special recognition and thanks to the staff of NOAA’s Strategic Environmental Assessments Division for their enormous amount of time and sacrifice in assisting in the planning and development of this plan.

Abstract

This abstract describes the Final Management Plan and Environmental Impact Statement (FMP/EIS) for the Florida Keys National Marine Sanctuary. Congress, recognizing the degradation of this unique ecosystem due to direct physical impacts and indirect impacts, passed the Florida Keys National Marine Sanctuary and Protection Act of 1990 (Public Law 101-605) designating the Florida Keys National Marine Sanctuary. The Act requires the National Oceanic and Atmospheric Administration (NOAA) to develop a comprehensive management plan with implementing regulations to govern the overall management of the Sanctuary and to protect Sanctuary resources and qualities for the enjoyment of present and future generations. The Act also establishes the boundary of the Sanctuary, prohibits any oil drilling and exploration within the Sanctuary, prohibits the operation of tank ships or ships greater than 50 meters in the Area to Be Avoided, and requires the development and implementation of a water quality protection program by the U.S. Environmental Protection Agency and the State of Florida, in conjunction with NOAA.

The Sanctuary consists of approximately 2,800 nm^2 (9,500 km^2) of coastal and oceanic waters, and the submerged lands thereunder, surrounding the Florida Keys, and extending westward to encompass the Dry Tortugas, but excluding the Dry Tortugas National Park. The shoreward boundary of the Sanctuary is the mean high-water mark. Within these waters are spectacular, unique, and nationally significant marine environments, including seagrass meadows, mangrove islands, and extensive living coral reefs. These marine environments support rich biological communities possessing extensive conservation, recreational, commercial, ecological, historical, research, educational, and aesthetic values that give this area special national significance. These environments are the marine equivalent of tropical rain forests in that they support high levels of biological diversity, are fragile and easily susceptible to damage from human activities, and possess high value to human beings if properly conserved.

The economy of the Keys is dependent upon a healthy ecosystem. Approximately four million tourists visit the Keys annually, participating primarily in water-related sports such as fishing, diving, boating, and other ecotourism activities. In 1991, the gross earnings of the Florida Keys and Monroe County totaled $853 million, 36 percent of which came from services provided as part of the tourism industry. Another 18.7 percent of the gross earnings came from the retail trade, which is largely supported by tourists. In 1990, half of the Keys' population held jobs that directly or indirectly supported outdoor recreation. In addition, the commercial fishing industry accounted for $17 million of the Keys' economy, more than 20 percent of Florida's total gross earnings from commercial fishing. All of these activities depend on a healthy marine environment with good water quality.

The purpose of the proposed Management Plan is to ensure the sustainable use of the Keys' marine environment by achieving a balance between comprehensive resource protection and multiple, compatible uses of those resources. Sanctuary resources are threatened by a variety of direct and indirect impacts. Direct impacts include boat groundings, propeller dredging of seagrasses, and diver impacts on coral. For example, over 30,000 acres of seagrasses have been impacted by boat propellers. Indirect impacts include marine discharge of wastes, land-based pollution, and external sources of water quality degradation. These and other management issues are addressed by the comprehensive Management Plan.

Volume I contains the final comprehensive Management Plan and includes the discussion of the Preferred Alternative and socioeconomic analysis as well as 10 action plans composed of management strategies developed with substantial input from the public, local experts, and the Sanctuary Advisory Council to address management issues. The action plans provide an organized process for implementing management strategies, including a description of the activities required, institutions involved, staffing requirements, and an estimate of the implementation cost. A list of the action plans in alphabetical order is as follows: 1) Channel/ Reef Marking; 2) Education and Outreach; 3) Enforcement; 4) Mooring Buoy; 5) Regulatory; 6) Research and Monitoring; 7) Submerged Cultural Resources; 8) Volunteer; 9) Water Quality; and 10) Zoning. These action plans include several critical activities designed to manage and protect the natural and historic resources of the Sanctuary, including:

- Establishing water-use zones providing focused protection for 60 to 70 percent of the well-developed reef formations, prohibiting consumptive activities in a small portion of the Sanctuary, buffering important wildlife habitat from human disturbance, and protecting several large reserves for species diversity replenishment, breeding areas, and genetic protection.

- Establishing Sanctuary regulations to designate nonconsumptive zones, prohibit damage to natural resources, establish special-use permits, and restrict other activities that may negatively impact Sanctuary resources.

- Expanding and coordinating the Enforcement Program to enforce the regulations, particularly in the zoned areas.

- Implementing an Ecological Monitoring Plan to evaluate the effectiveness of the zoned areas and the health of the Sanctuary.

- Expanding the Mooring Buoy Program to include the new zones and protect important coral reef and seagrass habitat.

- Implementing a Channel and Reef Marking Program to protect seagrasses, coral reefs, and mangroves in shallow-water areas.

- Implementing a Submerged Cultural Resources Plan to protect the numerous historically important shipwrecks and other submerged cultural resources.

- Expanding the Education and Volunteer programs to reach more users and the millions of visitors coming to the Keys each year.

Volume II describes the process used to develop the draft management alternatives and includes environmental and socioeconomic impact analyses of the alternatives used in the draft management plan and environmental impact statement.

Volume III consists of the appendices, including the two acts that designate and implement the Sanctuary.

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General Introduction

This is the first of three volumes describing the Final Management Plan/Environmental Impact Statement (FMP/EIS) for the Florida Keys National Marine Sanctuary. Volume I contains the selection of the Final Preferred Alternative, which is the Final Management Plan, including 10 detailed action plans. The Final Preferred Alternative explains the modifications to the Draft Preferred Alternative (III) based on public comments, the FKNMSPA, the NMSA and other considerations. Volume II describes the Management Plan/Environmental Impact Statement (MP/EIS) development process, including the process for selecting the Draft Preferred Alternative that underwent a nine month public review. Volume III contains the appendices referenced in Volumes I and II. The Final Plan is based on the EIS analysis in Volumes I and III.

Authority for Designation

National marine sanctuaries are routinely designated by the Secretary of Commerce through an administrative process established by the National Marine Sanctuaries Act (NMSA) of 1972, 16 U.S.C. 1431 et seq., as amended, including activation of candidate sites selected from the National Marine Sanctuary Program Site Evaluation List. Sanctuaries also have been designated by an Act of Congress. The Florida Keys National Marine Sanctuary was designated when the President signed the Florida Keys National Marine Sanctuary and Protection Act. Appendix A in Volume III contains a copy of this Act.

Terms of Statutory Designation

Section 304(a)(4) of the NMSA requires that the terms of designation set forth the geographic area included within the Sanctuary; the characteristics of the area that give it conservation, recreational, ecological, historical, research, educational, or aesthetic value; and the types of activities that will be subject to regulation by the Secretary of Commerce to protect those characteristics. This section also specifies that the terms of designation may be modified only through the same procedures by which the original designation was made. Thus, the terms of designation serve as a charter for the Sanctuary.

Mission and Goals of the National Marine Sanctuary Program

The purpose of a sanctuary is to protect resources and their conservation, recreational, ecological, historical, research, educational, or aesthetic values through comprehensive long-term management. National Marine Sanctuaries may be designated in coastal and ocean waters, the Great Lakes and their connecting waters, and submerged lands over which the United States exercises jurisdiction consistent with international law. They are built around distinctive natural and historical resources whose protection and beneficial use require comprehensive planning and management.

The National Oceanic and Atmospheric Administration (NOAA) administers the National Marine Sanctuary Program through the Sanctuaries and Reserves Division (SRD) of the Office of Ocean and Coastal Resource Management (OCRM).

In accordance with the NMSA, the mission of the National Marine Sanctuary Program is to identify, designate, and comprehensively manage marine areas of national significance. National Marine Sanctuaries are established for the public's long-term benefit, use, and enjoyment. To meet these objectives, the following National Marine Sanctuary Program goals have been established (15 CFR, Part 922.1(b)):

- Enhance resource protection through comprehensive and coordinated conservation and ecosystem management that complements existing regulatory authorities.
- Support, promote, and coordinate scientific research on, and monitoring of, the site-specific marine resources to improve management decisionmaking in national marine sanctuaries.
- Enhance public awareness, understanding, and the wise use of the marine environment through public interpretive, educational, and recreational programs.
- Facilitate, to the extent compatible with the primary objective of resource protection, multiple uses of National Marine Sanctuaries.

The Florida Keys National Marine Sanctuary is one of a system of national marine sanctuaries that has been established since the Program's inception in 1972. Sanctuaries are not new to the Florida Keys; there is a twenty year history of National Marine Sanctuaries in the Keys.

Background

Historical Perspective. The lure of the Florida Keys has attracted explorers and visitors for centuries. The clear tropical waters, bountiful resources, and appealing natural environment were among the many fine qualities that attracted visitors to the Keys. However, warning signs that the Keys' environment and natural resources were fragile, and not infinite, came early. In 1957, a group of conservationists and scientists held a conference at the Everglades National Park and discussed the demise of the coral reef resources in the Keys at the hands of those attracted there because of their beauty and uniqueness. This conference resulted in action that created the world's first underwater park, the John Pennekamp Coral Reef State Park in 1960. However, in just a little over a decade following the establishment of the park, a public outcry was sounded that cited pollution, overharvest, physical impacts, overuse, and use conflicts as continuing to occur in the Keys. These concerns continued to be voiced by environmentalists and scientists alike throughout the decade of the 1970's and indeed, into the 1990's.

Other management efforts were instituted to protect the coral reefs of the Florida Keys. The Key Largo National Marine Sanctuary was established in 1975 to protect 103 square nautical miles of coral reef habitat stretching along the reef tract from north of Carysfort Lighthouse to south of Molasses Reef, offshore of the Upper Keys. In 1981, the 5.32 square nautical mile Looe Key National Marine Sanctuary was established to protect the very popular Looe Key Reef located off Big Pine Key in the Lower Keys. Throughout the 80's mounting threats to the health and ecological future of the coral reef ecosystem in the Florida Keys prompted Congress to take action to protect this fragile natural resource. The threat of oil drilling in the mid to late 1980's off the Florida Keys, combined with reports of deteriorating water quality throughout the region, occurred at the same time scientists were assessing the adverse affects of coral bleaching, the die-off of the long-spined urchin, loss of living coral cover on reefs, a major seagrass die-off, declines in reef fish populations, and the spread of coral diseases. With the reauthorization of the National Marine Sanctuary Program in 1988, Congress directed the Sanctuary Program to conduct a feasibility study of possible expansion of Sanctuary sites in the Keys. Those study sites were in the vicinity of Alligator Reef, Sombrero Key, and westward from American Shoals. This endorsement for expansion of the Sanctuary program in the Keys was a Congressional signal that the health of the resources of the Florida Keys was of National concern. The feasibility study was overtaken by several natural events and ship groundings that precipitated the designation of the Florida Keys National Marine Sanctuary.

Three large ships ran aground on the coral reef tract within a brief 18 day period in the fall of 1989. Coincidental as it may seem, it was this final physical insult to the reef that prompted Congress to take action to protect the coral reef ecosystem of the Florida Keys. Although most remember the ship groundings as having triggered Congressional action, it was in fact the cumulative events of environmental degradation, in conjunction with the physical impacts that prompted Congressman Dante Fascell to introduce a bill into the House of Representatives in November of 1989. Congressman Fascell had long been an environmental supporter of South Florida and his action was very timely. The bill was sponsored in the Senate by Senator Bob Graham, also known for his support of environmental issues both in Washington, and as a Florida Governor. It was passed by Congress through bi-partisan support and was signed. On November 16, 1990, President George Bush signed into law the Florida Keys National Marine Sanctuary and Protection Act (FKNMSPA) (Appendix A in Volume III).

Florida Keys Environmental Setting. The Florida Keys National Marine Sanctuary extends approximately 220 miles southwest from the southern tip of the Florida peninsula. Located adjacent to the Keys' land mass are spectacular, unique, and nationally significant marine environments, including seagrass meadows, mangrove islands, and extensive living coral reefs. These support rich biological communities possessing extensive conservation, recreational, commercial, ecological, historical, research, educational, and aesthetic values that give this area special national significance. They are the marine equivalent of tropical rain forests, in that they support high levels of biological diversity, are fragile and easily susceptible to damage from human activities, and possess high value to humans if properly conserved.

The marine environment of the Florida Keys supports over 6,000 species of plants, fishes, and invertebrates, including the Nation's only coral reef that lies adjacent to the continent, and one of the largest seagrass communities in this hemisphere. Attracted by this natural diversity and tropical climate, approximately four million tourists visit the Keys annually, where they participate primarily in water-related sports such as fishing, diving, boating, and other activities.

Sanctuary Boundary. The Act designated 2,800 square nautical miles of coastal waters off the Florida Keys as the Florida Keys National Marine Sanctuary. The Sanctuary boundary extends southward on the Atlantic Ocean side of the Keys from the north easternmost point of the Biscayne National Park along the approximate 300-foot isobath for over 200 nautical miles to the Dry Tortugas. From there it turns north and east, encompassing a large portion of the Gulf of Mexico and Florida Bay, where it adjoins the Everglades National Park. The landward boundary is the mean high water mark. The Key Largo and Looe Key National Marine Sanctuaries, the State Parks and Aquatic Preserves, and the Florida Keys Refuges of the U.S. Fish and Wildlife Service are overlapped by the Sanctuary; whereas the Everglades National Park, Biscayne National Park, and Dry Tortugas National Park are excluded from the boundary of the Sanctuary.

Threats to the Environment. The deterioration of the marine environment in the Keys is no longer a matter of debate. There is a decline of healthy corals, an invasion by algae into seagrass beds and reefs, a decline in certain fisheries, an increase of coral diseases and coral bleaching. In Florida Bay, reduced freshwater flow has resulted in an increase in plankton blooms, sponge and seagrass die-offs, and fish kills.

Over four million people visit the Keys annually, 70% of whom visit the Sanctuary. Over 80,000 people reside in the Keys full time. Since 1965, the number of registered private recreational vessels has increased over six times. There are significant direct and indirect effects from the high levels of use of Sanctuary resources resulting from residents and tourists. The damage done by people hinders the ability of marine life to recover from naturally occurring stresses. Human impacts can be separated into direct and indirect impacts.

Direct human impacts. The most visible and familiar physical damage results from the carelessness or, on occasion, the recklessness of ship captains, boaters, divers, fishermen, snorkelers and beachgoers. Over 30,000 acres of seagrasses have been damaged by boat propellers. Direct impacts to resources also result from careless divers and snorkelers standing on coral, improperly placed anchors, and destructive fishing methods. In the period between 1993 and 1994, approximately 500 vessels were reported aground in the Sanctuary. These groundings have a cumulative effect on the resources. Over 19 acres of coral reef habitat has been damaged or destroyed by large ship groundings.

Indirect human impacts. The overnutrification of nearshore waters is a documented problem in the Sanctuary. A major source of excess nutrients is sewage-25,000 septic tanks, 7,000 cesspools, 700 shallow injection wells, and 139 marinas harboring over 15,000 boats. These nutrients are carried through the region by more than 700 canals and channels. Removing nitrogen and phosphorous from wastewater requires a technology that, at present, is lacking from sewage treatment facilities in the Keys.

Management Plan Requirements

The FKNMSPA directs the Secretary of Commerce to develop a comprehensive management plan and implement regulations to protect Sanctuary resources. The Act requires that the plan:

- facilitate all public and private uses of the Sanctuary consistent with the primary objective of resource protection;
- consider temporal and geographic zoning to ensure protection of Sanctuary resources;
- incorporate the regulations necessary to enforce the comprehensive water quality protection program developed under Section 8 of the FKNMSPA;
- identify needs for research, and establish a long-term ecological monitoring program;
- identify alternative sources of funding needed to fully implement the Plan's provisions and supplement appropriations authorized under Section 10 (16 U.S.C., §1444) of the FKNMSPA and Section 313 of the NMSA;
- ensure coordination and cooperation between Sanctuary managers and other Federal, State,

and local authorities with jurisdiction within or adjacent to the Sanctuary;

- promote education among users of the Sanctuary about coral reef conservation and navigational safety; and

- incorporate the existing Looe Key and Key Largo national marine sanctuaries into the Florida Keys National Marine Sanctuary.

All of these requirements have been addressed in the Management Plan.

In addition to the above statutory objectives, the Sanctuary Advisory Council, early on in the planning process in 1992, developed a set of goals and objectives for the Sanctuary that NOAA later adopted. The goal is:

"To preserve and protect the physical and biological components of the South Florida estuarine and marine ecosystem to ensure its viability for the use and enjoyment of present and future generations."

The objectives include:

- Encouraging all agencies and institutions to adopt an ecosystem and cooperative approach to accomplish the following objectives, including the provision of mechanisms to address impacts affecting Sanctuary resources but originating outside the boundaries of the Sanctuary;

- Providing a management system which is in harmony with an environment whose long-term ecological, economic, and sociological principles are understood, and which will allow appropriate sustainable uses;

- Managing the Florida Keys National Marine Sanctuary for the natural diversity of healthy species, populations, and communities;

- Reaching every single user and visitor to the FKNMS with information appropriate to their activities; and

- Recognizing the importance of cultural and historical resources, and managing these resources for reasonable, appropriate use and enjoyment.

NOAA incorporated the Sanctuary Advisory Council's objectives into the Final Comprehensive Management Plan, and some progress has already been made toward accomplishing these objectives. For example, steps have been taken to meet the first objective of ecosystem management. Sanctuary Staff have been involved in the efforts of the South Florida Ecosystem Restoration Task Force and the Governor's Commission for a Sustainable South Florida. These two efforts have focused on the restoration of the South Florida ecosystem, of which the Sanctuary is the downstream component. These combined efforts recognize the importance of protecting and preserving the natural environment for the sustainable use of future generations. The natural and built environments have to be managed in harmony to sustain the healthy environment upon which South Florida economy is dependent upon.

Overview of the Planning Process

The size of the Sanctuary and the diversity of its users required that NOAA adopt a holistic, ecosystem-based management approach to address the problems facing the Sanctuary. This meant using a problem-driven focus, relying on partnerships, and building consensus around the identification of issues and their short- and long-term solutions.

A Comprehensive Approach. The FKNMSPA requires NOAA to develop a comprehensive management plan. To meet this mandate, NOAA has addressed many problems and issues, such as water quality and land use, that are outside the "traditional" scope of Sanctuary management. The process involved unprecedented participation by the general public, user groups, and Federal, State, and local governments.

Because of the size of the Sanctuary and the variety of resources it contains, many problems never before encountered by Sanctuary management had to be addressed. For example, significant declines in water quality and habitat conditions in Florida Bay are threatening the health of Sanctuary resources. These conditions are thought to be the result of water quality and quantity management in the South Florida region. Such problems must be addressed by management to ensure adequate protection of Sanctuary resources. There is a need, therefore, to explicitly include the agencies with responsibilities in these areas in an ecosystem management approach.

Knowledge-based Consensus Building. A series of workshops followed a set of public scoping meetings, and laid the foundation for building this Plan. At

these work sessions, NOAA used a systematic process for obtaining relevant information from experts with knowledge of Sanctuary problems.

NOAA recognized that a useful management plan could not be developed and implemented without forging working teams to help provide the vision and knowledge necessary to accomplish the goals set forth in the FKNMSPA. Four teams were formed to ensure that input was provided by major Federal, State, and local interests in the Sanctuary, and to see that a plan was produced that met the goals and objectives set forth by the FKNMSPA and NOAA. There was considerable interaction, and some overlap in membership and function, among these teams.

- In July 1991, the Interagency Core Group, composed of Federal, State, and local agencies with direct jurisdictional responsibility in the Sanctuary, was formed to develop policies, and direct and oversee the management plan development process (Appendix B in Volume III lists the members of this Core Group).

- Sanctuary Planners held a series of workshops, from July 1991 through January 1992, which focused on a range of topics. The workshop topics included mooring buoys, education, photobathymetry, research, submerged cultural resources, and zoning.

- A Strategy Identification Work Group, composed of 49 local scientists and management experts, generated the initial set of strategies and details on implementation requirements.

- The Sanctuary Advisory Council (SAC) was established by the FKNMSPA to ensure public input into the Plan, and to advise and assist NOAA in its development and implementation. The SAC first met in February 1992 and conducted over 30 meetings that were open to the public (Appendix B in Volume III contains a list of SAC members). The SAC became an integral part of the Sanctuary planning process by serving as a direct link to the Keys' user communities, such as the dive industry, environmental groups, and commercial and recreational fishermen. In addition, the SAC has been instrumental in helping NOAA formulate policy, particularly with regard to: 1) the marine zoning plan, 2) activities needing regulation, and 3) recommending a preferred alternative for the Management Plan.

- A NOAA team composed of the Sanctuaries and Reserves Division, the Strategic Environmental Assessments Division, and the Office of the Assistant General Counsel for Ocean Services was responsible for developing and implementing the process to produce the Draft Plan. The Sanctuaries and Reserves Division is responsible for coordinating the review and producing the Final Management Plan and Environmental Impact Statement.

Focus on Management and Action. From the beginning of the Plan development process, it has been recognized that management is a continuous activity that must involve those responsible for implementing actions. The process has made maximum use of existing knowledge and experience to identify, characterize, and assess alternative management actions. Much of the planning process was devoted to identifying short- and long-term management actions or strategies, including their operational requirements. These management actions can be found in the detailed action plans contained in this volume. These plans address management issues ranging from channel marking, to volunteer programs, to regulations. They provide details on institutional needs, personnel, time requirements, and implementation costs. These details are necessary for the decisions that will have to be made upon Plan implementation by the managers in the region.

Toward Integrated, Continuous Management. A central purpose of the Management Plan is to take the disparate threads of protection and regulation that currently apply to the Florida Keys' ecosystem and weave them into a fabric of integrated coastal management (ICM). ICM is not a new idea or concept; what is new is the notion of applying it in a comprehensive and continuous manner. ICM is a process that begins with direct participation of managers, planners, analysts, scientists, and a concerned public. Developing an integrated management approach does not take place quickly; it evolves over time, based on incremental gains that build upon one another.

A major component of the Management Plan is the consideration of water quality issues and problems. The FKNMSPA called upon the U.S. Environmental Protection Agency and the State of Florida to develop a comprehensive water quality protection program for the Sanctuary. NOAA has incorporated this protection program into the Management Plan as the Water Quality Action Plan found in this volume.

Overview of the Public Review Process

The Draft Management Plan and Environmental Impact Statement (DMP/EIS) for the Florida Keys National Marine Sanctuary was released to the public at a Sanctuary Advisory Council meeting on April 4, 1995. This initiated a nine-month public review of the draft plan that ended December 31, 1995. During this review period, Sanctuary staff facilitated the public's review of the plan in a variety of ways that were designed to maximize the public's full understanding of the components and contents of the draft plan.

The nine month public review process included the following opportunities:

- *Sanctuary Advisory Council Preview*. On April 4, the draft plan was released in a public meeting. At this meeting, each of the authors of the Action Plans contained in the Preferred Alternative (Volume I) gave a verbal summary of the contents of the Action Plans. This day-long, detailed preview, initiated the public's review of the draft plan and served to introduce and familiarize the public with the plan.

- *Info-Expos*. The Sanctuary staff held two series of three-day-long Info-Expos in April and May of 1995 and October 1995. The Info-Expos were held in the Upper, Middle, and Lower Keys. They were set up like a trade show and individual tables served as information booths manned by Sanctuary staff, Sanctuary Advisory Council members, Core Group members, and a Spanish interpreter. The Info-Expo staff passed out materials and answered the public's questions about the draft plan. Each of the booths represented a specific theme such as water quality, fishing, boating, zoning, etc. Additionally, staff distributed copies of the draft plan to the public if they had not received one by mail.

- *Working Groups*. In June 1995, the Sanctuary Advisory Council established 10 Working Groups, one for each action plan, to assist in the public review of the draft plan. The SAC appointed a Chairperson for each of the Working Groups and other SAC members were encouraged to sign up to participate in the Working Groups that they were interested in monitoring.

  In August 1995, the Sanctuary Staff gave the Working Groups a briefing outlining the purpose, objectives, and ground rules for the Working Group's public review of the draft plan. The purpose of the Working Groups was to broaden the public's review of the draft plan in order to get the best and most comprehensive review possible. An objective of the process was to help the SAC formulate their comments on the draft plan. The ground rules were: that membership on the Working Groups was open and the public was encouraged to sign up and participate; no voting (strive for consensus, but record both sides when split); all suggestions were to be recorded; the Working Group meetings were to be held in different parts of the Keys; and Sanctuary staff were to serve in a support role.

  Each of the Working Groups held multiple meetings in various parts of the Keys. The public was given enormous opportunity to provide their input on the draft plan.

- *Public Hearings*. There were six public hearings held on the draft plan. The hearings were held in Miami, Key Largo, Marathon, Key West, St. Petersburg, and Silver Spring, Maryland. The Sanctuary Advisory Council was encouraged to attend as many of the meetings as possible in order to help the SAC further develop their comments on the draft plan. This made it possible for the SAC to take full advantage of the public's comments in their deliberations on the draft plan in November and December.

As a result of the public review process, NOAA received over 6,400 statements of public comment on the draft management plan and environmental impact statement. Clearly, the use of the Sanctuary Advisory Council Working Groups assisted the advisory council in the development of their comments on the draft plan. As a result of their review process, the input at public hearings, and written public comments, NOAA has been able to develop a Final Management Plan that reflects a broad range of public comments.

The Environmental Impact Statement Process

The National Environmental Policy Act of 1969 (NEPA) requires any Federal agency proposing a major action that significantly affects the quality of the human environment to develop an environmental impact statement that describes both the positive and negative impacts that may result from implementation. Accordingly, an EIS has been drafted to accompany the Management Plan, and both have gone through a public review and comment process prior to adoption in this Final Plan. The Draft EIS evaluated a range of reasonable alternative approaches to Sanctuary management. These alternatives are presented in Volume II to facilitate analysis of their effects. The Preferred Alternative for Sanctuary management is presented based on NOAA's analysis of its impacts and the public comments.

Contents of Volume I

This volume includes a summary of the Preferred Alternative, and a discussion of the final management plan. It consists of the following chapters: 1) the Preferred Alternative/Management Plan; and 2) Action Plans. Brief descriptions of these chapters follow.

The Preferred Alternative/Management Plan. This chapter includes a summary of the Preferred Alternative, and a discussion of the Final Management Plan. This is followed by a discussion of Plan implementation under the "continuous management process." The administrative framework for management, and a review of potential alternative funding sources, are also part of this chapter.

Action Plans. This chapter includes complete discussion of 10 action plans that provide the operational details for implementing the Management Plan. Each action plan is composed of a bundle of strategies sharing common management objectives, and presents the initial outline of the steps required for plan implementation. More specifically, the action plans provide an organized structure and process for implementing management strategies, including a description of the activities required, institutions involved, and requirements necessary for either complete or partial implementation.

The Research and Monitoring and Water Quality action plans each address requirements mandated in the FKNMSPA. Education and volunteer programs have been established to make the public a participant in protecting Sanctuary resources. The Enforcement, Channel/Reef Marking, Mooring Buoy, Submerged Cultural Resources, and Zoning action plans outline specific actions that will be taken to protect Sanctuary resources. The Regulatory Action Plan includes the regulations for the Sanctuary, and explains how management strategies have been incorporated into these regulations.

The Preferred Alternative/Management Plan

Introduction

The National Marine Sanctuaries Act (NMSA) and the Florida Keys National Marine Sanctuary and Protection Act of 1990 (FKNMSPA) mandate the development of a comprehensive management plan that protects Sanctuary resources and facilitates Sanctuary uses that are compatible with the primary objective of resource protection. The management plan was developed consistent with the planning guidelines in the National Environmental Policy Act (NEPA). The environmental and socioeconomic consequences of various alternatives have been taken into consideration in developing the final comprehensive management plan for the Sanctuary. The Draft Preferred Alternative was described in Volume II of the DMP/EIS and was the focus of a nine month public review from April 4, 1995 through December 31, 1995. This section sets forth the Final Preferred Alternative, and the way in which it was developed, through consideration of the public comments, of the FKNMSPA, and of NEPA.

The environment and the economy of South Florida and the Florida Keys are directly linked. The nearly $2 billion dollar economy of the region is dependent on a healthy environment and without a healthy environment the economy would surely decline. For example, in the Florida Keys the non-market user value of water-based recreational activity was estimated in 1990 to be worth about $660 million per year to both the residents and tourists (Leeworthy et al. 1993). That value has continued to increase. Clearly, if the health of the environment in the Florida Keys continues to decline as has been identified in Florida Bay and along the coral reef tract, the economy of South Florida and specifically the Florida Keys will be adversely affected.

In the development of the DMP/EIS, NOAA took into consideration the consequences of not taking any management actions to protect the fragile natural environment of the Florida Keys versus establishing extremely conservative and protective measures that would protect the natural resources of the Florida Keys regardless of the economic impacts on the area. Clearly recognizing the direct ties between the environment and the economy of the Keys, NOAA has balanced these interests in the development of the management plan for the Sanctuary. This task has not been easy because of the wide range of competing and conflicting interests. Many of the more than four million visitors annually come here to just look, others come because it is the sport fishing capital of the world, or its the place you can drive to and dive a tropical coral reef and still be in the continental U.S. One commentor at the public hearings said he “has the same right to look at a grouper as the next guy has to spear it.” That point was even more clear when another commentor pointed out that “many people can photograph a fish, while only one can spear it.”

The trends of increasing population and visitors adding pressures on the resources of the Florida Keys continue to grow. Nobody can deny or dispute that fact. The Final Management Plan and Environmental Impact Statement (FMP/EIS) provides a balanced approach to managing the resources of the Florida Keys by identifying ways of keeping the pulse of the health of the environment and communicating those conditions to the public, while creating ways the public can continue to use and enjoy the Keys environment with the least amount of impact. Conditions are changing rapidly in South Florida and the Florida Keys, and we must be prepared.

During the lengthy public review process for the DMP/EIS, NOAA received over 6,414 written and verbal comments on the draft plan and has given those comments full consideration in developing the FMP/EIS. In addition, the Sanctuary Advisory Council commented on the draft plan. Those comments have been given considerable weight in the development of the Final Plan.

Development of the Management Alternatives

The environmental impacts of the alternatives, including the Preferred Alternative for the MP/EIS, are described in Volume II (pages 136-156). Through scoping meetings, workshops, and other public processes, NOAA narrowed the scope in the Draft EIS to five management alternatives ranging from I-V, and eliminated I and V early in the evaluation process because they would not adequately achieve the environmental and economic requirements of the NMSA and FKNMSPA, and other applicable Federal, State, and local laws.

Alternative I, the most restrictive, focused solely on resource protection, and would not allow for compatible uses of the Sanctuary. While it would have

positive environmental impacts, Alternative I would have significant negative and unacceptable socio-economic impacts, such as virtually closing down commercial and recreational fishing and prohibiting many other recreational uses.

Alternative V (no action), the least restrictive, would have negative environmental and socioeconomic impacts over the long term, and would not accomplish the resource protection goals of the NMSA and the FKNMSPA. Without the implementation of a management plan, continued environmental degradation would occur, which ultimately would lead to significant losses of revenue, jobs, and investments in the marine-based tourism, recreation, and commercial fishing industries of the Florida Keys. These impacts are not consistent with the FKNMSPA goal of resource protection and facilitation of compatible, multiple Sanctuary uses.

After considering the environmental and socioeconomic impacts of the three mid-range (Alternatives II-IV) management alternatives in the draft plan, NOAA proposed for public comment Alternative III as the Preferred Management Alternative to achieve the proper balance of resource protection and facilitation of compatible uses. The process used to select the Preferred Alternative included considering recommendations of the Sanctuary Advisory Council, the Interagency Core Group, and the public. It involved careful examination of the relative impacts of each alternative on the region's natural resources and human activities.

NOAA has revised the Preferred Alternative based on the public and agency comments received during the nine month review process. Therefore, this section of the management plan describes the Final Preferred Alternative for managing the Sanctuary and the environmental and socioeconomic consequences taken into consideration in the selection process.

Final Plan for Sanctuary Management

The Final Management Plan contained in this volume includes10 Action Plans addressing management strategies developed from the planning process and the public's review of the DMP/EIS. These strategies are listed by Action Plan in Table 1. These strategies are the most balanced approach to meeting the goals of the laws establishing the Florida Keys National Marine Sanctuary (FKNMS). They provide potential solutions to known problems, and should prevent new problems from arising. While NOAA is charged with producing a "comprehensive" plan to manage the Sanctuary, the plan sets forth high, medium, and low priority levels for strategies, and only a subset of the proposed actions can be implemented in the near future. The mechanisms which will be used to apply these strategies, and the process used to identify strategies to be applied in the future, are described in the Action Plans contained in this volume.

Descriptions of the strategies used to develop the Action Plans and Alternatives are located in Appendix H of Volume III. These strategies were evaluated and scrutinized throughout the development of the Management Plan. Many were modified to reflect concerns and issues that were not evident when the process began (e.g., Florida Bay water quality problems). Some strategies were changed to address specific problems that were raised by the public at Advisory Council meetings, while others have remained essentially the same as drafted at the Strategy Assessment Workshop held in February 1992. Upon consideration of the public comments on the DMP/EIS, further changes were made, resulting in the Final Management Plan.

The actions in this Final Plan represent the efforts of many groups and individuals. While NOAA is responsible for developing the Management Plan, it has treated the process for its development as a partnership with the State of Florida, and has also sought the participation of other Federal agencies, local government agencies, non-governmental organizations, resource users, and the public. All of these parties have contributed to the content of this Plan.

Appendix L contains the record of significant public comment on the DMP/EIS. Although public comment on the draft plan was abundant and came from diverse sources, the issues and specific areas of concern were fairly narrow and focused in scope. The summary of comments and responses in Appendix L sets forth the significant concerns and explains how they are addressed in the Final Plan. The action plans that received the most abundant comment, resulting in the most revisions were: the education and outreach, regulatory, research and monitoring, submerged cultural resources, water quality, and zoning plans.

The issues that received the majority of public comment were: the operation of personal watercraft; marine zoning; certain proposed regulations; water quality; Sanctuary authority; and the draft Designation Document (Appendix K), containing a draft

Table 1. *Management Strategies by Action Plan*

Channel/Reef Marking			
B.1 Boat Access			
B.4 Channel/Reef Marking			
Education			
E.1 Printed Materials	E.4 Training/Workshops/Schools	E.7 Promotional/Educational Materials	E.12 Professional Development
E.2 Audio-Visual Materials	E.5 PSAs	E.10 Public Forum	
E.3 Signs/Displays/Exhibits	E.6 Advisory Board	E.11 Special Events	
Enforcement			
B. 6 Additional Enforcement			
B.12 Cross-deputization			
Mooring Buoy			
B.1 Boat Access	B.15 Mooring Buoy Management		
Regulatory			
B.4 Channel/Reef Marking	F.1 Consistent Fishing Regulations	L.14 Dredging Prohibition	Z.1 Wildlife Management Zones
B.7 Pollution Discharges	F.4 Aquaculture Alternatives	L.15 Dredging Regulation	Z.2 Ecological Reserves
B.11 Special-use Permits	F.7 Artificial Reefs	R.1 SCR Management	Z.3 Sanctuary Preservation Areas
B.13 Salvaging/Towing	F.8 Exotic Species	R.7 Coral Touching	Z.4 Existing Management Areas
B.17 Vessel Operations/ PWC Management	F.11 Gear/Method Impacts		Z.5 Special-use Areas
	F.14 Spearfishing		
Research and Monitoring			
B.2 Habitat Restoration	F.10 Bycatch	W.18 Pesticide Research	W.32 Technical Advisory Committee
B.11 National Marine Sanctuary Permits	F.11 Gear/Method Impacts	W.20 Monitoring	W.33 Ecological Monitoring
F.3 Stocking	F.14 Spearfishing	W.21 Predictive Models	Z.2 Ecological Reserves
F.4 Aquaculture Alternatives	F.15 Sponge Harvest	W.24 Florida Bay Influence	Z.3 Sanctuary Preservation Areas
F.6 Fisheries Sampling	R.5 Carrying Capacity	W.28 Regional Database	Z.5 Special-use Areas
F.7 Artificial Reefs	W 5 Water Quality Standards	W.29 Dissemination of Findings	
Submerged Cultural Resources			
R.1 SCR Management			
Volunteer			
B.1 Boat Access	E.1 Printed Materials	E.10 Public Forum	R.2 Recreation Survey
B.2 Habitat Restoration	E.2 Audio-Visual Materials	E.11 Special Events	W.20 WQ Monitoring
B.3 Derelict Vessels	E.3 Signs/Displays/Exhibits	F.7 Artificial Reefs	W.33 Ecological Monitoring
B.4 Channel/Reef Marking	E.4 Training/Workshops/Schools	F.9 Gear Removal	
B.9 Visitor Registration	E.5 PSAs	F.11 Gear/Method Impacts	
B.10 Damage Assessment	E.7 Promotional/Educational Materials	R.1 SCR Management	
Water Quality			
B.7 Pollution Discharges	W.4 Wastewater Disposal, Key West	W.15 HAZMAT Response	W.28 Regional Database
E.4 Training/Workshops/Schools	W.5 Water Quality Standards	W.16 Spill Reporting	W.29 Dissemination of Findings
L.1 Marina Pumpout	W.6 NPDES Program Delegation	W.17 Mosquito Spraying	W.32 Technical Advisory Committee
L.2 Marina Siting & Design	W.7 Res. Monitoring of Sfc. Discharge	W.18 Pesticide Research	W.33 Ecological Monitoring
L.3 Marina Operations	W.8 OSDS Permitting	W.19 Florida Bay Freshwater Flow	Z.5 Special-use Areas
L.6 Mobile Pumpout	W.9 Laboratory Facilities	W.20 Monitoring	
L.7 SWD Problem Sites	W.10 Canal WQ	W.21 Predictive Models	
L.10 HAZMAT Handling	W.11 Stormwater Retrofitting	W.22 Wastewater Pollutants	
W.1 OSDS Demonstration Project	W.12 Stormwater Permitting	W.23 Special Studies	
W.2 AWT Demonstration Project	W.13 Stormwater Management	W.24 Florida Bay Influence	
W.3 Wastewater Mangmt. Systems	W.14 Best Management Practices		
Zoning			
Z.1 Wildlife Management Areas	Z.3 Sanctuary Preservation Areas	Z.5 Special-use Areas	
Z.2 Ecological Reserves	Z.4 Existing Management Areas		
No Plan			
B.8 User Fees	L.8 Containment Options	L.18 Wetland Dredge and Fill	W.31 Global Change
B.10 Dock Permitting	L.9 SWD Policy Compliance	L.19 Growth Impacts	
F.5 Limited Entry	L.11 HAZMAT License	L.20 Public Access	
F.12 Finfish Traps	L.12 HAZMAT Collection	W.25 WQ Impact Research	
L.4 RV Pumpout	L.16 Water-use Reduction	W.26 Indicators	
L.5 RV Waste Reduction	L.17 Dredge and Fill Authority	W.27 Other Monitoring Tools	

Abbreviations: Mangmt., Management; Res., Resource; Sfc. Surface.

Note: Strategies may appear in more than one action plan.

scope of potential regulations. For example, of the 6,400 written comments received on the draft plan, over 50% addressed the operation of personal watercraft within the Sanctuary. Another 10% of the comments addressed the proposed Key Largo Replenishment Reserve in the draft marine zoning plan contained in the DMP/EIS.

The final preferred alternative reflects changes based on public comment and the recommendations from the Sanctuary Advisory Council and therefore differs from the draft preferred alternative. The significant differences in each of the 10 action plans are described below as well as their environmental and socioeconomic impacts. The most significant changes occur in the regulatory, zoning, and submerged cultural resources action plans with additional changes occurring in the rest of the action plans.

Summary by Action Plans

Channel/Reef Marking Action Plan

The Channel/Reef Marking Action Plan establishes an important management tool to identify areas that need channel markers and reef warning markers, and a process to select, install and maintain an effective channel/reef marking system for boaters Sanctuary-wide. It is well known that wide scale damage to shallow water marine resources, particularly seagrass beds and coral reefs, has occurred throughout the Florida Keys due to careless operation of vessels. Thousands of acres of seagrass have been impacted by propeller scars and significant coral reef formations have been destroyed from direct contact by vessels. Analysis of the patterns of shallow water marine resource damage indicates that in many cases, these injuries could have been avoided through the appropriate placement of channel or reef warning markers to indicate the best route through shallow, sensitive areas.

This action plan identifies background data and analysis necessary to identify areas that would benefit from channel/reef marking, establishes the criteria that will be used in determining priorities of new channel/reef markers, creates a mechanism to recommend and install new channel/reef markers and evaluates the effectiveness or potential impact of channel marking projects. Much of the data and analysis component of the action plan has already been completed. The primary mechanism for the implementation of the activities identified in this action plan is the creation of a Channel/Reef Marking Working Group (CMWG), comprised of representatives from each of the major governmental entities involved with channel/reef marking as well as representatives of affected citizen and user groups.

The goal of additional channel/reef marking in well-defined and prioritized locations is to reduce the damage to shallow-water resources. However, careful monitoring must be carried out to evaluate the effectiveness of the Channel/Reef marking program to insure that the markers are having the desired result. Markers that are found to increase shallow-water resource damage by attracting additional boating activity will be removed.

The installation of a channel/reef marking system will have very positive environmental benefits by protecting the seagrass communities which serve as important nursery areas for significant recreational and commercial species of fish and shellfish. This action plan will also have a very positive socioeconomic benefit in that it will provide protection to some of the most significant resources of the Sanctuary that are necessary to support the recreational and commercial interests of the Keys. A Channel/Reef Marking Program will reduce the incidence of vessel groundings which should have a positive economic impact on boaters since significant costs associated with damage to private vessels will be avoided. The plan may have a slight negative economic impact on the towing/salvage industry due to the anticipated reduction in the number of vessel groundings, but an overall positive socioeconomic benefit to the area by protecting the marine resources from the type of impact.

Education and Outreach Action Plan

One of the primary mandates of the Florida Keys National Marine Sanctuary and Protection Act is to educate the public about the marine environment surrounding the Keys. The diverse habitats, resources, and unique setting of the Keys offers opportunities for the interpretation of marine subtropical and temperate environments. Education and outreach efforts are extremely important resource protection tools. By fostering a sense of stewardship, resource managers can involve the public in reaching the goal of a sustained and healthy environment.

The goal of the Education and Outreach Action Plan is to protect marine resources by promoting a holistic view of the Keys' ecosystem as an interrelated and interdependent system of habitats, and by encouraging and promoting a sense of stewardship regarding

the marine environment. By implementing these strategies adverse impacts on Sanctuary resources will be reduced.

Changes to this action plan included a name change: outreach was added. Commentors recognized the importance of public outreach in an area where there is such heavy use of the resources by local residents and by vast numbers of tourists. Clearly, the education of the general public and user groups that must be reached in a very short time frame calls for the use of outreach strategies. In addition, a number of suggestions coming from the local education community have been integrated to better address learner outcome goals. Some comments suggested that products developed through this plan be multilingual when necessary and appropriate.

Other comments included increasing the priority of establishing a Sanctuary Advisory Board and the need for utilizing the existing network of educators and environmental education organizations and institutions already in place. NOAA has revised the document to reflect these comments.

The benefits of the Education and Outreach Action Plan are enormous. Fostering a sense of stewardship in a global community benefits all aspects of resource management, because an informed public is less likely to inflict negative impacts on the marine resources. Costs incurred for educational and outreach needs are nominal in the light of the exponential benefits of a skilled and knowledgeable public.

Enforcement Action Plan

Since 1980, the Sanctuary Enforcement Program in Florida has operated under a cooperative agreement with the State. In addition to enforcing local and state laws, Sanctuary enforcement officers possess the authority to enforce the National Marine Sanctuaries Act and other NOAA statutes that apply within the sanctuary. The State/Federal agreement on enforcement can be found in Appendix J of Volume III.

The goals of the Enforcement Action Plan are: (1) to protect sanctuary resources by increasing the public's understanding of the importance of sanctuary regulations, achieving voluntary compliance; and (2) promote public stewardship of the marine resources through interpretive enforcement.

Enforcement officers apply an "interpretive enforcement" strategy when patrolling waters or speaking to citizens. This approach seeks voluntary compliance with sanctuary regulations by educating users about regulations, why they should comply, and how they can comply. Reaching out to the sanctuary community through educational messages and literature reduces the number of violations, and fosters a sense of stewardship among Sanctuary users.

Changes to the Enforcement Action Plan were made in response to comments received. General comments were also received which stated that NOAA would never be able to fund the number of enforcement officers necessary and thus funding should be geared more toward education. NOAA agrees that enforcement of existing and new regulations will be both a physical and fiscal challenge. In order to protect the natural resources and look after the safety of the visitors and themselves, it is expensive to put uniformed officers on the water with all the equipment they are required to have to accomplish their jobs. These limitations serve as good reminders as to why it is important to maximize on coordinating all the marine protection efforts of enforcement agencies in the Keys. This coordination and sharing of human and material resources will have a positive environmental benefit in that there will be better coordinated efforts directed at resource protection. An example is the status of the current enforcement program for the Sanctuary where the Sanctuary Officers are FDEP Florida Marine Patrol Officers that are cross-deputized to enforce both State and Federal regulations. This arrangement has saved on creating duplicate communications systems, training, administrative costs, etc. and has resulted in a cost savings to the public. There will also be other very positive socioeconomic benefits that will come from sharing of costly material resources between agencies rather than the continued purchase or replacement of these resources.

NOAA also agrees that it is important to invest financial resources into education as a critical component of the enforcement program. That is specifically why National Marine Sanctuaries rely heavily on all the various management programs such as those outlined in this management plan to achieve its goals. NOAA will continue to use an educational and interpretive approach to enforcement to protect the resources of the Sanctuary, as it has at Key Largo NMS for 20 years and Looe Key NMS for 15 years.

No less than eight different enforcement agencies have jurisdiction within the Sanctuary. The Enforcement Action Plan calls for expanded coordination among all these agencies through an enforcement task force and more comprehensive protection

through cross-deputization of the various agencies to support one another in resource protection. The direct benefits include improved resource protection, greater public support, and savings to the taxpayers.

Mooring Buoy Action Plan

Mooring buoys have been shown to be an effective management tool to minimize the damage to coral reefs and other sensitive marine resources resulting from careless and/or inappropriate anchoring practices. However, concerns have been raised recently that the improper use of mooring buoys may have the potential to negatively impact marine resources by attracting more boaters, divers, and fishermen than would have previously used the areas where they are placed. This plan will establish a methodology for identifying areas appropriate for locating mooring buoys and managing boating activities near coral reefs so that the negative impacts will be minimized.

In response to numerous public comments the third of three mooring buoy strategies (R.5: Carrying Capacity) has been deleted from the Mooring Buoy Action Plan. Although many commentors wrote about their concerns that the Keys had exceeded their carrying capacity for a healthy environment, others felt that mooring buoys were not necessarily the mechanism for limiting impacts until further research is complete. NOAA has agreed, and consistent with the SAC recommendations has moved the Carrying Capacity strategy into the Research and Monitoring Action Plan. There the impacts from use of the resources versus the changes due to water quality and environmental changes can be identified and addressed.

Mooring buoys are one of the most basic and cost effective mechanisms for reducing physical impacts in sensitive areas. Beginning in the early 1980's NOAA began installing mooring buoys on coral reefs to prevent anchor damage. This has had a very positive environmental benefit in that mooring buoys provide direct protection to living corals from the impact of anchors. The designation of the FKNMS is partially the result of Congress' recognition of the vulnerability of the coral reefs to direct impacts from human use such as anchor damage. The environmental benefits will be high, and the socioeconomic benefits will be positive, in that mooring buoys will prevent the continued degradation reefs are receiving from more and more boat anchors.

The amount of protection that corals receive from the use of mooring buoys far outweighs their financial cost. Additionally, as in the past the Sanctuary will encourage private and nonprofit mooring buoy maintenance programs. Sanctuary staff have trained various nonprofit groups such as *Reef Relief* in the techniques of mooring buoy installation and have assisted these groups in the installation of mooring buoys in their areas. This relationship has been very positive in protecting coral reefs, developing partnerships within the community, and serving as a way to get outside funding for this important means of resource protection.

Regulatory Action Plan

The Regulatory Action Plan is divided into two sections. One section discusses the strategies developed in the MP/EIS planning process that contain a regulatory component and the second contains the regulations. Public comments focused on the draft regulations contained in the second section. Therefore, this Final Management Plan and analysis is specific to the public comments made on the draft regulations.

Drawing upon 20 years of management experience in the Key Largo and Looe Key Sanctuaries, NOAA developed regulations that protect natural and historic resources. Along with education and research, regulations are an integral tool for managing human activities in National Marine Sanctuaries. This regulatory section is based on the revisions made to the draft plan resulting from the public review process. The regulations have been developed to comply with the goals and objectives set forth in the Florida Keys National Marine Sanctuary and Protection Act and the National Marine Sanctuaries Act. The FMP/EIS is also the result of a careful balancing of resource protection and compatible multiple uses.

In addition to establishing new regulations, NOAA intends to utilize, to the extent possible, existing regulations under Federal, State, and local laws that already regulate some portion of the actions called for in specific management strategies. Because coordination with existing authorities is an important component of comprehensive ecosystem management, the Sanctuary regulations will supplement, not replace, existing authorities.

The Final regulations address 19 of the 53 management strategies that have a regulatory component in the FMP/EIS. The other 34 strategies are either regulations that have already been established by another agency, or strategies that need scientific analysis before they can be implemented.

The regulatory action plan is intended to establish a comprehensive and coordinated regulatory program for the FKNMS to ensure the protection and use of Sanctuary resources in a manner that:

- complements existing regulatory authorities;
- facilitates all public and private uses of the Sanctuary that are consistent with the primary objective of resource protection;
- utilizes a system of temporal and geographic zoning to ensure effective site-specific resource protection and use management;
- ensures coordination and cooperation between Sanctuary management and other Federal, State, and local authorities with jurisdiction within or adjacent to the Sanctuary;
- achieves simplicity in the regulatory process and promotes ease of compliance with Sanctuary regulations;
- promotes mechanisms for making informed regulatory decisions based on the best available research and analysis, taking into account information about the environmental, economic, and social impacts of Sanctuary regulations; and
- complements coordination among appropriate Federal, State, and local authorities to enforce existing laws that fulfill Sanctuary goals.

There are a number of existing Federal and State conservation laws that either partially or entirely address some regulatory components of the various management strategies. NOAA's Final regulations supplement existing laws and regulations and avoid unnecessary duplication except in instances where agencies involved in the planning process specifically requested an overlap of Sanctuary regulations. Clearly, effective enforcement of relevant existing Federal, State, and local regulations will be important for maintaining the health of the Sanctuary.

Generally speaking, the suggested changes to the draft regulations are not substantial in scope and NOAA has made every attempt to address the significant concerns raised regarding the draft regulations. This section includes a description of the revisions to the draft regulations. Also included is a discussion of the expected environmental and socioeconomic consequences of the regulations established for the Sanctuary in this Final Management Plan. A longer discussion of the environmental consequences is contained in Volume II and an expanded discussion of the socioeconomic consequences for the regulations is contained in Appendix M, Volume III.

The Sanctuary regulations are found in the Regulatory Action Plan (Volume I) Part 922, Subpart P - Florida Keys National Marine Sanctuary. It is important to note that the regulations are divided into sections based on their specific intent. The Prohibited Activities section is divided into two sections: (1) Prohibited activities - Sanctuary-wide; and (2) Additional activity regulations by Sanctuary area (zone). The Sanctuary-wide prohibitions include regulations that prohibit, restrict, or manage: oil drilling; injury or removal of coral or live rock; alteration or construction on the seabed; discharging materials such as pollutants; operation of vessels; diving without a flag; release of exotic species; tampering with markers; removing or injuring Sanctuary historical resources; taking or possessing protected wildlife; possession or use of explosives or electrical charges; interfering with law enforcement officers; and adoption of the state regulations on tropical fish and marinelife collecting throughout the Sanctuary. The second Prohibited Activities section are regulations that specifically address management needs for each area type. These regulations are especially useful in focusing management actions in geographically concentrated areas which will be environmentally beneficial in these areas. By concentrating the regulations in zoned areas the broader socioeconomic consequences on any user group will be lessened or eliminated. For example, during the 1991 scoping hearings for the Sanctuary, members of the public expressed a broad range of concerns about spearfishing. Some wanted spearfishing prohibited throughout the Sanctuary, while others wanted no restrictions on spearfishing. The no-take Sanctuary zones help balance these concerns. By prohibiting spearfishing in the heavily used areas of the coral reef, NOAA will provide environmental protection from this activity and there will be positive environmental benefits. However, by allowing spearfishing in the other parts of the coral reef that experience fewer users, the socioeconomic consequences will be lessened by using the zoning concept.

The following are specific changes to the draft regulations that appeared in the DMP/EIS. As part of the Administration's regulatory streamlining, technical changes to the format of the Sanctuary regulations have been made to incorporate the draft FKNMS regulations into 15 CFR Part 922 (National

Marine Sanctuary Program Regulations), as opposed to the FKNMS regulations standing alone in Part 929. Sections 922.3, 922.42, 922.45, 922.46 and 922.50 are found in Subparts A and E of 15 CFR Part 922 and apply to all sanctuaries and are very similar to provision of the draft FKNMS regulations. Sections 922.160, 922.161, 922.162, 922.163, 922.164, 922.165, 922.166, 922.167, and 922.168 are sections applicable only to the FKNMS and will appear in a new Subpart P to 15 CFR 922.

§ 929.1 Purpose (Now § 922.160). (No other Change)

§ 929.2 Boundary (Now § 922.161). (No other Change)

§ 929.3 Definitions (Now § 922.3 - Definitions applicable to all National Marine Sanctuaries; and § 922.162 - Definitions applicable to the Florida Keys National Marine Sanctuary only). (Revised)

The definitions in this section have been separated into those definitions applicable to all National Marine Sanctuaries (§ 922.3), including the Florida Keys National Marine Sanctuary, and those definitions applicable only to the Florida Keys National Marine Sanctuary (§ 922.162).

New definitions including those for corals, coral areas, coral reefs, hardbottoms, and residential shorelines were added to the Final Management Plan. These revisions were made based on public comments and to clarify the applicability of the regulations. The revisions should have no additional adverse impacts on the environment or Sanctuary users.

§ 929.4 (Now § 922.42) Allowed activities. (This section was revised based on recommendations from the SAC and has been incorporated into the sanctuary program regulations of general applicability in 15 CFR Part 922, Subpart E)

§ 929.5 (Now § 922.163) Prohibited activities - Sanctuary Wide (Revisions Made)

There were some revisions to the Sanctuary-wide draft regulations based on the public review of the DMP/EIS. These changes were made in the operation of vessels section of the Sanctuary-wide prohibited activities. Anchoring on corals is a threat to the health of coral reefs in the Florida Keys. This is especially true in areas of concentrated vessel use. Mooring buoys have been installed on some heavily used reefs to prevent anchor damage (see Mooring Buoy Action Plan, Volume I). Commentors indicated that this was not a practical solution for all the areas where fishermen conduct their activities, especially over some of the deeper reef habitats. However, anchoring on corals can be addressed in some areas where the boat operators should be able to see the bottom. Visibility of the bottom is now an element of the prohibition.

Since prohibiting anchoring on corals throughout the Sanctuary would be overly-restrictive and would have serious socioeconomic impacts on users, NOAA proposed draft regulations that prohibited anchoring a vessel on coral, in depths less than 50 feet. Reviewers of the draft plan, including the SAC, said this was too restrictive, especially in the Lower Keys where visibility often prevents a boat operator from being able to see the bottom at such depths. This is not the case in much of the Upper Keys, but still applies on some days when low visibility occurs. There would be greater environmental benefits from having this protection in all waters shallower than 50 feet. However, this regulation would have serious socioeconomic consequences in areas that are used regularly by fishermen when they can't see the bottom.

In the Final Plan, NOAA has restricted anchoring a vessel on coral in depths less than 40 feet of water when visibility is such that corals on the seabed can be seen. This prohibition does not apply to anchoring on hardbottom. The SAC recommended this regulation in their comments to NOAA, while some groups requested the prohibition apply throughout the Sanctuary, and others wanted no prohibition at all. This alternative will have positive environmental benefits by preventing anchor damage to coral reefs, thus protecting these resources from a source of direct impact that can be prevented. The socioeconomic consequences of this restriction will not have any direct economic impact on the visitor, but the overall, long-term economic benefit to society from protecting these important resources from anchor damage will far outweigh any inconveniences of having people be careful when they are dropping their anchors.

Fifty one percent (51%) of the public comments on the DMP/EIS addressed the issue of personal watercraft (PWCs or jet skis). The majority of them requested that NOAA not single personal watercraft out in its final regulations. Many of the public comments reminded NOAA that personal watercraft owners and users should act responsibly. Others asked that NOAA severely restrict, or even prohibit the operation of personal watercraft within the

Sanctuary. NOAA also received comments noting frequent environmental nuisance and safety issues associated with the operation of personal water craft. These included: reckless operating behavior, harassment of endangered and other species, harassment of other boaters (including disruption of fishing on flats), and noisy operation in canals and adjacent to residential shorelines. These commentors requested limiting and restricting or banning the use of personal water craft within the Sanctuary.

NOAA has developed a multi-prong approach to address the public's concern about the use of personal water craft. NOAA has accepted the SAC's recommendation to add a new section to the final regulations which prohibits reckless operation of watercraft. Additionally, Section 929. 5 (a)(5) (now § 922.163 (a)(5)) has been modified to prohibit operating a vessel at greater than idle speed only/no wake within 100 yards from residential shorelines, stationary vessels (except in marked channels) and navigational aids marking emerging or shallow reefs. NOAA has also incorporated into its regulations the ability to address negligent behavior and the authority to enforce all idle-speed only/no wake zones established throughout the Sanctuary. NOAA will use the existing county and State process for designating these zones and it is likely that these areas will be used to restrict personal watercraft in certain residential and other areas where they continue to be a nuisance or safety problem. The industry has indicated it is seriously committed to "self regulation" and is willing to work with NOAA to develop successful educational efforts geared toward changing user behavior. In particular, the PWC industry agreed to work with Sanctuary staff to establish criteria for the management of commercial PWC rental operations. The final component of NOAA's approach to PWC's is a modification of the SAC's recommendations . If initial efforts are not successful at significantly reducing or eliminating the nuisance and safety problems, NOAA will consider implementing broad zoning restrictions consistent with SAC recommendations. Such zoning has been successfully implemented in the Monterey Bay National Marine Sanctuary.

Based on its review of the public comments and consideration of the SAC recommendations, NOAA has established a series of regulations that address the operation of all vessels, including personal watercraft.

In the DMP/EIS, NOAA did not single out PWCs because other vessels used inappropriately also could impact the resources and users of the Sanctuary. Instead, NOAA proposed prohibiting the operation of all vessels at a speed greater than idle speed only/ no-wake within a residential canal, within 100 yards of the red and white "divers down" flag (or the blue and white "alpha" flag in Federal waters), or within 200 yards of:

- residential shorelines,
- mangrove fringed islands,
- stationary vessels, or
- signs indicating emergent or shallow reefs.

NOAA received considerable public comment on this draft regulation designed largely to address user conflicts and impacts to Sanctuary resources. A large number of commentors felt the 200 yard distance was impractical, especially in the Lower Keys where there are many islands with less than 400 yards between them and this restriction would create a burden. Boat operators would in some instances be forced to motor long distances at idle speed. This could potentially have adverse environmental impacts, especially in areas where it would be too shallow for conventional propeller driven boats to motor without remaining on a plane. There are many areas in the Lower Keys that will not be marked with channel markers, yet boaters need to transit through them. This restriction would have socioeconomic impacts on users and little environmental benefit. NOAA agrees and has made the following revisions in the Final Plan. The final regulation will prohibit operating a vessel at a speed greater than idle speed only/no-wake, except in marked channels and other less restrictive marked areas:

- in areas designated idle speed only/no wake zones;
- within 100 yards of navigational aides indicating emergent or shallow reefs (international diamond warning symbol);
- within 100 feet of the red and white "divers down" flag (or the blue and white "alpha" flag in Federal waters);
- within 100 yards of residential shorelines; or
- within 100 yards of stationary vessels.

In developing this final regulation, NOAA considered the existing regulations in the USFWS Refuges in the Lower Keys regarding the operation of vessels near

sensitive mangrove islands and their regulation that prohibits PWCs in some areas. The zoning (WMAs) regulations address the operation of vessels and PWCs in the Lower Keys Refuges. Therefore, the regulations on operation of vessels within 100 yards of residential shorelines and stationary vessels is considered to address resource impacts and user conflicts. Since mangrove fringed islands are no longer included in the final regulations, the geographical orientation of the Lower Keys with narrow passes between islands will not create a burden on users who need to transit long distances to the Gulf. Considering that 19 of the Wildlife Management Areas fall within this Lower Keys Region, where vessel access and operation are already managed, NOAA feels that complementing the USFWS regulations in the WMAs will have positive environmental benefit and low socioeconomic losses.

Additional regulations on the operation of vessels will include: (1) a prohibition on operating a vessel in such a manner as to injure, take or cause disturbance to wading, roosting, or nesting birds, or marine mammals; and (2) operating a vessel in a manner which unreasonably or unnecessarily endangers life, limb, marine resources, or property, including but not limited to, weaving through congested vessel traffic, jumping the wake of another vessel unreasonably or unnecessarily close to such other vessel or when visibility around such other vessel is obstructed, or waiting until the last possible moment to avoid a collision. These regulations will have positive environmental benefits and the socioeconomic impacts will be high if some action is not taken to manage operation of vessels.

The final regulations on the operation of vessels will have strong environmental benefits by preventing the harassment and disturbance of wildlife in the Sanctuary. This is particularly true along mangrove fringed shorelines and in shallow nearshore habitats. Here vessels operated too close to the mangroves cause the flushing of nesting birds, leaving their eggs exposed to extreme temperatures with resultant loss of the clutch of eggs. This unnecessary impact will be lessened by the regulations. NOAA feels this approach to regulating the operation of all vessels will have the least amount of socioeconomic consequences on any one user group with the greatest environmental benefits directed at protecting the wildlife resources of the Florida Keys.

§ 929.6 (now § 922.164) Additional Activity Regulations by Sanctuary area. (Revisions Made)

The regulations in the Final Management Plan for the zones primarily changed in geographical extent and number of specific zones, as opposed to the specific regulations within the different zones. Those changes are described in detail in the discussion of the Final Zoning Action Plan later in this volume. The environmental consequences and the socioeconomic benefits of each of the zones are discussed in the Zoning Action Plan description of this chapter. These topics are also discussed more extensively in Volume III, Appendix M.

In the Final Management Plan the following regulated activities are those that were revised for the Ecological Reserves and the Sanctuary Preservation Areas as a result of public comment, including comments from the SAC:

- Possessing, moving, harvesting, removing, taking, damaging, disturbing, breaking, cutting, spearing, or otherwise injuring any coral, marine invertebrate, fish, bottom formation, algae, seagrass or other living or dead organism, including shells, or attempting any of these activities. However, fish, invertebrates, and marine plants may be possessed aboard a vessel in an Ecological Reserve or Sanctuary Preservation Area, provided such resources can be shown not to have been harvested within, removed from, or taken within, the Ecological Reserve or Sanctuary Preservation Area, as applicable, by being stowed in a cabin, locker, or similar storage area prior to entering and during transit through such reserves or areas.

- Except for catch and release fishing by trolling in the Conch Reef, Alligator Reef, Sombrero Reef, and Sand Key SPAs, fishing by any means. However, gear capable of harvesting fish may be aboard a vessel in an Ecological Reserve or Sanctuary Preservation Area, provided such gear is not available for immediate use when entering and during transit through such Ecological Reserve or Sanctuary Preservation Area, and no presumption of fishing activity shall be drawn therefrom.

These revisions to the draft regulations are based on considerable public comment and are intended to lessen the socioeconomic impact on fishermen who need to transit these zones with their catch and fishing gear. Allowing this exception will not result in any additional environmental consequences.

In regards to allowing catch and release fishing by trolling in some Sanctuary Preservation Areas (SPA) and allowing baitfishing by net for ballyhoo in all SPAs, NOAA has attempted to lessen the socioeconomic impact of the proposed regulations with limited environmental consequences. These actions were supported by the SAC's comments on the DMP/EIS and address comments from the public, particularly fishermen and related bait businesses.

The Preferred Alternative in the DMP/EIS did not allow any catch and release fishing in the SPAs. During the public review of the draft plan NOAA received considerable public comment about this issue. Many commented that NOAA should allow catch and release fishing while other commentors raised concern about the environmental impact from the activity of catching and then releasing fish. Although estimates vary about the percentage of mortality of fish caught and released, NOAA has considered the SAC's recommendation to allow catch and release fishing in "specified SPAs." NOAA further looked at aerial census data (1994, FDEP and TNC work in progress) and considered the public comment on the draft plan and selected four SPAs to leave open to catch and release fishing by trolling. This will give NOAA areas to compare and contrast this activity between areas where catch and release fishing is allowed and not allowed in order to determine its short and long-range impact. Conch Reef, Alligator Reef, Sombrero Key, and Sand Key were selected partially on aerial census data and information gathered from the public comments. NOAA feels this allowed activity will have some adverse environmental impacts, but determined the socioeconomic benefits gained by the charterboat operators will outweigh the environmental loss while this activity is being assessed. Presently, the charterboat operators rely on the shallow reefs to provide fishing action when conditions are such that the boats can't operate offshore, or when other pelagic species of fish are not running. By allowing this activity, this socioeconomic impact will be lessened.

In the DMP/EIS NOAA prohibited baitfishing in SPAs, through the overall prohibition against taking anything in these areas. However, during the public comment process NOAA gained considerable knowledge about this activity and the importance of the SPAs for providing live bait for offshore, pelagic fishing. The recreational charter fishing industry relies heavily on its access to live bait along the coral reef tract when pelagic species of fish are migrating through the Keys. There was considerable public comment requesting NOAA allow the harvest of ballyhoo by nets in the SPAs. During the review process NOAA staff accompanied fishermen on the water for a firsthand look at ballyhoo fishing activity. Consequently, NOAA will allow ballyhoo fishing by net in the SPAs. The activity will be permitted with a no-cost, locally issued permit that fishermen can obtain at one of the Sanctuary offices. Due to the high migratory nature of baitfish across the SPAs, NOAA feels this harvesting activity will have low environmental impact on the resources and it will have high socioeconomic benefits associated with it.

There was some public concern about the ability of the Director or his designee to close SPAs to public access for a period of time. This issue was raised by the SAC and the general public as one that could have serious socioeconomic impacts on their activities. In public comments, there was a general request to establish some kind of time limit or process to close areas to public access for emergency reasons. NOAA has agreed and has revised the regulation to read as follows:

The Director will provide public notice of the restriction by publishing a notice in the Federal Register, and by such other means as the Director may deem appropriate. The Director may only restrict access to an area for a period of 60 days, with one additional 60 day renewal. The Director may restrict access to an area for a longer period pursuant to a notice and opportunity for public comment rulemaking under the Administrative Procedure Act. Such restriction will be kept to the minimum amount of area necessary to achieve the purposes thereof. In addition, the draft Co-Trustee Agreement with Florida has been modified so that the State is consulted prior to such designations, and the Governor has the authority to re-open temporary closures in State waters.

§ 929.7 (Now § 922.165) Emergency Regulations. (Revisions Made)

There was some public concern about the ability of the Director or his designee to establish emergency regulations which could affect access or activities. This issue was raised by the SAC and the general public as one that could have serious socioeconomic impacts on their activities. In public comments, there was a general request to establish some kind of time limit or process to close areas to public access for emergency reasons. NOAA has agreed and has revised the regulation to read as follows:

Any such temporary [emergency] regulation may be in effect for up to 60 days, with one 60-day extension. Additional or extended action will require notice

and comment rulemaking under the Administrative Procedure Act, notice in local newspapers, Notice to Mariners, and press releases.

§ 929.8 (Now § 922.45) Penalties. (This section is substantively the same as that in the draft, but has been incorporated into the sanctuary program regulations of general applicability at 15 CFR Part 922, Subpart E)

There was some public comment, including comment from the SAC, requesting that NOAA publish a penalty schedule for the Sanctuary in the Final Plan. The issue that prompted this request by the public and the SAC was NOAA's authority to collect $100,000 per day per infraction. There was a misunderstanding in some public comments that this would be the amount NOAA would seek for each infraction. NOAA has encouraged the public and SAC to review the penalty schedule established for the Key Largo and Looe Key NMS as a general reference for the approximate level of penalties applied historically in those Sanctuaries. NOAA's Office of General Counsel will develop a penalty schedule for the Sanctuary and it will be available to the public.

Penalties for regulations established under the NMSA are created under civil law and therefore differ from some those established under other Federal/ State jurisdictions within the Sanctuary. This will have both positive environmental benefits and overall positive socioeconomic benefits for the Sanctuary. The resources of the Sanctuary will receive a greater level of protection by providing civil authority to other agencies through cross-deputization. Enforcement of regulations is best facilitated by agencies cross deputizing to enforce civil penalties.

Civil authority and coordinated enforcement under the NMSA have positive socioeconomic impacts on society in general in that there are cost savings to the public when agencies can share authorities and combine human and material resources. The Sanctuary regulations provide supplemental civil penalty options. In some cases, civil may be more appropriate than criminal. In some cases, use of both civil and criminal may be appropriate. The resources can be better protected when there are more options for individuals enforcing the regulations. This, in turn, should lead to greater environmental and socioeconomic benefits.

Civil authority lends itself more freely to an educational and interpretive approach to enforcement of regulations in National Marine Sanctuaries. Simply the message that something is a Sanctuary violation is all that is needed to gain compliance of the vast majority of Sanctuary users.

§ 929.10 (Now § 922.166) National Marine Sanctuary Permits - Application Procedures And Issuance Criteria. (Revisions Made)

Permits are required in National Marine Sanctuaries for conducting activities that are prohibited by sanctuary regulations. NOAA has worked with the State of Florida to identify specific areas for permits that would be certified and authorized for the conduct of activities that would normally be prohibited within the Sanctuary. In an effort to reduce the burden of permitting, NOAA has also identified other agencies with whom to coordinate permitting activities. For example, regarding placement of artificial reefs, NOAA reviews and consults with the USACE on permitting of this activity within the Sanctuary. The Sanctuary is particularly concerned with site selection. Its other concerns are largely addressed by strict compliance with the NMFS/USACE Artificial Reef Plan. Similarly, in regards to "live rock" aquaculture sites, the Sanctuary reviews and consults with the NMFS permitting process for these activities. NOAA is establishing a permitting system that maximizes use of existing systems and therefore is not expected to have a significant incremental socioeconomic impact on the public.

In addition to permits for research, education, salvage and recovery operations, and management, a Sanctuary general permit may now also be issued for an activity that otherwise furthers Sanctuary purposes, including facilitating multiples use of the Sanctuary, to the extent compatible with the primary objective of resource protection. To increase resource protection, factors in the draft permit regulations that the Director considers in determining whether to issue a permit are now findings the Director must make in order to issue a Sanctuary permit. Further, the required findings will ensure applications for Sanctuary permits to conduct otherwise prohibited activities will be evaluated equitably because the Director must address all the factors listed in the regulations in making the required findings.

Sections 929.11 and 929.12, pertaining to Sanctuary Historical Resources permits and Special-use Permits, respectively, have been incorporated into § 922.166 so there is only one permit section addressing all types of Sanctuary permits. The deaccession/transfer of public historical resources to private permittees will be done through a Special-use Permit.

§ 929.11 National Marine Sanctuary Historical Resources Permits - Survey/Inventory, Research/ Recovery, Deaccession/Transfer - Application Procedures And Issuance Criteria. (Revisions Made)

The SCR permit system manages all activities which may impact SCRs. The regulations prohibit the removal or injury of Sanctuary historical resources. There are three types of permits which may be issued under this section, Survey/Inventory, Research/Recovery, and a Special-use Permit for Deaccession/Transfer.

In response to comments, this section was revised to make the permit management system more pragmatic from the perspective of the commercial salvors without compromising the primary objectives of protecting the submerged cultural resources.

After consultation with the State of Florida, NOAA deleted the regulatory provisions requiring a performance bond for all applicants. NOAA has also modified the regulations to clarify that other security instruments may be utilized in lieu of insurance policies. Additionally, NOAA modified regulatory language to clarify that the scope of coverage required is for "potential claims for damages to Sanctuary resources arising out of permitted activities" and to clarify that the amount of insurance or security should be reasonably equivalent with an estimated value of the Sanctuary resources in the vicinity of the permitted area and activities. These changes should make the requirement more flexible and thereby minimize some of the adverse socioeconomic consequences as compared to the draft plan.

This section has been incorporated into the Sanctuary permit section; § 922.166.

§ 929.12 Special-use permits. (This section has been incorporated into the Sanctuary permit section; § 922.166)

§ 929.13 Sanctuary Registry - Research Notice. (Deleted)

This section 929.13 was removed from the final regulations because the Sanctuary registry is voluntary and no regulation is necessary for its establishment.

§ 929.14 (Now § 922.167) Certification Of Preexisting Leases, Licenses, Permits, Approvals, Other Authorizations, Or Rights To Conduct A Prohibited Activity. (No Change)

§ 929.15 (Now § 922.168) Notification And Review Of Applications For Leases, Licenses, Permits, Approvals, Or Other Authorizations To Conduct A Prohibited Activity. (No Change)

§ 929.16 (Now § 922.50) Appeals Of Administrative Action. (This section has been incorporated into the sanctuary program regulations of general applicability at 15 CFR Part 922, Subpart E)

Research and Monitoring Action Plan

The main goal of the Research and Monitoring Action Plan is to provide the knowledge necessary for making informed decisions about protecting the Sanctuary resources. Research and monitoring is the essential first step in taking stock of the wealth represented in Sanctuary resources and planning for their conservation and use. It will do this by establishing an ecological monitoring program focusing on the no-take zones, disseminating scientific findings through a periodic report, permitting and coordinating research activities, investigating fisheries impacts, and establishing a research program on carrying capacity.

In response to public comments, minor changes were made to the Research and Monitoring Action Plan. Most public comments on the plan called for monitoring the no-take zones to determine their effectiveness. Research and monitoring of the zones was emphasized in the plan to accommodate this comment. The Sanctuary Advisory Council requested that the carrying capacity strategy be added to the plan which has been done. One State agency commented on the Strategy F.3 (moratorium on stocking) stating that it would curtail the State's ongoing queen conch stocking program. In response, the strategy was changed to call for permitting of all stocking programs.

The Research and Monitoring Action Plan in the Final Preferred Alternative will provide better scientific information in a more timely manner than was called for in the Draft Preferred Alternative; therefore, resource protection will be enhanced through more well-informed resource managers. Resource protection should be further enhanced by the permitting of research activities and the research on carrying capacity. A great many people utilize the Sanctuary resources for recreation as well as research; consequently, permitting prohibited activities will both accommodate multiple uses and minimize impacts to resources. Permitting procedures will create a minor burden in the way of paperwork for researchers and educators. Research on carrying capacity will help

reduce impacts to resources. In summary, the Research and Monitoring Action Plan will facilitate resource protection with minimal socioeconomic impacts on users.

Submerged Cultural Resources Action Plan

NOAA is committed to protecting and preserving the natural resources within its national marine sanctuaries, and is equally committed to its stewardship and trustee responsibilities for the historical resources in these areas. Such resources are defined as those "possessing historical, cultural, archaeological, or paleontological significance, including sites, structures, districts, and objects significantly associated with or representative of earlier people, cultures, and human activities and events" (15 CFR 922.2 (c)). In this action plan, the terms *historical resources , cultural resources,* and *submerged cultural resources (SCRs)* are used interchangeably. Within the nation's national marine sanctuaries, these resources include shipwrecks that are part of both U.S. and world history, as well as the remains of submerged prehistoric cultures.

The Sanctuary's submerged cultural resources encompass a broad historical range. Because of the Keys' strategic location on early European shipping routes, the area's shipwrecks reflect the history of the entire period of discovery and colonization. This richness of historical resources brings a corresponding responsibility for protecting resources of national and international interest. Accordingly, the resources should be managed for public benefit and enjoyment, while the historical-cultural heritage is preserved for the future. Long-term protection requires a precautionary approach to historical resource management, particularly when cultural information and/or the artifacts may be destroyed or lost intentionally or unintentionally through various direct and indirect activities. The Federal Archaeological Program or equivalent standards of conservation, cataloguing, display, curation, and publication must be assured before the excavation of historically significant resources is permitted. Such projects are expensive and labor-intensive, requiring specialists in the fields of archaeology, conservation, and museum work and historic shipwreck research and recovery. NOAA and the State will explore all public and private partnerships in fulfilling SCR management and will consider private sector implementation, if it is determined to be in the public's interest.

Sanctuary Goals. The Sanctuary has a trustee responsibility for protecting the cultural resources within its boundaries for current users and future generations. Because cultural resources are nonrenewable, decisions affecting these resources must be made with a precautionary approach, and only after careful and deliberate analyses of the potential consequences on long-term preservation.

The goals of the Florida Keys National Marine Sanctuary's Submerged Cultural Resources Program are to:

- gather sufficient information about the nature and extent of the area's cultural resources to allow managers to make informed decisions about resource protection and management;
- interpret the history and culture of the Keys for the public;
- allow/permit private-sector participation research, documentation, recovery, and curation of cultural resources; and
- to develop a community-based stewardship for cultural resources in the Sanctuary.

NOAA and the State of Florida carefully balanced the environmental and socioeconomic consequences of the management alternatives , including a no action alternative in developing a final SCR plan which is the final preferred alternative. This plan is also consistent with the resource protection and multiple use mandates in the National Marine Sanctuaries Act and the Abandoned Shipwreck Act (ASA). To protect SCRs, the regulations prohibit the removal or injury of Sanctuary historical resources. The environmental consequences should be positive for both SCRs and natural resources. There will be adverse socioeconomic impacts to commercial treasure salvage operators from this regulation. However, a SCR permit system has been established to minimize these impacts in a manner which is compatible with the primary objective of resource protection.

The SCR permit system manages all activities which may impact SCRs. The Programmatic SCR Agreement further details the management of SCRs to address the concerns of the National Historic Preservation Act, section 106. While "treasure hunting" in its traditional sense is not permitted in the Sanctuary, the SCR plan does provide for limited public and private sector recovery of certain objects consistent with the protection of natural and historical resource values and particularly the environmental integrity of the shipwrecks and sites. The plan's policy preference is it to preserve highly significant SCRs on site

within the Sanctuary and strictly regulate the recovery of SCRs to ensure that recovery is only permitted when determined to be in the public's interest and is done in an environmentally and archaeologically sound manner. To ensure positive environmental consequences, there will be no recovery permits issued in areas where there is coral, seagrass or other significant natural resources. However, to minimize the adverse socioeconomic impacts on commercial treasure salvors, private recovery of SCRs of low to moderate significance may be permitted in other areas of the Sanctuary which are relatively devoid of natural resources. Any SCR may be recovered if they are threatened or may otherwise be lost should they remain in the Sanctuary. In order to ensure positive environmental consequences, such recovery efforts will be strictly regulated and will require that any highly significant resources be preserved in a museum with public access consistent with the standards of the Federal Archaeological Program. In order to minimize the socioeconomic impacts to commercial treasure salvors, objects of low to moderate historic or archaeological significance may be deaccessioned or transferred for sale or other disposition.

The final plan ensures that there will be SCRs in the Sanctuary for research, education and recreational use. This should have positive environmental and socioeconomic consequences. See the environmental and socioeconomic impact analyses in Volume II and the OIRA analysis in Appendix M of Volume III.

To ensure positive environmental consequences, there is no commercial salvage permitted in the zoned areas and other areas of significant natural resources. To minimize adverse socioeconomic consequences, commercial salvage is permitted but to ensure positive environmental consequences, it is only permitted in areas relatively devoid of significant natural resources.

The permits for private recovery and deaccession/transfer only apply to abandoned vessels. As a trustee for such resources, NOAA will continue to respect the interests of the owners of the vessels and the sovereigns that represent those interests consistent with domestic and international law. Sunken warships and other public vessels entitled to sovereign immunity, regardless of location, remain the property of the nation to which they belonged at the time of sinking, unless that nation has taken formal action to abandon them or to transfer title to another party. It is a long-standing Navy policy that it does not abandon its public vessels. Therefore, no permits will be issued for the private recovery of Navy vessels without the express written permission of the Navy. In considering permits for the private recovery of other vessels entitled to sovereign immunity, NOAA may require the express permission of the appropriate sovereign representatives, or otherwise consider their interests in the vessel and its recovery.

In order to avoid adverse environmental consequences, commercial treasure salvage is strictly regulated to prevent harm to natural resources from various commercial treasure salvage methodologies, including "mail-boxing" (propeller dredging device).

Pursuant to consultation with the State of Florida, NOAA agreed to delete the regulatory provisions requiring a performance bond for all applicants. While the removal of this regulatory requirement should reduce the costs for meeting the permit criteria for most applicants, such performance bond may still be reasonable and appropriate in certain cases where applicants have not finished projects or have difficulty demonstrating their financial ability to complete the proposed project. In such cases, there will be socioeconomic costs involved in getting the bond.

The general liability insurance is a statutory requirement under Section 310 of the NMSA. However, commentors indicated that insurance companies were not providing policies for such coverage. NOAA has modified the regulatory provision in the final regulations to clarify that other security instruments may be utilized in lieu of an insurance policy so the requirement is more flexible. In addition, NOAA modified regulatory language to clarify that the scope of coverage required is for "potential claims for destruction, loss, or injury to Sanctuary resources arising out of permitted activities" and to clarify that the amount of insurance or security should be reasonably equivalent with an estimated value of the Sanctuary resources in the vicinity of the permitted area and activities. These changes should make the requirement more flexible and thereby minimize some of the adverse socioeconomic consequences as compared to the draft plan.

With regard to the requirement that SCRs be publicly displayed, NOAA did not intend to require that all SCRs be publicly displayed for all time. Instead, it was expected that this would be addressed in the curation agreements and that standard museum practices would be followed, consistent with the Federal Archaeological Program (FAP). The regulations have therefore been modified to indicate that permittees must provide public access and "periodic"

public display. The regulations also provide for a permit to deaccession certain SCRs. These changes make the plan more flexible, pragmatic, and thereby reduce some of the socioeconomic impacts as compared to the draft plan.

With regard to the requirement that a professional archaeologist be in charge of the archaeological research and recovery, that requirement has not been changed or modified. Recovery of historical and cultural resources inherently involves the destruction of contextual and other important archaeological information. The only way that such information is preserved through scientific recording of the recovery efforts consistent with standard archaeological principles. It is therefore imperative for environmental and socioeconomic reasons that a professional archaeologist supervise the recovery operations to ensure preservation standards are met. That is not to say that, as supervisor, the archaeologist needs to be on site at all times in every permit. However, the archaeologist needs to oversee the operations. The public's interest in the preservation of this archaeological information justifies the additional socioeconomic costs to the permittee. In addition, the administrative record indicates that many commercial salvors already employ an archaeologist, so the impact may be minimal.

With regard to the requirement of a professional nautical conservator, the plan has been modified to delete "professional" and insert "authorized" as suggested in comments in order to provide more flexibility in the permit system and allow for the consideration of field experience. As the professional archaeologist is responsible for supervising the operations, there appears to be no adverse environmental impacts to make this change which will make it more flexible and thereby minimize the socioeconomic consequences as compared to the draft plan.

With regard to the impacts from a special use permit, Section 310 of the National Marine Sanctuaries Act provides the authority for issuing Special Use Permits. The two criteria for Special Use Permits are set forth in Section 310 of the NMSA. Section 310 also provides for the assessment of associated fees which are to cover the administrative costs as well as a fair market value return to the public for use of public resources. Thus, while there will be adverse socioeconomic impacts to permittees, it is strictly minimized to conform to those described in the statutory provisions in NMSA Section 310.

With regard to the assessment of costs and waiver of fees, in implementing Special Use Permit authority, NOAA has the discretionary authority to consider waiver of costs and/or fees on a case by case basis when permitted activities result in a public benefit, whose value can be determined. For example, in the SCR context, the preferred policy is that the SCR be preserved on site. Waiver of fees for the removal of SCRs which are not under threat is unlikely. However, if it is determined that the SCR is being threatened by remaining in the Sanctuary, the research and recovery would appear to be in the public interest and reduction and/or waiver may therefore be considered in the cost and/or fee determination. The extent that private use is furthering resource protection, research, education and similar FKNMS management strategies is given due consideration in determining the amount of costs and fees. Thus, the plan contemplates the further consideration of environmental and socioeconomic considerations in the permit process.

Under the no action alternative, the recovery of SCRs would require an Antiquities Act permit from either DOI or NOAA, in addition to requirements under the State contract system in State waters and Admiralty Law in Federal waters. Extending the Florida contract system and the division ratio (80% salvor- 20% State) uniformly throughout the sanctuary was considered as an alternative, but was not preferred because it is inconsistent with the Federal Archaeological Program and with the Abandoned Shipwreck Act Guidelines. Prohibiting commercial salvage throughout the Sanctuary was also considered and rejected for environmental and socioeconomic reasons indicated above, The SCR Plan is the result of a careful balancing of resource protection and reasonable accommodation for commercial salvage in certain areas for certain SCRs. In developing the draft plan, NOAA considered the threats to natural and historical-cultural resources and sought to develop strict regulations to ensure recovery was environmentally and archaeologically sound, while at the same time, propose a permit system that was sensitive to the socioeconomic considerations of the commercial salvors and others. Similarly, in response to comments, additional changes were made in the final regulations and plan in an effort to make the permit management system more pragmatic from the perspective of the commercial salvors without compromising the primary objectives of protecting significant natural and historic Sanctuary resources. The permit conditions may be more rigorous than the requirements of the Admiralty court or the State contract system, and thus may involve additional costs, those permittees continue to work their sites.

One of the alternatives suggested in comments was that all SCRs be removed from the Sanctuary. The final policy preference under the FKNMS Plan, consistent with the preservation policy in the Federal Archaeological Program, and the resource protection mandate in the NMSA is that SCRs be preserved on site in the Sanctuary, unless the SCRs are under threat and removal is required to preserve them. As indicated above, there has been some accommodation for commercial salvage in certain areas of the Sanctuary and for certain SCRs to facilitate multiple use of SCRs in this Sanctuary . Besides being inconsistent with resource protection, the suggestion that all or most of the SCRs be removed from the Sanctuary is not consistent with the multiple use mandates of the National Marine Sanctuaries Act and the Abandoned Shipwreck Act and has therefore not been incorporated. The Abandoned Shipwreck Act and the NMSA are both concerned about public access to SCR for boaters, divers and others within the Sanctuary. The suggested change in policy appears to primarily benefit one special interest group, the commercial salvors. Access to Sanctuary resources for members of the public unable to enter the Sanctuary itself is accomplished through a variety of education and research products and mediums, including print, film, and computer informational products. The public access goal does not require physical access to the SCRs, nor does it require their removal for land based exhibits. However, as previously indicated, in this Sanctuary, the SCR plan provides for commercial salvage which will in turn result in the public display of certain recovered SCRs in museums and similar institutions of public access.

Another management alternative suggested in the comments was that the Florida Department of State/ Bureau of Archaeological Resources have the lead responsibility in the management of SCRs and that NOAA's role be limited to a financial assistance role. It was also suggested that the SCR inventory be accomplished through the use of the private sector, when funding is available, in order to lessen the burden on taxpayers.

No change was made to the plan regarding NOAA's lead responsibility for the management of SCRs including inventory The National Historic Preservation Act Section 110 requires Federal agencies to inventory historic resources such as SCRs under the Federal agencies management responsibility. However, as indicated in the plan, NOAA will work with the State and any other public and private entities interested in activities which fulfill this responsibility. Accordingly, the SCR plan has been revised to indicate that NOAA will also consider all public and private opportunities for accomplishing the inventory in a reasonable and cost-effective manner, including private sector funding through permits and otherwise.

Commentors suggested that the regulations expressly state that no Sanctuary permit is required for non-intrusive non-exclusive remote sensing activities, but also suggested that the survey/inventory permits expressly grant exclusive rights to explore the permitted areas. It was also suggested that these permits provide for limited manual alteration of the seabed, including hand fanning, provided there is no negative impact to coral, seagrass, sponges and other natural resources. The final plan clarifies that non-intrusive remote sensing is not prohibited. Therefore, the regulations expressly state that such activity does not require a permit. The regulations will indicate that permits may provide for limited manual alteration of the seabed, including handfanning, provided there is no adverse effect on Sanctuary resources. Such activity will continue to be considered on a case-by-case basis as part of the public interest balancing on whether to issue a permit and for determining the appropriate conditions to protect resources and manage multiple uses.

Commentors suggested exclusive rights for a survey-inventory permit but also suggested that remote sensing not require a permit. NOAA cannot prevent non-intrusive remote sensing in an area unless its prohibited in the regulations and the regulations do not prohibit remote sensing. However, NOAA and the State are cognizant of the underlying economic concerns of applicants and permittees in investing and expending financial resources exploring. Therefore, in an effort to reconcile these comments, the regulations have been modified to indicate that NOAA will not grant survey and inventory permits or research and recovery permits for areas covered by existing permits, unless authorized by such permittee. There is no entitlement to these and other permits, rather it involves the discretionary authority of NOAA and the State in granting a privilege which is determined to be in the public's interest.

Volunteer Action Plan

The Volunteer Program is designed to support the Sanctuary Program's efforts to improve public education and awareness regarding the proper treatment of the area's natural and cultural resources. Volunteers will provide a mechanism for increasing the community's involvement in Sanctuary activities, and represent a valuable resource that can

be used to accomplish a variety of Sanctuary-related tasks. Also, because of limits on financial resources, volunteer assistance will be critical to the ultimate success of the Keys' management program, and a main goal will be to use the available volunteer resources as completely as possible. The overall goal of the Volunteer Program is to provide a "hands-on" opportunity for public involvement in supporting the protection and preservation of Sanctuary resources.

While all comments on the Volunteer Action Plan were positive some specific comments were made requesting modifications to the plan. The goals of the Volunteer Plan were updated to include the future development of a strategy to target volunteer recruitment and strategy B.8: User Fees was deleted in response to these comments.

Clearly, the Volunteer Plan has enormous positive social impact. Volunteerism benefits the environment as well as the people who give of their time and effort. The general public, too, benefits from a cleaner, healthier environment fostered through the educational efforts of volunteers. The cost of this volunteer program is nominal in light of the benefit it provides to all.

Water Quality Action Plan

This action plan provides the strategies critical for improving water quality throughout the Florida Keys. It addresses critical issues including pollution from stormwater runoff, improper wastewater treatment, marinas and live-aboards, landfill sites, hazardous material spills, pesticides and herbicides, and external influences. Corrective actions, monitoring, research, and public education and outreach strategies will reduce the threat of pollutants and improve water quality.

The degradation of water quality over the past two decades has been a major concern for the residents of the Keys and was the primary issue raised at the scoping meetings for the Sanctuary. In passing the Act designating the Sanctuary, Congress recognized the critical role of water quality in maintaining Sanctuary resources. Congress directed the Environmental Protection Agency (EPA), in conjunction with the Governor of the State of Florida and in consultation with the Secretary of Commerce, to develop a comprehensive Water Quality Protection Program (WQPP) for the Sanctuary. This action plan is an abridged version of the information in the WQPP document. It is also the first water quality plan ever developed for a national marine sanctuary.

The WQPP consists of four interrelated components: corrective actions, monitoring, research/special studies, and public education and outreach. Corrective actions would reduce water pollution directly by using engineering methods or by prohibiting or restricting certain activities, tightening existing regulations, and/or increasing enforcement. Other corrective actions would make the regulatory system work more efficiently. The water quality monitoring program would provide information about the status and trends of water quality and biological resources in the Sanctuary and the effectiveness of corrective actions. Research and special studies would identify and document cause/effect linkages between pollutants, water quality problems, and ecological impacts. Research would also increase understanding of Sanctuary ecosystems and improve predictive capabilities. Public education and outreach strategies would increase public awareness of the Sanctuary, the WQPP, and pollution sources and impacts on Sanctuary resources.

Public comment precipitated changes to both the WQPP document and the Water Quality Action Plan. For the most part, commentors agreed that degradation of water quality is the greatest threat to both the natural resources and the economy of the Keys. They also agreed that funding for this program is vital. Some were more concerned about the influences of water quality from sources beyond Sanctuary boundaries. However, the plan addresses outside influences to water quality, and the Water Quality Protection Program Steering Committee explores this issue regularly. A few commentors stated that there was no water quality problem in the Keys. However, many scientists and users disagree with this statement based on observations as well as documented scientific evidence.

Improved water quality in the Keys will have environmental and socioeconomic benefits. Sanctuary resources such as coral reefs and seagrass beds sustain enormously valuable commercial and recreational fisheries and attract anglers, divers, and tourists from all over the world. The economy of the Florida Keys is tied directly to these resources which depend on the maintenance of outstanding water quality, including high water clarity, low nutrient levels, and low concentrations of contaminants. If water quality is allowed to deteriorate further, thriving industries such as fishing and tourism, as well as support businesses, will suffer the consequences. The WQPP would improve and maintain water quality, helping to ensure that Sanctuary resources and the economy dependent on them continue to thrive.

Zoning Action Plan

Zoning is the setting aside of areas for specific activities to balance commercial and recreational interests with the need for a sustainable ecosystem. Marine zoning has been successfully implemented at Australia's Great Barrier Reef, New Zealand, Kenya, the Philippines, the Cayman Islands, Bermuda, Exuma National Park in the Bahamas, and other countries. The concept has had limited application in the U.S. where it has been used at Looe Key National Marine Sanctuary (1981) to protect the shallow coral reef habitat from certain activities such as anchoring and setting of lobster traps and in the Monterey Bay National Marine Sanctuary (1992) to manage PWC activities. It has also been used in the Channel Islands National Marine Sanctuary/National Park where *Harvest Refugia* have been established to protect marine inhabitants from harvest. Only in the past few years have the Fisheries Management Councils used zoning to protect and manage fisheries, such as the closed *Oculina Banks* off the east coast of Florida.

The consideration of marine zoning as an integral Sanctuary management tool is mandated under section 7(a)(2) of the FKNMSPA. The process used to develop the draft zoning plan is described in Volume II. There were five zone types proposed in the draft plan that was reviewed by the public. Those zone types were: Wildlife Management Areas; Replenishment Reserves (renamed to Ecological Reserves); Sanctuary Preservation Areas; Existing Management Areas; and Special-use Areas. All of these zone types remain in the Final Management Plan to be implemented in the Sanctuary.

Figure 1 shows the existing management zones in the Sanctuary region. Figure 2 shows the zones proposed in the plan. Table 2 shows the sizes of some of these proposed zones.

The goals of the zoning action plan are:

- Protect and preserve sensitive areas of the ecosystem by regulating certain activities that occur within the zoned areas, and by facilitating activities that are compatible with resource protection;

Table 2. *Sizes of FKNMS Sanctuary Preservation Areas, Ecological Reserves, and Special-use Areas*

Zone	km^2	nm^2	ha
Florida Keys NMS	**9,515.5**	**2,774.3**	**9,51547.1**
Sanctuary Preservation Areas	**16.5**	**4.7**	**1,650.6**
Carysfort/South Carysfort Reef	5.1	1.5	514.5
The Elbow	0.9	0.3	90.2
Dry Rocks	0.2	0.0	15.5
Grecian Rocks	1.1	0.3	107.4
French Reef	0.4	0.1	36.8
Molasses Reef	0.9	0.3	88.6
Conch Reef	0.2	0.1	23.3
Davis Reef	0.6	0.2	57.7
Hen and Chickens	0.6	0.2	60.2
Cheeca Rocks	0.2	0.0	15.5
Alligator Reef	0.6	0.2	59.8
Coffins Patch	1.5	0.4	147.0
Sombrero Key	0.7	0.2	73.4
Looe Key	1.1	0.3	114.6
Newfound Harbor Key	0.4	0.1	42.6
Eastern Dry Rocks	0.3	0.1	27.4
Rock Key	0.3	0.1	25.1
Sand Key	1.5	0.4	151.0
Ecological Reserves	**30.8**	**9.0**	**3,084.1**
Western Sambos	30.8	9.0	3084.1
Special-use Areas	**1.9**	**0.5**	**186.0**
Conch Reef (Research Only)	0.7	0.2	71.7
Tennessee Reef (Research Only)	0.5	0.2	53.1
Looe Key (Research Only)	0.3	0.1	33.5
Eastern Sambos (Research Only)	0.3	0.1	27.7

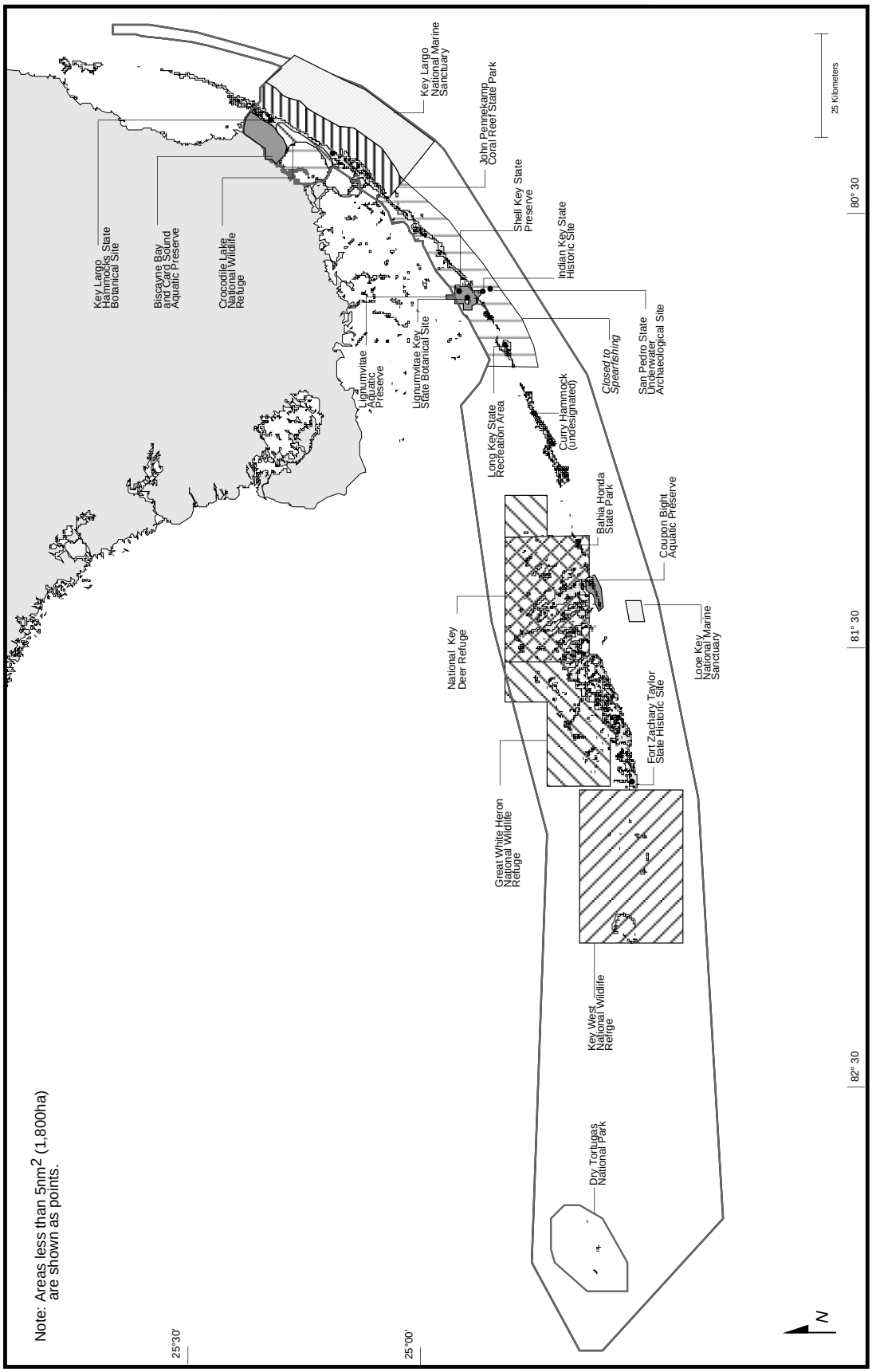


Figure 1. *Existing Management Areas*

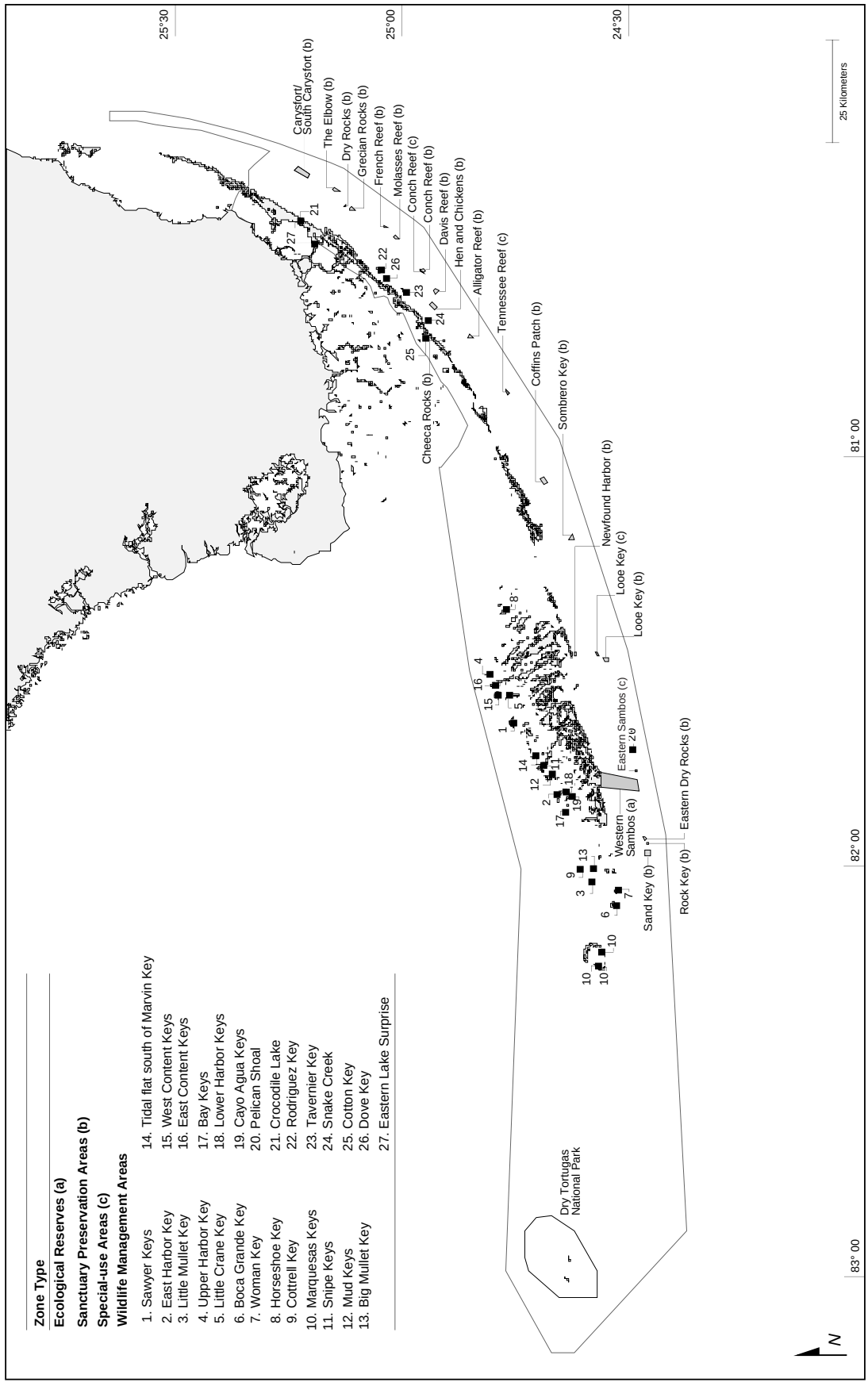


Figure 2. *Ecological Reserves, Sanctuary Preservation Areas, Special-use Areas, and Wildlife Management Areas*

- Ensure that areas of high ecological importance evolve naturally, with minimal human influence; and

- Protect areas representing a wide variety of habitats, and areas that are important for maintaining natural resources and ecosystem functions.

Each zone or area is designed to reduce damage to the environment, while allowing recreational activities to occur, as long as they are compatible with resource protection.

The Objectives necessary to achieve these goals are:

- reduce stresses from human activities by establishing areas that restrict access to especially sensitive wildlife populations and habitats;

- protect biological diversity and the quality of resources by protecting large, contiguous diverse habitats that are intended to provide natural spawning, nursery, and permanent residence areas for the replenishment and genetic protection of marine life and to protect and preserve all habitats and species;

- minimize conflicting uses;

- protect Sanctuary resources and separate conflicting uses by establishing a number of non-consumptive zones in areas that are experiencing conflict between consumptive and non-consumptive uses and in areas that are experiencing significant population or habitat declines;

- eliminate injury to critical/sensitive habitats;

- prevent heavy concentrations of uses that degrade Sanctuary resources;

- provide undisturbed monitoring sites for research activities by setting areas aside for scientific research, monitoring, and restoration;

- provide control sites to help determine the effects of human activities on resources; and

- disperse concentrated harvests of marine organisms.

Discussion of Zones

The following is a discussion of the expected environmental and socioeconomic consequences of the zone types established for the Sanctuary in this Final Management Plan. A longer discussion of the environmental consequences is contained in Volume II, which remains relevant to the final preferred alternative, and an expanded discussion of the socioeconomic consequences is contained in Appendix M, Volume III. The zone types are:

Wildlife Management Areas. These zones include areas that are of critical importance to wildlife, especially birds and threatened or endangered species. There are 27 such zones established in the Final Plan. Most of these areas include the waters adjacent to small islands located along the chain of approximately 1500 islands in the Florida Keys. The majority of these areas (20) fall under the jurisdiction of the U.S. Fish and Wildlife Service (USFWS) and Sanctuary regulations have been established to complement the USFWS criminal sanctions with Sanctuary civil penalties. Public access restrictions in these areas include idle speed only/no wake, no access buffer, no motor, and closed.

NOAA has mostly retained the Preferred Alternative in the Draft Plan for the Wildlife Management Areas, with only a few minor changes. As a result, consistent with existing USFWS regulations, access to Jewfish Creek and Steamboat Creek in the Crocodile Lake Wildlife Management Area is not restricted. See Volume II Preferred Alternative and Impact analysis. Public comments indicated fishermen and others regularly transit this area. This revision should result in minimal loss of environmental benefits, while not restricting boat traffic through the area, thus avoiding socioeconomic impact on the public's use of these creeks.

Additionally, the Final Plan includes one additional area over what was proposed in the Preferred Alternative of the Draft Management Plan (DMP/EIS, Vol. I). An idle speed only/no wake zone has been established in the area of Lake Surprise east of the US 1 highway that crosses Lake Surprise. This zone was established to protect the endangered American Crocodiles and West Indian Manatees that inhabit the area. This restriction will result in a greater level of environmental protection for these endangered species at a low socioeconomic cost. The eastern portion of Lake Surprise currently has low levels of use. A restriction on boat speeds will not halt the public's current fishing use of the area, but may extend time of transit.

In comparison to the other Draft Alternatives for this zone type, the Final Alternative has considerably higher environmental benefits over Alternative IV in the DMP/EIS (Volume II, page 136), which only included the 19 areas that are currently managed by the USFWS, and fewer environmental benefits than the 37 areas proposed in Alternative II of the DMP/EIS (Volume II, page 138). Since the Sanctuary Advisory Council recommendations were largely adopted in the Draft Preferred Alternative, it is understandable that the proposed WMAs in the draft plan did not receive much public comment during the public review process.

NOAA has taken action to establish these areas because of its mandates under the NMSA and the FKNMSPA and the level of public concern raised on issues involving threats to wildlife in the Florida Keys during its scoping process in 1991. NOAA and the USFWS worked very closely during the development of the management plan to complement each other's interest in protecting the wildlife resources of the Florida Keys, both inside the National Wildlife Refuges, as well as outside.

Ecological Reserves (formerly Replenishment Reserves). In the Draft Preferred Alternative this zone type was called Replenishment Reserves, and NOAA has changed the name to reflect public concerns over the purpose of these areas. The main purpose of Ecological Reserves is to maintain a natural assemblage of living resources in the Sanctuary by setting aside areas to assure minimal human disturbance. Nowhere in the Florida Keys has a complete component of the coral reef ecosystem been set aside from human disturbance. Ecological Reserves will give resource managers and the public an opportunity to have a cross-section of the coral reef community, including the nearshore mangrove fringe, hardbottoms, patch reefs, seagrass beds, mid-channel reef, and the offshore coral reef tract where they can experience the marine inhabitants in an almost natural state. These zones will serve to protect and enhance the spawning, nursery or permanent resident areas of fish and other marine life. Hundreds of marine species are not protected by any form of management and the Ecological Reserves will provide protection and allow areas to return to their natural state. These areas will additionally protect the food and home of commercially and recreationally important species of marine life. This zone type, when properly implemented, will result in long term environmental benefit to Sanctuary resources. There will be some short-term economic costs to fishermen and divers that harvest marine life and who are displaced. However, the Ecological Reserves constitute a small percentage of the overall marine community of the Sanctuary (under 3%) and NOAA has redrawn the zoning boundaries to minimize such costs (i.e. deleted Key Largo ER and delayed Dry Tortugas ER). As one benefit of maintaining the biodiversity of these areas, it is expected that the long-term benefits to fishermen from the increased productivity in the reserves will be positive. There will be spillover of larvae and adult fish to surrounding areas and an “edge effect” which has occurred in other marine reserves will provide excellent fishing along the boundaries of the reserve. The benefits to non-consumptive users of the Ecological Reserves also will be strongly positive as they will have areas in which they can view, photograph, and enjoy restored coral reef communities and habitats, swarming with large fish and minimal human damage to the coral and other coral reef resources. See Appendix M, Volume III for an expanded discussion of the socioeconomic benefits and costs of these areas.

All activities that do not result in removal of marine life or damage to the resources will be allowed in these areas. Spearfishing, shell collecting, tropical fish collecting, and other activities that result in the harvest of marine life by divers and snorkelers, and fishing activities will be prohibited in this zone type. In addition, direct physical impact to corals in these areas will be restricted.

This zone type has received the most revisions from the Draft Preferred Alternative to the Final Management Plan as compared to other zone types. Three Ecological Reserves were proposed in the draft plan. NOAA has eliminated one of these proposed reserves, maintained the proposed boundaries of another, and delayed action on the third for two years after the final plan is implemented in order to minimize the socioeconomic impact on fishermen. In the Final Management Plan NOAA has developed a final preferred alternative for Ecological Reserves that ranges between the No Action Alternative V and the Least Restrictive Alternative IV contained in the DMP/EIS (Volume II, page 136) by reducing the number of Ecological Reserves in the Final Management Plan. The proposed Ecological Reserves contained in Alternative IV of the DMP/EIS were the same number, but geographically smaller than those contained in the Draft Preferred Alternative III. The more restrictive Alternative II in the DMP/EIS contained eight Ecological Reserves that provided greater biogeographic coverage than the other draft alternatives.

In weighing the additional environmental benefits against the economic and social impacts on commercial and recreational users of the Key Largo Ecological Reserve, NOAA has eliminated that Reserve from the final plan and regulations. The resource protection provided by the existing protected areas, John Pennekamp Coral Reef State Park and the Key Largo National Marine Sanctuary contributed to this decision. Many prohibitions already exist in these areas, on activities such as spearfishing, tropical fish collecting, shell collecting, wire fish trapping, trawling, and the removal of any marine life by divers except for spiny lobster. Establishing an Ecological Reserve in these areas would have resulted in few additional environmental benefits. The full environmental benefit of the protection provided by Ecological Reserves will best be monitored and observed in areas where these harvesting activities are currently conducted. NOAA has taken this into consideration when considering the revisions from the Draft Preferred Alternative to the Final Plan.

NOAA has maintained the boundary that was proposed in the Draft Preferred Alternative for the Western Sambos Ecological Reserve. High environmental benefits will be gained by protecting this important portion of the coral reef environment. Although there will be positive environmental and socioeconomic benefits to groups such as divers, snorkelers, and glass-bottom boat operators, there will be some socioeconomic costs to fishermen due to displacement from the area. This Ecological Reserve is located adjacent to public property (Boca Chica Naval Airstation) and contains all the habitats that are typically found in an onshore/offshore cross-section of the Keys coral reef environment. Nearshore hardbottom habitats, beautiful inshore patch reefs, seagrass beds, some of the most diverse mid-channel reef, offshore patch reefs, and one of the Keys' best remaining spur and groove bank reefs help comprise this special area. Some of the best remaining coral formations and some of the best remaining water quality occur there. These qualities will help contribute to the success of this area as an Ecological Reserve and will aid NOAA in its mandate to "protect and preserve living and other resources of the Florida Keys marine environment (FKNMSPA, 1990)."

In the DMP/EIS, NOAA proposed boundaries for the Dry Tortugas Ecological Reserve. The north-south configuration of the proposed reserve, which was oriented primarily east of the Dry Tortugas National Park, received considerable public comment, particularly from fishermen. Many commentors suggested there would be little environmental benefits as compared to the significant adverse socioeconomic impacts which would result from implementation of the no-take regulations within the proposed boundary of the reserve. Shrimpers, lobster fishermen, spearfishermen, and hook and line fishermen testified that a substantial part of their fishing takes place within the proposed reserve. Recommendations ranged from eliminating the reserve entirely to reconfiguring the boundary of the reserve to minimize such impacts. A large number of citizens, scientists, and environmental groups commented that the Dry Tortugas would be a good location for an Ecological Reserve and wanted an area at least the size of that proposed in the draft Preferred Alternative designated. Some were as specific as to recommend a boundary to the west of the Dry Tortugas National Park, incorporating at least some of the National Park. The best coral reef habitats and communities lie to the western half of the Dry Tortugas Bank. By establishing an Ecological Reserve to the west, NOAA would be able to maximize the protection of important coral reef habitat. The National Park boundary does not include some of the ecologically important intermediate to deep reef habitats in the vicinity. An Ecological Reserve in this area is anticipated to have very positive environmental consequences. Water circulation in the Dry Tortugas, due to extensive counterclockwise gyres (Volume II, Affected Environment), will help entrain planktonic larvae for long periods of time, providing new marine life stock along the reef tract as the larvae settle to the bottom.

NOAA did not finalize the implementation of the Dry Tortugas ER in the regulations. Instead, NOAA will postpone final implementation of the boundary and regulations of the Dry Tortugas ER until it undertakes a process, in coordination with the National Park Service, to identify an appropriate final boundary for the Reserve, which will include portions of the Dry Tortugas National Park. To identify the final boundary, NOAA and the National Park Service will use the information gathered as part of the public review of the draft management plan, and hold workshops with users, agency representatives, environmental organizations and the public. Prior to making a final decision, the proposed final boundary of the Dry Tortugas Ecological Reserve will be published for public comment. In summary, while a number of comments supported Alternative III in the draft, the final is between V and IV in order to avoid or minimize socioeconomic impacts on fishermen.

Sanctuary Preservation Areas. These areas will protect shallow, heavily used coral reef communities where conflicts often occur between user groups.

The majority of these shallow reef habitats are scattered along the outer reef tract and are the coral reefs most frequently visited by snorkelers and divers. These areas, critical for sustaining important marine species and habitats, are the component of the coral reef ecosystem most vulnerable to direct human impact (e.g. anchor damage, boating impact, diver and snorkeler impacts, concentrated harvest by divers, and damage done by inexperienced fishermen) and indirect from water pollution impacts. All activities that do not result in removal of marine life or damage to the resources will be allowed in these areas. Activities that will be prohibited in the Sanctuary Preservation Areas (SPA's) include spearfishing, shell collecting, tropical fish collecting, fishing and other activities that result in the harvest of marine life by divers, snorkelers, and fishermen. In addition, direct physical impact to corals in these areas will be restricted.

In this Final Management Plan NOAA is implementing all of the SPAs that were proposed in the Draft Preferred Alternative (19) with the exception of the one for Western Sambos Reef. Since that reef is designated an Ecological Reserve, which has the same restrictions as the SPAs, NOAA eliminated this duplicate protection. A total of 18 SPAs are contained in the Final Plan. This will provide the same level of protection that was proposed for the Preferred Alternative in the DMP/EIS, except in the Carysfort SPA. Since NOAA has removed the Key Largo Ecological Reserve from the final plan, the SPA around Carysfort has been enlarged to encompass more of the coral reef community, including patch reefs, coral rubble areas, and intermediate reef habitat, the site of a known grouper spawning aggregation. The size of the SPA will only be expanded by one-half (1/2) of a square nautical mile over the proposed SPA. The more-restrictive alternative (II) in the DMP/EIS also proposed 18 SPAs, but some of them were considerably larger in size, and were not recommended by the Sanctuary Advisory Council (SAC) for the draft preferred alternative because of their greater socioeconomic consequences on the community. The 13 SPAs contained in the less-restrictive (IV) alternative of the DMP/EIS were determined not to be adequate to protect critical coral reefs.

The environmental benefits of this zoning type will be high because direct harvest and physical impacts to the heaviest used component of the coral reef ecosystem, the shallow coral reefs, will be lessened. According to data from an aerial survey (1994, FDEP and TNC work in progress), approximately 80% to 85% of the snorkelers and divers in the Florida Keys use the 18 SPAs during the year. Although the SPAs are small in size, they capture most of the snorkeling and diving use except during the opening of lobster season. Protecting these areas will have high long-term environmental benefits on the coral reef habitat and positive socioeconomic benefits to the local economy.

There will be a low socioeconomic impact on fishermen from prohibiting fishing in these areas. In the same aerial census cited above, it was determined that over 94% of the boats less than 30' in length fished outside the SPAs. Over 92% of the boats greater than 30' in length fished outside these areas. However, NOAA received considerable public comment on the draft plan (see comments and responses Appendix L, Volume III) regarding baitfishing activities in the shallow reef habitat. NOAA has revised the management plan and regulations to allow limited baitfishing in the SPAs rather than reduce the number of SPAs. NOAA will give permits for the netting of ballyhoo for bait in these areas and does not feel this activity will compromise the overall objective of the SPAs.

In another effort to reduce socioeconomic impacts from the SPAs, NOAA has modified the management plan and regulations to allow catch and release fishing by trolling in four of the Sanctuary Preservation Areas: Conch Reef, Alligator Reef, Sombrero Key, and Sand Key. This should avoid or minimize the socioeconomic impacts on these fishermen. This will also give NOAA areas with which to compare and contrast catch and release SPAs with those where no fishing takes place. These areas were selected on the basis of public comment and data from the aerial surveys. This will help NOAA assess the environmental costs of allowing this activity and the socioeconomic impacts of prohibiting it in the other SPAs.

During the preparation of the Draft MP/EIS commercial fishermen working with Sanctuary planners produced maps that demonstrated the shallow coral reef habitat was not critical to their activity, and since they are not heavily used by commercial fishermen and are relatively small, the socioeconomic impact on commercial fishermen is expected to be low to negligible. There were no negative comments from commercial fishermen, except baitfishermen, regarding the number or location of the SPAs.

Approximately 29 shallow reefs along the reef tract are named on NOAA navigational charts. NOAA has established 16 of these shallow coral reef communities as SPAs, protecting over 55% of this particular

type of shallow coral reef habitat in the Keys. Each of the SPAs encompass a variety of marine habitats including: coral reefs; rubble ridges; backreefs; seagrass; hardbottoms; and coral rubble. All of these habitats are important components of the coral reef community. The ecological benefits of protecting these types of habitats from harvesting activities has been documented in the Looe Key National Marine Sanctuary (Clark, et al, 1989). The SPAs designated in this Final Plan are predicted to have the same kind of successful results as those at Looe Key NMS.

Existing Management Areas. This is a simple acknowledgment of existing protected areas in the Sanctuary. These are zones that are currently managed by other agencies, and where regulations already exist. Out of the total 21 existing management zones, 15 are administered by the State of Florida Department of Environmental Protection, 4 by the Fish and Wildlife Service, and 2 by NOAA. Managing these areas within the Sanctuary may require additional regulations or restrictions to provide complete resource protection. These additional management needs will be developed in cooperation with the relevant agency and will be implemented with those agencies.

There are little or no anticipated socioeconomic impacts by establishing these zones since they are currently managed by other agencies. The availability of civil penalties may have some impact to violators. NOAA has included all of the same areas that were included in the Draft Preferred Alternative contained in the DMP/EIS. However, by coordinating management activities and programs with other agencies, such as in the case of the Wildlife Management Areas, where NOAA is coordinating with the USFWS, there will be increased environmental benefits by providing coordinated management. There will also be socioeconomic benefits by saving taxpayers money through sharing of human and material resources and coordinating various management programs such as education, research and monitoring, and resource protection.

Special Use Areas. These zones address special use activities and concerns within the Sanctuary, and may be established for education, science, restoration, monitoring, or research. Activities in these areas will be conducted by permit only.

There are only four special use areas in the Final Management Plan: Conch Reef, Tennessee Reef, Looe Key (patch reef), and Eastern Sambos Reef. These are all designated as research-only and NOAA has included all the same research-only areas that were contained in the Draft Preferred Alternative, with one change. Due to the consideration of socioeconomic impact described by the public during the review process, NOAA has eliminated the Pelican Shoal research-only Special-use Area and replaced it with the Eastern Sambos research-only, Special-use Area suggested by the state in its comments on the DMP/EIS. This change will provide a better research and monitoring site, while simultaneously lessening the socioeconomic impact to the public that would have occurred by limiting access to the reef around Pelican Shoal. However, in order to complement the State's seasonal closure of the land area, NOAA has designated a no-access 50 yard buffer around the island between April 1 and August 31. These dates coincide with those established by the Florida Game and Freshwater Fish Commission for this area.

The long-term environmental benefits of these areas will be strongly positive because they will allow managers to compare and contrast shallow coral reefs that are used by divers and snorkelers with those that are not used by these groups. An excellent example is an intended comparison study of the health of the coral reef at Eastern Sambos (research only site) with the coral reef at Western Sambos where diving and snorkeling is conducted. Both of these reefs are located in similar water quality conditions and they are in approximately the same physical and biological condition. These sites can then be compared to Tennessee Reef and Alligator Reef, which are located in an area that is exposed to poorer water quality. The results of such studies will benefit Sanctuary management. Diving, snorkeling, fishing, and other such recreational and commercial activities will not be allowed in these research-only areas except by scientific or educational permit.

There is also a possibility of establishing Special-use areas in the future for restoration, following some event which damages the resources. The environmental benefits of having these areas are high, whereas the socioeconomic impacts will be low due to their small size. Altogether, these four areas comprise less than one square nautical mile in size.

Sanctuary Management: How the Process Works

In practical terms, the implementation of Sanctuary management is already underway. On September 15, 1992, the Florida Trustees (the Governor and Cabinet) entered into an agreement with the administrator of NOAA to establish a mechanism for the cooperative development of the management plan as well as the cooperative interim management of the Sanctuary while the comprehensive plan was being developed. This interim management agreement provided for the development of several protocols on various cooperative management issues and ultimately provided the direction for the development of the memorandums of agreement and protocols included in Appendix J in Volume III: Draft Interagency Compact Agreement for the Integrated Management of the Florida Keys National Marine Sanctuary, Co-trustees Agreement, Submerged Cultural Resources Agreement, Law Enforcement Agreement, Natural Resources Damages/Civil Claims Agreement, Protocol for Cooperative Fisheries Management, Protocol for Emergency Response Notification, Permitting/Certifications Agreement, Water Quality Protection Plan Agreement, and Navigational Aids Agreement.

In the interim management agreement there were several provisions concerning jurisdiction and authority of the State as a result of Sanctuary designation.

Education programs have been implemented Sanctuary wide, research and monitoring programs have expanded Sanctuary wide, and various elements of the water quality protection program have been implemented throughout the Sanctuary. In addition, boat groundings are being responded to, the NMSA and the FKNMSPA are being enforced, and some cross-deputization of enforcement personnel has occurred. Many of the strategies included in the Final Alternative represent actions that will be carried out by either State or local agencies, with or without the cooperation of the Federal government. However, the important difference between these independent actions and the process of management outlined in this document is the degree of integration, coordination, and cooperation that must be applied. Achieving the long- and short-term goals for this unique region requires the development of a close and continuing partnership among all the agencies serving the residents of, and visitors to, the Keys. To this end, the existing management structure must be modified.

The FKNMSPA mandates the development of a comprehensive management plan that represents a major departure from the nation's traditional approach to marine resource management. NOAA is committed to coordinating with other Federal, State, and local agencies in a continuous management process. This process is designed to balance the demands of the many activities in the region, and to ensure the long-term protection of the resources that make the area unique. This requires the cooperation of many institutions that historically have not been focused on the same goals. Because of the complexity of managing the activities and resources in the Keys, no single agency or institution can effectively meet the goals of the Act designating the Sanctuary. Overlapping jurisdictions, different agency objectives, limited fiscal resources, and other problems point to the necessity of developing a management program that brings together multiple institutions for the common purpose of protecting this important area. The framework outlined in this chapter allows and encourages these institutions and the public to participate in the decision-making process.

The basic elements of the continuous management process are shown in Figure 3. The foundation for this process is the signing of an Interagency Compact Agreement (Volume III, Appendix J) formalizing Federal, State, and local government agency support for the Sanctuary. The elements necessary for successful implementation of the Management Plan focus on the Interagency Group, the Resource Management Team, the Sanctuary Advisory Council, and various Standing Committees. This management arrangement makes it possible for Ad Hoc Partnership Groups to be formed as committees that will provide input to the Management Team.

The details of the management process described in this document are the starting point for discussions between the parties that must cooperate to manage the Sanctuary. Subsequent negotiations between the responsible agencies may alter the framework, but its primary feature, the extensive amount of cooperation and integration of effort between and among these governmental and non-governmental bodies, must and will remain.

The Management Plan

The FKNMS Management Plan is the result of a cooperative effort among Federal, State, and local agencies and institutions. A significant amount of public, non-governmental organization (NGO), and user community input has been included in the development of this Plan. A set of actions is identified that will be implemented based on the continuous management process. Approval of the Plan by the participating agencies of the Interagency Compact Agreement is a prerequisite for successful management of the Sanctuary.

The Compact Agreement

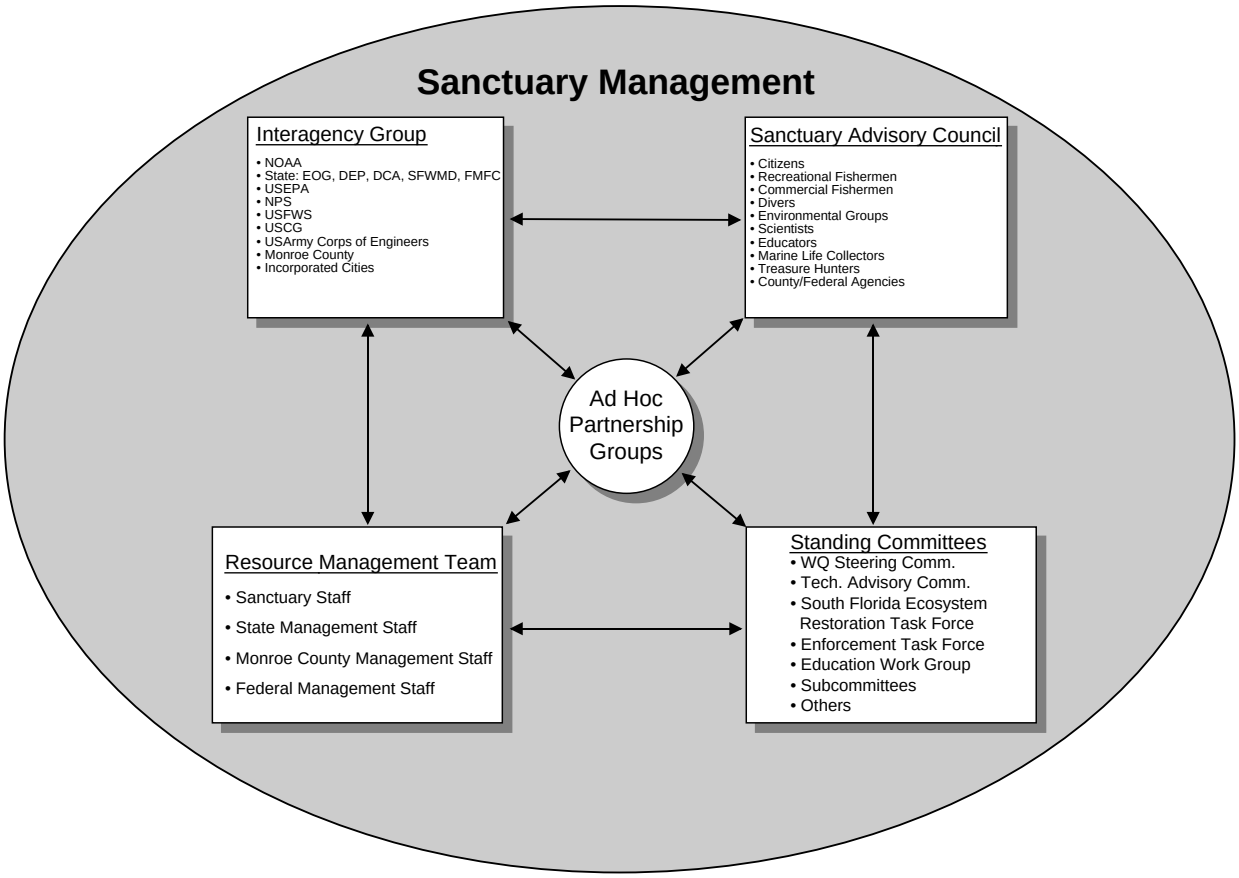
The FKNMSPA requires that NOAA coordinate with the appropriate Federal, State, and local agencies to support implementation of the Management Plan. The Interagency Compact Agreement officially joins the parties under the umbrella of this Plan. The provisions of the Draft Compact are included in this Final Management Plan (Volume III, Appendix J).

The Compact establishes a formal commitment to the management of the Sanctuary. This commitment is critical to ensuring full participation and cooperation from the many institutions that play a role in the successful management of the Sanctuary. Since State lands and waters make up the majority of the Sanctuary, the participation of State and local agencies is considered critical to providing a holistic ecosystem approach to management.

The Compact forms the foundation for subsequent interagency and intergovernmental cooperative agreements, protocols, and other less formal interagency work efforts. The signing of this Compact signals that the cooperative and integrated management approach established for this Sanctuary has been adopted.

The Compact reflects the Federal/State co-trustee management of the region's resources, reiterating the goals of the Act designating the Sanctuary. This will ensure that the work conducted by EPA as part of the Water Quality Protection Program is clearly connected to the overall management of the Sanctuary.

Figure 3. *Continuous Management: How the Process Works*



Cooperative Agreements

In order to formally implement cooperative management of the Florida Keys National Marine Sanctuary, a number of separate cooperative agreements must be entered into among the various governmental agencies and entities with cross jurisdictional and trustee interest in resource protection (Volume III, Appendix J). The following identifies the nature and purpose of prospective agreements:

Co-trustees Agreement - Establish, by way of a Memorandum of Agreement, the relative jurisdictional interests, management authorities, and conditions in State- and Federally-owned lands and resources as they pertain to the Sanctuary, agreeing to the cooperative management and enforcement of certain laws and regulations as they pertain to management of the Sanctuary, and generally adopting and agreeing to the integrated management approach for implementation of the sanctuary management plan.
Signatories: NOAA Administrator and Governor and Cabinet, as Florida Trustees.

Submerged Cultural Resources Agreement- Establish protocols, procedures and regulations for the comprehensive management of historical resources throughout the Sanctuary consistent with the National Marine Sanctuary Act, the Abandoned Shipwreck Act, AS Guidelines, and State laws and procedures.
Signatories: NOAA Administrator and the State of Florida, Secretary of State.

Cooperative Enforcement Agreement - Establish protocols, procedures and identify training needs to coordinate operational enforcement in the Sanctuary and cross-deputization of Federal/State/local law enforcement officers to expand enforcement capabilities under Sanctuary Act and other NOAA statutes.
Signatories: NOAA, Florida Marine Patrol, Florida Park Service, NMFS, U.S. Coast Guard, National Park Service, and U.S. Fish & Wildlife.

Agreement for the Coordination of Civil Claims- Establish protocols and procedures for notification and response to incidents involving injury, damage or loss of Sanctuary resources and the coordination of joint initiation and conduct of civil action and claims to remedy injury and recovery.
Signatories: NOAA and Governor and Cabinet, or designated cotrustees.

Protocol for Cooperative Fisheries Management - Establish protocol for the unified and cooperative State/Federal management of fishery resources within the Sanctuary, including a process for promulgation of consistent fishing regulations.
Signatories: Florida Marine Fisheries Commission, South Atlantic and Gulf of Mexico Fishery Management Councils, National Marine Fisheries Service, National Ocean Service.

Protocol for Emergency Response Notification - Establish operational protocol to ensure coordination and cooperation between sanctuary management and other Federal, State and local authorities with jurisdiction within or adjacent to the Sanctuary regarding notification, response and action taken in response to boat groundings and other physical damage to sanctuary resources. Cross reference to other emergency protocols, i.e. Oil Spills, will be included.
Signatories: NOAA; Department of Environmental Protection; Monroe County; U.S. Coast Guard; Nat. Park Service; U.S. Fish & Wildlife Service.

Sanctuary Certification and Permitting Agreement - Establish a procedure and protocol for interagency coordination and review of activities (leases, licenses, permits, approvals or other authorizations) which are specifically prohibited and/or may affect resources within the Sanctuary. Existing procedures and protocols will be considered in this agreement process. No new rules or governmental structures will be required. Signatories: NOAA, Director, Office of Ocean and Coastal Resource Management; Florida Department of Environmental Regulation, Secretary; South Florida Water Management District, Governing Board.

Water Quality Protection Program Steering Committee By-laws - Establish an agreement of understanding among the agencies and governmental entities associated with the Florida Keys Water Quality Protection Plan regarding implementation strategies and funding of programs. The By-Laws and Charter of the Water Quality Protection Plan Steering Committee will be used for this agreement.
Signatories: U. S. Environmental Protection Agency, Region IV Administrator; U.S. Coast Guard, Commandant; Florida Department of Environmental Protection, Secretary; South Florida Water Management District, Governing Board; Florida Department of Health and Rehabilitative Services, Secretary; Monroe County, Board of County Commissioners.

Navigational Aids Agreement - Establish a working group and a formal protocol and process for developing and implementing consistent marking and signage of channels and special use areas within and adjacent to the Sanctuary.
Signatories: NOAA; U.S. Fish and Wildlife Service; National Park Service; U.S. Coast Guard; U.S. Army Corps of Engineers; Florida Department of Environmental Protection; Florida Department of Community Affairs; Monroe County, Department of Marine Resources. This agreement has not been initiated.

The Management Team

The "overall" Management Team is comprised of an Interagency Group and a larger field staff level Resource Management Team, including Sanctuary staff. The Management Team represents agencies actively involved in some aspect of resource management in the Florida Keys. This Team will identify and recommend action items for the Federal, State, and local managing agencies to be implemented in the Sanctuary. One or more advisory councils will provide input to this process from the user perspective.

Interagency Group

The Interagency Group is comprised of agency staff representatives with statutory or direct responsibilities for Management Plan development and implementation. The agencies represented on this Interagency Group are those that have agreed to enter into the continuing integrated resource management process by signing the Interagency Compact Agreement. Their representatives have been involved in the development of the Draft Management Plan and continuous management process. The Interagency Group will meet at least two times per year. In addition, at least one public meeting of the entire Management Team, together with the Sanctuary Advisory Council, will be conducted to communicate the current status of management activities in the Sanctuary. The Interagency Group will assist in implementation of the management plan in a variety of ways: (1) by reviewing and commenting on the progress of management programs; (2) by identifying potential funding and personnel resources needed to implement programs; and (3) coordinating the development of policies at the national, state, and local levels with those identified in the management plan.

Resource Management Team

The Resource Management Team consists of representatives of Federal, State, regional, and local government agencies, and Sanctuary staff at the field level. These members are the field resource managers for the various agencies that are currently involved in resource management programs such as resource protection, science, and education. Examples of membership would include refuge managers, park managers, preserve managers, state lands managers, heads of agency science programs, and other local agency resource managers. This group will be established by a charter agreement or MOA. Team members will play an important role in continued cooperation between agencies by communicating relevant information on Sanctuary activities within their agency's internal management structures. This Team will be responsible for carrying out the various integrated management programs within the Sanctuary. They will be responsible for identifying new goals and objectives and raising any new issues or problems as they develop.

The Resource Management Team will communicate closely with the Interagency Group, the Sanctuary Advisory Council, and various Standing Committees to assure successful implementation of the Sanctuary Management Plan and the Water Quality Protection Program.

Sanctuary Advisory Council

The FKNMSPA and NMSA authorized the establishment of a Sanctuary Advisory Council (SAC) to assist NOAA in developing and implementing this Sanctuary Management Plan. Council participants represent conservation groups, public interest groups, local industry representatives, academia, commercial and recreational user groups, and the general public. The role of the Sanctuary Advisory Council is to provide recommendations to the Resource Management Team on Sanctuary management needs. The SAC will serve to identify gaps in Sanctuary management as well as serve in the capacity of liaisons to the community regarding Sanctuary issues. The SAC will also serve as the community's liaison to the Resource Management Team regarding the impact of implementation on the public and the public's interest in management needs. The SAC will serve to assist in resolving difficult and controversial issues in the Sanctuary by providing their expertise and advice in recommendations to the Resource Management Team and Sanctuary staff. The SAC will also serve as the local communities' liaison to the Resource Management

Team regarding the impact on the public of management implementation and their concerns about management. Members of the SAC will be asked to sit on Ad Hoc Partnership Groups and serve on various Standing Committees to assist in the implementation of the management plan and identification of Sanctuary management needs.

Ad Hoc Partnership Groups

The Ad Hoc Partnership Groups will be committees formed on a temporary basis to handle immediate Sanctuary management needs. These groups will be formed on an as needed basis to assist the Interagency Group, the Resource Management Team, the SAC, or any of the Standing Committees on specific tasks or projects. The membership of these groups may include members from any of the other groups, or outside experts asked to address a specific topic. For example, under the Permit MOA, an Ad Hoc group may be formed to coordinate multiple Federal, State, and local permits for large projects which are likely to affect Sanctuary resources. Another example is, under the Protocol for Fisheries Management, an Ad Hoc group may be formed to coordinate the management of fisheries in the Sanctuary by the South Atlantic Fishery Management Council, Gulf of Mexico Fishery Management Council, the Florida Marine Patrol, and the US Coast Guard. Chairs of these groups will be appointed at the time of their formation.

The South Florida Ecosystem Restoration Task Force

The South Florida Ecosystem Restoration Task Force (SFERTF) (Volume III, Appendix B) was established through an Interagency Agreement signed on September 23, 1993. The Task Force was established to "coordinate the development of consistent policies, strategies, plans, programs, and priorities for addressing the environmental concerns of the South Florida ecosystem." The Task Force created a Management and Coordination Working Group (The Working Group) to annually formulate and recommend to the Task Force management policies, strategies, plans, programs, and priorities for ecosystem restoration and maintenance. The efforts of the Working Group are facilitated and better integrated through the work of four Subgroups including: science; management; infrastructure; and public information and education. The Florida Keys National Marine Sanctuary has been identified as the downstream component of the South Florida ecosystem and for that reason management activities between the SFERTF and the Resource Management Team must be integrated to the greatest extent possible.

The memberships of the Interagency Task Force, Working Group, and Subgroups includes federal, state agencies, the Seminole Tribe of Florida, and the Miccosukee Tribe. Memberships of these groups overlap with the various groups identified for the Continuous Management Process of the Sanctuary. This overlap, especially in the subgroups, should facilitate the integration and implementation of the priorities established by the SFERTF with those of the Sanctuary.

Water Quality Protection Program Steering Committee

The FKNMSPA directed the U.S. Environmental Protection Agency (EPA) and the State of Florida, in consultation with NOAA, to develop a Water Quality Protection Program for the Florida Keys National Marine Sanctuary. The purpose of the Water Quality Protection Program is to "recommend priority corrective actions and compliance schedules addressing point and non-point sources of pollution to restore and maintain the chemical, physical, and biological integrity of the Sanctuary including restoration and maintenance of a balanced, indigenous population of corals, shellfish, fish, and wildlife, and recreational activities in and on the water." In addition to corrective actions, the Act also requires development of a water quality monitoring program and provision of opportunities for public participation in all aspects of developing and implementing the program.

Membership of the committee shall include representatives of the Environmental Protection Agency, National Park Service, U.S. Fish and Wildlife Service, Army Corps of Engineers, NOAA, Florida Department of Community Affairs, Florida Department of Environmental Protection, South Florida Water Management District, Florida Keys Aqueduct Authority, three individuals in local government in the Florida Keys, and three citizens knowledgeable about the Program. The Regional Director of EPA and the Florida Department of Environmental Protection serve as Co-chairs of the Steering Committee. The Director of NOAA's Office of Ocean and Coastal Resource Management is a committee member and ensures integration of the water quality program with the other Sanctuary management programs.

Implementation Costs

An integrated management approach involves many Federal, State, and local agencies that have a stake in the long-term health of the Sanctuary. Consequently, the total costs for managing the Sanctuary are to be shared by the participating Federal, State, and local agencies and may be further supported by private efforts, including NGOs. Table 3 presents the estimated annual operation and maintenance costs for implementing the Management Plan. The costs presented are for management of the Sanctuary and do not reflect costs to improve water quality in the Florida Keys. These costs are significant and are summarized in the Water Quality Action Plan and are explained in more detail in the Phase II document of the Water Quality Protection Program.

Current and Potential Funding Sources

Limited resources are currently available for full implementation of all the management actions outlined in the Preferred Alternative. Existing sources of financing will have to be supplemented if significantly more management activities are to be undertaken. Potential sources of additional funding are described in the following paragraphs.

Table 3. *Estimated Annual Operation and Maintenance Costs for Implementing the Management Plan*

Program Area	Cost (million dollars)
Administration	0.90
Channel Marking	0.60
Education	0.50
Enforcement	1.40
Mooring Buoy	1.00
Research and Monitoring	1.06
Submerged Cultural Resources	0.08
Volunteer	0.06
Zoning	1.00
Total	**6.60**

Sanctuary Operation Funds. The Sanctuary is managed jointly by NOAA's National Marine Sanctuary Program and Florida's Bureau of Coastal and Aquatic Managed Areas. Operating funds for Sanctuary management come from Federal appropriations to the National Marine Sanctuary Program. Operating funds cover expenses such as personnel salaries, boat maintenance, property rental, equipment and supplies, etc.

State of Florida. The State has ongoing resource protection, management, and permit programs that carry out Sanctuary objectives. State funding directed toward Sanctuary management could be increased and/or focused on activities identified in the Action Plans. For example, the State has provided funding to the Sanctuary Education Program on various projects, such as "Coral Reef Classroom" and "Team OCEAN".

Nonprofit Organizations. The Sanctuary has participated in cooperative projects with nonprofit organizations in which each party contributed partial funding. For example, the Sanctuary and The Nature Conservancy cooperatively support a program to recruit and organize volunteers to perform tasks that benefit the goals of the Sanctuary.

Foundations. NOAA's Sanctuaries and Reserves Division has been working with the National Fish and Wildlife Foundation (NFWF) to develop collaborative efforts to increase the visibility and accessibility of the National Marine Sanctuary Program. The NFWF operates by awarding challenge grants to match private-sector funds, often generating double- or triple-match cooperative projects. Sanctuary supporters in the Keys have established a Florida Keys Sanctuary Friends group to support Sanctuary programs and products. Similar foundations have been established in conjunction with national estuarine research reserves around the country.

Damage Assessment and Restoration Revolving Fund. Section 312 of the National Marine Sanctuaries Act (NMSA) authorizes NOAA to pursue civil actions to recover response costs and damages for incidents that injure, destroy, or cause the loss of Sanctuary resources. Since fiscal year 1991, funds collected by NOAA under Section 312 have been deposited in the Damage Assessment and Restoration Revolving Fund (DARRF). Section 312(c) requires that 20 percent of recovered damages, up to a maximum balance of $750,000, be used to finance response actions and damage assessments. The remaining damages are to be spent, in priority order, to: 1) restore, replace, or acquire the equivalent of the injured Sanctuary resources; 2) manage and improve the affected national marine sanctuary; and 3) manage and improve any other national marine sanctuary. The Florida/NOAA MOA for Coordination of Civil Claims Based on Injuries to Sanctuary Resources addresses the use of recovered sums to restore damaged resources consistent with Section 312. The strict criteria on the use of these Section 312 funds precludes expenditures for management purposes until other obligations for these funds are

met. These monies collected for Section 312 actions are not considered revenue generating funds because of the emphasis on directing the monies back to restoring the damaged resources.

Civil Penalty. Under Section 307(c) of the NMSA, NOAA can assess a maximum civil penalty of up to $100,000 per day per violation of the NMSA or any regulation or permit issued under the statute. While this maximum authority is ample for aggregious destruction of coral and other significant Sanctuary resources, most civil penalties for routine resource violations in the existing Key Largo and Looe Key NMS have been comparable to those collected by other agencies for similar infractions. The statute provides that funds are to be used, in priority order, to: 1) manage and improve the sanctuary within which the violation occurred; 2) pay a reward for information leading to a civil penalty or forfeiture action; and 3) manage and improve any other sanctuary. Under the Interim Management MOA and the Co-trustee Agreement, NOAA has agreed that any monetary recovery of civil penalties be used to remedy injury to Sanctuary resources for the exclusive benefit of the Florida Keys National Marine Sanctuary.

FKNMS License Plate Funds. An initiative is underway to introduce legislation setting up a specialty automobile license plate with a “Save the Coral Reef Tract” theme. Fees from Florida residents who purchase the license plate would go toward a fund dedicated to supporting reef protection activities. “Manatee” and “Florida Panther” license plates, made available in 1990, have generated $1 million to $2 million per year.

Boating Improvement Fund. The fund is administered by Monroe County and is derived from a portion of state vessel registration fees which are returned to the county where they are generated. The fund must be used for projects designed to enhance boating, and is specifically targeted at channel marking, launching facilities, and similar projects. Currently, Monroe County receives approximately $125,000 annually from this source; consequently, this is money that exists and is already being applied to channel marking needs in the Sanctuary.

South Florida Ecosystem Restoration. The South Florida Ecosystem Restoration Task Force (SFERTF) (Volume III, Appendix B) was established through an Interagency Agreement signed on September 23, 1993. The Task Force was established to “coordinate the development of consistent policies, strategies, plans, programs, and priorities for addressing the environmental concerns of the South Florida ecosystem.” Part of the Task Force’s responsibilities are to obtain funding for the restoration of the South Florida ecosystem including the Florida Keys National Marine Sanctuary. Potential funding sources that may be used for Sanctuary management and water quality improvements include the 1996 Farm Bill, highway toll collections, and monies earmarked for particular agencies through the Federal appropriations process for the restoration efforts in the South Florida ecosystem.

Action Plans

Introduction

The following chapters include the 10 Sanctuary action plans that outline the process for implementing Management Plan strategies. Action plans are composed of bundles of management strategies sharing common management objectives, and present the initial outline of the steps required for implementation. They provide an organized structure and process for implementing management strategies, including a description of the activities required, institutions involved, and requirements necessary for either complete or partial implementation. Although the plans are comprehensive, more detailed information about the tasks required must be developed for each strategy prior to implementation.

Action Plan Organization. All action plans are organized in three sections: 1) an introduction; 2) a description of strategies in the plan; and 3) a strategy implementation schedule. The introduction summarizes the goals and objectives of the plan and presents an overview of all strategies to be implemented. The description section lists the strategies and their component activities. Each activity is a subcomponent of the overall strategy, and represents a specific management action(s). The implementation section summarizes the requirements (e.g., funding, costs, personnel, etc.) needed to implement the strategies in each action plan.

Action Plan Specifics. The *Research and Monitoring* and *Water Quality* action plans address requirements mandated in the Florida Keys National Marine Sanctuary and Protection Act (FKNMSPA). In addition, the National Marine Sanctuary Program traditionally has *Education and Outreach*, *Enforcement,* and *Volunteer* programs at each sanctuary. The *Channel/Reef Marking, Mooring Buoy, Submerged Cultural Resources* and *Zoning* plans outline specific actions that will be taken to protect Sanctuary resources. The *Regulatory* plan includes the Sanctuary regulations and explains how management strategies have been incorporated into the regulations.

Limitations. Action plans provide only preliminary implementation and funding guidelines, and their parameters may change in the future. They present only the *planned* actions considered necessary to address the range of issues and problems confronting the Sanctuary. Their primary limitation is that strategies are expected to change with the evolution of the Sanctuary Program. Because the information in the action plans represents only the initial steps of implementation, the development of more-detailed information is still necessary.

Another limitation relates to the timing, cost, funding, and personnel requirements for each plan. This information is estimated and expressed in ranges, as more detailed information cannot be provided, given the uncertainties in the planning stage at this time. These estimates must be refined closer to the time of strategy implementation. This implementation is usually dependent on a coordinated mix of Federal, State, and local institutions, and many of these joint efforts will require memoranda of agreement and/or understanding among the cooperating agencies.

Although the thrust of what must occur to implement most strategies should already be identified in the action plans, they do not include all of the information required for complete implementation. Detailed information about the tasks, resource requirements, and agreements necessary to implement each strategy must still be developed. The Sanctuary staff and institutions providing assistance must develop the more detailed information required for such implementation to be successful.

Action Plan Development. Action plans were developed as a means of implementing management strategies recommended by the Core Group, Strategy Working Group, and Advisory Council. Topics were initially identified by NOAA and the Sanctuary Core Group, and were then assigned to professionals with expert knowledge about their specific theme (e.g., education, zoning, etc.). These professionals developed the draft text for the plans, and this text was reviewed by NOAA. The revised drafts were submitted to the Core Group members and peer reviewers for additional comments, and this information was incorporated into the plans found in this document. The paragraphs below describe the action plan development process in more detail.

Strategy Identification. The first step in developing action plans was to identify the strategies that would make up each plan. The 98 strategies in Alternative III were analyzed by the action plan authors and the Core Group to determine the appropriate mix of strategies in each plan. The objective was to place strategies in plans according to their management thrust. For example, all strategies that included specific educational activities were included in the Education and Outreach Action Plan. Strategies

requiring research and monitoring were included in that plan. Table 1 lists the strategies in each action plan.

Strategies in Multiple Plans. Due to the complexity of many strategies, some were included in more than one action plan. For example, a strategy may appear in both the Education and Outreach Plan and the Volunteer Plan, with each plan detailing the implementation procedure for the appropriate component of the strategy. The Printed Materials strategy, for example, includes both educational and volunteer components.

Other strategies, however, were exactly the same in multiple plans (e.g., many strategies in the Research and Monitoring Plan are the same as those in the Water Quality Action Plan). Where this is the case, a complete strategy description is included in only one plan, and that description is referred to when the strategy is mentioned in other plans.

Developing Background Information for Strategy Implementation. For each strategy within each action plan, information was developed regarding a number of parameters affecting strategy implementation. For example, information on the timing of implementation, costs, and currently available funding was compiled. This information was developed at planning workshops, and by the action plan authors, the Core Group, and peer reviewers. For each plan, information was developed for the parameters listed below.

Strategy Prioritization. Management strategies were organized into three groups (referred to as priority levels high, medium, and low in the action plans and action plan summaries) based on their relative importance or implementation feasibility. Because of the large number of strategies and the limited resources available, prioritization was necessary to determine the timing of strategy implementation. Initially, action plan authors identified "high-priority" strategies for their respective plans, and the list of these strategies was revised by the Core Group.

Planned Level of Activity inYear 1. Each strategy and activity has been assigned an estimated "activity level" (high, medium, low, or none) for year 1, and this information is included in each action plan. Activity levels represent the anticipated level of action in the first year following the adoption of the Sanctuary Management Plan.

Months to Complete Strategy. This is the *estimated* number of months required to complete each strategy or activity. If a strategy is expected to continue indefinitely, the number of months required to complete its main thrust is identified and it is listed as a continuous strategy. Although it would be useful to list a detailed milestone-type schedule for each strategy (i.e., defining when a strategy will begin and end), the uncertainties involved in implementing such a large number of strategies limit realistic scheduling to listing the number of months required for completion.

Funding. This is the level of funding currently available from all sources (Federal, State, local, and private) to complete each strategy. Because costs are not clearly defined, and the number of institutions that will be involved in funding activities may change, this is a subjective estimate based on expert knowledge (i.e., action plan authors and the Core Group). Funding-level estimates are provided for four availability categories: less than 50 percent; 50 to 74 percent; 75 to 99 percent; and 100 percent.

Costs. Estimates have been developed for each strategy and component activity for total capital costs and annual operations and maintenance costs. Costs are given in ranges and, when possible, are listed at the activity (strategy component) level within each action plan.

- Capital costs include the purchase of equipment (boats, vehicles, etc.), construction of buildings and plants, land acquisition, and other start-up expenses.
- Operations and maintenance costs include salaries, travel expenses, rent, utilities, upkeep, supplies (fuel, paper, etc.), and other administrative expenses. All cost estimates are listed in ranges.

Geographic Focus. The geographic focus of a strategy or activity. Management actions may be Sanctuary-wide, or limited to a specific area such as the Upper, Middle, or Lower Keys.

Personnel. The number of personnel required to implement the strategy or component activity. Estimates of staff requirements are listed in ranges.

Strategies Not Included in Action Plans. Nineteen strategies were not placed in action plans (excluding the Volunteer Action Plan), as they were not considered to fit within any plan. However, one stategy (B.10: Damage Assessment) was considered important enough to be a high-priority strategy (to be implemented in year 1). Based on its importance, the Sanctuary Superintendent will be responsible for ensuring that this strategy is fully implemented.

Channel/Reef Marking Action Plan

This action plan describes the strategies used to develop and implement a comprehensive channel/reef marking plan for the Sanctuary. The two strategies in the plan are derived from Alternative III, the most balanced of the management alternatives. The strategies are described in terms of their component activities. For each strategy/component activity, the time required for implementation, funding availability, costs, and responsible agencies/organizations are outlined. Table 4 summarizes key information about the strategies included in this plan.

Introduction

The strategies in this action plan are designed to establish an effective channel/reef marking system for boaters within the Sanctuary. Although Channel Marking is already in place in selected areas, considerable resource damage is occurring in areas lacking these navigational aids. The plan will establish a standardized system of signage that will be utilized throughout the Sanctuary, and will establish the priorities for channel/reef marker placement (emphasizing long-term protection and the enhancement of impacted shallow-water resources).

Marking the reefs as well as the entrance and exit areas and the major accessways to and from Florida Bay, the Gulf of Mexico, and the Atlantic Ocean will minimize the damage done to shallow-water resources throughout the Sanctuary. In addition, action plan implementation will facilitate enforcement action against damaging effects that are the result of inappropriate boater activities.

It is assumed that additional channel/reef marking in well-defined and prioritized locations will reduce the damage to shallow-water resources. A number of preliminary assessments must be completed before a recommendation about additional marking is made. Several inventories will be conducted to assess current shallow-water resource damage, the location of all existing markers (permitted and unpermitted), the location and function of all marine facilities, and depth of the entrance and exit channels from Keys subdivisions. In addition, tests of the premise that marking may increase boat traffic will need to be completed. Changes in boating activity will have to be monitored as new marking systems are placed in sensitive areas.

Although much of the work described in this action plan was completed by early 1994, these activities have been included in the plan to provide a complete description of the channel/reef marking requirements. In addition, those activities that have already been completed are identified. Overall, the Channel/Reef Marking Program should ultimately become a maintenance program, and will be a continuous component of the Sanctuary management process.

How the Plan is Organized. This plan outlines the approach for developing and implementing a Sanctuary-wide channel/reef marking scheme. The plan is based on the management strategies in Alternative III, and outlines the steps necessary to create an effective Channel/Reef Marking Program within the Sanctuary. The plan is composed of two strategies and their component activities, and is organized in three parts: an introduction, description of strategies, and a discussion of implementation considerations.

Background

Management Strategies. Each strategy in the Action Plan has been assigned an estimated activity level for year 1 (high, medium, low, or none) which represents an estimate of the planned level of action that

Table 4. *Summary of Channel Marking Strategies*

Page		Strategies	Overall Sanctuary Priority Level+	Planned Level of Action in Year 1	Months to Complete	Funding for Full Implementation	Number of Activities to be Undertaken	Number of Institutions
47	**Channel Marking Program**							
47	B.1	Boat Access Survey[1]	*	--	0	75-99%	5	2
48	B.4	Channel Marking	High	High	60+	75-99%	10	8

+ Strategies with an "*" for Overall Sanctuary Priority Level are already existing programs and/or will be completed in the first year of sanctuary operation.

1 Much of this strategy will be completed prior to year 1, however, it includes an activity that will continue indefinitely.

will occur in the year after the Sanctuary management plan is adopted. In addition, the time required for implementation, costs of implementation, and available funding (Federal, State, local, and private) have been estimated for each strategy. The component activities in each strategy, and the institutions responsible for implementing these activities, have been identified as well.

The strategies for the Management Plan, which includes the channel/reef marking Action Plan and all other action plans combined, have been grouped into three priority levels, based on their relative importance or feasibility. A strategy's priority level is based on factors such as available funding, costs, personnel requirements, timing, levels of existing implementation, and existing legislative/regulatory authority. The high priority level includes the 16 most important strategies. The medium priority level contains 36 strategies that represent the next level of importance to the Sanctuary and will have some level of activity in year one. Low priority items contain the remaining strategies in the Management Plan. Those strategies planned for completion in or before year one do not have a priority level.

Channel/reef marking Strategies. The Boat Access (B.1) strategy is completed, as outlined below, except for the continued update and maintenance of the database and GIS layer developed as the result of completing activities in this strategy. The channel/reef marking strategy (B.4) is included in priority level 1. Portions of this strategy have been completed, while some activities are ongoing.

Relationship to Other Action Plans. The regulations associated with the channel/reef marking strategy are included in the Regulatory Action Plan. Anticipated volunteer assistance is described in the Volunteer Action Plan. Also, while the Boat Access strategy is included as a component of the Mooring Buoy Action Plan, the implementation scheme (description of activities and associated information) for the strategy is only included in this action plan.

Goals and Objectives

National Goals. The need for channel/reef marking in the Sanctuary is unique within the National Marine Sanctuary Program. The Sanctuary contains broad shallow-water areas and significant reef tract that require channel/reef marking for adequate resource protection. Still, the implementation of a channel/reef marking Plan is based on the more general national goal of resource protection and the provision of reasonable and appropriate public access to the resource. The channel/reef marking Action Plan has been developed with these goals in mind.

Sanctuary Goals. The Sanctuary is affected greatly by broad spatial resource impacts, with a substantial proportion comprised of shallow benthic resources in waters affected by constant use. A main Sanctuary goal is the protection of these shallow areas by various means, including an extensive and well-managed Channel/Reef Marking Program. Sanctuary goals with respect to channel/reef marking include:

- protecting and improving degraded shallow-water resources;
- providing reasonable and appropriate public access while minimizing resource damage; and
- educating the public about what has been done to protect the resource and what they can do by becoming better boaters.

Program Objectives. To achieve these goals, the following objectives must be accomplished:

- assess the characteristics of boat use within the Sanctuary;
- assess the extent and intensity of damage that has occurred due to prop dredging;
- develop a standardized channel/reef marking system for the Sanctuary;
- develop channel/reef marking criteria that provide maximum protection to Sanctuary resources, ensure reasonable boating access, and allow for easy transit within the Sanctuary;
- gain agency and user consensus on the channel/reef marking criteria;
- implement a plan for installing new markers; and
- educate the public about the Channel/Reef Marking Program.

Description of Strategies

Channel Marking

The Channel/Reef Marking Program is comprised of two strategies. The Boat Access strategy (B.1) has been completed and has generated information about the location of existing marine facilities in the Keys and this data has been incorporated into a geographic information system (GIS) that will be maintained by the State. The GIS will be updated based on changes in facilities and newly issued permits. The channel/reef marking strategy (B.4) contains 10 activities. The first seven activities are largely complete and have provided the information necessary to assess need, prioritize and implement channel/reef marking. The other three will establish the process for developing a comprehensive Channel/Reef Marking Program. Activities 8 and 9 are underway.

Channel Marking Strategies

B.1: Boat Access
- Acquire existing information
- Develop and carry out boat access survey
- Input survey data to a GIS
- Make survey results available to resource managers
- Update survey results

B.4: Channel Marking
- Survey current boat travel patterns
- Survey boater use
- Survey damage from prop dredging
- Inventory and georeference channel markers
- Survey subdivisions for shallow-water access
- Assess channel marking effectiveness
- Integrate data
- Organize channel marking program
- Implement channel marking program
- Develop channel marker maintenance program

Strategy B.1: Boat Access

Conduct a survey to assess public and private boat access throughout the Sanctuary.
(Completed prior to Year 1)

Activity 1-Acquire Existing Information. Obtain information about the location of existing marine facilities in the Keys. Sources should be broad, and may include local comprehensive plans, permit data from Federal, State, and local agencies, and previously conducted surveys.

■*Existing Program Implementation.* The Monroe County Department of Marine Resources (DMR) and the Florida Marine Research Institute (FMRI) of the Florida Department of Environmental Protection (FDEP) have already completed this activity.

■*Implementation.* This activity was implemented by the FMRI and the Monroe County DMR.

■*Schedule.* This activity was completed prior to year 1.

Activity 2-Develop and Carry Out Boat Access Survey. Develop a data sheet to characterize each marine facility, and carry out a ground survey of each boat access site in the Keys. The sheet should include the precise location (local address and global positioning system (GPS) coordinates), type of facility, services provided, and intensity and type of use (recreational, commercial, live-aboard).

■*Existing Program Implementation.* The FMRI and Monroe County DMR have completed this activity.

■*Implementation.* This activity was implemented by the FMRI and Monroe County DMR.

■*Schedule.* This activity was completed prior to year 1.

Activity 3-Input Survey Data into a GIS. Input all data developed through the on-site survey into a GIS database.

■*Existing Program Implementation.* Monroe County DMR and the FMRI have completed this activity.

■*Implementation.* The Monroe County DMR was responsible for completing this activity under contract with the FMRI. All data has been turned over to the FMRI and will be updated by the Monroe County DMR as marine facilities change or new ones come into existence.

■*Schedule.* This activity was completed prior to year 1.

Activity 4-Make Survey Results Available to Resource Managers. Initiate a process to make the

information developed in the marine facilities survey available to resource managers in map, graphic, and written form.

■*Existing Program Implementation.* This activity is ongoing. Data is currently available through the FMRI. As part of FMRI's obligation to maintain data created as a result of activities carried out in the Sanctuary, this information will become more readily available over time. See Strategy W.28 in the Water Quality Action Plan.

■*Implementation.* The FMRI will be the lead agency responsible for implementing this activity. NOAA will assist in implementation.

■*Schedule.* This activity is ongoing as part of Strategy W.28 in the Water Quality Action Plan.

Activity 5-Update Survey Results. Update the marine facilities GIS database as facilities change and new ones are permitted.

■*Implementation.* The FMRI will be the lead agency responsible for implementing this activity. This activity should become a continuous process, with the Monroe County DMR providing primary support.

■*Schedule.* This activity will continue indefinitely.

This strategy is also included in the Volunteer Action Plan.

Strategy B.4.: Channel/reef marking

Establish a channel/waterway marking system throughout the Sanctuary. (High Priority Level, High Level of Action in Year 1, Five years to Complete, 75-99% Funding Available for Full Implementation)

This strategy is comprised of a number of ongoing projects whose purposes may be broader than the scope of the channel/reef marking strategy. However, the information made available through these projects will assist in the development of this strategy. These projects are listed as individual activities within this plan.

Activity 1-Survey Current Boat Travel Patterns. This survey was designed to determine the typical routes of travel used by all segments of the public within the Sanctuary. The survey included information about how participants believe channel/reef marking could be improved to facilitate their ability to travel, while minimizing potential damage to Sanctuary resources. All information collected will be entered into both a State and county GIS.

■*Existing Program Implementation*. Public meetings were held in 1992 to gather information about current travel routes. The survey was completed and the results confirmed in September 1993.

■*Implementation*. The Monroe County DMR had the lead responsibility for implementing this activity. The FMRI will provide a primary role in implementation by providing GIS assistance.

■*Schedule*. This activity was completed prior to year 1 and required two months to complete.

Activity 2-Survey Boater Use. This survey was designed to define the spatial and temporal patterns of boat use within the Sanctuary. It involved weekly overflights in a prescribed pattern along the Sanctuary's north/south boundaries from Soldier Key to the Marquesas. Boat counts were made during these flights, and each identified boat was assigned spatially to a one-minute grid. The overflights were coupled with simultaneous on-water surveys to enable clearer definition of specific boater activities at the time of each overflight. All data derived from this survey has been entered into a GIS.

■*Existing Program Implementation*. The overflights were initiated in late summer 1992 and continued through late summer 1993.

■*Implementation*. The FMRI had the lead responsibility for implementing this activity, and NOAA provided primary support. The Nature Conservancy assisted with implementation.

■*Schedule*. This activity was completed prior to year 1. The overflights required 12 months to complete. Work on the data at the FMRI lasted through 1995.

Activity 3-Survey Damage from Prop Dredging. The prop dredge survey was designed to determine the distribution and extent of damages to shallow-water resources in the Sanctuary that have resulted from boating activities.

■*Existing Program Implementation*. The survey has already been conducted using existing aerial photography and overflights of selected areas. Field work began in summer 1992 and was completed by January 1993. Information from the survey has been incorporated into the FMRI GIS. A summary report

was provided to FMRI in early 1993 to describe survey results. This information is now available on the FMRI, GIS and in FMRI Technical Report TR-1.

■*Implementation*. The FMRI had the lead responsibility for implementing this activity.

■*Schedule*. This activity was completed prior to year 1. It required nine months to complete the field survey work. The Technical Report was made available in 1995.

Activity 4-Inventory and Georeference Channel Markers. The channel marker inventory was designed to identify all known markers, and characterize and georeference them. Information gathered has been incorporated into a GIS. The survey will allow for an assessment of where new markers may be advantageous, will help determine where markers may be repositioned. The survey allowed the Monroe County DMR to identify the location of unpermitted markers and will help them determine if they should be removed. A relatively good database on permitted markers currently exists. However, prior to the completion of this survey, only anecdotal information was available for unpermitted markers.

■Implementation. Monroe County had the lead responsibility for implementing this activity. NOAA, the FMRI, and the U.S. Coast Guard (USCG) assisted with implementation.

■Schedule. This activity was completed prior to year 1. It required twelve months to complete.

Activity 5-Survey Subdivisions for Shallow-water Access. This survey was designed to complete an assessment of water depths at subdivision entrance points, and of shallow-water impediments between the Atlantic Ocean, Florida Bay, and the Gulf of Mexico and subdivision entrances. The information collected will be used to prioritize the placement of corrective or additional marking.

■*Implementation.* Monroe County had the lead responsibility for implementing this activity. The FMRI and the Florida Department of Community Affairs (FDCA) provided primary support.

■*Schedule.* This activity was completed prior to year 1. It was carried out at the same time as the channel marker survey and required twelve months to complete.

Activity 6-Assess channel/reef marking Effectiveness. This activity will establish two very important components of the Action Plan: 1) baseline photogrammetric (aerial photography) information for assessing changes in benthic communities in discrete areas following the establishment of the Channel/Reef Marking Program; and 2) baseline data for evaluating possible changes in boater use of an area which result from the installation of channel markers. The project will assess the effectiveness of various channel/reef marking methods to reduce shallow-water resource damage over time. It is anticipated that additional overflights will be completed each year for at least five years after new markers are installed so that resource managers can assess changes in prop scarred areas over time. Before and after surveys of boater use on various channels will also help to assess whether channel/reef marking increases the number and size of vessels using an area. Additional methods (e.g., on-site monitoring) for evaluating the effectiveness of the channel/reef marking effort will be used as the program is implemented.

■*Existing Program Implementation.* Five areas have already had aerial overflights completed. These are the north end of Big Coppitt Key, Lower Sugarloaf Sound, Kemp Channel south of U.S. Highway 1, the north end of Ramrod Key and the Lignum Vitae Aquatic Preserve area. Two of these areas, Lower Sugarloaf Sound and the Lignumvitae area, received channel/reef marking.

■*Implementation.* The Monroe County DMR will have the lead responsibility for implementing this activity, and the FMRI will provide technical and financial support.

■*Schedule.* This activity will be an ongoing part of the Channel/Reef Marking Program and will be completed in an effort to assess the effectiveness of channel/reef marking in each individual area marked.

Activity 7-Integrate Data. Virtually all of the information collected through the first five activities will be included in a GIS.

■*Implementation.* The FMRI and the Monroe County DMR had the lead responsibility for implementing this activity.

■*Schedule.* This activity was completed prior to year 1. It required 30 months to complete.

Activity 8-Organize Channel/Reef Marking Program. This activity will be implemented to develop the process for marking channels. A channel/reef marking Working Group (CMWG) composed of represen-

tatives from NOAA, Fish and Wildlife Service (FWS), National Park Service (NPS), U.S. Army Corps of Engineers (USACE), USCG, FDEP and FDCA, and the Monroe County DMR was established in 1993 to coordinate this activity. As a result, preliminary channel/reef marking criteria were developed in 1994. Citizen and user groups will also be asked to participate to assist the CMWG in refining the channel/reef marking criteria. The CMWG will be responsible for: 1) developing a joint statement of jurisdiction; 2) defining the typical conditions under which channel markers will be used; 3) recommending new types of signage for use in the shallow waters of the Keys, subject to approval by the U.S. Coast Guard; 4) continuing to develop the criteria for assessing the need for marking; 5) developing the list of potential locations for channel markers; 6) developing the criteria for prioritizing the order of importance for new channel marker installation; and 7) evaluating the need to remove channel/reef markers which are found to have a detrimental effect on shallow water communities. The 1994 Draft channel/reef marking Prioritization Criteria are provided in Table 5. The criteria are designed to emphasize the use of markers to eliminate documented damage where boat use is already established, rather than improving access to less frequented areas.

■*Implementation.* Through the CMWG, NOAA and Monroe County will take the lead responsibility for convening the agencies responsible for permitting and placing channel markers in the Sanctuary. In order to facilitate an accelerated and comprehensive program that meets the resource management goals of the Sanctuary, both agencies will work to coordinate and streamline the permitting process. This will include a consensus building effort designed to evaluate and come to terms with differences in resource management priorities in the wildlife refuges of the Lower Florida Keys. The FMRI will provide primary technical support. All aids to navigation must be approved by the USCG.

■*Schedule.* This activity will be completed by early 1997. It will require twelve months to complete. It is anticipated that the Monroe County DMR will receive grant funding to continue the development of the channel/reef marking Plan. This funding should allow for the completion of this activity and part of Activity 10.

Activity 9-Implement Channel/Reef Marking Program. Based on the information developed in the previous activities, channel/reef marking will be implemented. This activity consists of four components: 1) establishing funding sources and developing an implementation time frame based on current and projected funding allocations; 2) establishing implementation responsibilities; 3) submitting and reviewing permit applications based on the review of the CMWG recommendations; 4) installing the channel markers; and 5) removing channel/reef markers when necessary.

■*Existing Program Implementation.* Monroe County receives funding from the State of Florida through the Boating Improvement Fund (BIF). This fund is derived from State vessel registration fees, a portion of which is returned to the county where the fees were generated. In 1995, Monroe County received approximately $125,000 from the BIF. This money must be used for boating improvement activities, including channel markers. Monroe County has been active in sponsoring channel/reef marking projects utilizing this funding source. Projects originate with the Monroe County DMR and require review and approval by the Marine and Port Advisory Committee (MPAC) and the Board of County Commissioners. It is also possible for Monroe County to draft an ordinance which would allow the County to levy an additional 50 percent of the State's portion of vessel registration fees. For example, for a vessel 26 feet in length or less, the State's portion of the registration fee is $18.50. Thus, an additional $9.25 could be levied directly by the county. Such an ordinance would provide, at a minimum, an additional $200,000 per year to the County for boating improvement needs such as channel/reef marking. At current (1995) rates, if the County allocated 75% of the BIF to channel/reef marking, approximately 100 channel markers could be installed annually. Up to 250 to 300 markers could be installed annually if the ordinance were passed. A conservative estimate of the number of new markers required is in the range of 500 to 1,000.

■*Implementation.* The Monroe County DMR will have the lead responsibility for implementing this activity. The Florida DEP, the U.S. ACOE and the USCG will serve a primary role by reviewing permit applications for all aids to navigation. Monroe County will install the majority of the channel markers. All aids to navigation must be approved by the USCG.

■*Schedule.* Implementation will begin prior to year 1. The permitting and marking components of this activity will be continuous. At a minimum, the project would last four years based on full monetary commitment. It could last as long as 10 years. In the first two years more time would be spent in developing permit applications and in attaining permits. In subsequent years, a greater proportion of time allocation would

go to channel marker installation. A goal of the program is to mark 15 high priority channels over four years.

Activity 10-Develop Channel Marker Maintenance Program. A marker maintenance program will be developed and implemented to ensure the upkeep of channel markers. A major component of this process will include the development of a GIS database for the permitted markers.

■*Implementation.* The Monroe County DMR will have the lead responsibility for implementing this activity.

■*Schedule*. Development of the activity will require six+ months to complete. Actual on the water maintenance will be a continuous obligation.

This strategy is also included in the Regulatory and Volunteer action plans.

Table 5. *Channel/Reef Marking Prioritization Criteria*

Implementation

This section explains how the strategies in the channel/reef marking Action Plan will be implemented. The institutions responsible for each activity, and those agencies that will provide some level of assistance, are identified. The strategies are also ranked to indicate their overall priority level. In addition, the planned level of activity in year 1, months required to complete, funding availability, cost estimates, staff requirements, and the geographic focus of each strategy/activity are provided. Finally, the process used to evaluate the effectiveness of the Channel/Reef Marking Program as it evolves over time is provided.

Responsible Institutions. The Monroe County DMR will have the primary responsibility for implementing the activities within this action plan. However, the success of the Channel/Reef Marking Program will depend on the cooperation of other Federal, State, and local agencies, primarily the FMRI and FDEP, USCG, and NOAA. The channel/reef marking Working Group will also play an important role in strategy implementation. Table 6 lists the institutions responsible for implementing each activity.

Prioritization of Implementation. The channel/reef marking strategy is a high priority level, and is considered one of the sixteen most important strategies in the Management Plan. Since the Boat Access strategy is essentially complete, it has not been assigned a priority level.

Table 6. *Agencies/Organizations Identified for Implementing Strategies/Activities*

Strategy/Activity	Agencies/Organizations: NOAA	USACE	USCG	FDEP (ERP)	FMRI (FDEP)	FDCA	DMR	TNC
CHANNEL MARKING PROGRAM								
B.1 Boat Access Survey								
Acquire Existing Information					●			
Develop and Carry Out Boat Access Survey							●	
Input Survey Data into a GIS					●			
Make Survey Results Available to Resource Managers					●			
Update Survey Results					●		◉	
B.4 Channel Marking								
Survey Current Boat Travel Patterns					◉		●	
Survey Boater Use	◉				●			○
Survey Damage from Prop Dredging					●			
Inventory and Georeference Channel Markers	○		○		◉		●	
Survey Subdivisions for Shallow-Water Access					○	◉	●	
Assess Channel Marking Effectiveness				○	◉		●	
Integrate Data	◉				●		○	
Organize Channel Marking Program	●				◉		●	
Implement Channel Marking Program	◉	◉	●		◉		●	
Develop Channel Marker Maintenance Program			●				●	○

● Lead ◉ Primary Role ○ Assist

Abbreviations: NOAA, National Oceanic and Atmospheric Administration; USACE, U.S. Army Corps of Engineers; USCG, U.S. Coast Guard; FDEP, Florida Department of Environmental Protection; ERP, Environmental Resource Permitting; FMRI, Florida Marine Research Institute; FDCA, Florida Department of Community Affairs; DMR, Monroe County Department of Marine Resources; TNC, The Nature Conservancy.

Table 7. *Requirements for Implementation*

Strategy/Activity	Overall Sanctuary Priority Level	Implementation: Planned Level of Action in Year 1	Implementation: Months to Complete	Implementation: Funding Available to Complete	Cost to Complete: Total Capital ($1,000)	Cost to Complete: Annual Operations/ Maint. ($1,000)	Geographic Focus	# of Personnel
CHANNEL MARKING PROGRAM								
B.1 Boat Access Survey	**AC**	AC	AC	75-99%	<10	NC		2
Acquire Existing Information		AC	AC	75-99%	<10	NC	SW	
Develop and Carry Out Boat Access Survey		AC	AC	75-99%	<10	NC	SW	
Input Survey Data into a GIS		AC	AC	75-99%	<10	NC	SW	
Make Survey Results Available to Resource Managers		AC	AC	75-99%	<10	NC	SW	
Update Survey Results		High	C	75-99%	<10	NC	SW	
B.4 Channel/Reef Marking+	High	High	60+	75-99%	>5,000	260-600		10
Survey Current Boat Travel Patterns		AC	AC	75-99%	<10	NC	SW	
Survey Boater Use		AC	AC	75-99%	10-99	NC	SW	
Survey Damage from Prop Dredging		AC	AC	75-99%	10-99	NC	SW	
Inventory and Georeference Channel Markers		AC	AC	75-99%	10-99	NC	SW	
Survey Subdivisions for Shallow- Water Access		AC	AC	75-99%	<10	NC	SW	
Assess Channel Marking Effectiveness		High	C	75-99%	10-99	10-99	SW	
Integrate Data		AC	AC	75-99%	<10	NC	SW	
Organize Channel Marking Program		High	12	75-99%	<10	NC	SW	
Implement Channel Marking Program		High	C	<50%	1,000-5,000	250-500	SW	
Develop Channel Marker Maintenance Program		High	C	75-99%	<10	NC	SW	

Abbreviations: Maint., Maintenance; AC, Already Completed; C, Continuous; SW, Sanctuary Wide.
+All of the activities, except for implementing channel marking, are currently underway. Some may be completed prior to year 1.

Schedule. Table 7 lists the estimated time required to implement each strategy and activity in the Channel/Reef Marking Program. Most activities in the channel/reef marking strategy are expected to be completed in year 1. However, the implementation of this strategy (i.e., installing and maintaining channel markers), will be a continuous process. All activities (excluding updating survey results) in the Boat Access strategy will be completed before year 1. Updating boat survey results will be a continuous component of the Boat Access strategy.

Cost. The costs associated with implementing the Channel/Reef Marking Program are expected to be significant (up to $1 million in total capital costs and an additional $250,000 for annual operations and maintenance costs). The bulk of these costs are associated with placing and maintaining channel markers throughout the Sanctuary. The estimated cost of each activity is provided in Table 7.

Geographic Focus. Both strategies will be implemented Sanctuary-wide.

Personnel. About 10 staff members from the Monroe County DMR and the institutions identified in Table 6 will be required to implement the channel/reef marking strategy. Two staff members from the Monroe County DMR have been involved in implementing the Boat Access strategy and will continue to be involved in developing the plan, submitting permit applications, and developing installation and maintenance contracts.

Contingency Planning for a Changing Budget. About $125,000 per year is available from Monroe County Boating Improvement Funds, some aids to navigation will be owned and maintained by the USCG. Although the current level of funding will allow the Program to function, fully implementing the

Channel/Reef Marking Program will require additional funds. As noted previously, sufficient funds would become available immediately if the County were willing to adopt an ordinance to levy additional funds through the state vessel registration fee requirements. The program will be completed; additional funding simply shortens the time frame.

Evaluating Program Effectiveness and Efficiency. The effectiveness of the Channel/Reef Marking Program will be evaluated based on how many proposed markers are installed each year. The program's effectiveness will also be determined based on the success of the process to update the survey information developed through the Program.

Education and Outreach Action Plan

This action plan identifies and describes education and outreach strategies that will be implemented in the Florida Keys National Marine Sanctuary. The strategies in the plan are derived from the Preferred Alternative, the most balanced of the management alternatives. For each strategy, the time required for implementation, funding availability, costs, and responsible parties are outlined. All of the 10 strategies will be implemented in the first year of Sanctuary operation. These strategies are expected to have a significant effect on managing, protecting, and preserving both natural and cultural Sanctuary resources. Table 8 summarizes key information about the strategies included in this plan.

Introduction

One of the primary mandates of the Florida Keys National Marine Sanctuary and Protection Act (FKNMSPA) is to educate the public about the marine environment surrounding the Keys. The diverse habitats, resources, and unique setting of the Keys offer opportunities for the interpretation of marine subtropical and temperate environments. Educational and outreach strategies in the action plan fall into two general categories: community involvement/community program strategies and product development strategies. The first group includes education and outreach strategies designed as interactive programs for user groups (e.g., exhibit production, training programs, workshops, school programs, public-involvement forums, and special events). Strategies that result in the development of specific products (i.e., printed materials, audio-visual materials, signs and displays in high-use areas of the Keys, public service announcements, visitor booths/displays, etc.) providing a mechanism for public education and outreach are included in the second group. The education and outreach strategies included in this plan were developed based on input from environmental educators, the Sanctuary education staff, user groups, environmental activists, and concerned citizens through two workshops (May 1988 and September 1991) held in the Keys and through public comment received on the draft management plan. Guidance on levels of activities and priorities was provided by the Sanctuary Advisory Council and the FKNMS Core Working Group.

Education and outreach have been used as a tool in resource protection from the beginning of the Sanctuary Program in the Keys. The Looe Key and Key Largo national marine sanctuaries have used education as an effective management tool since their designation. A number of educational programs are currently underway at the two sanctuaries, and will continue to be implemented in the FKNMS (see inset box Existing Programs). Examples of these programs include instruction to teachers and students about the Sanctuary environment (Coral Reef Classroom), on-site interpretive tours, subject-specific slide programs, interpretive law enforcement, interpretive exhibits at trade shows and festivals, weekly campfire programs, training seminars, and volunteer programs.

Table 8. *Summary of Education and Outreach Strategies*

Page		Strategies	Overall Sanctuary Priority Level	Planned Level of Action in Year 1	Months to Complete	Funding for Full Implementation	Number of Activities to be Undertaken	Number of Institutions
62	**Community Involvement/Community Program**							
62	E.4	Training, Workshops, and School Programs	High	Medium	12+	<50%	7	19
64	E.6	Advisory Board	High	High	6+	100%	1	12
65	E.10	Public Forum	Medium	Low	12+	<50%	4	14
66	E.11	Special Events	Medium	Low	9+	<50%	5	20
67	E.12	Professional Development						
68	**Product Development**							
68	E.1	Printed Materials	High	Low	C	<50%	13	18
71	E.2	Audio-Visual Materials	Medium	Low	3+	<50%	2	11
72	E.3	Signs/Displays/Exhibits	Medium	Low	36+	<50%	6	17
74	E.5	PSAs	Medium	Low	60+	<50%	5	13
75	E.7	Promotional/Educational Materials	Medium	Low	48	<50%	2	8

Abbreviations: C, Continuous.

How the Plan is Organized. This action plan is organized in three sections: an introduction, description of strategies, and discussion of implementation procedures. The introduction summarizes the goals and objectives of the Education and Outreach Program and provides background information on planning efforts. The strategy description section groups strategies according to whether they contain community-involvement or product-development activities. The implementation section details how strategies in the plan will be placed into action. For each strategy and component activity, the priority level, funding availability, costs, and timing of implementation are summarized.

Background

Management Strategies. Each strategy has been assigned an estimated activity level for year 1 (high, medium, low, or none). This activity level is an estimate of the planned level of action that will occur in the first year after the Sanctuary Management Plan is adopted. In addition, the time required, costs of implementation, and funding availability (Federal, State, local, and private) have been estimated for all strategies. The component activities within each strategy, and the institutions responsible for implementation, have also been identified.

The strategies for the Management Plan, which includes the Education and Outreach Action Plan and all other action plans combined, have been grouped into three priority levels, based on their relative importance or feasibility. A strategy's priority level is based on factors such as available funding, costs, personnel requirements, timing, levels of existing implementation, and existing legislative/regulatory authority. The high priority level includes the 16 most important strategies. The medium priority level contains 36 strategies that represent the next level of importance to the sanctuary and will have some level of activity in year one. Low priority items contain the remaining strategies in the Management Plan. Those strategies planned for completion in or before year one do not have a priority level.

Education and Outreach Strategies. This action plan includes the 10 strategies in the Preferred Alternative that have an education or outreach component. Although the plan includes many strategies important to Sanctuary protection, the strategies concerning printed materials, training programs, and an advisory board are a high priority with regards to implementation. However, seven of the remaining strategies are included in medium priority level, and each will have some level of implementation in the first year of Sanctuary operation. Table 8 summarizes the education and outreach strategies and activities within this plan, including Sanctuary priority level, planned level of action in year 1, months to complete, and funding available for full implementation.

Relationship to Other Action Plans. In general, all management activities are dependent on successful interpretation and education and outreach. In fact, one can envision an educational and outreach component to all management strategies. The management plan conceptualizes the educational and outreach approach as a primary tool of resource management to help preserve natural marine habitats and submerged cultural resources, with enforcement activities as an additional tool for these purposes. All of the strategies listed in this plan, excluding the establishment of an education advisory board, are also included in the Volunteer Action Plan. The success of Sanctuary educational and outreach strategies is dependent upon the volunteer assistance. The Training, Workshops, and School Programs strategy is also included in the Water Quality Action Plan.

Goals and Objectives

National Program Goals. Marine Sanctuaries are established throughout the country in recognition of a site's unique environmental and/or historical and cultural characteristics. This plan's reference to the environment is intended to include natural as well as historical-cultural resources. Each Sanctuary stands apart as a national treasure, and education, outreach, and interpretation activities regarding the natural resources of these areas is often site-specific. However, there are National Marine Sanctuary Program goals that apply to each Sanctuary that help define the framework for developing site-specific education and outreach activities. The education goals of the National Program include:

- providing educational leadership in marine conservation and protection efforts throughout the nation's national marine sanctuaries and national estuarine research reserves;

- adopting a Sanctuary Program/system-wide unity and identity to promote greater national awareness, while encouraging site-specific individuality;

Existing Programs

Education and outreach has been a primary source of resource protection in the Florida Keys since the first sanctuary was established in 1975. There are a number of educational and outreach efforts underway at the Key Largo and Looe Key national marine sanctuaries that will continue within the framework of the FKNMS. Some of the more effective educational and outreach programs in the Keys are:

Coral Reef Classroom. This training program uses both the Key Largo and Looe Key national marine sanctuaries as *in situ* classrooms where students and teachers are taught about coral reef ecology, Sanctuary management, and coral reef monitoring. Monroe County science/ biology students have been provided on-site tours to observe the complexities of the coral reef ecosystem that cannot be gained in the traditional classroom.

On-Site Interpretive Tours. Tours within the waters of the existing sanctuaries have provided unique and meaningful educational experiences for participants. These snorkeling trips are usually preceded by a slide program or lecture. Topics of discussion include: Sanctuary management, coral reef ecology, research, and natural and human-induced impacts.

Subject-Specific Slide Programs. Slide and/or video programs are provided upon request to schools, colleges, special-interest groups, government officials, clubs, etc.

Interpretive Law Enforcement. In addition to enforcing Sanctuary regulations, Sanctuary law enforcement officers contact visitors on the water every day, distributing Sanctuary brochures and providing information. This approach enhances on-site identity, lends a friendly cooperative spirit, increases compliance with Sanctuary regulations, and prevents violations or negative impacts.

Interpretive Exhibits. Sanctuary exhibits are often provided at national trade shows/ conferences and local community events (i.e., seafood festivals, regional boat shows, and dive shows). These exhibits are usually staffed by Sanctuary personnel.

Frequent Users Meetings. These periodic meetings update commercial and recreational users of the Key Largo and Looe Key national marine sanctuaries about current management issues, educational products and programs, research results, and law enforcement concerns.

Weekly Campfire Programs. Sanctuary officers provide weekly slide programs at the Bahia Honda State Park during the winter tourist season (November through April).

Training Seminars. Sanctuary staff provide seminars on damage assessment techniques, mooring buoy installation, and reef cleanup on a request basis.

International Training Program. This program is administered by the National Marine Sanctuary Program and is established for managers and staff of marine protected areas around the world. The training includes instruction and discussion of management strategies, law enforcement, education, research, and facilities maintenance.

- linking the sanctuaries and reserves programs to each other through national environmental education programs; and
- establishing a standard of excellence that is attained through the education programs of all sites.

Sanctuary Education and Outreach Program Goals. Recognizing the importance of program consistency and the need to attain the standards that will link the programs of the sanctuaries and reserves, goals and objectives have been developed specifically for the FKNMS. These goals are designed to respond to the specific environmental education needs of the Keys' community and Sanctuary visitors/users.

There are three broad (and sometimes overlapping) characterizations of Sanctuary education and outreach program goals and objectives to be considered.

The first set of these are those with desired outcomes for Sanctuary staff and education provider groups. These address staff training and staff development.

The second broad category of goals and objectives adresses learner outcomes, and includes awareness, cognitive knowledge, skill development and participation in stewardship. These outcomes are very much linked to the first set of outcomes.

A final set of outcomes, categorized as Sanctuary outcomes, refers to issues of Sanctuary awareness, management and enforcement. According to these broad characterizations, the Sanctuary Education and Outreach Program goals are as follows:

Staff and Education Provider Goals:

- facilitating environmental education opportunities for all segments of society; and

- promoting and supporting education and training opportunities for Sanctuary staff and entities providing education programs within the Sanctuary.

Learner Outcome Goals:

- promoting a holistic view of the Keys' ecosystem as an interrelated and interdependent system of habitats;
- encouraging and promoting a sense of user stewardship regarding the marine environment by imparting strategies and skills which will help reduce the occurrence and effects of future resource impacts;
- promoting and fostering a clear awareness of the economic, biological, recreational, educational, and cultural values of the Keys' ecosystem, as well as the interdependence of these factors upon one another;
- fostering increased recognition and understanding of:
    1. social and political issues associated with these resource impacts and;
    2. associated management strategies intended to reduce or eliminate such impacts.
- fostering knowledge and understanding of the historical relationships between humans and these ecological systems, with attention to resource impacts, and the limitations of current scientific knowledge.

Sanctuary Outcome Goals:

- promoting the awareness of, and support for, the Florida Keys National Marine Sanctuary Program through community partners in education, outreach, awareness, enforcement, and management.

Sanctuary Education and Outreach Program Objectives

Because of the Sanctuary's large size and range of management issues, there are many Sanctuary Program objectives that encompass a wide variety of themes. To achieve the goals defined above, the following objectives should be met:

- support, develop, and establish cooperative agreements to promote innovative educational projects regarding the Sanctuary and/or the Keys' marine ecosystem;
- provide and support multi-disciplinary environmental education experiences;
- provide and support training opportunities for resource users;
- utilize the existing network of educators and environmental education organizations and institutions already in place;
- provide orientation and continuing education for FKNMS education staff, officers and others on ways to teach target groups about the resources in the Sanctuary, both at a cognitive and a skill-based level;
- cross reference regulatory and interpretive enforcement in the Education/Outreach Action Plan;
- provide educational opportunities for the educational community, including organizations and agencies delivering environmental, natural historical, cultural, and socio-economic education information, so that they may have access to consistent, accurate scientific information;
- provide mechanisms so that new ideas and policies can be introduced and incorporated into the ongoing Education and Outreach Action Plan; and
- provide permitting mechanisms so that pre-existing education organizations and new entries may carry out their activities within the Sanctuary with minimal processing.

Learner Outcome Objectives

- provide the public with information gained through research in a timely fashion;
- provide educational information at technical and scientific meetings;
- provide education for visitors to the Sanctuary;
- provide a cognitive understanding of broad ecosystem interactions as well as a skill-based understanding;

- facilitate specific education for Monroe County youth that emphasizes the interconnectedness of the Keys ecosystem through traveling sequential field trip programs;

- provide education for audiences outside of the Florida Keys (state, national, and international); and

- provide on-site opportunities for resource education.

Sanctuary Outcome Objectives

- increase NOAA and other organizations' awareness of educational programming activities in the Keys by non-agency organizations;

- increase public awareness of current Sanctuary activities;

- encourage community cooperation and participation in Sanctuary management;

- increase the understanding of, and voluntary compliance with, sanctuary resource management efforts (channel marking, mooring buoys) and regulatory requirements (e.g., zoning regulations);

- provide the public with information gained through research;

- increase public awareness of cumulative environmental impacts in the Keys;

- provide opportunities for individuals to become “caretakers” of the environment;

- provide information at “high-profile” locations;

- provide informative environmental education and outreach programs to school systems;

- provide exposure to environmental education, introducing an ecosystem approach over time;

- provide multilingual environmental education materials and programs; and

- provide environmental education opportunities for adults.

Description of Strategies

Community-Involvement/Community-Program Strategies

Education and outreach strategies designed to include opportunities for interaction can be defined as community-involvement/community-program strategies. Examples of activities within these strategies include educational exhibit production, training programs, workshops, school programs, public-involvement forums, and special events. New strategies and/or activities may be added as the program evolves. When possible, all strategies within this category will have a multilingual component, as a concerted effort will be made to communicate environmental education to the non-English-speaking population of South Florida.

Community-Involvement/Community-Program Strategies

E.4: Training/Workshops/School Programs
- Promote/support environmental education in Monroe County and State schools
- Produce the Florida Keys Environmental Education Resource Directory
- Provide/support environmental education workshops for educators
- Provide environmental education for law enforcement personnel
- Sponsor and support adult environmental education
- Establish a certification program
- Deliver education at the resource (Team O.C.E.A.N.)

E.6: Advisory Board
- Establish an education advisory board

E.10: Public Forum
- Establish public meeting program
- Develop a speakers' bureau and lecture series
- Conduct a poster contest
- Conduct a photo contest

E.11: Special Events
- Develop and maintain trade show information booths
- Hold an environmental exposition
- Hold a Sanctuary grand opening
- Design and implement a Kids' Week
- Design and implement a Sanctuary Awareness Week

E.12: Professional Development of Education and Outreach Staff

Strategy E.4: Training/Workshops/School Programs

This strategy will help develop instruction and training opportunities, including programs conducted by teachers, Sanctuary staff, other non-formal educators, and volunteers. Training programs (e.g., Coral Reef Classroom, submerged cultural resources, etc.) will also be provided for teachers, environmental professionals, business owners and operators, and law enforcement officials. These programs will be designed to keep these audiences up-to-date with consistent and accurate scientific information. Key elements of these training opportunities will include: 1) emphasis on an ecosystem approach; and 2) fostering a cognitive knowledge, as well as a skill-based knowledge, of the Key's ecosystem. *(Priority level High, Medium Level of Activity in Year 1, 12+ Months to Complete, <50% Funding Available for Full Implementation)*

Activity 1-Promote and Support Environmental Education in Monroe County and State Schools. The Education Program supported the additional development of a Monroe County Environmental Education Plan. The plan provides sequential exposure to environmental issues over the course of a student's development (from grades K-12). Sanctuary education staff and-or other professional environmental educators will develop grade-appropriate environmental education materials, provide and support natural and cultural resources field trips, and provide educators (private and public) with information regarding Sanctuary resources. Education staff will train volunteers and professional educators to provide presentations and support and conduct field trips. A strong component of this activity will be to include field trips to sites throughout the Keys to emphasize the connectedness of the local ecosystems. While engaging in this activity, Sanctuary staff will take advantage of the network of educators and institutions already in place, including the Monroe County School District. Expand the Coral Reef Classroom to educate about more habitats such as nearshore and bay areas. Education programs should focus on the cognitive development of the students as well as skill-based knowledge. The FKNMS will have the authority and option to issue RFP's for educational services to be awarded on a competitive basis.

■*Existing Program Implementation.* The Sanctuary Program currently provides an intensive marine education program for students in grades 7-9 at the Key Largo and Looe Key national marine sanctuaries. This two-day Coral Reef Classroom involves both lectures and on-water scientific instruction. It currently takes place over a five-week period during the Spring. Sanctuary education staff conduct all aspects of the course, and are working closely with the Monroe County school system to develop a comprehensive environmental education program for grades K-12. The Sanctuary Program also currently provides field trip opportunities for school groups and other independent environmental education organizations on request.

■*Implementation.* The Coral Reef Classroom program will be expanded to the Key West area, and classes will be offered over the course of the year. A part-time staff person will be responsible for organizing the course, and grant funds will be sought to support this effort. This program will be expanded to include more habitat such as the nearshore and bay areas. After a county school system education program is developed, the education staff will work with the county science coordinator to schedule field trips, or will provide information on other environmental programs that may provide educational support. Environmental educators within the school system and in private organizations will receive Sanctuary information on a regular basis. This information may be related to current resource issues and Sanctuary programs. Workshops will be investigated as a possible avenue for information dissemination, and educators will receive in-service credit for attending. There is a need to work more closely with elementary teachers on the development of thematic units for each grade (i.e. develop an articulated scope and sequence). It is recommended that the education staff seek to actively involve teachers, or teams of teachers, in such developmental efforts.

■*Schedule.* This activity will have a high level of action in year 1. It will be continuous.

Activity 2-Produce the Florida Keys Environmental Education Resource Directory (FKEERD). A directory of environmental (natural and historical-cultural resource) education activities in the Keys, including a description and listing of the groups involved, will be produced and distributed to interested parties. Information will be derived from the results of a 1991 survey of environmental educators and two workshops held with environmental educators. The directory will be updated every three years, ensuring that existing activities are not duplicated.

■*Existing Program Implementation.* The directory is currently available within the Sanctuary.

■*Implementation.* Sanctuary education staff will be responsible for producing the directory, and providing copies on request.

■*Schedule.* This activity will have a low level of action in year 1. It will require 8 months to complete.

Activity 3-Provide and/or Support Environmental Education Workshops for Educators. This activity will enhance the knowledge base of local educators through environmental education workshops regarding the Keys' natural and cultural resources, and will insure that the education community within the Keys is communicating consistent, accurate scientific information. Co-sponsorship of educational workshops (with financial assistance) will be investigated.

■*Existing Program Implementation.* Sanctuary education staff currently provide logistical support and instruction for teacher in-service and environmental education workshops sponsored by the Monroe County school system and other local environmental education programs.

■*Implementation.* Using the FKEERD, Sanctuary education staff will identify programs that provide training for environmental educators. Staff members will contact these programs to discuss how the Sanctuary Program can help. The staff will also determine whether training opportunities are lacking, and will coordinate with other groups to organize future workshops if necessary. Staff will incorporate the assistance of the local community of environmental educators already in place.

■*Schedule.* This activity will have a high level of action in year 1. It will be continuous.

Activity 4-Provide Environmental Education for Law Enforcement Personnel. Provide basic environmental education to law enforcement personnel regarding resource identification, and ecosystem significance. Because many law enforcement personnel operating in the Sanctuary will be cross-deputized, training on the Sanctuary's natural and cultural resources will be essential. Officers must understand environmental consequences that can occur as a result of violations. This approach should emphasize both cognitive and skill-based educational programming for these officers. It should also provide these officers with educational skills so that they act in the role of educators as well as enforcement agents.

■*Existing Program Implementation.* Federal/State and Sanctuary education and management staff currently assist the Florida Marine Patrol (FMP) and National Marine Fisheries Service (NMFS) law enforcement personnel when necessary. The Federal Law Enforcement Training Center provides training as does the State.

■*Implementation.* Sanctuary education staff will work with the FMP, NMFS and other Federal and State entities to develop training courses for law enforcement personnel.

■*Schedule.* This activity will have a medium level of action in year 1. It will require 12+ months to complete.

Activity 5-Sponsor and Support Adult Environmental Education. This activity will sponsor and support environmental education opportunities for local adults interested in learning more about the Keys' natural and cultural resources. Organizations offering adult education (e.g., Florida Keys Community College, the Power Squadron, and the U.S. Coast Guard Auxiliary) will be identified. Education staff will assist programs offering environmental (natural and cultural) education courses by conducting guest lectures, organizing field trips, and distributing educational brochures. When environmental education is not part of an organization's program, staff will confer with instructors to determine if such information may be included and what form it may take.

■*Existing Program Implementation.* Sanctuary staff often conduct guest lectures and offer field trip opportunities for the Florida Keys Community College, Florida Institute of Oceanography (FIO), and other organizations on request. There are also historical and cultural resource education programs in south Florida which provide opportunities for cooperation.

■*Implementation.* Sanctuary education staff will identify and contact adult education organizations to determine how the Sanctuary may support their efforts and/or establish an environmental education focus.

■*Schedule.* This activity will have a medium level of action in year 1. It will be continuous.

Activity 6-Establish a Certification Program. Environmentally responsible business practices will be encouraged through this voluntary activity. Criteria will be established that, when fulfilled, will qualify businesses to be "certified" as environmentally conscious operators. The businesses and their patrons will be provided with educational information regarding Sanctuary resources and regulations. A training program may be a component of this activity. Participation in any certification programs will be voluntary.

■*Implementation.* Sanctuary education staff will contact the Florida Association of Dive Operators, the Keys Association of Dive Operators, Professional Association of Dive Instructors, National Association of Underwater Instructors, the Young Men's Christian Association, chambers of commerce, and Tourist Development Council to determine the level of interest in this program and potential funding sources. The education staff, in coordination with staff from interested organizations, will develop the certification requirements and training materials.

■*Schedule.* This activity will have no action in year 1. It will require 12 months to complete.

Activity 7- Provide mechanisms outside of the law enforcement sector that can help deliver resource education at the site of the resource. An example may include volunteer and/or paid personnel located at popular Sanctuary sites where the public is likely to access the resource (i.e. Team O.C.E.A.N.).

■*Implementation.* Sanctuary education staff is working with volunteers to accomplish this, and using Federal and State funds to support this work.

■*Schedule*. This activity will have a high level of action in year 1. It will be continuous.

This strategy is also included in the Volunteer and Water Quality action plans.

Strategy E.6: Education Advisory Board

Establish an Education Advisory Board to advise educators on education goals, priorities, and funding sources for the Sanctuary. A full-time staff person will eventually be provided to devote 100 percent of his/her time to Advisory Board matters. The Advisory Board will provide a mechanism to introduce new ideas into the overall sanctuary Education and Outreach Action Plan.

The Advisory Board will examine and provide recommendations on matters important to implementing goals, objectives and strategies. The Education Advisory Board should also work to coordinate grant funding approaches made by the constituents in order to avoid duplication of effort, secure mutual support for projects and avoid competing for scarce financial resources. (*Priority Level High, Year 1 Activity, 6+ Months to Complete, 100% Funding Available for Full Implementation)*

Activity 1- Create an Education Advisory Board. The Board will be composed of members that represent diverse sectors and interests. This Board will be a working group of the Florida Keys National Marine Sanctuary Advisory Council. A majority of these members will be from the Florida Keys. Group activities will include but not be limited to 1) providing information on current activities in the education community; 2) encouraging cooperative efforts; 3) providing direction for the Sanctuary Education Program; 4) preventing the duplication of efforts; 5) promoting stewardship; and 6) guiding development of natural and cultural resource education products.

■*Implementation.* Sanctuary education staff will use the FKEERD and other relevant sources to identify environmental education organizations, and will select organizations based on regional or geographical representation (Upper, Middle and Lower Keys) and/or sector-based representation on the advisory board. Periodic meetings will be organized by the education staff. There will be an annual meeting of educational facility representatives.

The majority of members will be from the Florida Keys, and will represent diverse sectors and interests. These might include:

- The Monroe County Environmental Education Advisory Council;
- K-12 schools;
- the Monroe County School District, and the District EE Advisory Council;
- Florida Keys Community College and local colleges;
- Non-formal institutions which make extensive use of FKNMS resources and sites (e.g., Newfound Harbor Marine Institute, Pigeon Key, Sea Base, Marine Resources Development Foundation);
- Public information and education programs (e.g., public TV and radio stations);
- Entities which provide information and education programs (i.e. Reef Relief) for user groups (e.g., skin and scuba courses on reef ecology; sport fishermen programs on catch-and-release);
- Commercial interests whose livelihoods are tied to non-consumptive and consumptive uses of resources within the Sanctuary; and federal and state agencies which currently operate some form of information and education program within the FKNMS boundaries.

In addition, there are other groups with interests which are not located in the Keys per se, yet who are willing and able to provide support to the Education Plan and programs of the FKNMS. These include:

- Agencies with jurisdictional interests in or directly related to the FKNMS;
- Conservation and environmental organizations with interests in informational, interpretive or educational programs;
- State education and teacher organizations (e.g.,FAST, FMSEA, LEEF); and
- Educational organizations who hold meetings and conferences in the Keys on a periodic or regular basis.

■*Schedule.* This activity will have high priority in year 1. It will require 6+ months to complete.

Strategy E.10: Public Forum

Establish a program to ensure public involvement throughout South Florida in Sanctuary activities by holding public meetings and promoting Sanctuary awareness to extracurricular groups. A program will be established to provide Sanctuary sponsorship of contests/awards. *(Priority Level Medium, Low Level of Action in Year 1, 12+ Months to Complete, <50% Funding Available for Full Implementation)*

Activity 1-Establish a Public Meeting Program. A series of public meetings will be held throughout Monroe County to provide information to encourage user participation in Sanctuary management. Sanctuary staff and/or guest speakers will make presentations, and dialogue between staff members and the public will be encouraged. The activity will: 1) enhance communication between Sanctuary staff and the public; 2) provide an opportunity for periodic public input; and 3) provide an opportunity to educate the public about current management issues.

■*Existing Program Implementation.* The Looe Key and Key Largo National Marine Sanctuaries have

traditionally held “frequent-user meetings” in the Upper and Lower Keys. These meetings are forums that provide information on topics including Sanctuary regulations, research activities, and education programs.

■*Implementation.* Sanctuary education and management staff will have the primary responsibility for implementing this activity. Meetings will be held twice a year in the Upper, Middle, and Lower Keys, respectively. Both the public and commercial/recreational users will be invited to attend. Sanctuary staff will present information about management, education, research, and law enforcement practices. Guest speakers may also present information on timely topics. Dialogue and feedback from the participants will be encouraged.

■*Schedule.* This activity will have a low level of action in year 1. It will require 2+ months to complete.

Activity 2-Develop a Speakers’ Bureau and Lecture Series. A speakers’ bureau and public lecture series will be established that will cover environmental themes such as species (e.g., native, rare, endangered, understanding life histories), Keys’ history, research results, environmental action, weather, South Florida, artificial reefs, and diving. The bureau will include local citizens who will give presentations by request. Both the bureau and lecture series will enhance public understanding (especially for local and visiting adults) of Sanctuary-related topics. This activity will have an “outreach” component to provide services to audiences at the state, national and international location.

■*Existing Program Implementation.* Sanctuary staff currently give presentations by request.

■*Implementation.* Sanctuary education staff members will work with the volunteer coordinator and education advisory board to compile a list of potential lecture topics and speakers. Each series will run from November to May.

■*Schedule.* This activity will have a low level of action in year 1. It will require 7+ months to complete.

Activity 3-Conduct a Poster Contest. A theme-oriented poster contest will be conducted through Monroe County school system art classes. The contest will provide a creative method for educating local students about the Sanctuary.

■*Implementation.* Sanctuary education staff will coordinate with science and art teachers in Monroe County to establish the poster contest (e.g., determining the contest theme and educational message).

■*Schedule.* This activity will have no action in year 1. It will require 3 months to complete.

Activity 4-Conduct a Photo Contest. Underwater and top-side photo and/or video contests will be conducted to draw attention to the natural resources of the Keys’ marine ecosystem. The objective is to focus public attention on the beauty and importance of Sanctuary habitats.

■*Existing Program Implementation.* The Looe Key and Key Largo National Marine Sanctuaries have co-sponsored photo contests in the past.

■*Implementation.* Sanctuary education staff will identify a co-sponsor for this event. Photos and videos will be solicited in a variety of categories and prizes will be requested from local vendors. Winning entries will be circulated throughout Monroe County and may tour outside South Florida.

■*Schedule.* No action will occur in year 1. It will be continuous.

Strategy E.11: Special Events

Organize, support, and/or participate in special events (e.g., trade shows, expositions, grand openings, etc.) that allow for the exchange of Sanctuary information. The Sanctuary will co-sponsor a number of conferences and workshops, with selected sole sponsorship of some events. This would include a “Sanctuary Awareness Week” and a Sanctuary “Grand Opening”. The Sanctuary Program would cosponsor other “awareness” events/weeks (e.g., National Fishing Week, etc.).
(Priority Level Medium, Low Level of Action in Year 1, 9+ Months to Complete, <50% Funding Available for Full Implementation)

Activity 1-Develop and Maintain Trade Show Information Booths. Sanctuary staff will attend trade shows, local festivals, and other events, and set up displays to provide the public with information about Sanctuary resources.

■*Existing Program Implementation.* Sanctuary staff, using portable displays (e.g., posters) from the Key Largo and Looe Key National Marine Sanctuaries,

currently distribute Sanctuary information at local festivals and trade shows.

■*Implementation*. Education staff will identify the festivals and trade shows that provide the most-effective and efficient use of Sanctuary resources. The events selected will be those that attract a large audience. Materials developed in the signs/displays/exhibits strategy will be used. For future budgeting purposes, a list of staff assignments and shows will be compiled.

■*Schedule.* This activity will have a high level of action in year 1. It will be continuous.

Activity 2-Organize an Environmental Exposition. This forum will display environmentally sensitive products and technologies (e.g., sewage treatments options and alternative fishing gear) to educate the public regarding environmentally safe products and services.

■*Implementation.* The Sanctuary Program, working closely with the education staff, will contract with a private vendor to organize the environmental exposition. Co-sponsors will be solicited, and the event will take place at a central location in the Keys, either once or twice a year.

■*Schedule.* This activity will have a low level of action in year 1. It will require 9 months to complete.

Activity 3-Hold a Sanctuary Grand Opening. A large-scale social event will be held to announce the "grand opening" of the Sanctuary. This event may coincide with the first annual Environmental Exposition.

■*Implementation.* Sanctuary managers and education and outreach staff will work with the volunteer coordinator to plan a gala event to celebrate the Sanctuary's opening. The event will be held in a central location in the Keys.

■*Schedule.* This activity will have no action in year 1. It will require 3 months to complete.

Activity 4-Design and Implement a Kids' Week. A Kids' Week filled with special events for school students designed to enhance their awareness of the environment will be conducted. The events are intended to inspire a sense of stewardship for the environment, and illustrate that kids are direct participants in protecting the Sanctuary's resources.

■*Implementation.* Sanctuary education staff, in cooperation with the Volunteer Program staff and other cosponsors, will organize Kids' Week events. Activities may consist of lectures, classroom visits, field experiences, audio-visual presentations, and television shows.

■*Schedule.* This activity will have no action in year 1. It will require 6+ months to complete.

Activity 5-Design and Implement a Sanctuary Awareness Week. A week of activities designed to draw attention to the existence of the Sanctuary and the achievements of the Sanctuary Program will be conducted. The events are designed to raise awareness of the Sanctuary and generate a sense of stewardship for the resources of the Florida Keys.

■*Implementation.* Sanctuary management, education, outreach, enforcement, research and volunteer staff will together generate the activities for this event. Other commercial and nonprofit organizations will then be approached about participating and/or sponsoring some activities to take place. The event will be held during the busiest season, November through April, in order to reach the most people.

■*Schedule.* This activity will have no action in year 1. It will require 9 months to complete.

This strategy is also included in the Volunteer Action Plan.

Strategy E. 12
Professional Development of Education and Outreach Staff and Cooperating Educators

Develop a set of activities that provide for education for new members of the FKNMS education and outreach staff. Also provide continuing education for current staff.

■*Implementation.* Sanctuary education staff will attend professional conferences and programs. New staff will be provided with appropriate orientation programs.

■*Schedule.* Continuous.

Product Development Strategies

This group of strategies includes those centered on the development of some type of product. Print, audio, and video communication products are an integral component of the Sanctuary's public education and outreach program. Products produced through these strategies will be used as tools for implementing many other strategies in the management plan. Activities include the development of printed materials to promote public awareness of the Sanctuary; the production of a limited number of audio-visual materials; the establishment of signs and displays in high-use areas; the development of a program of public service announcements; and the establishment of visitor booths and displays for the distribution of educational materials. Materials shall be multilingual when appropriate and necessary. A focus of these materials shall be to disseminate current research and results to the public in a timely fashion. Strategies in this group may be revised or deleted and new strategies may be added, based on the progress and success of the strategies proposed.

Strategy E.1: Printed Materials

Develop printed materials to promote the public's awareness of the impact of their activities, both land and water-related, on the Sanctuary's resources and environmental quality. Promote the proper use of equipment used for these activities in order to minimize adverse impacts to natural resources. Materials will include brochures, posters, newsletters, contributions to periodicals, environmental nautical charts, color environmental atlases, and a color periodical. Distribute materials in bulk to high interception locations (e.g., marinas, boat ramps, dive shops, etc.) and include bulk mailings as a means of distribution.
(Priority Level High, Low Level of Action in Year 1, It will be Continuous, <50% Funding Available for Full Implementation)

Activity 1-Design and Print a Sanctuary Brochure. A brochure will be produced that contains comprehensive information about the Sanctuary.

■*Existing Program Implementation.* Under contract by NOAA, the Center for Marine Conservation developed a brochure in 1991. It educated the public about Sanctuary boundaries and designation and the Management Plan development process. The new brochure will summarize important components of the Management Plan and new Sanctuary programs.

■*Implementation.* The brochure will be designed by the Sanctuary education staff and will be printed using State or Federal funds. Design and production will begin as soon as the management plan is approved. The brochure will be updated in year 5, following the adoption of the management plan.

■*Schedule.* This activity will have a high level of action in year 1. It will require six months to complete.

Activity 2-Produce a Monthly FKNMS Newsletter. Sanctuary staff will produce a monthly color periodical. This newsletter will include information about current developments in FKNMS management, featuring projects and programs in the Sanctuary.

■*Existing Program Implementation.* Sanctuary staff produce a monthly newsletter titled "Sounding Line." The newsletter features projects and programs underway. It is mailed to a list of individuals and organizations nationwide who have expressed an interest in staying informed with regard to the Sanctuary.

■*Implementation.* Sanctuary staff will continue to develop the content of the monthly newsletter. Education and outreach staff will have primary responsibility for creative design to support the theme and content of each issue. All program disciplines will be asked to contribute articles and/or provide input on content and theme.

■*Schedule.* This activity will have a medium level of action in year 1. It will be continuous.

Activity 3-Provide Information to Shipping Businesses. Shipping business will be alerted about Sanctuary regulations (e.g., vessel waste discharge and Areas to be Avoided). Target audiences include large importers/exporters, port authorities, commercial fishing companies, and ship insurers.

■*Existing Program Implementation.* Information about the Areas to be Avoided and Sanctuary boundaries have already been included on NOAA nautical charts, but no educational or descriptive information has been distributed to the users directly.

■*Implementation.* The education staff will provide educational products (e.g., videos, brochures) to NOAA's Sanctuaries and Reserves Division (SRD).

SRD headquarters and the National Ocean Service (NOS) general counsel will contact the appropriate U.S. and international shipping interests. Field education staff will contact local port authorities and large vessel operators. NOAA headquarters, field and general counsel staff, and Florida's Bureau of Sanctuaries and Research Reserves will work cooperatively in implementing this activity.

■*Schedule.* This activity will have a low level of action in year 1. It will be continuous.

Activity 4-Provide Information to Community Leaders, Decision makers, and Organized User Groups. Community leaders, decision makers, and organized user groups will be informed about Sanctuary programs, zoning, research results, and the environmental consequences of their activities through mailings, speakers, and personal contact. Their constituents will be educated as an indirect result of this activity.

■*Existing Program Implementation.* Sanctuary employees currently give information to user groups and businesses, and brief decision makers on request. However, no standardized program for providing information has been developed.

■*Implementation.* Expanding this activity requires the development of topic-specific audio-visual products for group mailings (when staff are not available). This program is currently being implemented by the Sanctuary education staff. The scope of this effort will expand as staff size increases and audio-visual materials are produced.

■*Schedule.* This activity will have a low level of action in year 1. It will be continuous.

Product-Development Strategies

E.1: Printed Materials
- Design and print a Sanctuary brochure
- Produce a monthly FKNMS newsletter
- Provide information to shipping businesses
- Provide information to community leaders, decisionmakers, and organized user groups
- Provide interpretive information to periodicals and publications
- Provide information to businesses about sanctuary resources and activities
- Provide multilingual information to marine rental businesses
- Distribute educational materials at public boat ramps
- Produce and distribute a fact sheet on sanctuary boating rules, regulations, and etiquette to be distributed with annual registrations
- Produce a fact sheet for the Tourist Development Council
- Distribute information regarding the Sanctuary in utility bills, newsletters, and vehicle licenses/ registrations
- Provide information to service industries about environmentally safe practices
- Produce a color environmental atlas for the Sanctuary

E.2: Audio-Visual Materials
- Establish an audio and video library
- Produce audio and video tapes and theme-oriented slide presentations

E.3: Signs/Displays/Exhibits
- Establish wayside exhibits in the Florida Keys
- Establish static displays at appropriate locations
- Develop mobile displays with information on all aspects of the Sanctuary program
- Develop interactive educational computer stations
- Establish information booths at South Florida airports, car rental agencies, and visitor centers along US 1.
- Design and install road-side signs

E.5: PSAs
- Develop a program of PSAs
- Develop a media packet
- Develop and produce a series of video news releases
- Print marine etiquette on marine-related materials packaging
- Establish VHF and dedicated AM radio stations

E.7: Promotional
- Establish visitor booths/displays to distribute educational materials
- Establish interagency visitor center for orientation purposes

Activity 5-Provide Interpretive Information to Periodicals and Publications. Specific user groups or communities (e.g., the diving and fishing industries, research community, local naval facilities, and Spanish community) will be targeted with information about Sanctuary programs, research findings, and regulations.

■*Existing Program Implementation.* Administrative, research, and education staff currently provide articles to periodicals and newspapers. A limited number of articles have been produced by the Sanctuary Advisory Council for submission to local newspapers. This effort was supported by the Sanctuary's Volunteer Program.

■*Implementation.* In cooperation with the Volunteer Coordinator, the education staff will identify topics, authors, and media recipients for a continuing series of written pieces to be submitted for publication. Articles of various lengths should begin to be submitted by the end of year 1.

■*Schedule.* This activity will have a low level of action in year 1. It will be continuous.

Activity 6-Provide Information to Businesses about Sanctuary Resources and Activities. Information regarding Sanctuary regulations and resources will be provided to local on-water businesses.

■*Existing Program Implementation.* In the past, dive shops and selected marinas have received Sanctuary brochures and educational videos.

■*Implementation.* The education and outreach staff will develop a mailing list of water-related businesses in the Keys, and educational information will be distributed based on this list. The Volunteer Program will assist in distributing these materials.

■*Schedule.* This activity will have a low level of action in year 1. It will be continuous.

Activity 7-Provide Multilingual Information to Marine Rental Businesses. Multilingual information regarding Sanctuary activities including programs, regulations, and research activities will be provided to marine rental businesses (e.g., boat and personal watercraft rental operations, marina gas facilities, etc.) to educate rental operators and patrons about environmental issues.

■*Existing Program Implementation.* The education and outreach staff currently distributes multilingual videos, brochures, posters, and placards to marinas, dive shops, and boat rental businesses every two months or on request.

■*Implementation.* The education and outreach staff will continue to distribute multilingual educational information. Once the Management Plan has been adopted, staff will design and produce targeted educational materials.

■*Schedule.* This activity will have a low level of action in year 1. It will be continuous.

Activity 8-Distribute Educational Materials at Public Boat Ramps. Boaters will be provided with information about Sanctuary objectives, regulations, and safe boating practices at public boat ramps.

■*Implementation.* The education and outreach staff will work with the Sanctuary Volunteer Program and other local volunteer organizations to distribute educational materials. A cooperative agreement may be sought to achieve this activity.

■*Schedule.* This activity will have a low level of action in year 1. It will be continuous.

Activity 9-Produce and Distribute a Fact Sheet on Sanctuary Boating Rules, Regulations, and Etiquette to be Distributed with Annual Registrations. The fact sheet will be an effective means of disseminating information about Sanctuary resources and regulations to boat owners and operators.

■*Implementation.* The sheet will be developed by the education and outreach staff. Distribution will be coordinated by the education staff and the Florida Department of Environmental Protection (FDEP), and will occur when registrations are issued or renewed.

■*Schedule.* This activity will have a low level of action in year 1. It will be continuous.

Activity 10-Produce a Fact Sheet for the Tourist Development Council. The fact sheet will provide potential Sanctuary visitors with information about environmentally responsible behavior. It will also inform tourists of the environmental damage that may result from inappropriate actions.

■*Implementation.* The fact sheet will be prepared by the education and outreach staff, and will be reproduced and distributed by the Tourist Development Council (TDC). An agreement will be established with the TDC for implementing this activity.

■*Schedule.* This activity will have no action in year 1. It will require 6+ months to complete.

Activity 11-Distribute Information Regarding the Sanctuary in Utility Bills, Newsletters, and Vehicle/Licenses/Registrations. Through this activity, all residents of the Keys will receive information about the Sanctuary and the impacts of their water and land-based activities on Sanctuary resources. An informative brochure, including associated regulations and environmentally responsible methods of sewage and solid waste disposal and other household activities, will be included with utility bills and vehicle/boat registrations. Articles about the Sanctuary will also be included in utility newsletters.

■*Implementation.* The education and outreach staff will develop and submit brochures and articles to the appropriate utility companies and State and local agencies. Volunteers may help prepare and deliver newsletter articles.

■*Schedule.* This activity will have no action in year 1. It will be continuous.

Activity 12-Provide Information to Service Industries About Environmentally Safe Practices. Service industry personnel will be educated about environmentally safe practices.

■*Implementation.* The education and outreach staff will provide the educational materials, which will be distributed by volunteers as part of the Volunteer Program.

■*Schedule.* This activity will have no action in year 1. It will be continuous.

Activity 13-Produce a Color Environmental Atlas for the Sanctuary. Sanctuary education and outreach staff will work with NOAA, FDEP, and the Florida Marine Research Institute (FMRI) to produce a color atlas of Sanctuary resources including habitat types, population, hurricane paths, and other environmental or social themes to be determined.

■*Existing Implementation.* The FDEP has developed and produced benthic habitat maps for the FKNMS.

■*Implementation.* As information is gathered, NOAA will update the benthic habitat maps that have been produced. Concurrently, education and outreach staff will consult with NOAA and the FDEP and identify other themes for the atlas. As useful data become available, they will be included in the environmental atlas. Education staff will identify locations for copies of the atlas to be distributed and organize distribution with assistance from the Volunteer Program.

■*Schedule.* This activity will have no action in year 1. It will require 12 months to complete.

This strategy is also included in the Volunteer Action Plan.

Strategy E.2: Audio-Visual Materials

Inventory and use existing videos, films, and audio-visual environmental education materials portraying activities in the Florida Keys, and their impacts on Sanctuary resources. Produce a limited number of audios/videos to address gaps in available materials, and to address major activities including boating, fishing, diving, etc. Materials will be available at Sanctuary offices and will be distributed to key locations (dive shops, etc.) throughout South Florida. Materials will be multi-lingual as necessary and appropriate. (*Priority Level Medium, Low Level of Action in Year 1, 3+ Months to Complete, <50% Funding Available for Full Implementation*)

Activity 1-Establish Audio and Video Library. Audio-visual materials will be collected and organized, and a Sanctuary library created for use by Sanctuary staff and the public.

■*Existing Program Implementation.* Sanctuary offices currently have slide collections. Duplicates may be provided upon request.

■*Implementation.* The education and outreach staff will coordinate with the Volunteer Program to implement this activity. Slides, videos, and audio tapes will be cataloged by type of media, subject, and length. New contributions to Sanctuary slide and video libraries will be solicited from amateur and professional photographers. Additional video and audio tapes will be acquired based on budget allowances. Duplicates may be provided upon request. A system will be developed and implemented to provide for the loan of audio-visual products.

■Schedule. This activity will have a low level of action in year 1. It will require 3 months to complete. Donations will be accepted on a continuing basis.

Activity 2-Produce Audio and Video Tapes and Theme-Oriented Slide Presentations. Topic-oriented audio and video tapes and slide presenta-

tions will be developed for specific age groups, and their complexity will vary according to the intended audience. Products may range from short instructional pieces to longer presentations that summarize the Sanctuary development process. In addition, a weekly video television program, *Waterways*, will be produced to feature various scientific, educational, and management programs that occur in Sanctuary waters.

■*Existing Program Implementation.* Several videos have been produced which focus on the general setting of the Sanctuary, and some on-water activities and their impacts on Sanctuary resources. Two were produced by Looe Key and Key Largo national marine sanctuaries, one was produced by the FDEP and one was produced by the FIO. Each is available to the Sanctuary to reproduce and distribute. *Waterways* is being produced and aired on a weekly basis in partnership with ENP and EPA.

■*Implementation.* The education and outreach staff, Volunteer Program, and government or private interests (via cooperative agreements) will produce the educational presentations. Videos will range in length, with most lasting between 10 and 20 minutes. If possible, videos will be bilingual (i.e., English and Spanish). Topics will include FKNMS existence, programs and regulations, scientific research, educational projects, water quality, and habitat degradation issues (e.g., boating, fishing, and diving impacts). Outreach staff will continue to produce 30 minute episodes of *Waterways* exploring the topics mentioned above.

■*Schedule.* This activity will have a medium level of action in year 1. It will be continuous.

This strategy is also included in the Volunteer Action Plan.

Strategy E.3: Signs/Displays/Exhibits

Develop signs and displays at high-use areas, all public and some private boat ramps, and some public beach access areas to inform participants in water-based activities of regulations and environmentally sound practices, provide navigation information, and promote awareness of nearby sensitive areas. Establish visitor centers/booths at locations throughout the Keys at Sanctuary offices, Chamber of Commerce visitor centers, etc. Portable displays will also be produced with information on Sanctuary resources, regulations, environmental quality, etc. The signs will be multilingual where necessary and appropriate. Targeted multimedia displays will be developed with information and impacts on the Sanctuary relevant to the activity targeted. A number of wayside exhibits will be installed.

Develop a user-friendly computer system containing information on regulations, access, recreational sites, environmental etiquette, etc. for visitor use at selected sites throughout the Sanctuary within five years. (*Priority Level Medium, Low Level of Action in Year 1, 36+ Months to Complete, <50% Funding Available for Full Implementation*)

Activity 1-Establish Wayside Exhibits in the Florida Keys. Wayside exhibits are an effective means of educating the public about the Sanctuary. More than one exhibit may be established for location at popular fishing and disembarkation points in the Keys. The exhibits will provide information about Sanctuary boundaries, resources, and regulations.

■*Existing Program Implementation.* The education and outreach staff has designed a wayside exhibit for the Florida Keys National Marine Sanctuary, and approximately 40 to 50 exhibits have been placed at boat launching sites throughout the Keys. In addition, the FDEP's Division of State Lands has designed a wayside exhibit. Some exhibits have been placed at popular fishing and boat-launching sites. In addition, the U.S. Fish and Wildlife Service (FWS) is developing a wayside exhibit to be placed at disembarkation points near the boundaries of wildlife refuges located in the Keys.

■*Implementation.* Additional sites in the Keys have been identified for the placement of wayside exhibits, and an exhibit has been designed that gives information about Sanctuary boundaries, resources, and restrictions. Once the Management Plan is adopted, existing exhibits may need to be updated to reflect new regulations. A new exhibit may be designed or a second side, containing new information, may be attached to existing exhibits. A cooperative agreement will be sought to produce and install the exhibits. The education staff will be responsible for implementing this activity. Volunteers may be used to place the exhibits.

■Schedule. This activity will have a high level of action in year 1. It will require 6 months to complete.

Activity 2-Establish Static Displays at Appropriate Locations. Space will be secured and informa-

tional displays about the Sanctuary set up at visitor centers, sanctuary offices, museums, libraries, chambers of commerce and State Parks. These static displays will provide general information about the Sanctuary, and will educate visitors and residents about requirements and measures they can take to protect the area's natural resources. This product differs from wayside exhibits due to display design and information. These displays will be located indoors, and will focus on a broader range of topics than the wayside exhibit. In addition, an element of flexibility is contained within the static indoor displays that is not achieved with wayside exhibits.

■*Existing Program Implementation.* A display is currently located at John Pennekamp Coral Reef State Park that describes the Sanctuary and its associated programs. Local chambers of commerce also display Sanctuary brochures.

■*Implementation.* Education and outreach staff, along with the Volunteer Program, will identify potential exhibit sites. Cooperative agreements will be sought with entities outside the Sanctuary Program to assist in the design and funding of displays. Static displays will be bilingual (English/Spanish) or multilingual, depending on space availability. Sites under consideration already include the Key West Aquarium and the Florida Keys Natural History Museum.

■*Schedule.* This activity will have a low level of action in year 1. It will require 12 months to complete.

Activity 3-Develop Mobile Displays with Information on all Aspects of the Sanctuary Program. Each display will have a different focus and, because they are mobile, could be used at conventions, trade shows, educational meetings, or scientific gatherings. General information regarding Sanctuary location and programs may be communicated, along with current educational activities or research findings.

■*Existing Program Implementation.* One stand-alone display has been developed that conveys general information about the Looe Key and Key Largo national marine sanctuaries. It has been used at conventions, festivals, and trade shows.

■*Implementation.* The education and outreach staff will be responsible for implementing this activity. If sufficient funding is available, a contractor will be hired to construct the displays. In year 1 it is anticipated that three tabletop displays will be purchased. One will focus on general Sanctuary information, the second on Sanctuary education programs, and the third on current research topics. During year 2, a stand-alone exhibit conveying information about all aspects of Sanctuary operations will be purchased. Additional tabletop displays will be developed in year 3. Grant funding and donations will be actively sought to support display development and construction activities. Volunteers with appropriate expertise will assist in design and construction activities if necessary.

■*Schedule.* This activity will have a medium level of action in year 1. It will require 36 months to complete.

Activity 4-Develop Interactive Educational Computer Stations. Interactive educational displays that convey information about Sanctuary boundaries, regulations, resources, education programs, research programs, and volunteer opportunities will be developed at locations throughout the Keys. Each station will include current Sanctuary data that may be accessed by any visitor. These stations will have an audio and visual component, and will include a combination of stationary graphics, an interactive computer terminal, and audio recordings.

■*Implementation.* The education and outreach staff will define the content and logic for the interactive computer program, and volunteers will provide assistance. However, a private vendor will be contracted to develop and design the program. A pilot system will be established in year 1. Alterations will be made based on information obtained in the pilot, and additional sites will be identified for the placement of systems. Funding will be sought for placement locations from private and not-for-profit organizations.

■*Schedule.* This activity will have a low level of action in year 1. It will require 12 months to complete.

■*Cost*: To be determined.

Activity 5-Establish Information Booths at South Florida Airports, Car Rental Agencies, and Visitor Centers Along US 1. These booths will establish special areas promoting the Sanctuary at high-use tourist locations, and will provide public exposure regarding the Sanctuary and the South Florida ecosystem.

■*Implementation.* The education and outreach staff will identify booth sites and investigate potential funding sources. Booths will be designed on a site-by-site basis. Construction (when necessary) will either be conducted by volunteers or private contractors. The Sanctuary Program and other groups will

provide written materials for the booths. Input will be sought from the TDC and local chambers of commerce. When appropriate, bilingual materials will be provided.

■*Schedule.* This activity will have no action in year 1. It will require 24 months to complete.

■*Cost*: To be determined.

Activity 6-Design and Install Roadside Signs. Signs will be installed along the roadside in the Homestead/Key Largo area to alert travelers that they are entering/leaving the Sanctuary.

■*Implementation.* Education and outreach staff will design a sign to be placed on the roadside which will alert motorists that they are entering the Florida Keys National Marine Sanctuary. Sanctuary management staff will coordinate with the Florida Department of Transportation for location approval and installation.

■*Schedule.* This activity will have a medium level of action in year 1. It will require 9 months to complete.

This strategy is also included in the Volunteer Action Plan.

Strategy E.5: PSAs

Establish a program to promote Sanctuary goals and activities through public service announcements (PSAs) in South Florida, with some national and international public exposure, that present an overview of the Sanctuary, its resources, and their ecological significance for routine distribution to radio, cable television stations and newspapers. Develop editorial/contributions for other printed media. Funds will be spent on routine media exposure. PSAs will focus on participants in water-related and other activities that affect the Sanctuary (boaters, divers, household etc.). These materials will also be organized into a press packet. Appropriate materials shall be multilingual when necessary. One focus of these materials will be to disseminate current research results to the public in a timely fashion. (*Priority Level Medium, Low Level of Action in Year 1, 60+ Months to Complete, <50% Funding Available for Full Implementation*)

Activity 1-Develop a Program of PSAs. A program of public service announcements (PSAs) will be developed to educate the public about how their activities impact Sanctuary resources. These PSAs will be broadcast on radio and television, and will focus on boating, diving, household activities, other activities impacting Sanctuary resources, and upcoming events sponsored by the Sanctuary. The PSA program will focus primarily on the South Florida community, with limited State, national and international exposure. PSAs will be translated and broadcast on stations that target communities in which English is not the primary language.

■*Existing Program Implementation.* A number of short radio PSAs and one TV PSA have been developed. The radio PSAs are frequently used in conjunction with a special event such as the annual Underwater Music Festival. The television PSA is used as a promotion for the “Waterways” program sponsored by NOAA, ENP, and EPA.

■*Implementation.* The education and outreach staff will be responsible for implementing this activity. Topics will focus on resource values, upcoming programs, and Sanctuary development. The education staff will identify topics and, with the assistance of volunteers, prepare narrative and film or audio announcements. Television and radio broadcast time will be secured as funds allow, with first priority being Monroe County stations.

■*Schedule.* This activity will have a medium level of action in year 1. It will be continuous.

Activity 2-Develop a Media Packet. Factual information regarding the natural, cultural, and historic resources of the Sanctuary will be compiled for distribution. Information will be included on dimensions, acreage, and habitat disruption. Halftones or color transparencies and a video may be included. Information will also address the benefits of Sanctuary management, the ecological importance of the area’s resources, and concerns and threats to the environment.

■*Implementation.* The education and outreach staff will work with Sanctuary managers to develop a list of materials to be included in the press packet. Staff will then coordinate with the Volunteer Program to develop materials identified as needed, but not currently available. Volunteers will package the materials, and an initial mailing will be done to all local press representatives. In the future, this package will be provided at all public Sanctuary meetings and on request.

■*Schedule.* This activity will have a low level of action in year 1. It will require 6+ months to complete.

Activity 3-Develop and Produce a Series of Video News Releases. The media will be provided with information on current Sanctuary issues and activities through the development and production of a series of video news releases. Topics will address a broad range of subjects including, but not limited to, Sanctuary boundary awareness, regulations, zones, education programs/products, and research projects.

■*Implementation.* The education and outreach staff will develop a list of topics for which video news releases would be appropriate. This list will be provided with the press packet. Education and outreach staff will then produce the video news releases with the help of the volunteer staff. General news releases on Sanctuary programs will be provided with press packets. News releases developed on special topics will be provided individually to media contacts (initially television stations in South Florida). As a system is developed, contacts will be expanded throughout Florida and other areas from which visitors originate. Grant funds may be sought to support this effort.

■*Schedule.* This activity will have a low level of action in year 1. It will require 18+ months to complete.

Activity 4-Print Marine Etiquette on Marine-Related Materials Packaging. Printing messages about proper on-water etiquette on marine-related materials packaging is expected to improve these types of behaviors. The messages will appear on materials used for water-related activities, such as ice bags and bait boxes.

■*Implementation.* The education and outreach staff will identify appropriate products for marine-related message placement, and will contact the manufacturers and propose the idea of printing conservation messages on their packaging. The staff will also design the print message, for approval by the manufacturer. Volunteers will assist in this activity. The manufacturer will cover the cost of printing and producing the packaging material.

■*Schedule.* This activity will have no action in year 1. It will require 12 months to complete.

■*Cost*: To be determined.

Activity 5-Establish VHF and Dedicated AM Radio Stations. A VHF radio information frequency will be secured and dedicated to provide information about boating and related activities. The broadcasts will include information about Sanctuary regulations, navigation, resources, and weather/reef conditions. Messages will also be developed to help boaters, divers, and fishermen avoid impacting the environment. Information will be broadcast in several languages. A dedicated AM station will also be secured to deliver messages similar to those broadcast over the VHF station. The AM station may include more land-related information.

■*Implementation.* The education and outreach staff will contact the appropriate officials to obtain information on establishing the radio stations. Cost and target area assessments will be conducted. The Upper Keys will have the greatest need for the AM station. The Middle and Lower Keys will follow in years 2-3 and 4-5, respectively. The education staff will program the stations, and hire a program manager when funding is available. The education staff will work closely with the Volunteer Program to utilize volunteer expertise in this area. Grant funding will be sought to support implementation costs.

■*Schedule.* This activity will have no action in year 1. It will require 60+ months to complete.

This strategy is also included in the Volunteer Action Plan.

Strategy E.7: Promotional Educational Materials

Promote educational materials, including bilingual materials and other information about the Sanctuary and its resources, at existing Sanctuary offices and chambers of commerce. Establish interagency visitor centers with the U.S. Department of Interior (USDOI) and the FDEP. *(Priority Level Medium, Low Level of Action in Year 1, 48 Months to Complete, <50% Funding Available for Full Implementation)*

Activity 1-Establish Visitor Booths/Displays to Distribute Educational Materials. Visitor booths/displays will be developed to provide multilingual educational materials about Sanctuary resources, etiquette, and environmental quality. Existing Sanctuary offices will provide limited space for distribution on a walk-in basis.

■*Existing Program Implementation.* Each Sanctuary office has a very small area dedicated to the display

and dissemination of educational products (primarily brochures and newsletters).

■*Implementation.* The education and outreach staff will establish areas in existing Sanctuary offices for the display of materials. The education and outreach staff or volunteers may be used to help construct the displays. Alternately, an outside contractor will be hired. The education staff will consult with local chambers of commerce to determine if space is available for displaying Sanctuary information. Financial support will be sought from chambers of commerce and the TDC.

■*Schedule.* This activity will have a low level of action in year 1. It requires 12 months to complete.

Activity 2-Establish Interagency Visitor Center for Orientation Purposes. An interagency visitor center will be established in cooperation with the USDOI and the FDEP to provide visitors and residents with orientation information on various protected and managed areas. Cooperative efforts will allow agencies to pool resources and provide lowest-cost options for a special center. One goal of this Interagency Orientation program will be to inform sanctuary program/agency visitors about the extent of education programs (agency and non-agency) offered in the FKNMS.

■*Implementation.* Sanctuary Program managers will secure an interagency agreement with agencies interested in establishing a visitor center. The education staff will consult with Sanctuary managers, agency managers, and other agency personnel to determine the types of exhibits to be included in a visitor center. Activities will be divided among the agencies involved. The education and outreach staff will be responsible for designing and constructing educational exhibits focusing on the Sanctuary Program, and will either develop the exhibits or contract them out. A staff person will also be assigned to manage the visitor center, with salary funding coming from all agencies involved. The Volunteer Program will fulfill the center's additional staffing requirements. The Volunteer Program will fulfill the center's additional staffing requirements. Public information will be provided that describes ongoing programs, activities and organizations involved with educational activities in the Sanctuary.

■*Schedule.* This activity will have no action in year 1. It will require 48 months to complete.

This strategy is also included in the Volunteer Action Plan.

Implementation

This section explains how the strategies in the education and outreach plan will be implemented. The institutions responsible for each activity, and those agencies that will provide some level of assistance, are identified. Education and outreach strategies are also ranked to indicate their overall Sanctuary priority level. In addition, the planned level of activity in year 1, months required to complete, funding availability, cost estimates, staff requirements, and the geographic focus of each strategy/activity are provided. The process used to evaluate the effectiveness of the Education Program as it evolves over time is also presented.

Responsible Institutions. As the FKNMSPA mandates NOAA, EPA, and the State of Florida to provide education and interpretation regarding Sanctuary resources, these agencies will share the lead in implementing specific education and outreach activities, and will be responsible for coordinating the involvement of external organizations. A framework of Federal, State, and local agencies and commercial and nonprofit organizations will be responsible for implementing the overall Program. Efforts will be made to avoid duplicating the efforts of other programs and to utilize and support education efforts being conducted by other organizations. Table 9 lists the participating institutions and their level of responsibility for implementing each activity.

Prioritization of Implementation. Each strategy in the Management Plan has been placed in one of three groups based on its level of importance relative to all other management strategies. The printed materials, training programs and advisory board strategies are the highest-priority strategies in the Education and Outreach Program. The remaining seven strategies are medium priority level, and will have some level of activity in year 1. Specific activities within each strategy have also been organized according to implementation priority (Table 10), and are grouped in three categories (high, medium, and low priority). The rankings provide guidance on the types of activities that should be implemented if insufficient funding is available for full implementation. They also provide information about how to schedule the implementation of activities. The priority levels for activities should not be compared across strategies, however, as they only represent the relative importance of the activities within a particular strategy.

Strategy prioritization may change as certain activities are found to be more effective than others. In addition, new strategies and component activities will be established as the program evolves. In all cases, making the maximum use of available resources will be a priority.

Schedule. The number of months required to completely implement each strategy and activity in the Education Program is given in Table 10.

Cost. The estimated cost of implementing each activity is shown in Table 10. This figure represents the sum of Sanctuary staff salaries, equipment and supplies, general services, and other implementation requirements. The cost of implementing the existing Education Program in Fiscal Year 1992 was $140,000, including staff salaries and overhead. Over the past five years, the cumulative cost of implementing the Education and Outreach Program was approximately $450,000. The total estimated cost of implementing all activities in the Sanctuary Education Program is projected to be $5.2 million over the first five years.

Geographic Focus. Most of the activities in the Education and Outreach Program will be implemented Sanctuary-wide, with some limited to the Upper, Middle or Lower Keys. Others would be implemented worldwide, such as providing information to shipping businesses. The specific area targeted by an activity is included in Table 10 when applicable.

Personnel. The staff needed to implement the Education and Outreach Program represents a mix of full-time, volunteer, and other agency workers, including interns. Four full-time and one part-time education and outreach staff members are currently working in the Keys. It is estimated that the Keys' Education Program will require 22 full-time employees from NOAA, other agencies, and NGO partnerships. Staff will be distributed among the Upper Keys, Lower Keys, and Marathon sanctuary offices. In addition, one full-time volunteer coordinator (see the Volunteer Action Plan) and approximately 80 volunteers will be needed to adequately implement the strategies in the program. The following steps will be considered so that education and outreach staff as a whole can better meet current educational needs and responsibilities within the FKNMS:

- Positions allocated for education should be maintained as education and outreach positions, and not re-allocated to other areas;

- Vacant positions in education should be filled in as timely a manner as possible, so as not to unduly burden remaining staff; and

- Positions, roles and responsibilities should be clearly defined, based on established workplans and documented needs.

In order to address the multilingual nature of many of the activities, the hiring of a Spanish-speaking education staff member or intern should be given priority consideration.

Sanctuary Employees. The Education and Outreach Program will require one program manager ($42,000 per year), two educational coordinators ($30,000 per year), five educational assistants ($16,000 to $25,000 per year), and 14 interpreters ($13,000 to $18,000 per year). Funding for these salaries will come from a combination of NOAA and FDEP resources.

Interagency Employees. Eighteen staff members will either be hired through cooperative agreements with other agencies, or employed by other agencies working on education and outreach programs in the Sanctuary. RFP's will be issued to all NGOs when projects can be contracted at the same or lower cost for providing an additional employee.

Cooperative Agreements. The education and outreach staff needs may also be met or supplemented through cooperative agreements with others (public, private, individuals). A volunteer coordinator is currently employed jointly by NOAA and TNC.

Volunteers. Volunteers will be actively recruited to assist in implementing a variety of Education and Outreach Program activities.

Equipment. A variety of equipment will be required to implement many of the activities in the Program. Some are already located at the Key Largo, Looe Key, and Florida Keys national marine sanctuary offices, but numerous items still must be acquired to ensure the success of the program, including a Macintosh computer and a printer able to produce photocopy-ready documents. Mobile presentation materials, such as portable exhibition stands for use at trade shows and conferences, are also needed, as is video production equipment.

Contingency Planning for Changing Budget. If education and outreach allocations fall below the projected requirements, increased private support will be sought. If private support is not available, projects will be implemented in priority order and/or with recommendations of the Advisory Board.

Evaluating Program Effectiveness and Efficiency. The Education and Outreach Program will be evaluated on an ongoing basis to determine the effectiveness and efficiency of the component activities and to determine the Program's overall performance.

In some cases, background information (e.g., databases) needed to make such evaluations already exists. However, in other cases it may be necessary to conduct statistically sound information-collection efforts to enable useful evaluations.

This evaluation will determine the Program's level of effectiveness by assessing:

- the demand for information, products and programs;

- the level of media exposure;

- the level of awareness of target audiences (relative to the level of need);

- whether the level of compliance with zoning and regulatory provisions increases or decreases;

- public attitudes toward the Sanctuary; and

- the value placed on the natural resources of the local ecosystem.

This evaluation will determine the Program's level of efficiency by assessing:

- the extent the education product is used;

- the extent of participation in education and outreach programs;

- staff compliance with project deadlines; and

- budget costs relative to the products and programs produced.

Table 9. *Agencies/Organizations Identified for Implementing Strategies/Activities*

Strategy/Activity	Agencies/Organizations																							
	NOAA	USEPA	NPS	USFWS	FDEP	FDOEd	FDOS/BAR	Monroe County	Sea Grant	SAC	NPO	Ch. of Com.	TNC	TDC	Academia	Btng. Imp. Fnd	Media	Citizens of S.FL	FK Aque.Auth.	Reef Relief	Southern Bell	FADO/KADO	OFF	Planning Cncl.
COMMUNITY INVOLVEMENT/COMMUNITY PROGRAM																								
E.4 Training, Workshops, and School Programs																								
Promote/Support Environmental Education in Monroe County and State Schools	●				◍	○		◍												○				
Produce the Florida Keys Environmental Education Directory	●				◍																			
Provide/Support Environmental Education Workshops for Educators	●	○	○	○	◍	○	○	○	○											○				
Provide Environmental Education for Law Enforcement Personnel	●				◍		○		○											○				
Sponsor/Support Adult Environmental Education	●	○			◍	○		○	○				○		○			○		○				
Certification Program	●	○	○	○	◍			○	○		○	○	○	○		○		○		○		○	○	
Provide mechanisms Outside Law Enforcement to Help Deliver On-site Resource Education	●																							
E.6 Education Advisory Board																								
Establish Education Advisory Board	●	○	○	○	◍	○		○	○		○				○			○		○				
E.10 Public Forum																								
Establish a Public Meetings Program	●				◍																			
Develop a Speakers Bureau and Lecture Series	●	○	○	○	◍				○		○	○	○		○			○		○				
Conduct a Poster Contest	●				◍	○		○	○		○		○											
Conduct a Photo Contest	●				◍						○													
E.11 Special Events																								
Develop Trade Show Information Booths	●				◍								○							○				
Organize Environmental Exposition	●	○	○	○	◍		○	○	○		○	○	○	○			○	○	○		○	○	○	
Hold a Grand Opening	●	○			◍						○		○									○	○	
Implement Kid's Week	●	○	○	○	◍	○		○	○		○	○	○				○	○				○	○	
Design and Implement a Sanctuary Awareness Week	●	○			◍				○		○	○					○							
E.12 Professional Development of Education Staff	●																							
PRODUCT DEVELOPMENT																								
E.1 Printed Materials																								
Design and Print FKNMS Brochure	●				◍																			
Produce a Monthly FKNMS Newsletter	●				◍				○															
Provide Information to Shipping Businesses	●																							
Provide Information to Community Leaders/Decision Makers/Organized User Groups	●	○			◍		○	○	○	○	○	○								○				○
Provide Interpretive Information to Periodicals/Publications	●	○			◍		○			○	○		○							○				
Provide Information to Businesses about FKNMS Resources and Activities	●				◍				○		○	○	○							○				

● Lead ◍ Primary Role ○ Assist

Table 9. *Agencies/Organizations Identified for Implementing Strategies/Activities (cont.)*

Strategy/Activity	Agencies/Organizations																					
	NOAA	USEPA	NPS	USFWS	FDEP	FDOEd	FDOS/BAR	Monroe County	Sea Grant	SAC	NPO	Ch. of Com.	TNC	TDC	Academia	Btng. Imp. Fnd	Media	Citizens of S.FL.	FK Aque.Auth.	Reef Relief	Southern Bell	FADO/KADO	OFF	Planning Cncl.
E.1 Printed Materials (cont.)																								
Provide Multilingual Information to Marine Rental Businesses	●				◉			○			○	○	○					○		○				
Distribute Educational Materials at Public Boat Ramps	●				◉			○			○		○							○				
Produce and Distribute Fact Sheet on FKNMS Boating Rules, Regulations and Etiquette with Annual Boat Registration	●				◉			○	○											○				
Produce FKNMS Fact Sheet for Tourist Development Council	●				◉									○										
Distribute Information regarding FKNMS in Utility Bills, Newsletters, and Licenses/Registration	●				◉		○												○	○	○			
Provide Information to Service Industries about Environmentally Safe Practices	●				◉			○			○	○	○	○						○				
Produce a Color Environmental Atlas for the Sanctuary	●	○	○	○	◉		○	○																
E.2 Audio-visual Materials																								
Establish Audio and Video Library	●				◉								○											
Produce Video and Audio Tapes and Theme-Oriented Slide Presentations	●	○	○	○	◉			○			○		○	○	○					○				
E.3 Signs/Displays/Exhibits																								
Establish Wayside Exhibits in the Florida Keys	●				◉		○									○				○				
Establish Static Displays at Appropriate Locations	●	○	○	○	◉		○	○	○		○	○	○	○			○			○				
Develop Mobile Displays with Information on All Aspects of the FKNMS Program	●	○			◉								○	○			○							
Develop Interactive Computer Stations	●	○	○	○	◉			○				○				○					○		○	
Establish Information "Stations" at South Florida Airports/ Car Rental and Visitor Centers along US 1	●	○	○	○	◉			○			○	○	○											
Design and Install Roadside Signs	●				◉		○													○				
E.5 Public Service Announcements																								
Develop a Program of PSAs	●	○	○	○	◉			○	○		○						○			○				
Develop a Media Packet	●	○			◉								○				○	○		○				
Develop and Produce a Series of Video News Releases	●	○			◉			○			○		○		○		○	○						
Print Marine Etiquette on Marine Related Materials Packaging	●	○			◉			○			○					○		○		○				
Develop VHF and Dedicated AM Radio Station	●	○	○	○	◉			○																

● Lead ◉ Primary Role ○ Assist

Table 9. *Agencies/Organizations Identified for Implementing Strategies/Activities (cont.)*

Strategy/Activity	Agencies/Organizations																					
	NOAA	USEPA	NPS	USFWS	FDEP	FDOEd	FDOS/BAR	Monroe County	Sea Grant	SAC	NPO	Ch. of Com.	TNC	TDC	Academia	Btng. Imp. Fnd	Media	Citizens of S.FL.	FK Aque.Auth.	Reef Relief	Southern Bell	FADO/KADO	OFF	Planning Cncl.
E.7 Promotional Educational Materials																								
Establish Visitor Booths/Displays to Distribute Educational Materials	●				◉	○														○				
Establish Interagency Visitor Center for Orientation Purposes	●	○	○	○	◉				○															

● Lead ◉ Primary Role ○ Assist

Abbreviations: NOAA, National Oceanic and Atmospheric Administration; USEPA, U.S. Environmental Protection Agency; NPS, National Park Service; USFWS, U.S. Fish and Wildlife Service; FDEP, Florida Department of Environmental Protection; FDOEd, Florida Department of Education; FDOS/BAR, Florida Department of State/Bureau of Archaeological Resources; SAC, Sanctuary Advisory Council; NPO, Nonprofit Organizations; CH. of Com., Chambers of Commerce; TNC, The Nature Conservancy; TDC, Tourist Development Council; Btng. Imp. Fnd, Boating Improvement Fund; Citizens of S. FL., Citizens of South Florida; FK Aque. Auth., Florida Keys Aqueduct Authority; FADO/KADO, Florida Association of Dive Operators/Keys Association of Dive Operators; OFF, Organization of Florida Fisherman; Planning Cncl., Planning Council.

Table 10. *Requirements for Implementation*

Strategy/Activity	Overall Sanctuary Priority Level	Implementation: Planned Level of Action in Year 1	Implementation: Months to Complete	Implementation: Funding Available to Complete	Cost to Complete: Total Capital ($1,000)	Cost to Complete: Annual Operations/ Maint.($1,000)	Geographic Focus	# of Personnel
COMMUNITY INVOLVEMENT/COMMUNITY PROGRAMS								
E.4 Training, Workshops, and School Programs	High	Medium	12+	<50%	NC	100-999		7
Promote/Support Environmental Education in Monroe County and State Schools	High	High	C	100%		10-99	SW	
Produce the Florida Keys Environmental Education Directory	High	Low	8	<50%		<10	SW	
Provide/Support Environmental Education Workshops for Educators	High	Medium	C	<50%		10-99	SW	
Provide Environmental Education for Law Enforcement Personnel	High	Medium	12+	<50%		10-99	SW	
Sponsor/Support Adult Environmental Education	High	Medium	C	<50%		10-99	SW	
Certification Program	Medium	None	12+	<50%		10-99	SW	
Provide mechanisms Outside Law Enforcement to Help Deliver On-site Resource Education								
E.6 Education Advisory Board	High	High	6+	100%	NC	NC		1
Establish Education Advisory Board	High	High	6+	100%		10-99	SW	
E.10 Public Forum	Medium	Low	12+	<50%	<10	100-999		2
Establish a Public Meetings Program	High	Low	2+	<50%		<10	SW	
Develop a Speakers Bureau and Lecture Series	High	Low	7+	<50%		<10	SW	
Conduct a Poster Contest	Low	None	3	<50%		10-99	SW	
Conduct a Photo Contest	Low	None	C	<50%		10-99	SW	
E.11 Special Events	Medium	Low	9+	<50%	<10	10-99		5
Develop Trade Show Information Booths	High	High	C	<50%	<10	<10	SW	
Organize Environmental Exposition	Medium	Low	9	<50%		<10	MK	
Conduct a Grand Opening	Medium	None	3	<50%		<10	MK	
Implement Kid's Week	Medium	None	6+	<50%		10-99	SW	
Design and Implement Sanctuary Awareness Week	Medium	None	9	<50%		10-99	SW	
E.12 Professional Development of Education Staff			C					
PRODUCT DEVELOPMENT								
E.1 Printed Materials	High	Low	C	<50%	<10	10-99		4
Design and Print FKNMS Brochure	High	High	6	<50%	<10	10-99	SW	
Produce a Monthly FKNMS Newsletter	High	Medium	C	<50%		10-99	WW	
Provide Information to Shipping Businesses	High	Low	C	<50%		<10	WW	
Provide Information to Community Leaders/Decision Makers/Organized User Groups	High	Low	C	<50%		<10	SW	
Provide Interpretive Information to Periodicals/Publications	High	Low	C	<50%		<10	WW	
Provide Information to Businesses about FKNMS Resources and Activities	High	Low	C	<50%		<10	SW	

Abbreviations: Maint., Maintenance; C, Continuous; NC, No cost; WW, World Wide; SW, Sanctuary Wide; UK, Upper Keys; MK, Middle Keys; LK, Lower Keys

Note: The priority levels for activities should not be compared across strategies–they only represent the relative importance of activities contained within a strategy.

Table 10. *Requirements for Implementation (cont.)*

Strategy/Activity	Overall Sanctuary Priority Level	Implementation: Planned Level of Action in Year 1	Implementation: Months to Complete	Implementation: Funding Available to Complete	Cost to Complete: Total Capital ($1,000)	Cost to Complete: Annual Operations/ Maint. ($1,000)	Geographic Focus	# of Personnel
PRODUCT DEVELOPMENT								
E.1 Printed Materials (cont.)								
Provide Multilingual Information to Marine Rental Businesses	High	Low	C	<50%		<10	SW	
Distribute Educational Materials at Public Boat Ramps	High	Low	C	<50%	<10	<10	SW	
Produce and Distribute Fact Sheet on FKNMS Boating Rules, Regulations and Etiquette with Annual Boat Registration	Medium	Low	C	<50%		<10	SW	
Produce FKNMS Fact Sheet for Tourist Development Council	Medium	None	6+	<50%		<10	SW	
Distribute Information regarding FKNMS in Utility Bills, Newsletters, and Licenses/Registration	Medium	None	C	<50%		<10	SW	
Provide Information to Service Industries about Environmentally Safe Practices	Low	None	C	<50%		<10	SW	
Produce a Color Environmental Atlas for the Sanctuary	Low	None	12	<50%		<10	SW	
E.2 Audio-visual Materials	Medium	Low	3+	<50%	10-99	10-99		2
Establish Audio and Video Library	High	Low	3	<50%		<10	SW	
Produce Video and Audio Tapes and Theme-Oriented Slide Presentations	Medium	Medium	C	<50%	10-99	10-99	SW	
E.3 Signs/Displays/Exhibits	Medium	Low	36+	<50%	10-99	10-99		2
Establish Wayside Exhibits in the Florida Keys	High	High	6	50-74%	10-99	<10	SW	
Establish Static Displays at Appropriate Locations	High	Low	12	<50%		10-99	SW	
Develop Mobile Displays with Information on All Aspects of the FKNMS Program	High	Medium	36	<50%		10-99	SW	
Develop Interactive Computer Stations	High	Low	12	<50%	10-99	10-99	SW	
Establish Information "Stations" at South Florida Airports/ Car Rental and Visitor Centers along US 1	Low	None	24	<50%		10-99	SW	
Design and Install Roadside Signs	Low	Medium	9	<50%	10-99	10-99	SW	
E.5 PSAs	Medium	Low	60+	<50%	10-99	100-999		2
Develop a Program of PSAs	High	Medium	C	<50%		10-99	SW	
Develop a Media Packet	High	Low	6+	<50%		10-99	SW	
Develop and Produce a Series of Video News Releases	High	Low	18+	<50%	<10	10-99	SW	
Print Marine Etiquette on Marine Related Materials Packaging	Low	None	12	<50%		<10	SW	
Develop VHF and Dedicated AM Radio Station	High	None	60+	<50%	10-99	10-99	SW	

Abbreviations: Maint., Maintenance; C, Continuous; NC, No cost; WW, World Wide; SW, Sanctuary Wide; UK, Upper Keys; MK, Middle Keys; LK, Lower Keys

Note: The priority levels for activities should not be compared across strategies–they only represent the relative importance of activities contained within a strategy.

Table 10. *Requirements for Implementation (cont.)*

Strategy/Activity	Overall Sanctuary Priority Level	Implementation: Planned Level of Action in Year 1	Implementation: Months to Complete	Implementation: Funding Available to Complete	Cost to Complete: Total Capital ($1,000)	Cost to Complete: Annual Operations/ Maint. ($1,000)	Geographic Focus	# of Personnel
E.7 Promotional Educational Materials	Medium	Low	48	<50%	1,000-5,000	100-999		2
Establish Visitor Booths/Displays to Distribute Educational Materials	Medium	Low	12	<50%	<10	10-99	SW	
Establish Interagency Visitor Center for Orientation Purposes	High	None	48	<50%	1,000-5,000	100-999	UK	

Abbreviations: Maint., Maintenance; C, Continuous; NC, No cost; WW, World Wide; SW, Sanctuary Wide; UK, Upper Keys; MK, Middle Keys; LK, Lower Keys

Note: The priority levels for activities should not be compared across strategies–they only represent the relative importance of activities contained within a strategy.

Enforcement Action Plan

This action plan identifies and describes the requirements to develop and implement an enforcement plan for the Sanctuary. The plan is composed of two strategies: Additional Enforcement (B.6) and Cross-deputization (B.12). For each strategy, the time required for implementation, funding availability, costs, and responsible parties are outlined (Table 11).

Introduction

NOAA's primary law enforcement objective in the Sanctuary is to achieve resource protection by gaining compliance with the Sanctuary regulations and other Federal and State statutes that apply within the FKNMS. NOAA is also concerned with effective enforcement of all Federal, State, and local statutes that protect the natural, cultural, and historical resources within the FKNMS.

Besides the NMSA, NOAA has sole or shared primary jurisdiction for the Magnuson Fishery Conservation and Management Act (MFCMA), the Atlantic Tunas Convention Act (ATCA), the Marine Mammal Protection Act (MMPA), the Endangered Species Act (ESA), and the Lacey Act (LA), all of which apply to resources residing within or transiting through the FKNMS. In addition, numerous State and local laws will be enforced as part of the Sanctuary's integrated enforcement effort. How effectively these laws are enforced within and around the FKNMS will affect the success of Sanctuary management in conserving and protecting the resources.

Among Federal conservation laws enforced primarily by other agencies, but of concern to NOAA, are the Oil Pollution Act (OPA), the Clean Water Act (CWA), the Marine Plastic Pollution Research and Control Act (MPPRCA), the Abandoned Shipwreck Act (ASA), the Archaeological Resources Protection Act (ARPA), and the Migratory Bird Treaty Act (MBTA).

An Enforcement Program is one of the tools available to managers of marine protected areas. This program can complement other management programs (e.g., research and education), and lead to an increased level of success. Successful enforcement in the Sanctuary will require a coordinated inter/intra-agency effort. Furthermore, it will require resource managers to commit to Enforcement Programs that are properly supervised and funded. Combined with proper recruitment, training, equipment, policy, and guidelines, these criteria form the basis of a professional law enforcement operation.

How the Plan is Organized. This action plan is organized into three sections: an introduction, description of strategies, and implementation. The introduction summarizes the goals and objectives of the interpretive Enforcement Program and provides background information on planning efforts. The strategy description section groups activities by strategies. For each strategy and component activity, funding availability, costs, and timing of implementation are presented. It also describes how strategies in the plan will be placed into action. The implementation section summarizes the requirements for Sanctuary enforcement.

Sanctuary Enforcement Requirements

Since 1980, the Enforcement Programs and all other management programs at the two Florida Sanctuaries have been fully funded through a cooperative agreement with the State of Florida. The seven Sanctuary officers currently working in the Key Largo and Looe Key National Marine Sanctuaries are State employees. Sanctuary officers are assigned to the

Table 11. *Summary of Enforcement Strategies*

Page		Strategies	Overall Sanctuary Priority Level	Planned Level of Action in Year 1	Months to Complete	Funding for Full Implementation	Number of Activities to be Undertaken	Number of Institutions
91	**Enforcement Program**							
91	B.6	Additional Enforcement	High	Low	36+	<50%	4	7
92	B.12	Cross-deputization	High	Low	36+	75-99%	3	7

FDEP's Division of Law Enforcement, Florida Marine Patrol (FMP) with their supervision coordinated among NOAA, Florida Division of Marine Resources (FDMR), and the FMP. In addition to State laws and local ordinances, Sanctuary officers have statutory or delegated authority to enforce the NMSA and other statutes administered by NOAA.

Enforcement Philosophy. The Law Enforcement Program of the FKNMS is an essential component of resource protection within the Sanctuary. A goal of Sanctuary enforcement is to prevent resource impacts. This preventive enforcement is best achieved by maintaining sufficient patrol presence within the Sanctuary to deter violations and by preventing, through education, inadvertent violations of the law. Successful enforcement relies on frequent water patrols and routine vessel boardings and inspections. Water patrols will ensure that users of Sanctuary resources are familiar with the regulations, deter willful or inadvertent violations of the law, and provide quick response to violations and/or emergencies. Sanctuary officers have the capability to investigate, document, and assess Sanctuary violations.

Sanctuary officers practice a form of law enforcement known as "interpretive enforcement." This style of enforcement seeks voluntary compliance primarily through education of users. Interpretive law enforcement emphasizes informing the public through educational messages and literature about responsible behavior, before they adversely impact Sanctuary resources. On-site techniques are currently used to reach the public with educational messages at the

Enforcement Assets

Current enforcement within the FKNMS relies on a State-Federal partnership, utilizing all available enforcement assets of several agencies. The State of Florida, Florida Marine Patrol (FMP), Florida Park Service (FPS), NOAA, U.S. Coast Guard (USCG), and the U.S. Fish and Wildlife Service (FWS) have personnel operating in the FKNMS with statutory or delegated authority to enforce State laws, the National Marine Sanctuaries Act (NMSA), other NOAA statutes, and other acts. The National Park Service (NPS) has enforcement personnel in areas bordering the FKNMS. Land-based enforcement officials work for the Monroe County Sheriff's Office, the U.S. Army Corps of Engineers (ACOE), U.S. Customs, and Florida Game and Fresh Water Fish Commission (FGFWFC). Other Federal and State law enforcement agencies have officers based in the Keys, but do not regularly interact with Sanctuary officers. Some of these include: the State of Florida Department of Transportation; Drug Enforcement Agency; and Bureau of Alcohol, Tobacco, and Firearms.

A summary of the general enforcement assets for agencies conducting enforcement activity within the FKNMS is as follows:

Sanctuary Enforcement Officers. Currently seven Sanctuary Officers, funded by NOAA through an existing cooperative agreement, enforce regulations in the FKNMS. These are sworn, arms-bearing State of Florida Law Enforcement Officers who are deputized to enforce the NMSA, the Magnuson Fishery Conservation and Management Act (MFCMA), the Marine Mammal and Protection Act (MMPA), and the Endangered Species Act (ESA), as well as all State laws.

Sanctuary Officers report directly to an FMP Sanctuary Lieutenant, who in turn coordinates enforcement activities with the Sanctuary Agent and FMP. Sanctuary Officers are equipped with high performance vessels obtained from U.S. Customs seizures and provided by NOAA. Each vessel is equipped with electronic equipment (e.g. Loran, VHF radio, low band State and Federal radio) and emergency response equipment.

NOAA (Office of Enforcement). NOAA currently has one Special Agent assigned to the Florida Keys and another assigned to Miami. Both Agents are assigned to the National Marine Fisheries Service (NMFS), but provide assistance to the Sanctuary enforcement effort on an as-needed basis. Special Agents provide training to Coast Guard personnel and FMP officers in the enforcement of some NOAA statutes, primarily the MFCMA, the MMPA, and the ESA. NOAA has assigned a Sanctuary Special Agent with specific responsibilities for Sanctuary enforcement to the FKNMS. The Sanctuary Agent will be responsible for ensuring that NOAA's enforcement needs are met by the agencies funded through cooperative agreements for enforcement activity within the Sanctuary. The Office of Enforcement has Agents assigned throughout Florida, and in southern Georgia, who are available for special operations within the FKNMS on an as-needed, as-available basis.

Florida Marine Patrol. The FMP has an authorized force of 45 sworn enforcement officers and support personnel assigned to the district that includes the FKNMS. The FMP has available for Sanctuary enforcement small vessels for inshore patrols, a 50-foot patrol boat for offshore patrols, and a single engine sea plane. The FMP also maintains a response team that includes divers who can assist in damage assessment efforts. FMP uses an 800 MHz communications system to enhance enforcement effectiveness.

Under an interagency agreement with NOAA, all sworn FMP officers will be deputized to enforce the NMSA inside the FKNMS, as well as other NOAA statutes

existing sanctuaries. For example, Sanctuary officers talk with users and distribute brochures in the field. These encounters allow officers to make direct, informative contact with visitors, while conducting routine enforcement activity. In addition, Sanctuary officers are called upon to deliver interpretive programs both on-site and throughout the community. Sanctuary officers will continue to perform interpretive law enforcement within the FKNMS.

Integrating Enforcement Efforts. Across the nation, Federal, State, and local agencies are increasingly joining forces and targeting whole coastal ecosystems including rivers, bays, estuaries, and coastlines for comprehensive management and enforcement actions. Federal, State, and local laws provide government agencies with a variety of tools to protect coastal resources. In so doing, these laws strengthen law enforcement capabilities by allowing agencies to build on each other's expertise and share physical resources. Federal, State, and local agencies in the Keys are implementing this process of integrating efforts. In addition, local residents and frequent Sanctuary users are helping by detecting and reporting various violations and groundings, monitoring water quality, and submitting witness statement forms that document Sanctuary violations.

The success of Sanctuary enforcement depends largely on how well the enforcement entities in the Keys are coordinated. Because of limited resources at the Federal, State, and local levels, current enforcement assets must be targeted and used in an efficient and directed effort to achieve compliance

within and outside the Sanctuary boundaries. FMP officers also enforce a variety of State statutes related to resource protection and public safety.

National Park Service. The NPS has enforcement personnel stationed at Key Biscayne National Park, Everglades National Park and Dry Tortugas National Park. All three areas share boundaries with the FKNMS. NPS enforcement personnel will be deputized to enforce NOAA statutes.

U.S. Fish and Wildlife Service. Along with NOAA Special Agents, FWS Special Agents and officers have statutory authority to enforce the MMPA, ESA, the Bald and Golden Eagle Protection Act, and the Lacey Act. FWS also enforces the MBTA and other resource conservation laws within the boundaries of the FKNMS. FWS has five officers stationed in the area of the FKNMS who will be deputized to enforce the NMSA.

United States Coast Guard. The USCG Seventh District has responsibility for the area which includes the FKNMS. The Coast Guard has general law enforcement authority within the maritime jurisdiction of the United States. Coast Guard law enforcement patrols are usually multi-mission in nature, although patrols often emphasize enforcement of particular statutes. Typically, the Coast Guard depends on those agencies with specialized expertise to provide their patrol units with training and support in the conduct of law enforcement activities.

Within the FKNMS, the Coast Guard conducts between 2,400 to 2,500 hours of surface patrols and 200 to 300 hours of aerial patrols per year dedicated to enforcement.

The Coast Guard also has a primary role in protecting natural resources under the Oil Pollution Act of 1990, the Rivers and Harbors Act of 1899, the Deepwater Port Act, the Clean Water Act of 1977, and the Marine Plastic Pollution Research and Control Act.

Department of Environmental Protection, Florida Park Service. State parks in the Keys are unique in that their boundaries, including any waters they protect, are incorporated into the FKNMS boundaries. Florida Park Service officers are under the DEP Division of Law Enforcement and have the same jurisdiction as the Florida Marine Patrol. The officers conduct regular water patrols within park or aquatic preserve boundaries and may be available for assistance when necessary.

John Pennekamp Coral Reef State Park (JPCRSP) has a small land base with water boundaries extending from mean high tide out to the three-mile limit. The park borders Biscayne National Park to the north and extends approximately 22 miles south. JPCRSP's three-mile limit boundary is immediately adjacent to the boundaries of the Key Largo National Marine Sanctuary. The boat fleet for JPCRSP consists of research vessels and patrol boats. The officers patrol the park waters on a regular basis.

Monroe County Sheriff's Office (SO). Although the SO is primarily land based, they regularly use three boats for water patrol in excess of 16 patrol hours per month. The SO willingly assists the FMP in special events (e.g., boat races or movies) and the opening day of lobster season, and has jurisdiction within State waters. The officers have crossover training with U.S. Customs. There are currently three environmental officers, three to five person dive teams available for emergency response, and two planes for aerial patrol.

with existing (Federal, State, and local) and proposed regulations. Consequently, the coordination of enforcement assets will be an integral component of the continuous management process described in this Plan. Interagency agreements among NOAA and the other enforcement entities in the Keys (National Park Service (NPS), U.S. Coast Guard (USCG), U.S. Fish and Wildlife Service (FWS), Florida Department of Environmental Protection (FDEP), including Florida Park Service (FPS) and Florida Game and Fresh Water Fish Commission (FGFWFC)), are being established to ensure a cooperative and integrated enforcement operation.

A clear vision of the interagency mission and an understanding of the assets and resources currently available for an interagency effort to manage Sanctuary resources is essential to successfully managing the FKNMS. An assessment of existing Federal, State, and local enforcement assets in the Keys will be conducted. This assessment will develop detailed information about the number of officers, vessels, and equipment available by agency to protect resources within the Keys. This is essential information to determine the capabilities of enforcement operations within the Keys.

Conduct of the Enforcement Program. Sanctuary enforcement operations are a major component of Sanctuary management. A NOAA/National Marine Fisheries Service (NMFS) Special Agent (Sanctuary Agent) will serve as coordinator of the operational Enforcement Program on behalf of, and working in close consultation with, the Sanctuary Superintendent. The Sanctuary Agent is provided through an existing memorandum of understanding between the Assistant Administrator for Fisheries and the Assistant Administrator for Ocean Services and Coastal Zone Management. The Sanctuary Agent will coordinate operational enforcement with all participating agencies through their respective chains of command. Enforcement will be conducted in accordance with enforcement operations plans, to be developed by NOAA's Office of Enforcement and approved by Sanctuary management. Enforcement operations plans, subject to revision as necessary, will include enforcement priorities, patrol schedules, procedures for documenting violations, boarding procedures, information needs, and other instructions specific to the conduct of day-to-day enforcement.

The Sanctuary Agent will coordinate patrol schedules, enforcement priorities, and other related enforcement matters with the Sanctuary Lieutenant. The Agent will in turn coordinate with the Sanctuary officers through their FMP chain of command. The success of the Sanctuary enforcement effort depends on the level of cooperation among Sanctuary management and the enforcement staff. This kind of cooperative enforcement is not a new concept in the FKNMS. From the outset, all enforcement in the Looe Key and Key Largo National Marine Sanctuaries has been conducted by State law enforcement officers, under the direction of NOAA and State managers.

Operational Considerations. The Sanctuary Agent is stationed at the Marathon office. The seven current Sanctuary officers will be assigned to patrol the Upper, Middle, and Lower Keys, with emphasis placed on patrols in the Sanctuary Preservation Areas and Ecological Reserves. Patrol priorities will be based primarily on the protection of resources as opposed to user conflicts.

The Sanctuary officers will be stationed in the Upper, Middle and Lower Keys. Each officer (current and future) will be outfitted with a vehicle, a patrol boat, and all required law enforcement equipment (weapons, etc.).

Currently, the annual cost to NOAA for the Enforcement Programs at the Key Largo and Looe Key National Marine Sanctuaries is $610,000. This figure does not include the purchase cost of patrol vessels, but does include operations and maintenance costs.

Enforcement Program Review. As part of the continuous management process, an enforcement review program will be established for the Sanctuary. This program will ensure that management issues are being addressed by all agencies involved in Sanctuary enforcement, and that the proper training and marine resource identification and protection information is reaching the enforcement staff.

Background

Management Strategies. The strategies for the Management Plan, which includes the Enforcement Action Plan and all other action plans combined, have been grouped into three priority levels, based on their relative importance or feasibility. A strategy's priority level is based on factors such as available funding, costs, personnel requirements, timing, levels of existing implementation, and existing legislative/regulatory authority. The high priority level includes the 16 most important strategies. The medium priority level contains 36 strategies that represent the next level of importance to the sanctuary and will have some level of activity in year one. Low priority items contain the remaining strategies in the Management Plan. Those strategies planned for completion in or before year one do not have a priority level.

Enforcement Action Plan Strategies. This action plan contains only two strategies. The Additional Enforcement (B.6) and Cross-deputization (B.12) strategies are included in high priority level (Table 13). Overall, the Enforcement and the Cross-deputization strategies will have a low level of implementation within the first year of Sanctuary operation.

Program Objectives

The objective of enforcement in the National Marine Sanctuary Program is to protect Sanctuary resources by achieving compliance with the applicable laws. Effective enforcement of all Federal, State, and local statutes that protect the natural, cultural, and historical resources within the Sanctuary is required. The principal goals associated with Sanctuary enforcement include:

- increasing the public's understanding of why it is important to comply with Sanctuary regulations;
- achieving voluntary compliance with applicable laws; and
- promoting public stewardship of the marine resources through interpretive enforcement efforts.

The mechanisms for accomplishing these goals are as follows:

Agreements/Cooperative Efforts

- strengthen the existing enforcement partnership with the State of Florida;
- develop partnerships with other Federal and local enforcement agencies in order to provide a strong enforcement presence throughout the Sanctuary;
- maintain an active relationship with international, Federal, State, and local enforcement agencies to identify areas of mutual concern, and to develop cooperative responses to enforcement issues;
- explore cooperative relationships with foreign governments;
- enter, if necessary, into memoranda of understanding, cooperative enforcement agreements, and joint operations plans with other enforcement agencies as appropriate;
- facilitate communication among enforcement assets to avoid duplication of effort;
- promote cooperation, standardization of gear, and coordination of limited resources such as vessels, radios, radio frequencies, and training;
- promote training and cross-deputization among enforcement agencies;

Community Involvement

- encourage public involvement by encouraging site-specific interpretive patrols by volunteer groups;
- involve USCG, Civil Aeronautical Patrol, power squadrons, charter boat and fishing organizations in promoting compliance with Sanctuary regulations;
- maintain an active relationship with citizen groups interested in compliance with Sanctuary regulations;
- conduct a community outreach program to encourage compliance with Sanctuary regulations and citizen involvement in reporting violations;
- establish a Sanctuary Auxiliary Officer Program similar to other enforcement auxiliaries;

Education

- emphasize education as a tool to achieve compliance with regulations;
- promote voluntary compliance and stewardship of the general public through specific outreach programs regarding enforcement of Sanctuary regulations;
- train user groups about regulations and procedures for reporting violations (witness statement forms);
- identify major user groups and develop and disseminate specific materials to these groups through semiannual meetings and workshops;

Operations

- maintain an investigative capability to ensure quick response to purposeful unlawful acts;
- develop and maintain the capability to effectively respond to violations of Sanctuary regulations and to emergencies;
- establish an Enforcement Advisory Committee consisting of relevant regional law enforcement organizations (possibly a reorganization of the Environmental Enforcement Task Force and the Upper Keys Emergency Response Task Force);
- develop enforcement operation plans that identify specific enforcement strategies and priorities and outline the best means of achieving them; and
- develop regulations for the FKNMS that are comprehensible to the general public and are easily enforced.

Description of Strategies

Enforcement Program

The Enforcement Action Plan contains two management strategies. The first strategy (B.6) calls for increasing the enforcement assets by 30 officers, identifying high-use and sensitive areas, and developing remote observation techniques to aid enforcement efforts. The second strategy (B.12) will enhance existing enforcement efforts by cross-deputizing officers from different agencies, developing standard operating procedures, and establishing a training program. These strategies will essentially provide the resources necessary to achieve compliance with applicable regulations.

Enforcement Strategies

B.6: Additional Enforcement
- Hire Sanctuary agent
- Identify high-use and sensitive areas
- Hire additional enforcement officers
- Develop remote observation techniques to aid enforcement efforts

B.12: Cross-deputization
- Develop inter-agency agreements
- Develop standard operating procedures
- Develop a standardized training program

Strategy B.6: Additional Enforcement

Need 30 Sanctuary enforcement officers to deploy in high-use and sensitive areas.
(Priority Level High, Low Level of Action in Year 1, 36+ Months to Complete, <50% Funding for Full Implementation)

This strategy will increase the presence of law enforcement officers (LEO) on the water to protect resources and reduce user conflicts. This will be accomplished by hiring 30 more LEOs and deploying them in high-use and sensitive areas. Remote observation techniques may be used to aid enforcement efforts. High-use and sensitive areas will be identified.

Activity 1-Hire the Sanctuary Agent. The National Marine Fisheries Service's (NMFS) Office of Enforcement has assigned to the FKNMS headquarters a NOAA/NMFS Special Agent (Sanctuary Agent) to coordinate operational enforcement within the FKNMS. Working in close cooperation with the Sanctuary Superintendent, regional managers and representatives from the FMP, the USCG, and, when appropriate, the NPS and FWS, the Agent will develop annual enforcement operations plans, including necessary revisions and updates of the plan throughout the year. These plans will include a summary of relevant regulations; a planned patrol schedule to include the number, type, frequency, and geographic area of the patrols; the priority for each patrol; and a response protocol for each type of violation. The Agent will also—

- ensure that case reports of violations of the NMSA or other NOAA statutes are complete and meet prosecutorial requirements before forwarding them to the NOAA general counsel;
- ensure that all officers enforcing NOAA statutes within the FKNMS are properly deputized and have up-to-date training; and
- serve as NOAA's point of contact within the FKNMS for operational enforcement with other federal and state enforcement agencies. In this role, the Sanctuary Agent will facilitate communication among all enforcement participants.

■*Implementation.* The Sanctuary Agent has been assigned to the Sanctuary by the Office of Enforcement (NMFS).

■*Schedule.* This activity has been completed.

Activity 2-Identify High-use and Sensitive Areas. Because of the size of the Sanctuary, enforcement officers (including new hires) will be assigned primarily to high-use and sensitive areas, with priorities based on the protection of resources over the resolution of user conflicts. These areas may include all or some of the Sanctuary zones (Sanctuary Preservation Areas, Ecological Reserves, Wildlife Management Areas, Special-use Areas, and Existing Management Areas), as well as other areas of particular natural/cultural resource significance. Determination of sensitive cultural significance is part of the SCR inventory objective. High-use and sensitive areas must be identified prior to assigning additional enforcement officers to cover these areas. This is critical, because new officers will be phased in over a multi-year period.

Sanctuary managers must assess the law enforcement needs of the areas they manage. The costs of training, retraining, firearms qualifications, equipment, maintenance, and the staff necessary to manage a program must be considered when assessing the law enforcement needs of the Sanctuary.

Resources should be inventoried, and priorities assigned to their protection, based on an assessment of their significance and vulnerability. The numbers of visitors, visitor demographics, average length of stay, length of commercial and recreational seasons, seasonal variations, and visitation trends all greatly affect the amount and type of law enforcement services required. The variety and impacts of public use and special events or seasons are major influences on the scope of the Sanctuary's Enforcement Program. Access, circulation patterns, and high-use areas all have significant impacts on the Sanctuary's Enforcement Program. Recent overflight surveys will provide data to assist in identifying high-use and sensitive areas needing specific enforcement efforts.

■*Implementation*. NOAA will be the lead agency responsible for implementing this activity. The FMP will assist in identifying high-use and sensitive areas and enforcement levels.

■*Schedule*. This activity will have a low level of activity in year 1. It will require 6+ months to complete.

Activity 3-Hire Additional Enforcement Officers. Once high-use and sensitive areas are identified, an adequate level of enforcement must be determined and the corresponding officers hired. Given current funding limitations, additional officers will be phased in over a multi-year period.

■*Implementation*. NOAA will be the lead agency responsible for implementing this activity.

■*Schedule*. This activity will have a low level of activity in year 1. It will be continuous.

Activity 4-Develop Remote Observation Techniques to Aid Enforcement Efforts. Floatplanes, tethered aerostats, etc. may be used to aid enforcement efforts.

■*Implementation*. NOAA will be the lead agency responsible for implementing this activity, with the assistance of other enforcement agencies.

■*Schedule*. This activity will have no action in year 1. It will require 36 months to complete.

Strategy B.12: Cross-deputization

Expand Federal, State, and local enforcement and cross-deputization programs and prioritize enforcement areas.
(Priority Level High, Low Level of Action in Year 1, 36+ Months to Complete, 75-99% Funding for Full Implementation)

Activity 1-Develop Interagency Agreements Establishing Cross-agency Enforcement Authority. A prerequisite to effective Sanctuary enforcement is the establishment of interagency agreements with various enforcement entities in the Keys. These agreements will set forth Federal, State, and local enforcement authority among all officers. *It is anticipated that officers with the following organizations will be cross-deputized*:

National Marine Fisheries Service. As a result of a March 1993 agreement between the National Ocean Service (NOS) and NMFS, the Sanctuary Agent (Office of Enforcement, NMFS), in close consultation with the Sanctuary Superintendent and the Sanctuary Lieutenant, will coordinate all enforcement operations within the FKNMS.

Florida Marine Patrol. The Sanctuary enforcement staff at the Key Largo and Looe Key national marine sanctuaries are supervised by the FMP under an agreement that allows these officers to enforce NMSA and other NOAA statutes. A new interagency agreement will allow all other FMP officers to enforce statutes that apply within the entire Sanctuary, including the NMSA and other relevant Federal statutes. As such, FMP officers (Sanctuary and non-Sanctuary officers) will be the primary enforcement asset in the Sanctuary.

Note: The enforcement abilities of the Department of Environmental Protection's Division of Law Enforcement are subject to the operational parameters of that law enforcement entity, and may be limited by the levels of staffing and funding proposed by this plan. Accordingly, the designation of the FMP as the primary enforcement asset in the Sanctuary may be subject to change.

Interagency agreements are being established between NOAA and the following entities to allow their officers to enforce NMSA and other statutes administered by NOAA:

- U.S. Coast Guard;
- U.S. Fish and Wildlife Service;
- National Park Service;
- Florida Department of Environmental Protection (Florida Park Service); and
- Florida Game and Fresh Water Fish Commission.

■*Implementation*. NOAA is the lead agency responsible for establishing interagency agreements with the agencies listed above.

■*Schedule*. This activity has a high level of action planned for year 1. It will require 12+ months to complete.

Activity 2-Develop Standard Operating Procedures. This will increase the efficiency and effectiveness of enforcement efforts. It will establish coordination and cooperation among agencies and increase interagency communication by:

- scheduling staff and equipment efficiently among all agencies;
- developing a process for handling violations;
- standardizing radio communications (i.e., use of a standard radio frequency);
- promoting cooperation with the military in detecting violations; and
- determining priority enforcement areas (establishing interagency agreements and identifying priority areas are prerequisites).

■*Implementation*. NOAA's Sanctuary Agent will be responsible for implementing this activity by coordinating with affected agencies.

■*Schedule*. This activity has no action planned for year 1. It will require 24 months to complete.

Activity 3-Develop a Standardized Training Program. A training program will be developed to enable various enforcement agencies to educate each other about their respective statutes and codes.

■*Implementation*. NOAA's Sanctuary Agent and the Sanctuary Superintendent and/or education staff will be responsible for implementing this activity by developing a standard training course on the enforcement of the NMSA, MFCMA, MMPA, and ESA. The Sanctuary should also coordinate with the National Park Service and other federal/state training programs on enforcement of archaelogical and historic preservation laws. The FMP will be responsible for developing a course on the Florida statutes and Monroe County codes.

■*Schedule*. This activity has no action planned for year 1. It will require 36+ months to complete.

Implementation

This section summarizes key information about the implementation of the strategies included in this plan. The institutions responsible for each activity, and those agencies providing some level of assistance, are identified (Table 12). The strategies are also ranked to indicate their overall priority level. In addition, the planned level of activity in year 1, months required to complete, funding availability, cost estimates, staff requirements, and the geographic focus of each strategy/activity are provided (Table 13). Finally, the process used to evaluate the effectiveness of the program as it evolves over time is presented.

The strategies in this plan will have a low level of action during the first year. Funding will be a major consideration, given that many different agencies will be involved to different degrees.

Responsible Institutions. NOAA will be the lead agency responsible for implementing the activities within this action plan. However, the success of the Enforcement Program depends on the cooperation of other State and Federal agencies, primarily the FDEP, FMP, FPS, FGFWFC, USFWS, USCG, NPS, and Monroe County.

Prioritization of Implementation. Because of their importance, the Cross-deputization strategy and the Additional Enforcement strategy are included in high priority level. Consequently, they are included among the highest-ranking strategies in the Management Plan.

Cost. The costs associated with implementing this action plan are estimated to be significant (up to $1 million in capital costs and an additional $1 million for operation and maintenance costs). These costs are primarily associated with hiring additional officers (i.e., salaries and equipment), and will be distributed among the participating institutions. The funding will come primarily from the various Federal agencies' enforcement budgets and State funds.

Geographic Focus. Each strategy in this plan will be implemented throughout the Sanctuary.

Staff. A staff of two full-time Sanctuary personnel (including the Sanctuary Agent) will be needed to:

- coordinate the interaction of the various enforcement assets in the Sanctuary; and
- oversee the enforcement officers. This plan calls for the hiring of up to 30 additional enforcement officers.

Table 12. *Agencies/Organizations Identified for Implementing Strategies/Activities*

Strategy/Activity	Agencies/Organizations: NOAA-Sanctuary	NOAA-NMFS	FWS	USCG	NPS	FDEP-FMP	Monroe County
ENFORCEMENT PROGRAM							
B.6 Additional Enforcement							
Hire the Sanctuary Agent	◐	●					
Identify High-use and Sensitve Areas	●	●	○	○	○	◐	○
Hire Additional Enforcement Officers	●	●				◐	
Develop Remote Observation Techniques to Aid Enforcement Efforts		●	○	○	○	◐	○
B.12 Cross-deputization							
Develop Interagency Agreements	●	◐	○	○	○	○	○
Develop Standard Operating Procedures	○	●	○	○	○	◐	○
Develop Standardized Training	●	●	○	○	○	◐	○

● Lead ◐ Primary Role ○ Assist

Abbreviations: NOAA, National Oceanic and Atmospheric Administration; NMFS, National Marine Fisheries Service; FWS, U.S. Fish and Wildlife Service; USCG, U.S. Coast Guard; NPS, National Park Service; FDEP, Florida Department of Environmental Protection; FMP, Florida Marine Patrol.

Equipment. If 30 additional officers are hired, each will require a high performance vessel. Each officer will have to be equipped with enforcement gear at approximately $1,500 per officer. Each officer must initially attend the FMP Law Enforcement Academy and then participate in the Academy's annual training program.

Evaluating Program Effectiveness and Efficiency. A system will be designed for evaluating the effectiveness of enforcement efforts. Evaluating efficiency will be done on a monthly and annual basis on both a regional and Sanctuary-wide scale. The regional managers will assess enforcement efforts in known hot spots and coordinate enforcement coverage accordingly. On a yearly basis, the heads of the various enforcement agencies will meet to discuss enforcement issues, including whether heavily used and sensitive areas are being adequately patrolled.

Table 13. *Requirements for Implementation*

Strategy/Activity	Overall Sanctuary Priority Level +	Implementation: Planned Level of Action in Year 1	Implementation: Months to Complete	Implementation: Funding Available to Complete	Cost to Complete: Total Capital ($1,000)	Cost to Complete: Annual Operations/ Maint. ($1,000)	Geographic Focus	# of Personnel
ENFORCEMENT PROGRAM								
B.6 Additional Enforcement	High	Low	36+	<50%	100-999	100-999		30
Hire the Sanctuary Agent	*	--	--	100%	0	10-99	SW	
Identify High-use and Sensitive Areas	High	Low	6+	75-99%	0	<10	SW	
Hire Additional Enforcement Officers	Medium	Low	C	<50%	100-999	100-999	SW	
Develop Remote Observation Techniques to Aid Enforcement Efforts	Low	None	36+	<50%	10-99	10-99	SW	
B.12 Cross-deputization	High	Low	36+	75-99%	<10	10-99		5
Develop Interagency Agreements	High	High	12+	75-99%	0	<10	SW	
Develop Standard Operating Procedures	Medium	None	24+	<50%	0	<10	SW	
Develop Standardized Training Program	Medium	None	36+	<50%	0	<10	SW	

Abbreviations: C, Continuous; SW, Sanctuary Wide; Maint., Maintenance.

+ Activities with an "* " for Overall Sanctuary Priority Level will be completed prior to Year 1.

Mooring Buoy Action Plan

This action plan identifies and describes the strategies needed to develop and implement a comprehensive mooring buoy siting plan for the Sanctuary. The strategies within the plan are derived from Alternative III, the most balanced of the mid-range management alternatives. For each strategy, the time required for implementation, funding availability, costs, and responsible parties are outlined. Table 14 summarizes key information about the implementation of the strategies included in this plan.

Introduction

Mooring buoys have been shown to be an effective management tool when used to minimize the damage to coral reefs and other sensitive marine resources resulting from careless and/or inappropriate anchoring practices. A system of mooring buoys is already in use in the Keys through the efforts of Key Largo and Looe Key national marine sanctuaries and several volunteer groups, most prominently Reef Relief in Key West. However, concerns that the inappropriate use of mooring buoys may have the potential to negatively impact marine resources by attracting more boaters, divers, and fishermen than would have previously used the areas where they are placed have been raised recently. This plan will establish a methodology for identifying areas appropriate for locating mooring buoys and managing boating activities near coral reefs so that the negative impacts will be minimized.

How the Plan is Organized. This action plan is organized into three sections: an introduction, description of strategies, and implementation. The introduction summarizes the goals and objectives of the Mooring Buoy Program and provides background information on planning efforts. The strategy description section groups activities by strategy. For each strategy and component activity, the priority level, funding availability, costs, and timing of implementation are summarized. The implementation section details how strategies in the plan will be placed into action.

Background

Management Strategies. Each strategy in the action plan has been assigned an estimated activity level for year 1 (high, medium, low, or none) which represents an estimate of the planned level of action that will occur in the year after the Sanctuary Management Plan is adopted. In addition, the time required for implementation, costs of implementation, and available funding (Federal, State, local, and private) have been estimated for each strategy. The component activities in each strategy, and the institutions responsible for implementing these activities, have been identified as well.

The strategies for the Management Plan, which includes the Mooring Buoy Action Plan and all other action plans combined, have been grouped into three priority levels, based on their relative importance or feasibility. A strategy's priority level is based on factors such as available funding, costs, personnel requirements, timing, levels of existing implementation, and existing legislative/regulatory authority. The high priority level includes the 16 most important strategies. The medium priority level contains 36 strategies that represent the next level of importance to the sanctuary and will have some level of activity in year one. Low priority items contain the remaining strategies in the Management Plan. Those strategies planned for completion in or before year one do not have a priority level.

Mooring Buoy Action Plan Strategies. The Boat Access (B.1) strategy is completed, as indicated in

Table 14. *Summary of Mooring Buoy Strategies*

Page		Strategies	Overall Sanctuary Priority Level	Planned Level of Action in Year 1	Months to Complete	Funding for Full Implementation	Number of Activities to be Undertaken	Number of Institutions
100	**Mooring Buoy Program**							
100	B.1	Boat Access			*Refer to Channel Marking Action Plan*			
100	B.15	Mooring Buoy Management	High	Medium	36+	<50%	10	13

the Channel/Reef Marking Action Plan. The Mooring Buoy Management (B.15) strategy is included in priority level 2 (Table 14). This strategy will have some level of implementation within year 1.

Implementing all mooring buoy strategies is expected to cost $1.2 million over five years. Funding will come from a mix of public (Federal, State, and local) and private agencies and institutions. Only about 20 percent of the funding needed for full implementation is currently available. Twenty-four institutions are identified as potential participants in this program.

Relationship to Other Action Plans. The Boat Access strategy is described in detail in the Channel/Reef Marking Action Plan. Both the Boat Access and Mooring Buoy Management strategies are also included in the Regulatory and Volunteer action plans.

Goals and Objectives

National Goals. The goals of the Mooring Buoy Program represent, and are consistent with, the goals of the National Marine Sanctuary Program regarding the protection of Sanctuary resources, specifically coral reef formations and other sensitive marine habitats. By allowing and/or directing access at selected locations, a Mooring Buoy Program can also limit resource-use conflicts and damage to the Sanctuary environment.

Sanctuary Goals. The Mooring Buoy Action Plan will further the Sanctuary's goal of protecting and managing the Keys' natural and cultural resources by:

- minimizing impacts to sensitive marine habitats, specifically coral reef formations, caused by the inappropriate use of anchors;
- providing reasonable access to Sanctuary resources, consistent with the primary goal of resource protection; and
- managing and/or restricting human activities where such activities are found to have a detrimental impact on Sanctuary resources.

Mooring Buoy Program Objectives. To accomplish these goals, the following objectives have been set:

- the characteristics of boater and diver use in coral reef areas throughout the Sanctuary will be assessed;
- a database of boater and diver use and existing mooring buoy locations will be prepared;
- the criteria necessary for determining the location of additional mooring buoys to meet the existing demand will be developed;
- the impact of boater and diver use in coral reef areas will be assessed;

Existing Programs

Mooring buoys have been used as a management tool in the Keys for many years, primarily within the Key Largo and Looe Key national marine sanctuaries. The mooring buoys located in the sanctuaries are maintained through NOAA funds contracted to private individuals or organizations. Mooring buoys have also been used in John Pennekamp Coral Reef State Park, but have been removed due to increased damage that occurred to the patch reefs. In addition, several non-profit and volunteer-based groups have installed and maintained mooring buoys in the Keys. The primary volunteer organizations involved in mooring buoy placement are: Reef Relief, which has installed more than 125 buoys around Key West; and the Coral Reef Foundation, which has installed 24 buoys in the Islamorada/Tavernier area. Volunteer donations of time and money are the primary methods of buoy maintenance.

In addition to these groups, several private organizations have installed mooring buoys at specific locations associated with their interests or business. For example, the buoys at Cheeca Rocks off Islamorada were installed by the Cheeca Lodge Resort.

A cooperative boat-use survey has been conducted by The Nature Conservancy and the Florida Department of Environmental Protection. It provides aerial and on-water assessments of spatial and temporal boater use within the Sanctuary. A series of overflights from Fowey Rocks (Biscayne National Park) to the Marquesas was conducted to provide instantaneous boat counts throughout Sanctuary waters. A stratified random sampling procedure was used to collect representative data for weekends, weekdays, seasons, and special events (holidays, lobster season, etc.). The aerial surveys classify boat use into several size and activity categories, and have a resolution of approximately one square mile. The on-water surveys were conducted to provide hourly boat counts at selected locations to calibrate the aerial counts, and determine peak usage and turnover patterns. These surface surveys also tallied boating activities and the number of divers and/or snorkelers, information that can then be used to determine use levels at various locations.

- a standardized marking system for mooring buoys within the Sanctuary will be developed;
- the impact of large vessels on mooring buoy systems and the optimum vessel size for a variety of buoys will be determined; and
- vessel size restrictions associated with mooring buoy use will be considered.

Description of Strategies

Mooring Buoy Program

The Mooring Buoy Action Plan contains two strategies developed during the Management Plan process and included in Alternative III. The first will assess boat access throughout the Sanctuary; and the second will use this information (through a cooperative forum of involved agencies and interest groups) to develop a comprehensive mooring buoy siting and management plan.

Mooring Buoy Strategies

B.1: Boat Access (This strategy is described in detail in the Channel Marking Action Plan)

B.15: Mooring Buoy Management
- Maintain existing mooring buoys
- Assess current mooring buoy technology
- Review visitor use and boating data
- Develop siting criteria
- Recommend new sites for mooring buoy installation
- Conduct site assessments of proposed locations
- Determine costs of implementation and maintenance
- Install additional mooring buoys
- Implement vessel size limits in high-use areas
- Evaluate effectiveness and influences of mooring buoy placement

Strategy B.1: Boat Access

Conduct a survey to assess public and private boat access throughout the Sanctuary to develop a low-impact access plan; direct new public access to low-impact areas; and modify as appropriate any access affecting sensitive areas throughout the Sanctuary.

This strategy is described in detail in the Channel Marking Action Plan. It is also included in the Volunteer Action Plan.

Strategy B.15: Mooring Buoy Management

Develop a comprehensive mooring buoy plan providing for the maintenance of buoys, the placement of buoys as needed, and the implementation of vessel size limits at mooring buoys throughout the Sanctuary. Conduct an assessment of current mooring buoys and mooring buoy technology to determine the influence that the presence of mooring buoys has on Sanctuary resources; and to evaluate which are the most environmentally sound, cost-effective, and functional for use in Sanctuary waters.
(Priority Level High, Medium Level of Action in Year 1, 36+ Months to Complete, <50% Funding for Full Implementation)

Activity 1-Maintain Existing Mooring Buoys. While the Comprehensive Mooring Buoy Plan is being developed, the existing system of mooring buoys must be maintained. In some cases, volunteers may help to maintain the mooring buoys.

■*Existing Program Implementation.* There are currently over 340 mooring buoys within the Sanctuary that are maintained through a combination of government agencies and private organizations.

■*Implementation.* NOAA, in cooperation with existing agencies and NGOs that maintain mooring buoys, will be the lead agency responsible for implementing this activity. At a minimum, this will include maintaining the mooring buoys within the Key Largo and Looe Key national marine sanctuaries, and adjacent areas where the sanctuary is currently maintaining buoys. NOAA will also assist, both financially and through logistical support, other organizations that install and maintain mooring buoys. Volunteers will be utilized to assist in some aspects of the maintenance of mooring buoys to the maximum extent feasible.

■*Schedule.* This activity will have a high level of action in year 1. It will be an ongoing activity and obligation.

Activity 2-Assess Current Mooring Buoy Technology. The various types of mooring buoy designs available for use in the Sanctuary will be reviewed, and the substrate type most appropriate for each will be determined. Methods of limiting resource damage through mooring buoy installation will be assessed, as will vessel impacts on mooring buoys.

■*Existing Program Implementation.* Many components of this activity have already been completed through an ongoing analysis of mooring buoy systems in use at the Key Largo and Looe Key national marine sanctuaries and research on visitor use impacts to patch reefs at JPCRSP. The publication "The Use of Mooring Buoys as a Management Tool" (van Breda and Gjerde, 1992) also contains an excellent review of mooring buoy types and uses. Vessel impacts on mooring buoys remain to be addressed.

■*Implementation.* NOAA will be the lead agency responsible for implementing the assessment of vessel impacts. NOAA will work with the Sanctuary Advisory Council, other sanctuaries, such as Flower Garden Banks, and applicable nongovernmental organizations (NGOs), such as Reef Relief, that have experience with mooring buoy systems used by larger vessels.

■*Schedule.* This activity will have high level of action in year 1. It will require 6 months to complete.

Activity 3-Review Visitor-Use and Boating Data. All boating activity and visitor-use data collected by various surveys will be compiled in a format that relates to mooring buoy planning. This will include targeting data on diving activity around major coral reef systems, and considering the impact of special events, such as holidays and lobster season, on boating patterns. On-water surveys will be correlated with aerial data to determine peak usage and turnover rates in high-use areas. To enable recommendations for mooring buoy additions or deletions, visitation data will be compared with existing mooring buoy locations.

■*Existing Program Implementation.* The FDEP, through Looe Key National Marine Sanctuary, contracted TNC to compile visitor-use and boating data related to mooring buoy planning. A report entitled "An Evaluation of Mooring Buoys in the Florida Keys National Marine Sanctuary Based on Boating Patterns" has been completed addressing some of the items identified in this activity.

■*Implementation*. NOAA will be the lead agency responsible for implementing this activity. The recommendations of the visitor use and boating survey will be considered, along with additional data, analyses and input from all available sources. NOAA will work with the Sanctuary Advisory Council and the working group established in Activity 4 to review the information gathered in this activity.

■*Schedule.* This activity will have a high level of action in year 1. It will require 6 months to complete.

Activity 4-Develop Siting Criteria. Based on all available information, criteria will be developed for future mooring buoy siting within the Sanctuary. A workshop will be conducted with representatives of the Sanctuary Advisory Council, affected agencies, NGOs and other interested parties to identify criteria for allocating existing buoys and siting new buoys. A working group will be established to advise and facilitate the development of the mooring buoy management plan.

■*Implementation.* NOAA will be the lead agency responsible for implementing this activity by organizing the working group and facilitating the workshop.

■*Schedule.* This activity will have a medium level of action in year 1. It will require 12 months to complete.

Activity 5-Recommend New Sites for Mooring Buoy Installation. After mooring buoy siting criteria have been established, areas where new mooring buoys should be installed will be identified based on the visitor-use data, resource management concerns, level of demand and other relevant information. Priority areas for installation will be developed based on established criteria.

■*Implementation.* NOAA will be the lead agency responsible for implementing this activity. Recommendations will be made by the working group established in Activity 4.

■*Schedule.* This activity will have a medium level of action in year 1. It will require 12 months to complete.

Activity 6-Conduct Site Assessments of Proposed Locations. Areas identified for the installation of new mooring buoys will be surveyed to determine: 1) the health of the habitat in relation to visitor use; 2) types of use and use patterns (e.g., size of vessels, glass-bottom boat use, unusual features, etc.); and 3) the number, location, and concentration of specific mooring buoys on the reef. The areas will be mapped using aerial photographs, and proposed mooring buoy locations will be identified.

■*Implementation.* NOAA will be the lead agency responsible for implementing this activity. Biologists from the FDEP and members of the Sanctuary Advisory Council will be consulted for the resource survey.

■*Schedule.* This activity will have a low level of action in year 1. It will require 18 months to complete.

Activity 7-Determine Costs of Implementation and Maintenance. After establishing the number of mooring buoys suitable for each primary area, installation and maintenance costs will be determined. Maintenance costs will be based on past costs at the Key Largo and Looe Key National Marine Sanctuaries and relevant NGOs (e.g., Reef Relief, etc.). The ability to fund adequate maintenance activities will be a primary factor in determining the priority areas where new mooring buoys will be installed.

■*Implementation.* NOAA will be the lead agency responsible for implementing this activity. Other agencies and NGOs with mooring buoy experience (e.g., the FDEP, Reef Relief, etc.) will be consulted to determine installation and maintenance costs.

■*Schedule.* This activity will have a low level of action in year 1. It will require 18 months to complete.

Activity 8-Install Additional Mooring Buoys. Based on the recommendations developed in Activity 5, 6 and 7, new mooring buoys will be installed at the locations identified. In some cases, volunteers may help to install the mooring buoys.

■*Implementation.* NOAA will be the lead agency responsible for implementing this activity. Assistance will be solicited from other agencies, volunteers and NGOs.

■*Schedule.* This activity will have a low level of action in year 1. It will require 24 months to complete.

Activity 9-Implement Vessel Size Limits in High-Use and Sensitive Areas. Based on vessel-impact information, size limits will be established for the various classifications of mooring buoys. Size limits will be based on considerations concerning the force necessary to make the anchoring system fail under established design parameters. To allow larger vessel buoy use in selected areas, several categories of mooring buoy sizes (such as the “big boat” buoys that have been installed by Reef Relief near Key West) will be considered. Aesthetic and recreational crowding factors will be considered as well. *The size limits shall be incorporated into the Federal Regulations established for the Sanctuary after the supporting data has been gathered.*

■*Implementation.* NOAA will be the lead agency responsible for implementing this activity. Other agencies, the Sanctuary Advisory Council, and NGOs with mooring buoy experience (e.g., Reef Relief, etc.) will be consulted.

■*Schedule.* This activity will have a low level of action in year 1. It will require 24+ months to complete.

Activity 10-Evaluate effectiveness and influences of mooring buoy placement and make changes as necessary. This activity will establish a monitoring program to assess the effectiveness and influences of mooring buoys on coral reefs and other sensitive habitats. Baseline surveys and monitoring programs will be conducted in areas with existing mooring buoys, prior to and after the installation of new mooring buoys, and in areas without mooring buoys that have little or no diving or boating activity. This activity will be coordinated with the monitoring programs established for the Sanctuary Preservation Areas and Research-Only Special-Use Areas in the Research and Monitoring Action Plan. In areas that are found to be detrimentally impacted by the presence of mooring buoys, those buoys will be removed.

■*Implementation.* NOAA will be the lead agency responsible for implementing this activity. FDEP will provide support in implementing this activity.

■*Schedule.* This activity will have a medium level of action in year 1. It will require 36+ months to complete.

Implementation

This section explains how the strategies in the Mooring Buoy Action Plan will be implemented. The institutions responsible for each activity, and those agencies that will provide some level of assistance, are identified. In addition, the planned level of activity in year 1, months required to complete, funding availability, cost estimates, staff requirements, and geographic focus for each strategy/activity are provided. Finally, the process used to evaluate the effectiveness of the Mooring Buoy Program as it evolves over time is described.

The primary strategy associated with this plan (B.15, development of a comprehensive mooring buoy plan) is considered a high-priority strategy, due to the success of mooring buoy programs in the Key Largo and Looe Key National Marine Sanctuaries, and other locations in the Florida Keys. Funding will be a major consideration, because developing a mooring buoy system similar to that currently in place in existing sanctuaries would be considerably expensive. Creative ways of funding the mooring buoy system must be explored to maintain it in the long term.

Responsible Institutions. NOAA will be the lead agency responsible for implementing the activities

Table 15. *Agencies/Organizations Identified for Implementing Strategies/Activities*

Strategy/Activity	Agencies/Organizations: NOAA-Sanctuary	USFWS	USCG	ACOE	NPS	FDEP	FDCA	Monroe County	TNC	RR	CMC
MOORING BUOY PROGRAM											
B.1 Boat Access	*Refer to Channel Marking Action Plan*										
B.15 Mooring Buoy Management											
Maintain the Existing Mooring Buoy System	●										
Assess Current Mooring Buoy Technology	●					◉		○	◉	○	○
Review Visitor-Use and Boating Data	●	○	○	○	○	○	○	○	○	○	○
Develop Siting Criteria	●	○	○	○	○	○	○	○	○	○	○
Recommend New Sites for Mooring Buoy Installation	●	○	○	○	○	◉	○	○	◉	○	○
Conduct Site Assessments of Proposed Locations	●			○		◉				○	
Determine Costs of Implementation and Maintenance	●					◉					
Install Additional Mooring Buoys	●									○	
Implement Vessel Size Limits in High-use Areas	●		○			○		○			
Evaluate Effectiveness and Influences of Mooring Buoy Placement and Make Changes as Necessary	●					○					

● Lead ◉ Primary Role ○ Assist

Abbreviations: NOAA, National Oceanic and Atmospheric Administration; USFWS, U.S. Fish and Wildlife Service; USCG, U.S. Coast Guard; ACOE, U.S. Army Corps of Engineers; NPS, National Park Service; FDEP, Florida Department of Environmental Protection; FDCA, Florida Department of Community Affairs; TNC, The Nature Conservancy; RR, Reef Relief; CMC, Center for Marine Conservation.

Table 16. *Requirements for Implementation*

Strategy/Activity	Overall Sanctuary Priority Level	Implementation: Planned Level of Action in Year 1	Implementation: Months to Complete	Implementation: Funding Available to Complete	Cost to Complete: Total Capital ($1,000)	Cost to Complete: Annual Operations /Maint. ($1,000)	Geographic Focus	# of Personnel
MOORING BUOY PROGRAM								
B.1 Boat Access		*Refer to Channel Marking Action Plan*						
B.15 Mooring Buoy Impacts	Medium	Low	36+	<50%	100-999	1,000-5,000		20
Maintain the Existing Mooring Buoy System	High	High	36+	<50%	100-999	1,000-5,000	SW	
Assess Current Mooring Buoy Technology	High	High	6	75-99%	NC	<10	SW	
Review Visitor-Use and Boating Data	High	High	6	75-99%	NC	<10	SW	
Develop Siting Criteria	High	Medium	12	75-99%	NC	<10	SW	
Recommend New Sites for Mooring Buoy Installation	High	Medium	12	75-99%	NC	<10	SW	
Conduct Site Assessments of Proposed Locations	High	Low	18	<50%	NC	10-99	SW	
Determine Costs of Implementation and Maintenance	High	Low	18	75-99%	NC	<10	SW	
Install Additional Mooring Buoys	High	Low	24	<50%	10-99	10-99	SW	
Implement Vessel Size Limits in High-use Areas	Medium	Low	24+	100%	NC	NC	SW	
Evaluate Effectiveness and Influences of Mooring Buoy Placement	Medium	Low	36+	<50%	10-99	10-99	SW	

Abbreviations: Maint., Maintenance; SW, Sanctuary Wide.

Note: The priority levels for activities should not be compared across strategies–they only represent the relative importance of activities contained within a strategy.

within this action plan. However, the success of the Mooring Buoy Program will depend on the cooperation of other Federal, State, and local government agencies, primarily the FDEP (Division of Marine Resources, Florida Marine Research Institute, and Florida Marine Patrol), U.S. Army Corps of Engineers, U.S. Coast Guard, and Monroe County. NGOs including TNC, Reef Relief, the Coral Reef Foundation, and the Center for Marine Conservation will also play an important role implementing activities in the plan. Reef Relief will play a primary role due to its history of mooring buoy installation and maintenance in the Key West area. Table 15 lists the responsible institutions and their level of responsibility in each activity.

Prioritization of Implementation. The Boat Access strategy (B.1) is essentially complete and, therefore, has not been assigned a priority level. Strategy B.15 is included in medium priority level (Table 16). Consequently, it is expected to be implemented in year 1. The implementation of a mooring buoy system has been shown to be an effective management tool for protected marine areas worldwide, especially in coral reef ecosystems. It is a simple, relatively noncontroversial, and extremely visible action that will protect delicate reef structures. Accordingly, the Mooring Buoy strategy is ranked among the three highest groups for management action.

Schedule. Table 16 lists the estimated time required for implementing each strategy and activity in the program. The number of months required to complete each strategy and activity is also provided.

Cost. The costs associated with implementing the Mooring Buoy Program are expected to be significant (up to $250,000 in initial capital costs and an additional $200,000 for annual operation and maintenance costs). Annual maintenance of the mooring buoy system will be a significant ongoing obligation. Funding will depend on allocation from NOAA's operations budget. In addition, funding mechanisms already established by NGOs must be maintained and new funding sources (e.g., "Adopt-a-Buoy," etc.) explored.

Geographic Focus. Each strategy will be implemented Sanctuary-wide.

Staff. A staff of four full-time personnel will be needed to maintain the mooring buoy system adequately Sanctuary-wide. All staff must be experienced boat captains with local knowledge of Sanctuary waters. Alternatively, contracts could be developed with private contractors on a regional basis to ensure buoy maintenance. If the latter approach is taken, the Sanctuary staff will only need to include one contract/grant specialist, and the mooring buoy-related activities will require approximately 25 percent of his/her time.

Equipment. If the mooring buoys are maintained by Sanctuary staff, two vessels will be required. Each vessel should be at least 25 to 30 feet in length and should be fully equipped with standard navigational equipment. At least one of the vessels should have a built-in hydraulic winch system for servicing larger boundary buoys. The Sanctuary currently owns two complete sets of hydraulic installation equipment. One additional backup system may be required in the future.

Contingency Planning for a Changing Budget. To the extent possible, the Sanctuary will encourage the mooring buoy maintenance programs of existing and future private and nonprofit organizations. The Sanctuary will also consider alternative funding sources for the mooring buoy system, including an "Adopt-a-Buoy" program, utilizing volunteers, or other innovative funding mechanisms. If an adequate budget is not available and alternative funding sources are not feasible, mooring buoy maintenance costs can be reduced by cutting the number of mooring buoys in the system. However, the use of mooring buoys is one of the most basic and cost effective mechanisms for reducing physical impacts in sensitive areas, and reducing the number of buoys will only be considered after all other cost saving actions have been explored. Reductions in buoy placement levels will be based on existing and ongoing boater and visitor-use data, ensuring that the most heavily used areas continue to be maintained.

Evaluating Program Effectiveness and Efficiency. Information on boater and visitor-use patterns is extremely important in determining whether the mooring buoy system is being utilized efficiently. Areas where mooring buoys are not being used should be removed from the system. A study should be conducted to determine whether buoy maintenance is most cost-efficient through an in-house program or through an external contract. A research program should be carried out to determine whether the system is reducing damage to coral reefs and other marine habitats by limiting anchor damage. The research must address concerns that the buoys attract more boaters and divers to an area, thereby contributing to long-term cumulative damage resulting from overuse.

Regulatory Action Plan

This action plan sets forth the regulations for the Florida Keys National Marine Sanctuary (FKNMS or Sanctuary), and explains how management strategies have been incorporated into them. Regulations are an integral component of the FKNMS management process. They make up an important part of the management plan by regulating certain activities on a Sanctuary-wide basis and by regulating other activities depending on how that area of the Sanctuary has been categorized or zoned. Permitting, certification, and notification and review processes are established to allow certain activities otherwise prohibited to take place under carefully controlled circumstances. The regulations comply with the goals and objectives of the Florida Keys National Marine Sanctuary and Protection Act (FKNMSPA) and the National Marine Sanctuaries Act (NMSA).

In addition to the issuance of these regulations, NOAA intends to coordinate with other Federal/State and local agencies in their enforcement of existing regulations under Federal, State, and local laws that already regulate some portion of the actions called for in specific management strategies. Because coordination with existing authorities is an important component of comprehensive ecosystem management, the Sanctuary regulations supplement, not replace, existing authorities.

The final regulations address 19 of the management strategies that have a regulatory component. The other strategies that have a regulatory component are either management actions that are already covered by existing Federal, State, or local regulations or strategies that need further analysis before they can be implemented.

About this Plan. The format of this action plan is unlike the others in this document. The action plan outlines how management strategies have been incorporated into the regulations, and summarizes the process for developing future regulations. The action plan's main component is the attached FKNMS regulations.

Goals and Objectives

This action plan establishes a comprehensive and coordinated regulatory program for the FKNMS to ensure the protection and use of Sanctuary resources in a manner that:

- complements existing regulatory authorities;
- facilitates all public and private uses of the Sanctuary that are consistent with the primary objective of resource protection;
- utilizes a system of temporal and geographic zoning to ensure effective site-specific resource protection and use management;
- ensures coordination and cooperation between Sanctuary management and other Federal, State, and local authorities with jurisdiction within or adjacent to the Sanctuary;
- achieves simplicity in the regulatory process and promotes ease of compliance with Sanctuary regulations;
- promotes mechanisms for making informed regulatory decisions based on the best available research and analysis, taking into account information about the environmental, economic, and social impacts of Sanctuary regulations; and
- complements coordination among appropriate Federal, State, and local authorities to enforce existing laws that fulfill Sanctuary goals.

Existing Legislative Authorities

There are a number of existing Federal and State conservation laws that either partially or entirely address some regulatory components of the various management strategies. NOAA's final regulations supplement existing laws and regulations and avoid unnecessary duplication. In a few instances agencies involved in the planning process specifically requested that the Sanctuary regulations incorporate existing laws and regulations to improve and enhance enforcement, through such things as the use of civil penalties under the Sanctuary acts. Clearly, effective enforcement of relevant existing Federal, State, and local regulations will be important for maintaining the health of the Sanctuary (see Enforcement Action Plan).

Relevant Federal laws include the Coastal Zone Management Act; Magnuson Fishery Conservation and Management Act; Clean Water Act, Rivers and

Harbors Act; and Coastal Barrier Resources Act. At the State level, laws that address the regulatory requirements specified in the strategies include the Beach and Shore Preservation Act; Florida Environmental Land and Water Management Act; Florida Air and Water Pollution Control Act, and the Florida Clean Vessel Act. These laws and others are summarized in Appendix C of Volume III.

At the local level, the regulatory requirements complement the goals, objectives, and policies established by Monroe County in its Year 2010 Comprehensive Plan.

NOAA Regulatory Actions

The primary purpose of regulating activities affecting Sanctuary resources or qualities is to protect, preserve, and manage the area's conservation, ecological, recreational, research, educational, historical, and aesthetic resources and qualities. Another purpose is to minimize conflicts among users of these resources. The regulations are based primarily on the requirements of the FKNMSPA and NMSA, as specified in 20 management strategies developed in accordance with the comprehensive planning process for the Sanctuary.

Boating

B.4: Marking Channels/Reefs. This strategy requires: 1) the placement of buoys; 2) marking frequently used and preferred channels; and 3) reducing boat wakes in sensitive habitats, areas vulnerable to erosion, and high-density areas such as marinas.

Sanctuary Regulations. These requirements are partially addressed by section 922.163(a)(5) which prohibits operating a vessel at a speed greater than idle speed only/no-wake within certain areas including: areas designated idle speed only/no wake; and 100 yards of navigational aids indicating emergent or shallow reefs.

B.5: Boat Groundings. Developing a response plan for boat groundings throughout the Sanctuary. Under this strategy, a standard response plan will be developed to address boat groundings throughout the Sanctuary.

Sanctuary Regulations. These requirements are partially addressed by section 922.163(a)(5) which prohibits prop scarring or other injury to seagrasses or the seabed.

B.7: Pollution Discharges. This strategy will help avoid further water quality degradation in the Sanctuary caused by boaters and live-aboards by: 1) requiring them to use holding tanks; and 2) prohibiting the discharge of substances (other than finfish waste and exhaust) into nearshore waters.

Sanctuary Regulations. These requirements are partially addressed by section 922.163(a)(4) which prohibits discharging or depositing materials or other matter in the Sanctuary. Exceptions to this prohibition are discharging or depositing fish, fish parts, and bait during traditional fishing operations; from vessel operations (cooling waters, engine exhaust, and deck wash) and marine sanitation devices. However, in protective zones (i.e., Wildlife Management Areas, Ecological Reserves, Sanctuary Preservation Areas, and Special-use Areas), the only discharges allowed are from engine exhaust and cooling water.

B.11: Special-use Permits. This strategy allows the issuance of Special-use permits to conduct concession-type or commercial activities within the Sanctuary under certain conditions. Activities conducted under Special-use Permits will be monitored and permit conditions enforced.

Sanctuary Regulations. Section 922.166(d) provides for the issuance of national marine sanctuary Special-use Permits.

B.13: Salvaging/Towing. This strategy will reduce damage to natural resources resulting from improper vessel salvage methods by developing standard vessel salvage procedures, including: 1) obtaining a permit; 2) notifying authorities; 3) where appropriate, having an authorized observer at the site or receiving permission to proceed; 4) providing operator training; and 5) promoting the use of environmentally sound salvaging and towing practices and techniques. Permitting for salvaging and towing operations will be implemented throughout the Sanctuary.

Sanctuary Regulations. NOAA is not at this time issuing regulations to implement this strategy; however, it is working with the salvage and tow industry to achieve this goal. However, to the extent that a salvage operation involves conducting prohibited activities, section 929.166 provides for the issuance of national marine sanctuary general permits or Special-use permits to allow the activity.

B.17: Vessel Operations/PWC Management. This strategy addresses impacts to Sanctuary resources and conflicts among users of the Sanctuary resulting from vessel operation, including personal watercraft.

Vessel Operation. This strategy imposes a number of different restrictions, at section 922.163(a)(5), on all vessels, including personal watercraft. Restrictions include the following:

1) a prohibition on operating vessels in a manner which injures coral, seagrasses, and hardbottom habitats throughout the Sanctuary;

2) a prohibition on anchoring vessels on coral in depths less than 40 feet of water when the operator can see the seabed;

3) a prohibition on operating vessels carelessly or recklessly;

4) a prohibition on all vessels from operating at speeds greater than idle speed only/no wake (except in marked channels) in areas designated as idle speed only/no wake, within 100 yards of residential shorelines and stationary vessels, within 100 feet of the red and white "divers down" flag or the blue and white "alpha" flag (in Federal waters), and within 100 yards of navigational aids indicating shallow or emergent reefs; and

5) a prohibition on all vessels from operating in such a manner as to injure, harass, or cause disturbance to wading, roosting, or nesting birds or marine mammals.

PWC Management. The issue of operation of personal watercraft within the Sanctuary received the largest volume of public comment during the 9 month review of the draft management plan. It continued throughout the comment period to be the most heavily debated issue by the Sanctuary Advisory Council aside from the draft zoning plan. For these reasons, NOAA has paid particular attention to this issue and is making a commitment to resolving the issue, beginning with the final regulations. Although the interest of all concerned parties may not be met to their full satisfaction, the final plan takes a proactive approach to dealing with this issue based on recommendations from the Sanctuary Advisory Council.

In addition to the above regulations on vessel operation, the final regulations prohibit the operation of PWCs in portions of the Wildlife Refuges in the Lower Keys. During the year following issuance of the regulations, NOAA will work with the Sanctuary Advisory Council and the personal watercraft industry to resolve some of the issues that remain, such as limiting commercial rental operations to within line of sight, requiring a rescue/chase vessel be available, making training available for employees of rental operations, etc.

Fishing

F.1: Consistent Fishing Regulations. This strategy should ensure administrative and regulatory coordination between fisheries regulatory agencies operating within Sanctuary waters through a protocol for drafting and revising fisheries regulations in order to implement a consistent set of fishing regulations throughout the Sanctuary. This strategy is encompassed in the Protocol for Cooperative Fisheries Management, Volume III, Appendix J.

F.4: Aquaculture Alternatives. This strategy should reduce fishing pressures on wild marine life species and help satisfy the commercial demand for these species. This is a long-term effort designed to identify and develop mariculture techniques and promote the development of mariculture operations.

Sanctuary Regulation(s). These requirements are addressed by section 922.166(d) which provides for the issuance of Special-use permits and section 922.168 which governs notification and review of applications for leases, licenses, permits approvals, or other authorizations to conduct a prohibited activity.

F.7: Artificial Reefs. Regulations will be developed for the construction of artificial reefs in the Sanctuary.

Sanctuary Regulations. These requirements are partially addressed by sections 922.163(a)(3) and (4) which prohibit alteration of the seabed and discharge/deposit of materials without a permit, respectively, section 922.166 which provides for the issuance of national marine sanctuary general permits, section 922.167 which governs certification of preexisting leases, licenses, permits, approvals, other authorizations, or rights to conduct a prohibited activity, and section 922.168 which governs notification and review of applications for leases, licenses, permits approvals, or other authorizations to conduct a prohibited activity.

F.8: Exotic Species. Implement regulations to prevent the release of exotic species into the Sanctuary.

Sanctuary Regulations. These requirements are addressed by section 922.163(a)(7) which prohibits the release or introduction of exotic species of plants, invertebrates, fish, amphibians, or reptiles into waters of the Sanctuary.

F.11: Gear/Method Impacts. Regulations will be developed requiring the use of low-impact gear and methods in priority areas. Regulatory implementation will be in accordance with strategy F.1.

Sanctuary Regulations. These requirements are partially addressed by section 922.163(a)(11) which prohibits the use of explosives, poisons, oil, and bleach as fishing methods and the Protocol for Cooperative Fisheries Management.

F.14: Spearfishing. Regulations restricting spearfishing will be developed for high-priority areas (i.e., those areas exhibiting a low stock abundance, a high degree of habitat damage, or a high degree of user conflicts). Restriction may include gear prohibitions, or the closure of selected areas (e.g., around residential areas). This strategy will also support any existing spearfishing closures in Sanctuary waters.

Sanctuary Regulations. These requirements are partially addressed by section 922.164 which prohibits spearfishing in Ecological Reserves, Sanctuary Preservation Areas, the Key Largo and Looe Key existing management areas, and the four research-only Special-use Areas and by the Protocol for Cooperative Fisheries Management.

Submerged Land Use

L.14: Dredging Prohibition. This strategy will eliminate the possibility of new dredge and fill activities within the Sanctuary. However, dredge and fill activities may be allowed if they are in the public's interest (as determined by the USACE) and if little or no environmental degradation is likely to occur. No dumping of dredge material will be permitted in the Sanctuary except as a restoration or renourishment project strictly conditioned to allow little or no environmental degradation.

Sanctuary Regulations. These requirements are partially addressed by section 922.163(a)(3) which, with certain exceptions, prohibits alteration of the seabed (with exceptions), section 922.163(a)(4) which prohibits discharging or depositing materials or other matter (with exceptions), section 922.166 which sets forth a permitting mechanism for allowing otherwise prohibited activities in the Sanctuary; section 922.167 which sets forth a requirement and procedures for the certification of preexisting leases, licenses, permits, approvals, other authorizations, or rights to conduct a prohibited activity; and section 922.168 which requires the notification of and review of applications for leases, licenses, permits, approvals, or other authorizations to conduct a prohibited activity.

L.15: Dredging Regulation. This strategy calls for the development of new policies and regulations requiring the use of low-impact technologies for maintenance dredging and prohibiting such dredging in areas where significant reestablishment of sensitive benthic communities has occurred (i.e., seagrass and coral habitats).

Sanctuary Regulations. These requirements are partially addressed by section 922.163(a)(3) which prohibits, with certain exceptions, alteration of the seabed, section 922.163(a)(4) which prohibits, with certain exceptions, discharging or depositing materials or other matter, section 922.166 which sets forth a permitting mechanism for allowing otherwise prohibited activities in the Sanctuary; section 922.167 which sets forth a requirement and procedures for the certification of preexisting leases, licenses, permits, approvals, other authorizations, or rights to conduct a prohibited activity; and section 922.168 which requires the notification of and review of applications for leases, licenses, permits, approvals, or other authorizations to conduct a prohibited activity.

Submerged Cultural Resources

R.1 SCR Management. This strategy calls for the development of a set of management practices, guidelines, and regulations addressing the exploration, removal, research, and dispensation of artifacts consistent with Federal and State archaeological policies, programs, and regulations. It also requires the development and implementation of a permitting system for these artifacts, to be applied throughout the Sanctuary, with a provision for exemptions for nondestructive exploration.

Sanctuary Regulations. These requirements are partially addressed by section 922.163(a)(3) which prohibits the alteration of, or construction on, the seabed; section 922.163(a)(9) which prohibits moving, removing, injuring, or possessing a Sanctuary historic resource (or attempting to do any of these activities), except pursuant to a valid Sanctuary permit; and section 922.166 which provides, in

pertinent part, for the issuance of national marine sanctuary permits for the survey/inventory and research/recovery of historical resources and national marine sanctuary Special-use Permits for the deaccession/transfer of such resources.

Recreation

R.7 Coral Touching. This strategy will protect coral communities from damage by prohibiting coral touching in high-use, sensitive, and vulnerable areas.

Sanctuary Regulations. These requirements are partially addressed by section 922.163(a)(2) which prohibits the removal, damage, distribution, or injury of any living or dead coral or coral formation and section 922.164 which prohibits the touching of coral in Sanctuary Preservation Areas and Ecological Reserves.

Zoning

Z.1 Wildlife Management Areas. Under this strategy, regulations have been developed to protect wildlife populations and habitat, while providing opportunities for public use. Regulations include various access restrictions including no-access buffer zones, no-motor zones, and idle speed only/no-wake zones. Some of the regulations have seasonal components (e.g., nesting season closures). Sanctuary permits allow for access and activities otherwise prohibited. This zoning type includes measures contained in management plans for the Great White Heron, Key West, and National Key Deer Wildlife Refuges developed by the USFWS and the FDEP.

Sanctuary Regulations. These requirements are partially addressed by section 922.164 which contains, in pertinent part, certain provisions applicable to Wildlife Management Areas and section 922.162 which defines this zone type.

Z.2 Ecological Reserves. Ecological Reserves are designed to protect and preserve natural assemblages of habitats and species consistent with the resource protection and multiple-use objectives of the Sanctuary.

Sanctuary Regulations. These requirements are partially addressed by section 922.164 which contains, in pertinent part, certain provisions applicable to Ecological Reserves and section 922.162 which defines this zone type.

Z.3 Sanctuary Preservation Areas. These zones focus on the protection of shallow, heavily used reefs where conflicts occur between user groups and where concentrated visitor activity leads to resource degradation. They are designed to enhance the reproductive capabilities of renewable resources, protect areas that are critical for sustaining and protecting important marine species, and reduce user conflicts in high-use areas. This is accomplished through a prohibition of consumptive activities within these areas.

Sanctuary Regulations. These requirements are partially addressed by section 922.164 which contains, in pertinent part, certain provisions applicable to Sanctuary Preservation Areas and section 922.162 which defines this zone type.

Z.4 Existing Management Areas. This strategy identifies existing resource management areas established by NOAA or by another Federal, State, or local authority within the Sanctuary. This strategy may necessitate additional regulations in areas currently managed by agencies other than the Sanctuary. Additional regulations would recognize established management areas and complement existing management programs.

Sanctuary Regulations. These requirements are partially addressed by section 922.164 which contains, in pertinent part, certain provisions applicable to Existing Management Areas and section 922.162 which defines this zone type.

Z.5 Special-use Areas. This strategy is designed to delineate areas of special concern where specific issues can be addressed through the use of zoning. Through the zone type, areas can be set aside for specific uses to reduce conflicts and minimize adverse environmental effects from high-impact activities. This will be accomplished by designating selected areas where activities can be conducted with minimal disturbance to other users and the environment. Special-use Areas may include areas set aside for research and monitoring, restoration sites, archaeological sites, etc. They will also delineate areas where activities, such as personal watercraft use and live-aboard mooring fields are established in specific areas to reduce adverse environmental impacts. This is the broadest zoning classification, and encompasses the greatest range of management issues. The boundaries of these areas will be established to address management issues and needs, and may include seasonal or emergency closures.

Sanctuary Regulations. These requirements are partially addressed by section 922.164 which contains, in pertinent part, certain provisions applicable to Special-use Areas, section 922.166, which in pertinent part, provides for the issuance of Special-use Permits, and section 922.162 which defines this zone type.

Next Steps

There are management strategies with a regulatory component that may be addressed in the future. They were not addressed in the final regulations because they either require additional information gathering, are addressed through existing regulatory authorities, or were not identified as strategies requiring the immediate commitment of available management and enforcement resources. In addition, there are components of strategies that were addressed, while other components will or may be addressed in the continuing management process.

Existing authorities will be utilized to the maximum extent possible to establish comprehensive management. Existing legislation, either in its current form or slightly modified, may be adequate to accomplish the regulatory objectives of selected strategies.

Florida Keys National Marine Sanctuary Regulations

15 CFR PART 922—Provisions applicable to the Florida Keys National Marine Sanctuary (FKNMS)

[Sections 922.3, 922.42, 922.45, 922.46 and 922.50 are found in Subparts A and E of 15 CFR Part 922 and except for minor technical revisions are as they presently exist (provisions of these sections not applicable to the FKNMS have been omitted); sections 922.160, 922.161, 922.162, 922.163, 922.164, 922.165, 922.166, 922.167, and 922.168 are new sections applicable only to the FKNMS and will appear in a new Subpart P to 15 CFR 922. When this notice is published in the Federal Register it will be revised to include amendatory language to the Code of Federal Regulations and to eliminate sections reprinted here that presently appear in the Code of Federal Regulations.]

Sec.

§ 922.160	**Purpose.**
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Appendix I to Part 922, Subpart P—Florida Keys National Marine Sanctuary boundary coordinates

Appendix II to Part 922, Subpart P—Existing Management Areas boundary coordinates

Appendix III to Part 922, Subpart P—Wildlife Management Areas access restrictions

Appendix IV to Part 922, Subpart P—Ecological Reserves boundary coordinates

Appendix V to Part 922, Subpart P—Sanctuary Preservation Areas boundary coordinates

Appendix VI to Part 922, Subpart P—Special-use Areas boundary coordinates and use designations

Appendix VII to Part 922, Subpart P—Areas To Be Avoided boundary coordinates

Appendix VIII to Part 922, Subpart P—Marine Life Rule

Authority: Sections 302, 303, 304, 305, 307, 310 and 312 of National Marine Sanctuaries Act (NMSA) (16 U.S.C. 1431 et seq.) and Sections 5, 6 and 7 of the Florida Keys National Marine Sanctuary and Protection Act, Pub. L. 101-605, 104 Stat. 3090-3093.

§ 922.160 Purpose.

The purpose of the regulations in this part is to implement the comprehensive management plan for the Florida Keys National Marine Sanctuary by regulating activities affecting the resources of the Sanctuary or any of the qualities, values, or purposes for which the Sanctuary is designated, in order to

protect, preserve and manage the conservation, ecological, recreational, research, educational, historical, and aesthetic resources and qualities of the area. In particular, the regulations in this part are intended to protect, restore, and enhance the living resources of the Sanctuary, to contribute to the maintenance of natural assemblages of living resources for future generations, to provide places for species dependent on such living resources to survive and propagate, to facilitate to the extent compatible with the primary objective of resource protection all public and private uses of the resources of the Sanctuary not prohibited pursuant to other authorities, to reduce conflicts between such compatible uses, and to achieve the other policies and purposes of the Florida Keys National Marine Sanctuary and Protection Act and the National Marine Sanctuaries Act.

§ 922.161 Boundary.

The Sanctuary consists of all submerged lands and waters from the mean high water mark to the boundary described in Appendix I to this part, with the exception of areas within the Dry Tortugas National Park. Appendix I to this part sets forth the precise Sanctuary boundary established by the Florida Keys National Marine Sanctuary and Protection Act. (See FKNMSPA § 5(b)(2)).

§ 922.3 Definitions applicable to all National Marine Sanctuaries.

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Assistant Administrator means the Assistant Administrator for Ocean Services and Coastal Zone Management, National Oceanic and Atmospheric Administration (NOAA), or designee.

Benthic community means the assemblage of organisms, substrate, and structural formations found at or near the bottom that is periodically or permanently covered by water.

Commercial fishing means any activity that results in the sale or trade for intended profit of fish, shellfish, algae, or corals.

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Cultural resource means any historical or cultural feature, including archaeological site, historic structure, shipwreck, and artifact.

Director means, except where otherwise specified, the Director of the Office of Ocean and Coastal Resource Management, NOAA, or designee.

Exclusive economic zone means the exclusive economic zone as defined in the Magnuson Fishery Conservation and Management Act, 16 U.S. 1801 et seq.

Fish wastes means waste materials resulting from commercial fish processing operations.

Historical resource means any resource possessing historical, cultural, archaeological or paleontological significance, including sites, contextual information, structures, districts, and objects significantly associated with or representative of earlier people, cultures, maritime heritage, and human activities and events. Historical resources include "submerged cultural resources", and also include "historical properties," as defined in the National Historic Preservation Act, as amended, and its implementing regulations, as amended.

Indian tribe means any American Indian tribe, band, group, or community recognized as such by the Secretary of the Interior.

Injure means to change adversely, either in the short or long term, a chemical, biological or physical attribute of, or the viability of. This includes, but is not limited to, to cause the loss of or destroy.

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Marine means those areas of coastal and ocean waters, the Great Lakes and their connecting waters, and submerged lands over which the United States exercises jurisdiction, including the exclusive economic zone, consistent with international law.

Mineral means clay, stone, sand, gravel, metalliferous ore, nonmetalliferous ore, or any other solid material or other matter of commercial value.

National historic landmark means a district, site, building, structure or object designated as such by the Secretary of the Interior under the National Historic Landmarks Program (36 CFR part 65).

National Marine Sanctuary means an area of the marine environment of special national significance due to its resource or human-use values, which is designated as such to ensure its conservation and management.

Person means any private individual, partnership, corporation or other entity; or any officer, employee, agent, department, agency or instrumentality of the Federal government, of any State or local unit of government, or of any foreign government.

Regional Fishery Management Council means any fishery council established under section 302 of the Magnuson Fishery Conservation and Management Act, 16 U.S.C. 1801 et seq.

Sanctuary quality means any of those ambient conditions, physical-chemical characteristics and natural processes, the maintenance of which is essential to the ecological health of the Sanctuary, including, but not limited to, water quality, sediment quality and air quality.

Sanctuary resource means any living or nonliving resource of a National Marine Sanctuary that contributes to the conservation, recreational, ecological, historical, research, educational, or aesthetic value of the Sanctuary, including, but not limited to, the substratum of the area of the Sanctuary, other submerged features and the surrounding seabed, carbonate rock, corals and other bottom formations, coralline algae and other marine plants and algae, marine invertebrates, brine-seep biota, phytoplankton, zooplankton, fish, seabirds, sea turtles and other marine reptiles, marine mammals and historical resources.

Secretary means the Secretary of the United States Department of Commerce, or designee.

***

State means each of the several States, the District of Columbia, the Commonwealth of Puerto Rico, the Commonwealth of the Northern Mariana Islands, American Samoa, the United States Virgin Islands, Guam, and any other commonwealth, territory, or possession of the United States.

Subsistence use means the customary and traditional use by rural residents of areas near or in the marine environment for direct personal or family consumption as food, shelter, fuel, clothing, tools, or transportation; for the making and selling of handicraft articles; and for barter, if for food or non-edible items other than money, if the exchange is of a limited and non-commercial nature.

Take or taking means: (1) For any marine mammal, sea turtle, or seabird listed as either endangered or threatened pursuant to the Endangered Species Act, to harass, harm, pursue, hunt, shoot, would, kill, trap, capture, collect or injure, or to attempt to engage in any such conduct; (2) For any other marine mammal, sea turtle, or seabird, to harass, hunt, capture, kill, collect or injure, or to attempt to engage in any such conduct. For the purposes of both (1) and (2) of this definition, this includes, but is not limited to, to collect any dead or injured marine mammal, sea turtle or seabird, or any part thereof; to restrain or detain any marine mammal, sea turtle or seabird, or any part thereof, no matter how temporarily; to tag any sea turtle, marine mammal or seabird; to operate a vessel or aircraft or to do any other act that results in the disturbance or molestation of any marine mammal, sea turtle or seabird.

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§ 922.162 Definitions applicable to the Florida Keys National Marine Sanctuary only.

(a) The following definitions apply to the Florida Keys National Marine Sanctuary regulations. To the extent that a definition appears in § 922.3 and this section, the definition in this section governs.

Acts means the Florida Keys National Marine Sanctuary and Protection Act, as amended, (FKNMSPA) (Pub. L. 101-605), and the National Marine Sanctuaries Act (NMSA), also known as Title III of the Marine Protection, Research, and Sanctuaries Act, as amended, (MPRSA) (16 U.S.C. § 1431 et seq.).

Adverse effect means any factor, force, or action that independently or cumulatively damages, diminishes, degrades, impairs, destroys, or otherwise harms any Sanctuary resource, as defined in section 302(8) of the NMSA
(16 U.S.C. § 1432(8)) and in this section, or any of the qualities, values, or purposes for which the Sanctuary is designated.

Airboat means a vessel operated by means of a motor driven propeller that pushes air for momentum.

Areas To Be Avoided means the areas described in the Federal Register notice of May 9, 1990 (55 Fed. Reg. 19418-19419) in which vessel operations are prohibited pursuant to section 6(a)(1) of the FKNMSPA (see § 922.164(a)). Appendix VII to this part sets forth the geographic coordinates of these areas, including any modifications thereto made in accordance with section 6(a)(3) of the FKNMSPA.

Closed means all entry or use is prohibited.

Coral means the corals of the Class Hydrozoa (stinging and hydrocorals); the Class Anthozoa, Subclass Hexacorallia, Order Scleractinia (stony corals) and Antipatharia (black corals).

Coral area means marine habitat where coral growth abounds including patch reefs, outer bank reefs, deepwater banks, and hardbottoms.

Coral reefs means the hard bottoms, deep-water banks, patch reefs, and outer bank reefs.

Ecological Reserve means an area of the Sanctuary consisting of contiguous, diverse habitats, within which uses are subject to conditions, restrictions and prohibitions, including access restrictions, intended to minimize human influences, to provide natural spawning, nursery, and permanent residence areas for the replenishment and genetic protection of marine life, and also to protect and preserve natural assemblages of habitats and species within areas representing a broad diversity of resources and habitats found within the Sanctuary. Appendix IV to this part sets forth the geographic coordinates of these areas.

Existing Management Area means an area of the Sanctuary that is within or is a resource management area established by NOAA or by another Federal authority of competent jurisdiction as of [insert effective date of these regulations] where protections above and beyond those provided by Sanctuary-wide prohibitions and restrictions are needed to adequately protect resources. Appendix II to this part sets forth the geographic coordinates of these areas.

Exotic species means a species of plant, invertebrate, fish, amphibian, reptile or mammal whose natural zoogeographic range would not have included the waters of the Atlantic Ocean, Caribbean, or Gulf of Mexico without passive or active introduction to such area through anthropogenic means.

Fish means finfish, mollusks, crustaceans, and all forms of marine animal and plant life other than marine mammals and birds.

Fishing means: (1) the catching, taking, or harvesting of fish; (2) the attempted catching, taking, or harvesting of fish; (3) any other activity which can reasonably be expected to result in the catching, taking, or harvesting of fish; or (4) any operation at sea in support of, or in preparation for, any activity described in subparagraphs (1) through (3). Such term does not include any scientific research activity which is conducted by a scientific research vessel.

Hardbottom means a submerged marine community comprised of organisms attached to exposed solid rock substrate. Hardbottom is the substrate to which corals may attach but does not include the corals themselves.

Idle speed only/no-wake means a speed at which a boat is operated that is no greater than 4 knots or does not produce a wake.

Idle speed only/no-wake zone means a portion of the Sanctuary where the speed at which a boat is operated may be no greater than 4 knots or may not produce a wake.

Live rock means any living marine organism or an assemblage thereof attached to a hard substrate (including dead coral or rock but not individual mollusk shells(e.g., scallops, clams, oysters). Living marine organisms associated with hard bottoms, banks, reefs, and live rock may include, but are not limited to: sea anemones (Phylum Cnidaria: Class Anthozoa: Order Actinaria); sponges (Phylum Porifera); tube worms (Phylum Annelida), including fan worms, feather duster worms, and Christmas tree worms; bryozoans (Phylum Bryzoa); sea squirts (Phylum Chordata); and marine algae, including Mermaid's fan and cups (*Udotea* spp.), corraline algae, green feather, green grape algae (*Caulerpa* spp.) and watercress (*Halimeda* spp.).

Marine life species means any species of fish, invertebrate, or plant included in sections (2), (3), or (4) of Rule 46-42.001, Florida Administrative Code, reprinted in Appendix VIII to this part.

Military activity means an activity conducted by the Department of Defense with or without participation by foreign forces, other than civil engineering and other civil works projects conducted by the U.S. Army Corps of Engineers.

No-access buffer zone means a portion of the Sanctuary where vessels are prohibited from entering regardless of the method of propulsion.

No motor zone means an area of the Sanctuary where the use of internal combustion motors is prohibited. A vessel with an internal combustion motor may access a no motor zone only through the use of a push pole, paddle, sail, electric motor or similar means of operation but is prohibited from using it's internal combustion motor.

Not available for immediate use means that is not readily accessible for immediate use, e.g., by being stowed in a cabin, locker, or similar storage area, or by being securely covered and lashed to a deck or bulkhead.

Officially marked channel means a channel marked by Federal, State of Florida, or Monroe County officials of competent jurisdiction with navigational aids except for channels marked idle speed only/no wake.

Personal watercraft means any jet or air-powered watercraft, including class A-1 or A-2 vessels, designed to be operated by standing, sitting, or kneeling on or behind the vessel and that uses an engine to power a water jet pump for propulsion, in contrast to a conventional boat, which uses a propeller and where the operator stands or sits inside the vessel.

Prop dredging means the use of a vessel's propulsion wash to dredge or otherwise alter the seabed of the Sanctuary. Prop dredging includes, but is not limited to, the use of propulsion wash deflectors or similar means of dredging or otherwise altering the seabed of the Sanctuary. Prop dredging does not include the disturbance to bottom sediments resulting from normal vessel propulsion.

Prop scarring means the injury to seagrasses or other immobile organisms attached to the seabed of the Sanctuary caused by operation of a vessel in a manner that allows its propeller or other running gear, or any part thereof, to cause such injury (e.g., cutting seagrass rhizomes). Prop scarring does not include minor disturbances to bottom sediments or seagrass blades resulting from normal vessel propulsion.

Residential shoreline means any man-made or natural a) shoreline, b) canal mouth, c) basin, or d) cove adjacent to any residential land use district, including improved subdivision, suburban residential or suburban residential limited, sparsely settled, urban residential, and urban residential mobile home under the Monroe County land development regulations.

Sanctuary means the Florida Keys National Marine Sanctuary.

Sanctuary Preservation Area means an area of the Sanctuary that encompasses a discrete, biologically important area, within which uses are subject to conditions, restrictions and prohibitions, including access restrictions, to avoid concentrations of uses that could result in significant declines in species populations or habitat, to reduce conflicts between uses, to protect areas that are critical for sustaining important marine species or habitats, or to provide opportunities for scientific research. Appendix V to this part sets forth the geographic coordinates of these areas.

Sanctuary wildlife means any species of fauna, including avifauna, that occupy or utilize the submerged resources of the Sanctuary as nursery areas, feeding grounds, nesting sites, shelter, or other habitat during any portion of their life cycles.

Seagrass means any species of marine angiosperms (flowering plants) that inhabit portions of the seabed in the Sanctuary. Those species include, but are not limited to: *Thalassia testudinum* (turtle grass); *Syringodium filiforme* (manatee grass); *Halodule wrightii* (shoal grass); *Halophila decipiens, H. engelmannii, H. johnsonii*; and *Ruppia maritima*.

Special-use Area means an area of the Sanctuary set aside for scientific research and educational purposes, recovery or restoration of Sanctuary resources, monitoring, to prevent use or user conflicts, to facilitate access and use, or to promote public use and understanding of Sanctuary resources. Appendix VI to this part sets forth the geographic coordinates of these areas.

Tank vessel means any vessel that is constructed or adapted to carry, or that carries, oil or hazardous material in bulk as cargo or cargo residue, and that— (A) is a United States flag vessel; (B) operates on the navigable waters of the United States; or (C) transfers oil or hazardous material in a port or place subject to the jurisdiction of the United States [46 U.S.C. 2101].

Traditional fishing means those commercial or recreational fishing activities that were customarily conducted within the Sanctuary prior to its designation as identified in the Environmental Impact Statement and Management Plan for this Sanctuary.

Tropical fish means any species included in section (2) of Rule 46-42.001, Florida Administrative Code, reproduced in Appendix VIII to this part, or any part thereof.

Vessel means a watercraft of any description, including, but not limited to, motorized and non-motorized watercraft, personal watercraft, airboats, and float planes while maneuvering on the water, capable of being used as a means of transportation

in/on the waters of the Sanctuary. For purposes of this part, the terms “vessel,” “watercraft,” and “boat” have the same meaning.

Wildlife Management Area means an area of the Sanctuary established for the management, protection, and preservation of Sanctuary wildlife resources, including such an area established for the protection and preservation of endangered or threatened species or their habitats, within which access is restricted to minimize disturbances to Sanctuary wildlife; to ensure protection and preservation consistent with the Sanctuary designation and other applicable law governing the protection and preservation of wildlife resources in the Sanctuary. Appendix III lists these areas and their access restrictions.

(b) Other terms appearing in the regulations in this part are defined at 15 CFR 922.3, and/or in the Marine Protection, Research, and Sanctuaries Act (MPRSA), as amended, 33 U.S.C. 1401 et seq. and 16 U.S.C. 1431 et seq.

§ 922.42 Allowed activities.

All activities (e.g., fishing, boating, diving, research, education) may be conducted unless prohibited or otherwise regulated in subparts F through P, subject to any emergency regulations promulgated pursuant to §§ 922.44, 922.111(c), or 922.165, subject to all prohibitions, regulations, restrictions, and conditions validly imposed by any Federal, State, or local authority of competent jurisdiction, including Federal and State fishery management authorities, and subject to the provisions of
§ 312 of the Act. The Assistant Administrator may only directly regulate fishing activities pursuant to the procedure set forth in § 304(a)(5) of the NMSA.

§ 922.163 Prohibited activities - Sanctuary-wide.

(a) Except as specified in paragraph (b) through (e) of this section, the following activities are prohibited and thus are unlawful for any person to conduct or to cause to be conducted:

(1) Mineral and hydrocarbon exploration, development and production. Exploring for, developing, or producing minerals or hydrocarbons within the Sanctuary.

(2) Removal of, injury to, or possession of coral or live rock. (i) Moving, removing, taking, harvesting, damaging, disturbing, breaking, cutting, or otherwise injuring, or possessing (regardless of where taken from) any living or dead coral, or coral formation, or attempting any of these activities, except as permitted under 50 CFR part 638.

(ii) Harvesting, or attempting to harvest, any live rock from the Sanctuary, or possessing (regardless of where taken from) any live rock within the Sanctuary, except as authorized by a permit for the possession or harvest from aquaculture operations in the Exclusive Economic Zone, issued by the National Marine Fisheries Service pursuant to applicable regulations under the appropriate Fishery Management Plan, or as authorized by the applicable State authority of competent jurisdiction within the Sanctuary for live rock cultured on State submerged lands leased from the State of Florida, pursuant to applicable State law. See § 370.027, Florida Statutes and implementing regulations.

(3) Alteration of, or construction on, the seabed. Drilling into, dredging, or otherwise altering the seabed of the Sanctuary, or engaging in prop-dredging; or constructing, placing or abandoning any structure, material, or other matter on the seabed of the Sanctuary, except as an incidental result of:

(i) Anchoring vessels in a manner not otherwise prohibited by this part (see §§ 922.163(a)(5)(ii) and 922.164(d)(1)(v));

(ii) Traditional fishing activities not otherwise prohibited by this part;

(iii) Installation and maintenance of navigational aids by, or pursuant to valid authorization by, any Federal, State, or local authority of competent jurisdiction;

(iv) Harbor maintenance in areas necessarily associated with Federal water resource development projects in existence on [insert effect date of these regulations], including maintenance dredging of entrance channels and repair, replacement, or rehabilitation of breakwaters or jetties;

(v) Construction, repair, replacement, or rehabilitation of docks, seawalls, breakwaters, piers, or marinas with less than ten slips authorized by any valid lease, permit, license, approval, or other authorization issued by any Federal, State, or local authority of competent jurisdiction.

(4) Discharge or deposit of materials or other matter. (i) Discharging or depositing, from within the boundary of the Sanctuary, any material or other matter, except:

(A) Fish, fish parts, chumming materials, or bait

used or produced incidental to and while conducting a traditional fishing activity in the Sanctuary;

(B) Biodegradable effluent incidental to vessel use and generated by a marine sanitation device approved in accordance with Section 312 of the Federal Water Pollution Control Act, as amended, (FWPCA), 33 U.S.C. 1322 et seq.;

(C) Water generated by routine vessel operations (e.g., deck wash down and graywater as defined in section 312 of the FWPCA), excluding oily wastes from bilge pumping; or

(D) Cooling water from vessels or engine exhaust;

(ii) Discharging or depositing, from beyond the boundary of the Sanctuary, any material or other matter that subsequently enters the Sanctuary and injures a Sanctuary resource or quality, except those listed in paragraph (a)(4)(i)(A) through (D) above and those authorized under Monroe County land use permits.

(5) Operation of vessels.

(i) Operating a vessel in such a manner as to strike or otherwise injure coral, seagrass, or any other immobile organism attached to the seabed, including, but not limited to, operating a vessel in such a manner as to cause prop-scarring.

(ii) Anchoring a vessel on coral other than hardbottom in water depths less than 40 feet when visibility is such that the seabed can be seen.

(iii) Except in officially marked channels, operating a vessel at a speed greater than 4 knots or in manner which creates a wake:

(A) within an area designated idle speed only/no wake;

(B) within 100 yards of navigational aids indicating emergent or shallow reefs (international diamond warning symbol);

(C) within 100 feet of the red and white “divers down” flag (or the blue and white “alpha” flag in Federal waters);

(D) within 100 yards of residential shorelines; or

(E) within 100 yards of stationary vessels.

(iv) Operating a vessel in such a manner as to injure, take or cause disturbance to wading, roosting, or nesting birds or marine mammals.

(v) Operating a vessel in a manner which unreasonably or unnecessarily endangers life, limb, marine resources, or property, including but not limited to, weaving through congested vessel traffic, jumping the wake of another vessel unreasonably or unnecessarily close to such other vessel or when visibility around such other vessel is obstructed, or waiting until the last possible moment to avoid a collision.

(6) Conduct of diving/snorkeling without flag. Diving or snorkeling without flying in a conspicuous manner the red and white “divers down” flag (or the blue and white “alpha” flag in Federal waters).

(7) Release of exotic species. Introducing or releasing an exotic species of plant, invertebrate, fish, amphibian, or mammals into the Sanctuary.

(8) Damage or removal of markers. Marking, defacing, or damaging in any way or displacing, removing, or tampering with any official signs, notices, or placards, whether temporary or permanent, or with any navigational aids, monuments, stakes, posts, mooring buoys, boundary buoys, trap buoys, or scientific equipment.

(9) Movement of, removal of, injury to, or possession of Sanctuary historical resources. Moving, removing, injuring, or possessing, or attempting to move, remove, injure, or possess, a Sanctuary historical resource.

(10) Take or possession of protected wildlife. Taking any marine mammal, sea turtle, or seabird in or above the Sanctuary, except as authorized by the Marine Mammal Protection Act, as amended, (MMPA), 16 U.S.C. 1361 et seq., the Endangered Species Act, as amended, (ESA), 16 U.S.C. 1531 et seq., and the Migratory Bird Treaty Act, as amended, (MBTA) 16 U.S.C. 703 et seq.

(11) Possession or use of explosives or electrical charges. Possessing, or using explosives, except powerheads, or releasing electrical charges within the Sanctuary.

(12) Harvest or possession of marine life species. Harvesting, possessing, or landing any marine life species, or part thereof, within the Sanctuary, except in accordance with rules 46-42.001 through 46-42.003, 46-42.0035, and 46-42.004 through 46-42.007, and 46.42.009 of the Florida Administrative Code, reproduced in Appendix VIII to this part, and such rules shall apply *mutatis mutandis* (with necessary editorial changes) to all Federal and State waters within the Sanctuary.

(13) Interference with law enforcement. Interfering with, obstructing, delaying or preventing an investigation, search, seizure, or disposition of seized

property in connection with enforcement of the Acts or any regulation or permit issued under the Acts.

(b) Notwithstanding the prohibitions in this section and in § 922.164, and any access and use restrictions imposed pursuant thereto, a person may conduct an activity specifically authorized by, and conducted in accordance with the scope, purpose, terms, and conditions of, a National Marine Sanctuary permit issued pursuant to § 922.166.

(c) Notwithstanding the prohibitions in this section and in § 922.164, and any access and use restrictions imposed pursuant thereto, a person may conduct an activity specifically authorized by a valid Federal, State, or local lease, permit, license, approval, or other authorization in existence on [insert the effective date of these regulations], or by any valid right of subsistence use or access in existence [insert the effective date of these regulations], provided that the holder of such authorization or right complies with § 922.167 and with any terms and conditions on the exercise of such authorization or right imposed by the Director as a condition of certification as he or she deems reasonably necessary to achieve the purposes for which the Sanctuary was designated.

(d) Notwithstanding the prohibitions in this section and in § 922.164, and any access and use restrictions imposed pursuant thereto, a person may conduct an activity specifically authorized by any valid Federal, State, or local lease, permit, license, approval, or other authorization issued after [insert the effective date of these regulations], provided that the applicant complies with § 922.168, the Director notifies the applicant and authorizing agency that he or she does not object to issuance of the authorization, and the applicant complies with any terms and conditions the Director deems reasonably necessary to protect Sanctuary resources and qualities. Amendments, renewals and extensions of authorizations in existence on [insert the effective date of these regulations] constitute authorizations issued after [insert the effective date of these regulations].

(e)(1) All military activities shall be carried out in a manner that avoids to the maximum extent practical any adverse impacts on Sanctuary resources and qualities. The prohibitions in paragraph (a) of this section and § 922.164 do not apply to existing classes of military activities which were conducted prior to the effective date of these regulations, as identified in the Environmental Impact Statement and Management Plan for the Sanctuary. New military activities in the Sanctuary are allowed and may be exempted from the prohibitions in paragraph (a) of this section and in § 922.164 by the Director after consultation between the Director and the Department of Defense pursuant to section 304(d) of the NMSA. When a military activity is modified such that it is likely to destroy, cause the loss of, or injure a Sanctuary resource or quality in a manner significantly greater than was considered in a previous consultation under section 304(d) of the NMSA, or it is likely to destroy, cause the loss of, or injure a Sanctuary resource or quality not previously considered in a previous consultation under section 304(d) of the NMSA, the activity is considered a new activity for purposes of this paragraph. If it is determined that an activity may be carried out, such activity shall be carried out in a manner that avoids to the maximum extent practical any adverse impact on Sanctuary resources and qualities.

(2) In the event of threatened or actual destruction of, loss of, or injury to a Sanctuary resource or quality resulting from an untoward incident, including but not limited to spills and groundings caused by the Department of Defense, the cognizant component shall promptly coordinate with the Director for the purpose of taking appropriate actions to prevent, respond to or mitigate the harm and, if possible, restore or replace the Sanctuary resource or quality.

(f) The prohibitions contained in paragraph (a)(5) of this section do not apply to Federal, State and local officers while performing enforcement duties and/or responding to emergencies that threaten life, property, or the environment in their official capacity.

(g) Notwithstanding paragraph (b) of this section and paragraph (a) of § 922.168, in no event may the Director issue a permit under § 922.166 authorizing, or otherwise approve, the exploration for, leasing, development, or production of minerals or hydrocarbons within the Sanctuary, the disposal of dredged material within the Sanctuary other than in connection with beach renourishment or Sanctuary restoration projects, or the discharge of untreated or primary treated sewage (except by a certification, pursuant to § 922.167, of a valid authorization in existence on [insert effective date of these regulations]), and any purported authorizations issued by other authorities after [insert the effective date of these regulations] for any of these activities within the Sanctuary shall be invalid.

§ 922.164 Additional activity regulations by Sanctuary area.

In addition to the prohibitions set forth in § 922.163, which apply throughout the Sanctuary, the following regulations apply with respect to activities conducted within the Sanctuary areas described in this section and in Appendix (II) through (VII) to this part. Activities located within two or more overlapping Sanctuary areas are concurrently subject to the regulations applicable to each overlapping area.

(a) Areas To Be Avoided. Operating a tank vessel or a vessel greater than 50 meters in registered length is prohibited in all areas to be avoided, except if such vessel is a public vessel and its operation is essential for national defense, law enforcement, or responses to emergencies that threaten life, property, or the environment. Appendix VII to this part sets forth the geographic coordinates of these areas.

(b) Existing Management Areas.

(1) Key Largo and Looe Key Management Areas. The following activities are prohibited within the Key Largo and Looe Key Management Areas (also known as the Key Largo and Looe Key National Marine Sanctuaries) described in Appendix II to this part:

(i) Removing, taking, damaging, harmfully disturbing, breaking, cutting, spearing or similarly injuring any coral or other marine invertebrate, or any plant, soil, rock, or other material, except commercial taking of spiny lobster and stone crab by trap and recreational taking of spiny lobster by hand or by hand gear which is consistent with these regulations and the applicable regulations implementing the applicable Fishery Management Plan.

(ii) Taking any tropical fish.

(iii) Fishing with wire fish traps, bottom trawls, dredges, fish sleds, or similar vessel-towed or anchored bottom fishing gear or nets.

(iv) Fishing with, carrying or possessing, except while passing through without interruption or for law enforcement purposes: pole spears, air rifles, bows and arrows, slings, Hawaiian slings, rubber powered arbaletes, pneumatic and spring-loaded guns or similar devices known as spearguns.

(2) Great White Heron and Key West National Wildlife Refuge Management Areas. The following activities are prohibited within the marine portions of the Great White Heron and Key West National Wildlife Refuge Management Areas described in Appendix II to this part:

(i) Operating a personal watercraft, operating an airboat, or water skiing except within Township 66 South, Range 29 East, Sections 5, 11, 12 and 14; Township 66 South, Range 28 East, Section 2; Township 67 South, Range 26 East, Sections 16 and 20, all Tallahassee Meridian.

(ii) Discharging or depositing any material or other matter except cooling water or engine exhaust.

(c) Wildlife Management Areas. (1) Marine portions of the Wildlife Management Areas listed in Appendix III to this part or portions thereof may be designated “idle speed only/no-wake,” “no-motor” or “no-access buffer” zones or “closed”. The Director, in cooperation with other Federal, State, or local resource management authorities, as appropriate, shall post signs conspicuously, using mounting posts, buoys, or other means according to location and purpose, at appropriate intervals and locations, clearly delineating an area as an “idle speed only/no wake”, a “no-motor”, or a “no-access buffer” zone or as “closed”, and allowing instant, long-range recognition by boaters. Such signs shall display the official logo of the Sanctuary.

(2) The following activities are prohibited within the marine portions of the Wildlife Management Areas listed in Appendix III to this part:

(i) In those marine portions of any Wildlife Management Area designated an “idle speed only/no wake” zone in Appendix III to this part, operating a vessel at a speed greater that idle speed only/no wake.

(ii) In those marine portions of any Wildlife Management Area designated a “no-motor” zone in Appendix III to this part, using internal combustion motors or engines for any purposes. A vessel with an internal combustion motor or engine may access a “no-motor” zone only through the use of a push pole, paddle, sail, electric motor or similar means of propulsion.

(iii) In those marine portions of any Wildlife Management Area designated a “no-access buffer” zone in Appendix III of this part, entering the area by vessel.

(iv) In those marine portions of any Wildlife Management Area designated as closed in Appendix III of this part, entering or using the area.

(v) Discharging or depositing any material or other matter except cooling water or engine exhaust.

(3) The Director shall coordinate with other Federal, State, or local resource management authorities, as appropriate, in the establishment and enforcement of access restrictions described in (c)(2)(i)-(iv) of this section in the marine portions of Wildlife Management Areas.

(4) The Director may modify the number and location of access restrictions described in (c)(2)(i)-(iv) of this section within the marine portions of a Wildlife Management Area if the Director finds that such action is reasonably necessary to minimize disturbances to Sanctuary wildlife, or to ensure protection and preservation of Sanctuary wildlife consistent with the purposes of the Sanctuary designation and other applicable law governing the protection and preservation of wildlife resources in the Sanctuary. The Director will effect such modification by:
(i) publishing in the Federal Register, after notice and an opportunity for public comments in accordance, an amendment to the list of such areas set forth in Appendix III to this part, and a notice regarding the time and place where maps depicting the precise locations of such restrictions will be made available for public inspection, and (ii) posting official signs delineating such restrictions in accordance with subparagraph (c)(1).

(d) Ecological Reserves and Sanctuary Preservation Areas. (1) The following activities are prohibited within the Ecological Reserves described in Appendix IV to this part, and within the Sanctuary Preservation Areas, described in Appendix V to this part:

(i) Discharging or depositing any material or other matter except cooling water or engine exhaust.

(ii) Possessing, moving, harvesting, removing, taking, damaging, disturbing, breaking, cutting, spearing, or otherwise injuring any coral, marine invertebrate, fish, bottom formation, algae, seagrass or other living or dead organism, including shells, or attempting any of these activities. However, fish, invertebrates, and marine plants may be possessed aboard a vessel in an Ecological Reserve or Sanctuary Preservation Area, provided such resources can be shown not to have been harvested within, removed from, or taken within, the Ecological Reserve or Sanctuary Preservation Area, as applicable, by being stowed in a cabin, locker, or similar storage area prior to entering and during transit through such reserves or areas.

(iii) Except for catch and release fishing by trolling in the Conch Reef, Alligator Reef, Sombrero Reef, and Sand Key SPAs, fishing by any means. However, gear capable of harvesting fish may be aboard a vessel in an Ecological Reserve or Sanctuary Preservation Area, provided such gear is not available for immediate use when entering and during transit through such Ecological Reserve or Sanctuary Preservation Area, and no presumption of fishing activity shall be drawn therefrom.

(iv) Touching living or dead coral, including but not limited to, standing on a living or dead coral formation.

(v) Placing any anchor in a way that allows the anchor or any portion of the anchor apparatus (including the anchor, chain or rope) to touch living or dead coral, or any attached organism. When anchoring dive boats, the first diver down must inspect the anchor to ensure that it is not touching living or dead coral, and will not shift in such a way as to touch such coral or other attached organisms. No further diving shall take place until the anchor is placed in accordance with these requirements.

(vi) Anchoring instead of mooring when a mooring buoy is available or anchoring in other than a designated anchoring area when such areas have been designated and are available.

(vii) Except for passage without interruption through the area, for law enforcement purposes, or for purposes of monitoring pursuant to paragraph (d)(2), violating a temporary access restriction imposed by the Director pursuant to paragraph (d)(2).

(2) The Director may temporarily restrict access to any portion of any Sanctuary Preservation Area or Ecological Reserve if the Director, on the basis of the best available data, information and studies, determines that a concentration of use appears to be causing or contributing to significant degradation of the living resources of the area and that such action is reasonably necessary to allow for recovery of the living resources of such area. The Director will provide for continuous monitoring of the area during the pendency of the restriction. The Director will provide public notice of the restriction by publishing a notice in the Federal Register, and by such other means as the Director may deem appropriate. The

Director may only restrict access to an area for a period of 60 days, with one additional 60 day renewal. The Director may restrict access to an area for a longer period pursuant to a notice and opportunity for public comment rulemaking under the Administrative Procedure Act. Such restriction will be kept to the minimum amount of area necessary to achieve the purposes thereof.

(e) Special-use Areas. (1) The Director may set aside discrete areas of the Sanctuary as Special-use Areas, and, by designation pursuant to this paragraph, impose the access and use restrictions specified in subparagraph (e)(3). Special-use Areas are described in Appendix VI to this part, in accordance with the following designations and corresponding objectives:

(i) "Recovery area" to provide for the recovery of Sanctuary resources from degradation or other injury attributable to human uses;

(ii) "Restoration area" to provide for restoration of degraded or otherwise injured Sanctuary resources;

(iii) "Research-only area" to provide for scientific research or education relating to protection and management, through the issuance of a Sanctuary General permit for research pursuant to § 922.166 of these regulations; and

(iv) "Facilitated-use area" to provide for the prevention of use or user conflicts or the facilitation of access and use, or to promote public use and understanding, of Sanctuary resources through the issuance of special-use permits.

(2) A Special-use Area shall be no larger than the size the Director deems reasonably necessary to accomplish the applicable objective.

(3) Persons conducting activities within any Special-use Area shall comply with the access and use restrictions specified in this paragraph and made applicable to such area by means of its designation as a "recovery area," "restoration area," "research-only area," or "facilitated-use area." Except for passage without interruption through the area or for law enforcement purposes, no person may enter a Special-use Area except to conduct or cause to be conducted the following activities:

(i) in such area designated as a "recovery area" or a "restoration area", habitat manipulation related to restoration of degraded or otherwise injured Sanctuary resources, or activities reasonably necessary to monitor recovery of degraded or otherwise injured Sanctuary resources;

(ii) in such area designated as a "research only area", scientific research or educational use specifically authorized by and conducted in accordance with the scope, purpose, terms and conditions of a valid National Marine Sanctuary General or Historical Resources permit, or

(iii) in such area designated as a "facilitated-use area", activities specified by the Director or specifically authorized by and conducted in accordance with the scope, purpose, terms, and conditions of a valid Special-use permit.

(4)(i) The Director may modify the number of, location of, or designations applicable to, Special-use Areas by publishing in the Federal Register, after notice and an opportunity for public comment in accordance with the Administrative Procedure Act, an amendment to Appendix VI to this part, except that, with respect to such areas designated as a "recovery area," "restoration area," or "research only area," the Director may modify the number of, location of, or designation applicable to, such areas by publishing a notice of such action in the Federal Register if the Director determines that immediate action is reasonably necessary to:

(A) prevent significant injury to Sanctuary resources where circumstances create an imminent risk to such resources;

(B) initiate restoration activity where a delay in time would significantly impair the ability of such restoration activity to succeed;

(C) initiate research activity where an unforeseen natural event produces an opportunity for scientific research that may be lost if research is not initiated immediately.

(ii) If the Director determines that a notice of modification must be promulgated immediately in accordance with subparagraph (4)(i), the Director will, as part of the same notice, invite public comment and specify that comments will be received for 15 days after the effective date of the notice. As soon as practicable after the end of the comment period, the Director will either rescind, modify or allow the modification to remain unchanged through notice in the Federal Register.

§ 922.165 Emergency regulations.

Where necessary to prevent or minimize the destruction of, loss of, or injury to a Sanctuary

resource or quality, or minimize the imminent risk of such destruction, loss, or injury, any and all activities are subject to immediate temporary regulation, including prohibition. Any such temporary regulation may be in effect for up to 60 days, with one 60-day extension. Additional or extended action will require notice and comment rulemaking under the Administrative Procedure Act, notice in local newspapers, notice to Mariners, and press releases.

§ 922.45 Penalties.

(a) Each violation of the NMSA or FKNMSPA, any regulation in this part, or any permit issued pursuant thereto, is subject to a civil penalty of not more than $100,000. Each day of a continuing violation constitutes a separate violation.

(b) Regulations setting forth the procedures governing administrative proceedings for assessment of civil penalties, permit sanctions, and denials for enforcement reasons, issuance and use of written warnings, and release or forfeiture of seized property appear at 15 CFR part 904.

§ 922.46 Response costs and damages.

Under section 312 of the Act, any person who destroys, causes the loss of, or injures any Sanctuary resource is liable to the United States for response costs and damages resulting from such destruction, loss or injury, and any vessel used to destroy, cause the loss of, or injure any Sanctuary resource is liable *in rem* to the United States for response costs and damages resulting from such destruction, loss or injury.

§ 922.166 Permits - application procedures and issuance criteria.

(a) National Marine Sanctuary General Permit.

(1) A person may conduct an activity prohibited by §§ 922.163 or 922.164, other than an activity involving the survey/inventory, research/recovery, or deaccession/transfer of Sanctuary historical resources, if such activity is specifically authorized by, and provided such activity is conducted in accordance with the scope, purpose, terms and conditions of, a National Marine Sanctuary General permit issued under this paragraph (a).

(2) The Director, at his or her discretion, may issue a General permit under this paragraph (a), subject to such terms and conditions as he or she deems appropriate, if the Director finds that the activity will: (i) further research or monitoring related to Sanctuary resources and qualities; (ii) further the educational value of the Sanctuary; (iii) further the natural or historical resource value of the Sanctuary; (iv) further salvage or recovery operations in or near the Sanctuary in connection with a recent air or marine casualty; (v) assist in managing the Sanctuary; or (vi) otherwise further Sanctuary purposes, including facilitating multiple use of the Sanctuary, to the extent compatible with the primary objective of resource protection.

(3) The Director shall not issue a General permit under this paragraph (a), unless the Director also finds that: (i) the applicant is professionally qualified to conduct and complete the proposed activity; (ii) the applicant has adequate financial resources available to conduct and complete the proposed activity; (iii) the duration of the proposed activity is no longer than necessary to achieve its stated purpose; (iv) the methods and procedures proposed by the applicant are appropriate to achieve the proposed activity's goals in relation to the activity's impacts on Sanctuary resources and qualities; (v) the proposed activity will be conducted in a manner compatible with the primary objective of protection of Sanctuary resources and qualities, considering the extent to which the conduct of the activity may diminish or enhance Sanctuary resources and qualities, any indirect, secondary or cumulative effects of the activity, and the duration of such effects; (vi) it is necessary to conduct the proposed activity within the Sanctuary to achieve its purposes; and (vii) the reasonably expected end value of the activity to the furtherance of Sanctuary goals and purposes outweighs any potential adverse impacts on Sanctuary resources and qualities from the conduct of the activity. For activities proposed to be conducted within any of the areas described in
§ 922.164(b)-(e), the Director shall not issue a permit unless he or she further finds that such activities will further and are consistent with the purposes for which such area was established, as described in §§ 922.162 and 922.164 and in the management plan for the Sanctuary.

(b) National Marine Sanctuary Survey/Inventory of Historical Resources Permit.

(1) A person may conduct an activity prohibited by §§ 922.163 or 922.164 involving the survey/inventory of Sanctuary historical resources if such activity is specifically authorized by, and is conducted in accordance with the scope, purpose, terms and conditions of, a Survey/Inventory of Historical Resources permit issued under this paragraph (b).

Such permit is not required if such survey/inventory activity does not involve any activity prohibited by §§ 922.163 or 922.164. Thus, survey/inventory activities that are non-intrusive, do not include any excavation, removal, or recovery of historical resources, and do not result in destruction of, loss of, or injury to Sanctuary resources or qualities do not require a permit. However, if a survey/inventory activity will involve test excavations or removal of artifacts or materials for evaluative purposes, a Survey/Inventory of Historical Resources permit is required. Regardless of whether a Survey/Inventory permit is required, a person may request such permit. Persons who have demonstrated their professional abilities under a Survey/Inventory permit will be given preference over other persons in consideration of the issuance of a Research/Recovery permit. While a Survey/Inventory permit does not grant any rights with regards to areas subject to pre-existing rights of access which are still valid, once a permit is issued for an area, other survey/inventory permits will not be issued for the same area during the period for which the permit is valid.

(2) The Director, at his or her discretion, may issue a Survey/Inventory permit under this paragraph (b), subject to such terms and conditions as he or she deems appropriate, if the Director finds that such activity: (i) satisfies the requirements for a permit issued under paragraph (a)(3) of this section; (ii) either will be non-intrusive, not include any excavation, removal, or recovery of historical resources, and not result in destruction of, loss of, or injury to Sanctuary resources or qualities, or if intrusive, will involve no more than the minimum manual alteration of the seabed and/or the removal of artifacts or other material necessary for evaluative purposes and will cause no significant adverse impacts on Sanctuary resources or qualities; and (iii) that such activity will be conducted in accordance with all requirements of the Programmatic Agreement for the Management of Submerged Cultural Resources in the Florida Keys National Marine Sanctuary among NOAA, The Advisory Council on Historic Preservation, and the State of Florida (hereinafter SCR Agreement), and that such permit issuance is in accordance with such SCR Agreement. This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. The SCR Agreement is reproduced in the "Submerged Cultural Resources Action Plan" set forth in Volume 1 of the Florida Keys National Marine Sanctuary Management Plan, dated 1996. Copies of the SCR Agreement may also be examined at, and obtained from, the Sanctuaries and Reserves Division, Office of Ocean and Coastal Resource Management, National Ocean Service, National Oceanic and Atmospheric Administration, 1305 East-West Highway, 12th floor, Silver Spring, MD 20910; or from the Florida Keys National Marine Sanctuary Office, P.O. Box 500368, Marathon, FL 33050.

(c) National Marine Sanctuary Research/Recovery of Sanctuary Historical Resources Permit.

(1) A person may conduct any activity prohibited by §§ 922.163 or 922.164 involving the research/recovery of Sanctuary historical resources if such activity is specifically authorized by, and is conducted in accordance with the scope, purpose, terms and conditions of, a Research/Recovery of Historical Resources permit issued under this paragraph (c).

(2) The Director, at his or her discretion, may issue a Research/Recovery of Historical Resources permit, under this paragraph (c), and subject to such terms and conditions as he or she deems appropriate, if the Director finds that: (i) such activity satisfies the requirements for a permit issued under paragraph (a)(3) of this section; (ii) the recovery of the resource is in the public interest as described in the SCR Agreement; (iii) recovery of the resource is part of research to preserve historic information for public use; and (iv) recovery of the resource is necessary or appropriate to protect the resource, preserve historical information, and/or further the policies and purposes of the NMSA and the FKNMSPA, and that such permit issuance is in accordance with, and that the activity will be conducted in accordance with, all requirements of the SCR Agreement.

(d) National Marine Sanctuary Special-use Permit.

(1) A person may conduct any commercial or concession-type activity prohibited by §§ 922.163 or 922.164, if such activity is specifically authorized by, and is conducted in accordance with the scope, purpose, terms and conditions of, a Special-use permit issued under this paragraph (d). A Special-use permit is required for the deaccession/transfer of Sanctuary historical resources.

(2) The Director, at his or her discretion, may issue a Special-use permit in accordance with this paragraph (d), and subject to such terms and conditions as he or she deems appropriate and the mandatory terms and conditions of section 310 of the NMSA, if the Director finds that issuance of such permit is reasonably necessary to: (i) establish conditions of access to and use of any Sanctuary

resource; or (ii) promote public use and understanding of any Sanctuary resources. No permit may be issued unless the activity is compatible with the purposes for which the Sanctuary was designated and can be conducted in a manner that does not destroy, cause the loss of, or injure any Sanctuary resource, and if for the deaccession/transfer of Sanctuary Historical Resources, unless such permit issuance is in accordance with, and that the activity will be conducted in accordance with, all requirements of the SCR Agreement.

(3) The Director may assess and collect fees for the conduct of any activity authorized by a Special-use permit issued pursuant to this paragraph (d). No Special-use permit shall be effective until all assessed fees are paid, unless otherwise provided by the Director by a fee schedule set forth as a permit condition. In assessing a fee, the Director shall include:

(i) all costs incurred, or expected to be incurred, in reviewing and processing the permit application, including, but not limited to, costs for: (A) number of personnel; (B) personnel hours;
(C) equipment; (D) biological assessments; (E) copying; and (F) overhead directly related to reviewing and processing the permit application;

(ii) all costs incurred, or expected to be incurred, as a direct result of the conduct of the activity for which the Special-use permit is being issued, including, but not limited to: (A) the cost of monitoring the conduct both during the activity and after the activity is completed in order to assess the impacts to Sanctuary resources and qualities; (B) the use of an official NOAA observer, including travel and expenses and personnel hours; and
(C) overhead costs directly related to the permitted activity; and

(iii) an amount which represents the fair market value of the use of the Sanctuary resource and a reasonable return to the United States Government.

(4) Nothing in this paragraph (d) shall be considered to require a person to obtain a permit under this paragraph for the conduct of any fishing activities within the Sanctuary.

(e) Applications. (1) Applications for permits should be addressed to the Director, Office of Ocean and Coastal Resource Management; ATTN: Sanctuary Superintendent, Florida Keys National Marine Sanctuary, P.O. Box 500368, Marathon, FL 33050. All applications must include: (i) a detailed description of the proposed activity including a timetable for completion of the activity and the equipment, personnel and methodology to be employed; (ii) the qualifications and experience of all personnel; (iii) the financial resources available to the applicant to conduct and complete the proposed activity; (iv) a statement as to why it is necessary to conduct the activity within the Sanctuary; (v) the potential impacts of the activity, if any, on Sanctuary resources and qualities; (vi) the benefit to be derived from the activity; and (vii) such other information as the Director may request depending on the type of activity. Copies of all other required licenses, permits, approvals, or other authorizations must be attached to the application.

(2) Upon receipt of an application, the Director may request such additional information from the applicant as he or she deems reasonably necessary to act on the application and may seek the views of any persons. The Director may require a site visit as part of the permit evaluation. Unless otherwise specified, the information requested must be received by the Director within 30 days of the postmark date of the request. Failure to provide such additional information on a timely basis may be deemed by the Director to constitute abandonment or withdrawal of the permit application.

(f) A permit may be issued for a period not exceeding five years. All permits will be reviewed annually to determine the permittee's compliance with permit scope, purpose, terms and conditions and progress toward reaching the stated goals and appropriate action taken under paragraph (g) if warranted. A permittee may request permit renewal pursuant to the same procedures for applying for a new permit. Upon the permittee's request for renewal, the Director shall review all reports submitted by the permittee as required by the permit conditions. In order to renew the permit, the Director must find that the: (i) activity will continue to further the purposes for which the Sanctuary was designated in accordance with the criteria applicable to the initial issuance of the permit; (ii) permittee has at no time violated the permit, or these regulations; and (iii) the activity has not resulted in any unforeseen adverse impacts to Sanctuary resources or qualities.

(g) The Director may amend, suspend, or revoke a permit for good cause. The Director may deny a permit application, in whole or in part, if it is determined that the permittee or applicant has acted in violation of a previous permit, of these regulations, of the NMSA or FKNMSPA, or for other good cause. Any such action shall be communicated in writing to the permittee or applicant by certified mail and shall set forth the reason(s) for the action taken. Procedures governing permit sanctions and denials for

enforcement reasons are set forth in Subpart D of 15 CFR part 904.

(h) The applicant for or holder of a National Marine Sanctuary permit may appeal the denial, conditioning, amendment, suspension or revocation of the permit in accordance with the procedures set forth in § 922.50.

(i) A permit issued pursuant to this section other than a Special-use permit is nontransferable. Special-use permits may be transferred, sold, or assigned with the written approval of the Director. The permittee shall provide the Director with written notice of any proposed transfer, sale, or assignment no less than 30 days prior to its proposed consummation. Transfers, sales, or assignments consummated in violation of this requirement shall be considered a material breach of the Special-use permit, and the permit shall be considered void as of the consummation of any such transfer, sale, or assignment.

(j) The permit or a copy thereof shall be maintained in legible condition on board all vessels or aircraft used in the conduct of the permitted activity and be displayed for inspection upon the request of any authorized officer.

(k) Any permit issued pursuant to this section shall be subject to the following terms and conditions:

(1) All permitted activities shall be conducted in a manner that does not destroy, cause the loss of, or injure Sanctuary resources or qualities, except to the extent that such may be specifically authorized.

(2) The permittee agrees to hold the United States harmless against any claims arising out of the conduct of the permitted activities.

(3) All necessary Federal, State, and local permits from all agencies with jurisdiction over the proposed activities shall be secured before commencing field operations.

(l) In addition to the terms and conditions listed in paragraph (k), any permit authorizing the research/recovery of historical resources shall be subject to the following terms and conditions:

(1) a professional archaeologist shall be in charge of planning, field recovery operations, and research analysis.

(2) an agreement with a conservation laboratory shall be in place before field recovery operations are begun, and an approved nautical conservator shall be in charge of planning, conducting, and supervising the conservation of any artifacts and other materials recovered.

(3) a curation agreement with a museum or facility for curation, public access and periodic public display, and maintenance of the recovered historical resources shall be in place before commencing field operations (such agreement for the curation and display of recovered historical resources may provide for the release of public artifacts for deaccession/transfer if such deaccession/transfer is consistent with preservation, research, education, or other purposes of the designation and management of the Sanctuary. Deaccession/transfer of historical resources requires a Special-use permit issued pursuant to paragraph (d) and such deaccession/transfer shall be executed in accordance with the requirements of the SCR Agreement).

(4) the site's archaeological information is fully documented, including measured drawings, site maps drawn to professional standards, and photographic records.

(m) In addition to the terms and conditions listed in paragraph (k) and (l), any permit issued pursuant to this section is subject to such other terms and conditions, including conditions governing access to, or use of, Sanctuary resources, as the Director deems reasonably necessary or appropriate and in furtherance of the purposes for which the Sanctuary is designated. Such terms and conditions may include, but are not limited to:

(1) Any data or information obtained under the permit shall be made available to the public.

(2) A NOAA official shall be allowed to observe any activity conducted under the permit.

(3) The permittee shall submit one or more reports on the status, progress, or results of any activity authorized by the permit.

(4) The permittee shall submit an annual report to the Director not later than December 31 of each year on activities conducted pursuant to the permit. The report shall describe all activities conducted under the permit and all revenues derived from such activities during the year and/or term of the permit.

(5) The permittee shall purchase and maintain general liability insurance or other acceptable security against potential claims for destruction, loss of, or

injury to Sanctuary resources arising out of the permitted activities. The amount of insurance or security should be commensurate with an estimated value of the Sanctuary resources in the permitted area. A copy of the insurance policy or security instrument shall be submitted to the Director.

§ 922.167 Certification of preexisting leases, licenses, permits, approvals, other authorizations, or rights to conduct a prohibited activity.

(a) A person may conduct an activity prohibited by
§§ 922.163 or 922.164 if such activity is specifically authorized by a valid Federal, State, or local lease, permit, license, approval, or other authorization in existence on [insert the effective date of these regulations], or by any valid right of subsistence use or access in existence on [insert the effective date of these regulations], provided that:

1) The holder of such authorization or right notifies the Director, in writing, within 90 days of [insert the effective date of these regulations], of the existence of such authorization or right and requests certification of such authorization or right; 2) the holder complies with the other provisions of this § 922.167; and 3) the holder complies with any terms and conditions on the exercise of such authorization or right imposed as a condition of certification, by the Director, to achieve the purposes for which the Sanctuary was designated.

(b) The holder of an authorization or right described in paragraph (a) above authorizing an activity prohibited by
§§ 922.163 or 922.164 may conduct the activity without being in violation of applicable provisions of §§ 922.163 or 922.164, pending final agency action on his or her certification request, provided the holder is in compliance with this § 922.167.

(c) Any holder of an authorization or right described in paragraph (a) above may request the Director to issue a finding as to whether the activity for which the authorization has been issued, or the right given, is prohibited by §§ 922.163 or 922.164, thus requiring certification under this section.

(d) Requests for findings or certifications should be addressed to the Director, Office of Ocean and Coastal Resource Management; ATTN: Sanctuary Superintendent, Florida Keys National Marine Sanctuary, P.O. Box 500368, Marathon, FL 33050. A copy of the lease, permit, license, approval, or other authorization must accompany the request.

(e) The Director may request additional information from the certification requester as he or she deems reasonably necessary to condition appropriately the exercise of the certified authorization or right to achieve the purposes for which the Sanctuary was designated. The information requested must be received by the Director within 45 days of the postmark date of the request. The Director may seek the views of any persons on the certification request.

(f) The Director may amend any certification made under this
§ 922.167 whenever additional information becomes available justifying such an amendment.

(g) Upon completion of review of the authorization or right and information received with respect thereto, the Director shall communicate, in writing, any decision on a certification request or any action taken with respect to any certification made under this § 922.167, in writing, to both the holder of the certified lease, permit, license, approval, other authorization, or right, and the issuing agency, and shall set forth the reason(s) for the decision or action taken.

(h) Any time limit prescribed in or established under this
§ 922.167 may be extended by the Director for good cause.

(i) The holder may appeal any action conditioning, amending, suspending, or revoking any certification in accordance with the procedures set forth in § 922.50.

(j) Any amendment, renewal, or extension made after [insert the effective date of these regulations], to a lease, permit, license, approval, other authorization or right is subject to the provisions of § 922.168.

§ 922.168 Notification and review of applications for leases, licenses, permits, approvals, or other authorizations to conduct a prohibited activity.

(a) A person may conduct an activity prohibited by
§§ 922.163 or 922.164 if such activity is specifically authorized by any valid Federal, State, or local lease, permit, license, approval, or other authorization issued after [insert effective date of these regulations], provided that: 1) the applicant notifies the Director, in writing, of the application for such authorization (and of any application for an amendment, renewal, or extension of such authorization) within fifteen (15) days of the date of filing of the application

or [insert the effective date of these regulations], whichever is later; 2) the applicant complies with the other provisions of this § 922.168; 3) the Director notifies the applicant and authorizing agency that he or she does not object to issuance of the authorization (or amendment, renewal, or extension); and 4) the applicant complies with any terms and conditions the Director deems reasonably necessary to protect Sanctuary resources and qualities.

(b) Any potential applicant for an authorization described in paragraph (a) above may request the Director to issue a finding as to whether the activity for which an application is intended to be made is prohibited by §§ 922.163 or 922.164.

(c) Notification of filings of applications should be addressed to the Director, Office of Ocean and Coastal Resource Management; ATTN: Sanctuary Superintendent, Florida Keys National Marine Sanctuary, P.O. Box 500368, Marathon, FL 33050. A copy of the application must accompany the notification.

(d) The Director may request additional information from the applicant as he or she deems reasonably necessary to determine whether to object to issuance of an authorization described in paragraph (a) above, or what terms and conditions are reasonably necessary to protect Sanctuary resources and qualities. The information requested must be received by the Director within 45 days of the postmark date of the request. The Director may seek the views of any persons on the application.

(e) The Director shall notify, in writing, the agency to which application has been made of his or her pending review of the application and possible objection to issuance. Upon completion of review of the application and information received with respect thereto, the Director shall notify both the agency and applicant, in writing, whether he or she has an objection to issuance and what terms and conditions he or she deems reasonably necessary to protect Sanctuary resources and qualities, and reasons therefor.

(f) The Director may amend the terms and conditions deemed reasonably necessary to protect Sanctuary resources and qualities whenever additional information becomes available justifying such an amendment.

(g) Any time limit prescribed in or established under this § 922.168 may be extended by the Director for good cause.

(h) The applicant may appeal any objection by, or terms or conditions imposed by, the Director to the Assistant Administrator or designee in accordance with the provisions of
§ 922.50.

§ 922.50 Appeals of administrative action.

(a)(1) Except for permit actions taken for enforcement reasons (see subpart D of 15 CFR part 904 for applicable procedures), an applicant for, or a holder of, a National Marine Sanctuary permit, or Special Use permit pursuant to section 310 of the Act; a person requesting certification of an existing lease, permit, license or right of subsistence use or access under § 922.47; or, for those Sanctuaries described in subparts L through P, an applicant for a lease, permit, license or other authorization issued by any Federal, State, or local authority of competent jurisdiction (hereinafter appellant) may appeal to the Assistant Administrator:

(i) The granting, denial, conditioning, amendment, suspension, or revocation by the Director of a National Marine Sanctuary or Special Use permit;

(ii) The conditioning, amendment, suspension, or revocation of a certification under § 922.47; or

(iii) For those Sanctuaries described in subparts L through P, the objection to issuance of or the imposition of terms and conditions on a lease, permit, license, or other authorization issued by any Federal, State, or local authority of competent jurisdiction.

(2) For those National Marine Sanctuaries described in subparts F through K, any interested person may also appeal the same actions described in paragraphs (a)(1)(i) and (ii) of this section. For appeals arising from actions taken with respect to these National Marine Sanctuaries, the term “appellant” includes any such interested persons.

(b) An appeal under paragraph (a) of this section must be in writing, state the action(s) by the Director appealed and the reason(s) for the appeal, and be received within 30 days of receipt of notice of the action by the Director. Appeals should be addressed to the Assistant Administrator, Office of Ocean and Coastal Resource Management, ATTN: Sanctuaries and Reserves Division, Office of Ocean and Coastal Resource Management, National Ocean Service, National Oceanic and Atmospheric Administration, 1305 East-West Highway, Silver Spring, MD 20910.

(c) While the appeal is pending, appellants may not conduct their activities without being subject to the prohibitions in §§ 922.163 and 922.164.

(d)(1) The Assistant Administrator may request the appellant to submit such information as the Assistant Administrator deems reasonably necessary in order for him or her to decide the appeal. The information requested must be received by the Assistant Administrator within 45 days of the postmark date of the request. The Assistant Administrator may seek the views of any other persons. For the Monitor National Marine Sanctuary, if the appellant has requested a hearing, the Assistant Administrator shall grant an informal hearing. For all other National Marine Sanctuaries, the Assistant Administrator may determine whether to hold an informal hearing on the appeal. If the Assistant Administrator determines that an informal hearing should be held, the Assistant Administrator may designate an officer before whom the hearing shall be held.

(2) The hearing officer shall give notice in the Federal Register of the time, place, and subject matter of the hearing. The appellant and the Director may appear personally or by counsel at the hearing and submit such material and present such arguments as deemed appropriate by the hearing officer. Within 60 days after the record before the hearing officer closes, the hearing officer shall recommend a decision in writing to the Assistant Administrator.

(e) The Assistant Administrator shall decide the appeal using the same regulatory criteria as for the initial decision and shall base the appeal decision on the record before the Director and any information submitted regarding the appeal, and if a hearing has been held, on the record before the hearing officer and the hearing officer's recommended decision. The Assistant Administrator shall notify the appellant of the final decision and the reason(s) therefore in writing. The Assistant Administrator's decision shall constitute final agency action for purposes of the Administrative Procedure Act.

(f) Any time limit prescribed in or established under this section other than the 30-day limit for filing an appeal may be extended by the Assistant Administrator or hearing officer for good cause.

Appendix I to Part 922, Subpart P—Florida Keys National Marine Sanctuary boundary coordinates

(Appendix based on North American Datum of 1983)

The boundary of the Florida Keys National Marine Sanctuary—

(a) begins at the northeasternmost point of Biscayne National Park located at approximately 25 degrees 39 minutes north latitude, 80 degrees 5 minutes west longitude, then runs eastward to the 300-foot isobath located at approximately 25 degrees 39 minutes north latitude, 80 degrees 4 minutes west longitude;

(b) then runs southward and connects in succession the points at the following coordinates:

(i) 25 degrees 34 minutes north latitude, 80 degrees 4 minutes west longitude,

(ii) 25 degrees 28 minutes north latitude, 80 degrees 5 minutes west longitude, and

(iii) 25 degrees 21 minutes north latitude, 80 degrees 7 minutes west longitude;

(iv) 25 degrees 16 minutes north latitude, 80 degrees 8 minutes west longitude;

(c) then runs southwesterly approximating the 300-foot isobath and connects in succession the points at the following coordinates:

(i) 25 degrees 7 minutes north latitude, 80 degrees 13 minutes west longitude,

(ii) 24 degrees 57 minutes north latitude, 80 degrees 21 minutes west longitude,

(iii) 24 degrees 39 minutes north latitude, 80 degrees 52 minutes west longitude,

(iv) 24 degrees 30 minutes north latitude, 81 degrees 23 minutes west longitude,

(v) 24 degrees 25 minutes north latitude, 81 degrees 50 minutes west longitude,

(vi) 24 degrees 22 minutes north latitude, 82 degrees 48 minutes west longitude,

(vii) 24 degrees 37 minutes north latitude, 83 degrees 6 minutes west longitude,

(viii) 24 degrees 40 minutes north latitude, 83 degrees 6 minutes west longitude,

(ix) 24 degrees 46 minutes north latitude, 82 degrees 54 minutes west longitude,

(x) 24 degrees 44 minutes north latitude, 81 degrees 55 minutes west longitude,

(xi) 24 degrees 51 minutes north latitude, 81 degrees 26 minutes west longitude, and

(xii) 24 degrees 55 minutes north latitude, 80 degrees 56 minutes west longitude;

(d) then follows the boundary of Everglades National Park in a southerly then northeasterly direction through Florida Bay, Buttonwood Sound, Tarpon Basin, and Blackwater Sound;

(e) after Division Point, then departs from the boundary of Everglades National Park and follows the western shoreline of Manatee Bay, Barnes Sound, and Card Sound;

(f) then follows the southern boundary of Biscayne National Park to the southeasternmost point of Biscayne National Park; and

(g) then follows the eastern boundary of Biscayne National Park to the beginning point specified in paragraph (a).

Appendix II to Part 922, Subpart P—Existing Management Areas boundary coordinates

The Existing Management Areas are located within the following geographic boundary coordinates:

National Oceanic and Atmospheric Administration, Preexisting National Marine Sanctuaries:

Key Largo Management Area (Key Largo National Marine Sanctuary):

Point	Latitude	Longitude
1	25°19.45'N	80°12.00'W
2	25°16.02'N	80°08.07'W
3	25°07.05'N	80°12.05'W
4	24°58.03'N	80°19.08'W
5	25°02.02'N	80°25.25'W

Looe Key Management Area (Looe Key National Marine Sanctuary):

Point	Latitude	Longitude
1	24°31.37'N	81°26.00'W
2	24°33.34'N	81°26.00'W
3	24°34.09'N	81°23.00'W
4	24°32.12'N	81°23.00'W

United States Fish and Wildlife Service:

Great White Heron National Wildlife Refuge (based on the North American Datum of 1983)

Point	Latitude	Longitude
1	24°43.8'N	81°48.6'W
2	24°43.8'N	81°37.2'W
3	24°49.2'N	81°37.2'W
4	24°49.2'N	81°19.8'W
5	24°48.0'N	81°19.8'W
6	24°48.0'N	81°14.4'W
7	24°49.2'N	81°14.4'W
8	24°49.2'N	81°08.4'W
9	24°43.8'N	81°08.4'W
10	24°43.8'N	81°14.4'W
11	24°43.2'N	81°14.4'W
12	24°43.2'N	81°16.2'W
13	24°42.6'N	81°16.2'W
14	24°42.6'N	81°21.0'W
15	24°41.4'N	81°21.0'W
16	24°41.4'N	81°22.2'W
17	24°43.2'N	81°22.2'W
18	24°43.2'N	81°22.8'W
19	24°43.8'N	81°22.8'W
20	24°43.8'N	81°24.0'W
21	24°43.2'N	81°24.0'W
22	24°43.2'N	81°26.4'W
23	24°43.8'N	81°26.4'W
24	24°43.8'N	81°27.0'W
25	24°43.2'N	81°27.0'W
26	24°43.2'N	81°29.4'W
27	24°42.6'N	81°29.4'W
28	24°42.6'N	81°30.6'W
29	24°41.4'N	81°30.6'W
30	24°41.4'N	81°31.2'W
31	24°40.8'N	81°31.2'W
32	24°40.8'N	81°32.4'W
33	24°41.4'N	81°32.4'W
34	24°41.4'N	81°34.2'W
35	24°40.8'N	81°34.2'W
36	24°48.0'N	81°35.4'W
37	24°39.6'N	81°35.4'W
38	24°39.6'N	81°36.0'W
39	24°39.0'N	81°36.0'W
40	24°39.0'N	81°37.2'W
41	24°37.8'N	81°37.2'W
42	24°37.8'N	81°37.8'W
43	24°37.2'N	81°37.8'W
44	24°37.2'N	81°40.2'W
45	24°36.0'N	81°40.2'W
46	24°36.0'N	81°40.8'W
47	24°35.4'N	81°40.8'W
48	24°35.4'N	81°42.0'W
49	24°36.0'N	81°42.0'W
50	24°36.0'N	81°48.6'W

Key West National Wildlife Refuge

Point	Latitude	Longitude
1.....	24°40'N	81°49'W
2.....	24°40'N	82°10'W
3.....	24°27'N	82°10'W
4.....	24°27'N	81°49'W

When differential Global Positioning Systems data becomes available, these coordinates may be revised by Federal Register notice to reflect the increased accuracy of such data.

Appendix III to Part 922, Subpart P—Wildlife Management Areas access restrictions

Area	Access Restrictions
Bay Keys	No-motor zone (300 feet) around one key; idle speed only/no-wake zones in tidal creeks
Boca Grande Key	South one-half of beach closed (beach above mean high water closed by Depart ment of Interior)
Woman Key	One-half of beach and sand spit on southeast side closed (beach and sand spit above mean high water closed by Department of Interior)
Cayo Agua Keys	Idle speed only/no-wake zones in all navigable tidal creeks
Cotton Key	No-motor zone on tidal flat
Snake Creek	No-motor zone on tidal flat
Cottrell Key	No-motor zone (300 feet) around entire key
Little Mullet Key	No-access buffer zone (300 feet) around entire key
Big Mullet Key	No-motor zone (300 feet) around entire key
Crocodile Lake	No-access buffer zone (100 feet) along shoreline be- tween March 1 and October 1
East Harbor Key	No-access buffer zone (300 feet) around northernmost island
Lower Harbor Keys	Idle speed only/no-wake zones in selected tidal creeks
Eastern Lake Surprise	Idle speed only/no-wake zone east of highway U.S. 1
Horseshoe Key	No-access buffer zone (300 feet) around main island (main island closed by Department of Interior)
Marquesas Keys	(i) No-motor zones (300 feet) around three smallest keys on western side of chain; (ii) no-access buffer zone (300 feet) around one island at western side of chain; (iii) idle speed only/no-wake zone in south west tidal creek
Tidal flat south of Marvin Key	No-access buffer zone on tidal flat
Mud Keys	(i) Idle speed only/no-wake zones in the two main tidal creeks; (ii) two smaller creeks on west side closed
Pelican Shoal	No-access buffer zone out to 50 meters from shore between April 1 and August 31 (shoal closed by the Florida Game and Freshwater Fish Commis sion)
Rodriguez Key	No-motor zone on tidal flats
Dove Key	No-motor zone on tidal flats; area around the two small islands closed
Tavernier Key	No-motor zone on tidal flats
Sawyer Keys	Tidal creeks on south side closed
Snipe Keys	(i) Idle speed only/no-wake zone in main tidal creek; (ii) no-motor zone in all other tidal creeks

Upper Harbor Key	No-access buffer zone (300 feet) around entire key
East Content Keys	Idle speed only/no-wake zones in tidal creeks between southwesternmost keys
West Content Keys	Idle speed only/no-wake zones in selected tidal creeks; no-access buffer zone in one cove
Little Crane Key	No-access buffer zone (300 feet) around entire key

Appendix IV to Part 922, Subpart P—Ecological Reserves boundary coordinates

One Ecological Reserve—the Western Sambos Ecological Reserve—is designated in the area of Western Sambos reef. NOAA has committed to designating a second Ecological Reserve within two years from issuance of this plan in the area of the Dry Tortugas. The establishment of a Dry Tortugas Ecological Reserve will be proposed by a notice of proposed rulemaking with a proposed boundary determined through a joint effort among the Sanctuary, and the National Park Service, pursuant to a public process involving a team consisting of managers, scientists, conservationists, and affected user groups.

The Western Sambos Ecological Reserve (based on North American Datum of 1983, aerial photos, charts, and Geographic Information Systems data) is located within the following geographic boundary coordinates:

WESTERN SAMBOS

Point	Latitude	Longitude
1.....	24°33.70'N	81°40.80'W
2.....	24°28.70'N	81°41.90'W
3.....	24°28.50'N	81°43.70'W
4.....	24°33.50'N	81°43.10'W

When differential Global Positioning Systems data becomes available, these coordinates may be revised by Federal Register notice to reflect the increased accuracy of such data.

Appendix V to Part 922, Subpart P—Sanctuary Preservation Areas boundary coordinates

The Sanctuary Preservation Areas (SPAs) (based on North American Datum of 1983, aerial photos, charts, and Geographic Information Systems data) are located within the following geographic boundary coordinates:

ALLIGATOR REEF

Point	Latitude	Longitude
1.....	24°50.8'N	80°36.8'W
2.....	24°50.4'N	80°37.3'W
3.....	24°50.7'N	80°37.6'W
4.....	24°51.1'N	80°37.5'W

Catch and release fishing by trolling only is allowed in this SPA.

CARYSFORT/SOUTH CARYSFORT REEF

Point	Latitude	Longitude
1.....	25°13.6'N	80°12.2'W
2.....	25°11.9'N	80°12.8'W
3.....	25°12.2'N	80°13.8'W
4.....	25°14.0'N	80°12.7'W

CHEECA ROCKS

Point	Latitude	Longitude
1.....	24°54.6'N	80°37.6'W
2.....	24°54.3'N	80°37.5'W
3.....	24°54.2'N	80°37.7'W
4.....	24°54.5'N	80°37.8'W

COFFINS PATCH

Point	Latitude	Longitude
1.....	24°41.5'N	80°57.7'W
2.....	24°41.1'N	80°57.5'W
3.....	24°40.6'N	80°58.4'W
4.....	24°41.1'N	80°58.6'W

CONCH REEF

Point	Latitude	Longitude
1.....	24°57.5'N	80°27.4'W
2.....	24°57.4'N	80°27.3'W
3.....	24°57.0'N	80°27.7'W
4.....	24°56.9'N	80°27.6'W

Catch and release fishing by trolling only is allowed in this SPA.

DAVIS REEF

Point	Latitude	Longitude
1.....	24°55.6'N	80°30.3'W
2.....	24°55.3'N	80°30.0'W
3.....	24°55.1'N	80°30.4'W
4.....	24°55.4'N	80°30.7'W

DRY ROCKS

Point	Latitude	Longitude
1.....	25°7.6'N	80°17.9'W
2.....	25°7.4'N	80°17.7'W
3.....	25°7.3'N	80°17.8'W
4.....	25°7.4'N	80°18.1'W

GRECIAN ROCKS

Point	Latitude	Longitude
1.....	25°6.9'N	80°18.2'W
2.....	25°6.6'N	80°17.9'W
3.....	25°6.1'N	80°18.5'W
4.....	25°6.2'N	80°18.6'W
5.....	25°6.8'N	80°18.6'W

EASTERN DRY ROCKS

Point	Latitude	Longitude
1.....	24°27.9'N	81°50.5'W
2.....	24°27.7'N	81°50.4'W
3.....	24°27.5'N	81°50.6'W
4.....	24°27.7'N	81°50.8'W

THE ELBOW

Point	Latitude	Longitude
1.....	25°9.1'N	80°15.4'W
2.....	25°8.9'N	80°15.1'W
3.....	25°8.1'N	80°15.7'W
4.....	25°8.8'N	80°15.7'W

FRENCH REEF

Point	Latitude	Longitude
1.....	25°2.2'N	80°20.6'W
2.....	25°1.8'N	80°21.0'W
3.....	25°2.3'N	80°21.2'W

HEN AND CHICKENS

Point	Latitude	Longitude
1.....	24°56.4'N	80°32.9'W
2.....	24°56.2'N	80°32.7'W
3.....	24°55.7'N	80°33.1'W
4.....	24°55.9'N	80°33.3'W

LOOE KEY

Point	Latitude	Longitude
1.....	24°33.2'N	81°24.2'W
2.....	24°32.6'N	81°24.8'W
3.....	24°32.5'N	81°24.7'W
4.....	24°33.1'N	81°24.8'W

MOLASSES REEF

Point	Latitude	Longitude
1.....	25°0.9'N	80°22.4'W
2.....	25°0.7'N	80°22.0'W
3.....	25°0.2'N	80°22.8'W
4.....	25°0.7'N	80°22.8'W

NEWFOUND HARBOR KEY

Point	Latitude	Longitude
1.....	24°37.1'N	81°23.3'W
2.....	24°36.7'N	81°23.8'W
3.....	24°36.8'N	81°23.3'W
4.....	24°36.9'N	81°23.9'W

ROCK KEY

Point	Latitude	Longitude
1.....	24°27.5'N	81°51.3'W
2.....	24°27.3'N	81°51.2'W
3.....	24°27.2'N	81°51.5'W
4.....	24°27.5'N	81°51.6'W

SAND KEY

Point	Latitude	Longitude
1.....	24°27.6'N	81°53.1'W
2.....	24°27.0'N	81°53.1'W
3.....	24°27.0'N	81°52.3'W
4.....	24°27.6'N	81°52.3'W

Catch and release fishing by trolling only is allowed in this SPA.

SOMBRERO KEY

Point	Latitude	Longitude
1.....	24°37.9'N	81°6.8'W
2.....	24°37.4'N	81°6.1'W
3.....	24°37.2'N	81°7.0'W

Catch and release fishing by trolling only is allowed in this SPA.

When differential Global Positioning Systems data becomes available, the coordinates for all these areas may be revised by Federal Register notice to reflect the increased accuracy of such data.

Appendix VI to Part 922, Subpart P—Special-use Areas boundary coordinates and use designations

The Special-use Areas (based on North American Datum of 1983) are located within the following geographic boundary coordinates:

CONCH REEF (RESEARCH ONLY)

Point	Latitude	Longitude
1.....	24°56.8'N	80°27.2'W
2.....	24°57.0'N	80°27.0'W
3.....	24°57.2'N	80°27.5'W
4.....	24°57.5'N	80°27.4'W

EASTERN SAMBOS (RESEARCH ONLY)

Point	Latitude	Longitude
1.....	24°29.4'N	81°39.3'W
2.....	24°29.7'N	81°40.2'W
3.....	24°29.5'N	81°39.6'W
4.....	24°29.8'N	81°39.7'W

LOOE KEY (RESEARCH ONLY)

Point	Latitude	Longitude
1.....	24°34.1'N	81°23.3'W
2.....	24°34.0'N	81°23.2'W
3.....	24°33.8'N	81°23.8'W
4.....	24°34.0'N	81°23.9'W

TENNESSEE REEF (RESEARCH ONLY)

Point	Latitude	Longitude
1.....	24°45.9'N	80°45.6'W
2.....	24°45.7'N	80°45.4'W
3.....	24°46.0'N	80°44.9'W
4.....	24°46.2'N	80°45.1'W

Appendix VII to Part 922, Subpart P—Areas To Be Avoided boundary coordinates

IN THE VICINITY OF THE FLORIDA KEYS

(Reference Charts: United States 11466, 27th Edition -
September 1, 1990 and United States 11450, 4th Edition -August 11, 1990.)

Point	Latitude	Longitude
1.....	25°45.00'N	80°06.10'W
2.....	25°38.70'N	80°02.70'W
3.....	25°22.00'N	80°03.00'W
4.....	25°00.20'N	80°13.40'W
5.....	24°37.90'N	80°47.30'W
6.....	24°29.20'N	81°17.30'W
7.....	24°22.30'N	81°43.17'W
8.....	24°28.00'N	81°43.17'W
9.....	24°28.70'N	81°43.50'W
10.....	24°29.80'N	81°43.17'W
11.....	24°33.10'N	81°35.15'W
12.....	24°33.60'N	81°26.00'W
13.....	24°38.20'N	81°07.00'W
14.....	24°43.20'N	80°53.20'W
15.....	24°46.10'N	80°46.15'W
16.....	24°51.10'N	80°37.10'W
17.....	24°57.50'N	80°27.50'W
18.....	25°09.90'N	80°16.20'W
19.....	25°24.00'N	80°09.10'W
20.....	25°31.50'N	80°07.00'W
21.....	25°39.70'N	80°06.85'W
22.....	25°45.00'N	80°06.10'W

IN THE VICINITY OF KEY WEST HARBOR

(Reference Chart: United States 11434, 21st Edition - August 11, 1990.)

Point	Latitude	Longitude
23.....	24°27.95'N	81°48.65'W
24.....	24°23.00'N	81°53.50'W
25.....	24°26.60'N	81°58.50'W
26.....	24°27.75'N	81°55.70'W
27.....	24°29.35'N	81°53.40'W
28.....	24°29.35'N	81°50.00'W
29.....	24°27.95'N	81°48.65'W

AREA SURROUNDING THE
MARQUESAS KEYS

(Reference Chart: United States 11434, 21st Edition - August 11, 1990.)

Point	Latitude	Longitude
30.....	24°26.60'N	81°59.55'W
31.....	24°23.00'N	82°03.50'W
32.....	24°23.60'N	82°27.80'W
33.....	24°34.50'N	82°37.50'W
34.....	24°43.00'N	82°26.50'W
35.....	24°38.31'N	81°54.06'W
36.....	24°37.91'N	81°53.40'W
37.....	24°36.15'N	81°51.78'W
38.....	24°34.40'N	81°50.60'W
39.....	24°33.44'N	81°49.73'W
40.....	24°31.20'N	81°52.10'W
41.....	24°28.70'N	81°56.80'W
42.....	24°26.60'N	81°59.55'W

AREA SURROUNDING THE
DRY TORTUGAS ISLANDS

(Reference Chart: United States 11434, 21st Edition - August 11, 1990.)

Point	Latitude	Longitude
43.....	24°32.00'N	82°53.50'W
44.....	24°32.00'N	83°00.05'W
45.....	24°39.70'N	83°00.05'W
46.....	24°45.60'N	82°54.40'W
47.....	24°45.60'N	82°47.20'W
48.....	24°42.80'N	82°43.90'W
49.....	24°39.50'N	82°43.90'W
50.....	24°35.60'N	82°46.40'W
51.....	24°32.00'N	82°53.50'W

Appendix VIII to Part 929-Marine Life Rule [as excerpted from Chapter 46-42 of the Florida Administrative Code]

46-42.001 Purpose and Intent; Designation of Restricted Species; Definition of "Marine Life Species."

46-42.002 Definitions.

46-42.003 Prohibition of Harvest: Longspine Urchin, Bahama Starfish.

46-42.0035 Live Landing and Live Well Requirements.

46-42.0036 Harvest in Biscayne National Park.*

46-42.004 Size Limits.

46-42.005 Bag Limits.

46-42.006 Commercial Season, Harvest Limits.

46-42.007 Gear Specifications and Prohibited Gear.

46-42.008 Live Rock.*

46-42.009 Prohibition on the Taking, Destruction, or Sale of Marine Corals and Sea Fans.

*- Part 42.0036 was not reproduced because it does not apply to the Sanctuary.

*- Part 42.008 was not reproduced because it is regulated pursuant to this Part 922.163(2)(ii).

46-42.001 Purpose and Intent; Designation of Restricted Species; Definition of "Marine Life Species".--

(1)(a) The purpose and intent of this chapter are to protect and conserve Florida's tropical marine life resources and assure the continuing health and abundance of these species. The further intent of this chapter is to assure that harvesters in this fishery use nonlethal methods of harvest and that the fish, invertebrates, and plants so harvested be maintained alive for the maximum possible conservation and economic benefits.

(b) It is the express intent of the Marine Fisheries Commission that landing of live rock propagated through aquaculture will be allowed pursuant to the provisions of this chapter.

(2) The following fish species, as they occur in waters of the state and in federal Exclusive Economic Zone (EEZ) waters adjacent to state waters, are hereby designated as restricted species pursuant to Section 370.01(20),Florida Statutes:

(a) Moray eels - Any species of the Family Muraenidae.

(b) Snake eels - Any species of the Genera Myrichthys and Myrophis of the Family Ophichthidae.

(c) Toadfish - Any species of the Family Batrachoididae.

(d) Frogfish - Any species of the Family Antennariidae.

(e) Batfish - Any species of the Family Ogcocephalidae.

(f) Clingfish - Any species of the Family Gobiesocidae.

(g) Trumpetfish - Any species of the Family Aulostomidae.

(h) Cornetfish - Any species of the Family Fistulariidae.

(i) Pipefish/seahorses - Any species of the Family Syngnathidae.

(j) Hamlet/seabass - Any species of the Family Serranidae, except groupers of the genera Epinephalus and Mycteroperca, and seabass of the genus Centropristis.

(k) Basslets - Any species of the Family Grammistidae.

(l) Cardinalfish - Any species of the Family Apogonidae.

(m) High-hat, Jackknife-fish, Spotted drum, Cubbyu - Any species of the genus Equetus of the Family Sciaenidae.

(n) Reef Croakers - Any of the species Odontocion dentex.

(o) Sweepers - Any species of the Family Pempheridae.

(p) Butterflyfish - Any species of the Family Chaetodontidae.

(q) Angelfish - Any species of the Family Pomacanthidae.

(r) Damselfish - Any species of the Family Pomacentridae.

(s) Hawkfish - Any species of the Family Cirrhitidae.

(t) Wrasse/hogfish/razorfish - Any species of the Family Labridae, except hogfish, Lachnolaimus maximus.

(u) Parrotfish - Any species of the Family Scaridae.

(v) Jawfish - Any species of the Family Opistognathidae.

(w) Blennies - Any species of the Families Clinidae or Blenniidae.

(x) Sleepers - Any species of the Family Eleotrididae.

(y) Gobies - Any species of the Family Gobiidae.

(z) Tangs and surgeonfish - Any species of the Family Acanthuridae.

(aa) Filefish/triggerfish - Any species of the Family Balistes, except gray triggerfish, Balistidae capriscus.

(bb) Trunkfish/cowfish - Any species of the Family Ostraciidae.

(cc) Pufferfish/burrfish/balloonfish - Any of the following species:

1. Balloonfish - Diodon holocanthus.

2. Sharpnose puffer - Canthigaster rostrata.

3. Striped burrfish - Chilomycterus schoepfi.

(3) The following invertebrate species, as they occur in waters of the state and in federal Exclusive Economic Zone (EEZ) waters adjacent to state waters, are hereby designated as restricted species pursuant to Section 370.01(20), Florida Statutes:

(a) Sponges - Any species of the Class Demospongia, except sheepswool, yellow, grass, glove, finger, wire, reef, and velvet sponges, Order Dictyoceratida.

(b) Upside-down jellyfish - Any species of the Genus Cassiopeia.

(c) Siphonophores/hydroids - Any species of the Class Hydrozoa, except fire corals, Order Milleporina.

(d) Soft corals - Any species of the Subclass Octocorallia, except sea fans Gorgonia flabellum and Gorgonia ventalina.

(e) Sea anemones - Any species of the Orders Actinaria, Zoanthidea, Corallimorpharia, and Ceriantharia.

(f) Featherduster worms/calcareous tubeworms - Any species of the Families Sabellidae and Serpulidae.

(g) Star-shells - Any of the species Astraea americana or Astraea phoebia.

(h) Nudibranchs/sea slugs - Any species of the Subclass Opisthobranchia.

(i) Fileclams - Any species of the Genus Lima.

(j) Octopods - Any species of the Order Octopoda, except the common octopus, Octopodus vulgaris.

(k) Shrimp - Any of the following species:

1. Cleaner shrimp and peppermint shrimp - Any species of the Genera Periclimenes or Lysmata.

2. Coral shrimp - Any species of the Genus Stenopus.

3. Snapping shrimp - Any species of the Genus Alpheus.

(l) Crabs - Any of the following species:

1. Yellowline arrow crab - Stenorhynchus seticornis.

2. Furcate spider or decorator crab - Stenocionops furcata.

3. Thinstripe hermit crab - Clibanarius vittatus.

4. Polkadotted hermit crab - Phimochirus operculatus.

5. Spotted porcelain crab - Porcellana sayana.

6. Nimble spray or urchin crab - Percnon gibbesi.

7. False arrow crab - Metoporhaphis calcarata.

(m) Starfish - Any species of the Class Asteroidea, except the Bahama starfish, Oreaster reticulatus.

(n) Brittlestars - Any species of the Class Ophiuroidea.

(o) Sea urchins - Any species of the Class Echinoidea, except longspine urchin, Diadema antillarum, and sand dollars and sea biscuits, Order Clypeasteroida.

(p) Sea cucumbers - Any species of the Class Holothuroidea.

(q) Sea lillies - Any species of the Class Crinoidea.

(4) The following species of plants, as they occur in waters of the state and in federal Exclusive Economic Zone (EEZ) waters adjacent to state waters, are hereby designated as restricted species pursuant to Section 370.01(20), Florida Statutes:

(a) Caulerpa - Any species of the Family Caulerpaceae.

(b) Halimeda/mermaid's fan/mermaid's shaving brush - Any species of the Family Halimedaceae.

(c) Coralline red algae - Any species of the Family Corallinaceae.

(5) For the purposes of Section 370.06(2)(d), Florida Statutes, the term "marine life species" is defined to mean those species designated as restricted species in subsections (2), (3), and (4) of this rule.

Specific Authority 370.01(20), 370.027(2), 370.06(2)(d), F.S. Law Implemented 370.01(20), 370.025, 370.027, 370.06(2)(d), F.S. History -- New 1-1-91, Amended 7-1-92, 1-1-95.

46-42.002 Definitions.-- As used in this rule chapter:

(1) "Barrier net," also known as a "fence net," means a seine used beneath the surface of the water by a diver to enclose and concentrate tropical fish and which may be made of either nylon or monofilament.

(2) "Drop net" means a small, usually circular, net with weights attached along the outer edge and a single float in the center, used by a diver to enclose and concentrate tropical fish.

(3) "Hand held net" means a landing or dip net as defined in Rule 46-4.002(4), except that a portion of the bag may be constructed of clear plastic material, rather than mesh.

(4) "Harvest" means the catching or taking of a marine organism by any means whatsoever, followed by a reduction of such organism to possession. Marine organisms that are caught but immediately returned to the water free, alive, and unharmed are not harvested. In addition, temporary possession of a marine animal for the purpose of measuring it to determine compliance with the minimum or maximum size requirements of this chapter shall not constitute

harvesting such animal, provided that it is measured immediately after taking, and immediately returned to the water free, alive, and unharmed if undersize or oversize.

(5) "Harvest for commercial purposes" means the taking or harvesting of any tropical ornamental marine life species or tropical ornamental marine plant for purposes of sale or with intent to sell. The harvest of tropical ornamental marine life species or tropical ornamental marine plants in excess of the bag limit shall constitute prima facie evidence of intent to sell.

(6) "Land," when used in connection with the harvest of marine organisms, means the physical act of bringing the harvested organism ashore.

(7) "Live rock" means rock with living marine organisms attached to it.

(8) "Octocoral" means any erect, nonencrusting species of the Subclass Octocorallia, except the species Gorgonia flabellum and Gorgonia ventalina.

(9) "Slurp gun" means a self-contained, handheld device that captures tropical fish by rapidly drawing seawater containing such fish into a closed chamber.

(10) "Total length" means the length of a fish as measured from the tip of the snout to the tip of the tail.

(11) "Trawl" means a net in the form of an elongated bag with the mouth kept open by various means and fished by being towed or dragged on the bottom.

"Roller frame trawl" means a trawl with all of the following features and specifications:

(a) A rectangular rigid frame to keep the mouth of the trawl open while being towed.

(b) The lower horizontal beam of the frame has rollers to allow the trawl to roll over the bottom and any obstructions while being towed.

(c) The trawl opening is shielded by a grid of vertical bars spaced no more than 3 inches apart.

(d) The trawl is towed by attaching a line or towing cable to a tongue located above or at the center of the upper horizontal beam of the frame.

(e) The trawl has no doors attached to keep the mouth of the trawl open.

(12) "Tropical fish" means any species included in subsection (2) of Rule 46-42.001, or any part thereof.

(13) "Tropical ornamental marine life species" means any species included in subsections (2) or (3) of Rule 46-42.001, or any part thereof.

(14) "Tropical ornamental marine plant" means any species included in subsection (4) of Rule 46-42.001.

Specific Authority 370.027(2), F.S. Law Implemented 370.025, 370.027, F.S. History -- New 1-1-91, Amended 7-1-92, 1-1-95.

46-42.003 Prohibition of Harvest: Longspine Urchin, Bahama Starfish.-- No person shall harvest, possess while in or on the waters of the state, or land any of the following species:

(1) Longspine urchin, Diadema antillarum.

(2) Bahama starfish, Oreaster reticulatus.

Specific Authority 370.027(2), F.S. Law Implemented 370.025, 370.027, F.S. History -- New 1-1-91, Amended 7-1-92.

46-42.0035 Live Landing and Live Well Requirements.--

(1) Each person harvesting any tropical ornamental marine life species or any tropical ornamental marine plant shall land such marine organism alive.

(2) Each person harvesting any tropical ornamental marine life species or any tropical ornamental marine plant shall have aboard the vessel being used for such harvest a continuously circulating live well or aeration or oxygenation system of adequate size and capacity to maintain such harvested marine organisms in a healthy condition.

Specific Authority 370.027(2), F.S. Law Implemented 370.025, 370.027, F.S. History -- New 7-1-92.

46-42.004 Size Limits.--

(1) Angelfishes.-

(a) No person harvesting for commercial purposes shall harvest, possess while in or on the

waters of the state, or land any of the following species of angelfish, of total length less than that set forth below:

1. One-and-one-half (1 1/2) inches for:

a. Gray angelfish (Pomacanthus arcuatus).

b. French angelfish (Pomacanthus paru).

2. One-and-three-quarters (1 3/4) inches for:

a. Blue angelfish (Holacanthus bermudensis).

b. Queen angelfish (Holacanthus ciliaris).

3. Two (2) inches for rock beauty (Holacanthus tricolor).

(b) No person shall harvest, possess while in or on the waters of the state, or land any angelfish (Family Pomacanthidae), of total length greater than that specified below:

1. Eight (8) inches for angelfish, except rock beauty (Holacanthus tricolor).

2. Five (5) inches for rock beauty.

(c) Except as provided herein, no person shall purchase, sell, or exchange any angelfish smaller than the limits specified in paragraph (a) or larger than the limits specified in paragraph (b). This prohibition shall not apply to angelfish legally harvested outside of state waters or federal Exclusive Economic Zone (EEZ) waters adjacent to state waters, which angelfish are entering Florida in interstate or international commerce. The burden shall be upon any person possessing such angelfish for sale or exchange to establish the chain of possession from the initial transaction after harvest, by appropriate receipt(s), bill(s) of sale, or bill(s) of lading, and any customs receipts, and to show that such angelfish originated from a point outside the waters of the State of Florida or federal Exclusive Economic Zone (EEZ) waters adjacent to Florida waters and entered the state in interstate or international commerce. Failure to maintain such documentation or to promptly produce same at the request of any duly authorized law enforcement officer shall constitute prima facie evidence that such angelfish were harvested from Florida waters or adjacent EEZ waters for purposes of this paragraph.

(2) Butterflyfishes.--

(a) No person harvesting for commercial purposes shall harvest, possess while in or on the waters of the state, or land any butterflyfish (Family Chaetodontidae) of total length less than one (1) inch.

(b) No person shall harvest, possess while in or on the waters of the state, or land any butterflyfish of total length greater than 4 inches.

(3) Gobies -- No person shall harvest, possess while in or on the waters of the state, or land any gobie (Family Gobiidae) of total length greater than 2 inches.

(4) Jawfishes -- No person shall harvest, possess while in or on the waters of the state, or land any jawfish (Family Opistognathidae) of total length greater than 4 inches.

(5) Spotfin and Spanish hogfish --

(a) No person shall harvest, possess while in or on the waters of this state, or land any Spanish hogfish (Bodianus rufus) of total length less than 2 inches.

(b) No person shall harvest, possess while in or on the waters of this state, or land any Spanish hogfish (Bodianus rufus) or spotfin hogfish (Bodianus pulchellus) of total length greater than 8 inches.

Specific Authority 370.027(2), F.S. Law Implemented 370.025, 370.027, F.S. History -- New 1-1-91, Amended 7-1-92, 1-1-95.

46-42.005 Bag limit.--

(1) Except as provided in Rule 46-42.006 or subsections (3) or (4) of this rule, no person shall harvest, possess while in or on the waters of the state, or land more than 20 individuals per day of tropical ornamental marine life species, in any combination.

(2) Except as provided in Rule 46-42.006, no person shall harvest, possess while in or on the waters of the state, or land more than one (1) gallon per day of tropical ornamental marine plants, in any combination of species.

(3) Except as provided in Rule 46-42.006, no person shall harvest, possess while in or on the waters of the state, or land more than 5 angelfishes (Family Pomacanthidae) per day. Each angelfish

shall be counted for purposes of the 20 individual bag limit specified in subsection (1) of this rule.

(4)(a) Unless the season is closed pursuant to paragraph (b), no person shall harvest, possess while in or on the waters of the state, or land more than 6 colonies per day of octocorals. Each colony of octocoral or part thereof shall be considered an individual of the species for purposes of subsection (1) of this rule and shall be counted for purposes of the 20 individual bag limit specified therein. Each person harvesting any octocoral as authorized by this rule may also harvest substrate within 1 inch of the perimeter of the holdfast at the base of the octocoral, provided that such substrate remains attached to the octocoral.

(b) If the harvest of octocorals in federal Exclusive Economic Zone (EEZ) waters adjacent to state waters is closed to all harvesters prior to September 30 of any year, the season for harvest of octocorals in state waters shall also close until the following October 1, upon notice given by the Secretary of the Department of Environmental Protection, in the manner provided in s.120.52(16)(d), Florida Statutes.

Specific Authority 370.027(2), F.S. Law Implemented 370.025, 370.027, F.S. History -- New 1-1-91, Amended 1-1-95.

46-42.006 Commercial Season, Harvest Limits.--

(1) Except as provided in Rule 46-42.008(7), no person shall harvest, possess while in or on the waters of the state, or land quantities of tropical ornamental marine life species or tropical ornamental marine plants in excess of the bag limits established in Rule 46-42.005 unless such person possesses a valid saltwater products license with both a marine life fishery endorsement and a restricted species endorsement issued by the Department of Environmental Protection.

(2) Persons harvesting tropical ornamental marine life species or tropical ornamental marine plants for commercial purposes shall have a season that begins on October 1 of each year and continues through September 30 of the following year. These persons shall not harvest, possess while in or on the waters of the state, or land tropical ornamental marine life species in excess of the following limits:

(a) A limit of 75 angelfish (Family Pomacanthidae) per person per day or 150 angelfish per vessel per day, whichever is less.

(b) A limit of 75 butterflyfishes (Family Chaetodontidae) per vessel per day.

(c) There shall be no limits on the harvest for commercial purposes of octocorals unless and until the season for all harvest of octocorals in federal Exclusive Economic Zone (EEZ) waters adjacent to state waters is closed. At such time, the season for harvest of octocorals in state waters shall also close until the following October 1, upon notice given by the Secretary of the Department of Environmental Protection, in the manner provided in Section 120.52(16)(d), Florida Statutes. Each person harvesting any octocoral as authorized by this rule may also harvest substrate within 1 inch of the perimeter of the holdfast at the base of the octocoral, provided that such substrate remains attached to the octocoral.

(d) A limit of 400 giant Caribbean or "pink-tipped" anemones (Genus Condylactus) per vessel per day.

Specific Authority 370.027(2), F.S. Law Implemented 370.025, 370.027, F.S. History - New 1-1-91, Amended 7-1-92, 1-1-95.

46-42.007 Gear Specifications and Prohibited Gear.--

(1) The following types of gear shall be the only types allowed for the harvest of any tropical fish, whether from state waters or from federal Exclusive Economic Zone (EEZ) waters adjacent to state waters:

(a) Hand held net.

(b) Barrier net, with a mesh size not exceeding 3/4 inch stretched mesh.

(c) Drop net, with a mesh size not exceeding 3/4 inch stretched mesh.

(d) Slurp gun.

(e) Quinaldine may be used for the harvest of tropical fish if the person using the chemical or possessing the chemical in or on the waters of the state meets each of the following conditions:

1. The person also possesses and maintains aboard any vessel used in the harvest of tropical fish with quinaldine a special activity license authorizing the use of quinaldine, issued by the Division of Marine Resources of the Department of Environmen-

tal Protection pursuant to Section 370.08(8), Florida Statutes.

2. The quinaldine possessed or applied while in or on the waters of the state is in a diluted form of no more than 2% concentration in solution with seawater. Prior to dilution in seawater, quinaldine shall only be mixed with isopropyl alcohol or ethanol.

(f) A roller frame trawl operated by a person possessing a valid live bait shrimping license issued by the Department of Environmental Protection pursuant to Section 370.15, Florida Statutes, if such tropical fish are taken as an incidental bycatch of shrimp lawfully harvested with such trawl.

(g) A trawl meeting the following specifications used to collect live specimens of the dwarf seahorse, Hippocampus zosterae, if towed by a vessel no greater than 15 feet in length at no greater than idle speed:

1. The trawl opening shall be no larger than 12 inches by 48 inches.

2. The trawl shall weigh no more than 5 pounds wet when weighed out of the water.

(2) This rule shall not be construed to prohibit the use of any bag or container used solely for storing collected specimens or the use of a single blunt rod in conjunction with any allowable gear, which rod meets each of the following specifications:

(a) The rod shall be made of nonferrous metal, fiberglass, or wood.

(b) The rod shall be no longer than 36 inches and have a diameter no greater than 3/4 inch at any point.

(3) No person shall harvest in or from state waters any tropical fish by or with the use of any gear other than those types specified in subsection (1); provided, however, that tropical fish harvested as an incidental bycatch of other species lawfully harvested for commercial purposes with other types of gear shall not be deemed to be harvested in violation of this rule, if the quantity of tropical fish so harvested does not exceed the bag limits established in Rule 46-42.005.

Specific Authority 370.027(2), F.S. Law Implemented 370.025, 370.027, F.S. History -- New 1-1-91, Amended 7-1-92, 1-1-95.

46-42.009 Prohibition on the Taking, Destruction, or Sale of Marine Corals and Sea Fans; Exception; Repeal of Section 370.114, Florida Statutes.--

(1) Except as provided in subsection (2), no person shall take, attempt to take, or otherwise destroy, or sell, or attempt to sell, any sea fan of the species Gorgonia flabellum or of the species Gorgonia ventalina, or any hard or stony coral (Order Scleractinia) or any fire coral (Genus Millepora). No person shall possess any such fresh, uncleaned, or uncured sea fan, hard or stony coral, or fire coral.

(2) Subsection (1) shall not apply to:

(a) Any sea fan, hard or stony coral, or fire coral legally harvested outside of state waters or federal Exclusive Economic Zone (EEZ) waters adjacent to state waters and entering Florida in interstate or international commerce. The burden shall be upon any person possessing such species to establish the chain of possession from the initial transaction after harvest, by appropriate receipt(s), bill(s) of sale, or bill(s) of lading, and any customs receipts, and to show that such species originated from a point outside the waters of the State of Florida or federal Exclusive Economic Zone (EEZ) adjacent to state waters and entered the state in interstate or international commerce. Failure to maintain such documentation or to promptly produce same at the request of any duly authorized law enforcement officer shall constitute prima facie evidence that such species were harvested from Florida waters in violation of this rule.

(b) Any sea fan, hard or stony coral, or fire coral harvested and possessed pursuant to permit issued by the Department of Environmental Protection for scientific or educational purposes as authorized in Section 370.10(2), Florida Statutes.

(c) Any sea fan, hard or stony coral, or fire coral harvested and possessed pursuant to the aquacultured live rock provisions of Rule 46-42.008(3)(a) or pursuant to a Live Rock Aquaculture Permit issued by the National Marine Fisheries Service under 50 C.F.R. Part 638 and meeting the following requirements:

1. Persons possessing these species in or on the waters of the state shall also possess a state submerged lands lease for live rock aquaculture and a Department of Environmental Protection permit for live rock culture deposition and removal or a federal Live Rock Aquaculture Permit. If the person possessing these species is not the person named in the

documents required herein, then the person in such possession shall also possess written permission from the person so named to transport aquacultured live rock pursuant to this exception.

2. The nearest office of the Florida Marine Patrol shall be notified at least 24 hours in advance of any transport in or on state waters of aquacultured live rock pursuant to this exception.

3. Persons possessing these species off the water shall maintain and produce upon the request of any duly authorized law enforcement officer sufficient documentation to establish the chain of possession from harvest on a state submerged land lease for live rock aquaculture or in adjacent Exclusive Economic Zone (EEZ) waters pursuant to a federal Live Rock Aquaculture Permit.

4. Any sea fan, hard or stony coral, or fire coral harvested pursuant to Rule 46-42.008(3)(a) shall remain attached to the cultured rock.

Specific Authority 370.027(2), F.S.; Section 6, Chapter 83-134, Laws of Florida, as amended by Chapter 84-121, Laws of Florida. Law Implemented 370.025, 370.027, F.S.; Section 6, Chapter 83-134, Laws of Florida, as amended by Chapter 84-121, Laws of Florida. History - New 1-1-95.2222

Research and Monitoring Action Plan

This action plan identifies and describes research and monitoring strategies that will be implemented for the Florida Keys National Marine Sanctuary. The strategies within the plan are derived from Alternative III, the most balanced of the management alternatives. For each strategy, the time required for implementation, funding availability, costs, and responsible parties are outlined. Although this is the final set of research and monitoring strategies, only a subset will be implemented in the first year of Sanctuary operation. These strategies are expected to have a significant impact on Sanctuary resources. Table 17 summarizes key information about the implementation of research and monitoring strategies.

Introduction

Research and monitoring are critical to achieving the Sanctuary's primary goal of resource protection. The Keys' ecosystem is diverse and complex, and many of its processes and their interrelationships are not well known. Also, while many resource impacts are obvious and severe, they are often not documented or quantified, and their causes may be even less clear or completely unknown. The purpose of research and monitoring is to establish a baseline of information on the resource and the various components of the ecosystem, and how they interact. In this way, research and monitoring can ensure the effective implementation of management strategies using the best available scientific information.

Research and monitoring activities must focus on fundamental processes and specific management-driven topics. Information generated from such activities will be used to:

- provide the public with a means to evaluate the effectiveness of the Sanctuary;
- provide a means to distinguish between the effects of human activities and natural variability;
- develop hypotheses about causal relationships which can then be investigated;
- evaluate management actions; and
- verify and validate quantitative predictive models used to evaluate and select management actions.

Two laws require that a research and monitoring program be implemented within the Sanctuary. Section 309 of the NMSA mandates that the "Secretary of Commerce shall take such action as is necessary and reasonable to promote and coordinate the use of national marine sanctuaries for research, monitoring, and education purposes." The 1992 amendments to the FKNMSPA (Section 7(a)(4)) are much more specific, calling on the Secretary of Commerce to:

- identify priority needs for research and amounts needed to improve management of the Sanctuary, and in particular, the coral reef ecosystem within the Sanctuary;
- identify clearly the cause-and-effect relationships between factors threatening the health of the coral reef ecosystem in the Sanctuary; and
- establish a long-term ecological monitoring program and database, including methods to disseminate information on the management of the coral reef ecosystem.

How the Plan is Organized. This action plan is organized into three sections: an introduction, description of strategies, and implementation. The introduction summarizes the goals and objectives of the Research and Monitoring Program, and provides background information on planning efforts. The strategy description section organizes strategies into several groups, including: 1) research management; 2) monitoring; 3) fisheries impacts; 4) environmental assessment; and 5) predictive strategies. The implementation section details how strategies in the plan will be placed into action. For each strategy and component activity, the priority level, funding availability, costs, and timing of implementation are summarized.

Background

It has long been recognized that research efforts in the Keys must be focused on priority issues, and various workshops have been held to define those issues. In October 1991, NOAA's Sanctuaries and Reserves Division sponsored a workshop where over 90 environmental managers and scientists presented their views and developed a list of priorities and objectives for managing a successful research program (Harwell, 1991). NOAA had previously

(1988) funded the Marine Resources Development Foundation to sponsor a workshop to discuss management, education, and research issues, and to develop priority action plans (Miller, 1988). Other pertinent planning efforts include the five-year research plan of the Florida Marine Research Institute (FMRI) (FDNR, 1989); the Florida Keys Environmental Summit Report (Olson, 1991); an international workshop on coral reefs and their response to global climate change (D'Elia et al., 1991); EPA's Water Quality Protection Program Plan for the Florida Keys National Marine Sanctuary; and the management plans for the Key Largo and Looe Key National Marine Sanctuaries. The Sanctuary will enable improvements in the funding, focus, and quality of research, and the free exchange and discussion of research information. It will influence research by establishing priorities, encouraging open communication among researchers and managers, and allowing Sanctuary staff to work closely with researchers to accomplish mutual goals.

Both research and monitoring activities are in this plan because they employ similar methods, are often conducted by the same people and agencies, and must be linked to one another. Research is goal-oriented with well-defined, testable hypotheses, and is of finite duration. Monitoring involves systematic long-term data collection and analysis to measure the state of the resource and detect changes over time. Detecting such changes can prompt management decisions, can be used to evaluate the success of management strategies, or to focus research on determining the reason for the change.

Management Strategies. Each strategy has been assigned an estimated activity level for year 1 (high, medium, low, or none). This activity level is an estimation of the planned level of action that will occur in the first year after the Sanctuary Management Plan is adopted. In addition, the time required, costs of implementation, and funding availability (Federal, State, local, and private) have been esti-

Table 17. *Summary of Research and Monitoring Strategies*

Page		Strategies	Overall Sanctuary Priority Level [+]	Planned Level of Action in Year 1	Months to Complete	Funding for Full Implementation	Number of Activities to be Undertaken	Number of Institutions
149		**Research Management**						
149	B.11	National Marine Sanctuary Permits	*	High	<12	100%	1	5
150	W.28	Regional Database	High	*Refer to Water Quality Action Plan*				
150	W.29	Dissemination of Findings	Medium	*Refer to Water Quality Action Plan*				
150	W.32	Technical Advisory Committee	*	*Refer to Water Quality Action Plan*				
150		**Monitoring**						
151	F.6	Fisheries Sampling	High	High	36+	<50%	2	7
152	W.20	Monitoring	High	*Refer to Water Quality Action Plan*				
152	W.33	Ecological Monitoring	High	Medium	60+	<50%	7	8
155	Z.2	Ecological Reserves	High	Medium	36+	<50%	4	4
156	Z.3	Sanctuary Preservation Areas	High	Medium	36+	<50%	4	4
157	Z.5	Special-use Areas	High	Medium	36+	<50%	4	5
158		**Fisheries Impacts**						
158	F.3	Stocking	Low	None	36	None	1	9
159	F.4	Aquaculture Alternatives	Low	None	36+	<50%	1	8
159	F.7	Artificial Reefs	Low	None	48+	<50%	1	7
159	F.10	Bycatch	Low	None	48+	<25%	1	7
160	F.11	Gear/Method Impacts	Low	None	48+	<25%	1	7
160	F.14	Spearfishing	Low	None	36	0%	2	5
161	F.15	Sponge Harvest	Medium	Medium	36	<75%	1	8
161		**Special Studies**						
161	B.2	Habitat Restoration	Medium	Medium	24+	50-74%	2	8
162	R.5	Carrying Capacity	Medium	Low	48+	<50%	1	9
162	W.5	Water Quality Standards	Medium	*Refer to Water Quality Action Plan*				
163	W.18	Pesticide Research	High	*Refer to Water Quality Action Plan*				
163	W.24	Florida Bay Influence	High	*Refer to Water Quality Action Plan*				
163		**Predictive Strategies**						
163	W.21	Predictive Models	High	*Refer to Water Quality Action Plan*				

[+] Strategies with an "* " for Overall Sanctuary Priority Level are already existing programs and/or will be completed in the first year of sanctuary operation.

Existing Research and Monitoring Programs

Research. Much research has been done in the Florida Keys, and a synopsis of this work can be found in the Description of the Affected Environment chapter of this Management Plan and in the Site Characterization for the Sanctuary, 1996. Research is conducted by many groups, including local, State, and Federal agencies; public and private universities; private research foundations; environmental organizations; and independent researchers. While productive, research efforts are driven by diverse goals, vary in available resources and quality, and do not effectively share results. Leading research groups include:

- NOAA's on-site National Marine Sanctuary Program and National Marine Fisheries Service (NMFS) staff;
- NOAA's on-site National Undersea Research Center (NURC) at the University of North Carolina-Wilmington. Since 1991, NURC's Florida program has been a major sponsor of undersea research in the Sanctuary. Using the Aquarius undersea laboratory and surface boats, scientists conduct research in the following areas: reef health, reef development, water quality, fisheries, and ecology.
- The U.S. Geological Service's Center for Coastal Geology maps and conducts geological research on coral reefs in the Florida Keys;
- The Florida Department of Environmental Protection (FDEP), Florida Marine Research Institute (FMRI) (St. Petersburg and Long Key laboratories);
- The University of Miami's Rosenstiel School for Marine and Atmospheric Sciences;
- The State university system coordinated through the Florida Institute of Oceanography (FIO). The most active universities are the University of Florida, the University of South Florida, and Florida International University. FIO collaborates with the FDEP in running the Long Key Lab.

Monitoring. A number of monitoring activities are occurring in or near the Keys. The most comprehensive, long-term monitoring program underway in the Keys is conducted through the Water Quality Protection Program (WQPP) funded by USEPA. The WQPP monitoring program began in 1994 and consists of three components: water quality, corals/hardbottoms, and seagrasses. The following are some of the monitoring efforts that are occurring in this area:

Corals. Coral population dynamics are being monitored at 42 fixed stations throughout the Keys as part of the WQPP. Historical monitoring has been done throughout the Keys by the NMFS, FDEP, SEAKEYS, and the College of Charleston.

Fish. The NMFS and the FDEP monitor recreational and commercial catch statistics concerning commercially important species. NMFS' Reef Resources Team has been gathering baseline data on reef fish populations in and around the no-take zones since 1993.

Seagrass. Seagrass dynamics are being monitored at 51 sites throughout the Sanctuary as part of the WQPP. The National Park Service (NPS) and the University of Virginia monitor seagrass productivity in Everglades National Park.

Mangroves. The NPS in Everglades National Park is evaluating the effects of sea level rise on mangroves.

Benthic Organisms. NOAA, Biscayne National Park, and the FDEP are monitoring organisms such as spiny lobster, sponge, conch, stone crabs, and Diadema. NOAA's National Status and Trends Program monitors one mollusc in the Upper Keys for toxic contamination.

Hardbottom Communities. The Nature Conservancy's (TNC) Florida and Caribbean Marine Conservation Science Center has been monitoring hardbottom communities since 1981.

Algal Blooms. TNC and the FDEP have been monitoring and mapping algal blooms in Florida Bay and the Sanctuary.

Physical parameters. FIO's SEAKEYS program has been operating six automated, instrumented monitoring stations placed strategically along the Keys for the past 7 years. These stations monitor wind speed, wind direction, precipitation, barometric pressure, air temperature, solar irradiance near surface and at 3m, seawater temperature near surface and 3m depth, and surface salinity.

mated for all strategies. The component activities within each strategy, and the institutions responsible for implementing them, have been identified.

The strategies for the Management Plan, which includes Research and Monitoring Action Plan and all other action plans combined, have been grouped into three priority levels, based on their relative importance or feasibility. A strategy's priority level is based on factors such as available funding, costs, personnel requirements, timing, levels of existing implementation, and existing legislative/regulatory authority. The high priority level includes the 16 most important strategies. The medium priority level contains 36 strategies that represent the next level of importance to the Sanctuary and will have some level of activity in year one. Low priority items contain the remaining strategies in the Management Plan. Those strategies planned for completion in or before year one do not have a priority level.

Research and Monitoring Strategies. The plan includes the 27 strategies within Alternative III that have a research and/or monitoring component. The highest-ranking strategies, in terms of overall priority, are Water Quality Monitoring, Ecological Reserves, and Sanctuary Preservation Areas. These strategies include major research and monitoring efforts, and are critical to the ultimate success of the Sanctuary. Thirteen other research and monitoring strategies are included in both medium and high priority levels. As stated above,

the strategies in the first two priority levels are planned to have some level of activity in year 1.

Research and monitoring strategies are organized into five theme groups: research management; monitoring; fisheries impacts; environmental assessment; and predictive strategies. Research management strategies are those that facilitate or enhance the capabilities for conducting research and monitoring within the Sanctuary. Monitoring strategies are composed of those that establish monitoring programs of Sanctuary resources. The fisheries impacts group includes seven strategies that will provide basic research on fisheries management techniques, aquaculture, the impacts of artificial reefs, and harvesting methods. Environmental assessment strategies will result in the assessment of environmental conditions within the Sanctuary. Predictive strategies will provide research that will allow resource managers to assess the potential impact of selected management strategies.

Relationship to Other Action Plans. Because of the need to establish separate management components (i.e., research, water quality, regulatory, volunteer) within the Sanctuary, research and monitoring strategies in this plan also appear in other action plans. For example, in addition to having a research thrust, a strategy may also have a water quality, volunteer, or regulatory component. All of the water quality strategies, with the exception of Ecological Monitoring (W.33), are only given by title in this plan. The detailed implementation scheme for these strategies is provided in the Water Quality Action Plan. If a strategy appears in more than one action plan and/or components of the strategy appear in other action plans, this is noted in the description.

Goals and Objectives

The primary goal of the Research and Monitoring Program is to provide the knowledge necessary to make informed decisions about protecting the biological diversity and natural ecosystem processes of the Sanctuary and its resources.

Sanctuary Goals. Two acts, the NMSA and the FKNMSPA, establish additional research and monitoring goals, including the:

- identification of priority areas for research;
- establishment of an ecological monitoring program;
- development of standards based on biological monitoring or assessment to ensure the protection and restoration of water quality, coral reefs, and other marine resources;
- establishment of a comprehensive water quality monitoring program to determine the sources of pollution and evaluate the results of pollution-reduction efforts;
- evaluation of progress in achieving water quality standards and protecting and restoring the Sanctuary's coral reefs and living marine resources;
- establishment of strong communication and cooperation between the scientific community and resource managers;
- coordination of research efforts to achieve the most beneficial results; and
- promotion of public awareness and resource stewardship.

Sanctuary Objectives. To achieve these goals, the following objectives should be met:

- provide leadership and coordination in research and monitoring activities by: a) recruiting other institutions to carry out priority actions under the Sanctuary program, including volunteer groups that can foster an attitude of community stewardship; and b) registering researchers within the Sanctuary in order to share information about research activities and encourage coordination and cooperation among scientists and resource managers;

- outline information needs and set priorities for research and monitoring that address issues related to management actions to be implemented and evaluated over the next five years, such as: a) baseline studies and long-term monitoring programs addressing water quality and the evaluation of water quality improvement strategies; b) studies on the impacts to habitats and their recovery from physical damage, as well as the effectiveness of restoration actions; c) baseline surveys and long-term monitoring that measure the ecological effects of establishing no-take zones and Wildlife Management Areas; and d) studies that distinguish human impacts from natural variability and contribute to biologically-based standards for the sustainable use of the Sanctuary;

- encourage and provide support for research and monitoring that lead to a better understanding of key ecological processes and criteria for recognizing ecological change;

- take a lead role in making the results of research and monitoring efforts available to all audiences, either directly or through collaborating institutions;

- ensure research is funded on an open and competitive basis;

- coordinate research permitting among agencies; and

- use research and monitoring results to evaluate management actions and improve them accordingly.

Description of Strategies

Research Management

Research management strategies include those that facilitate or enhance the capabilities for conducting research and monitoring within the Sanctuary. The first strategy will result in the development of a sanctuary-wide permitting program to allow researchers, educators, and others to conduct prohibited activities under certain circumstances. The second strategy will result in the development of a regional database for storing research and monitoring results. The third strategy (W.29) creates a program to disseminate information about research findings among scientists and resource managers. The fourth strategy (W.32) establishes an advisory committee for coordinating and guiding research activities relating to water quality, and ecology.

Research Management Strategies

B.11: National Marine Sanctuary Permits
• Establish permitting program

W.28: Regional Database
(This strategy is described in detail in the Water Quality Action Plan)

W.29: Dissemination of Findings
(This strategy is described in detail in the Water Quality Action Plan)

W.32: Technical Advisory Committee
(This strategy is described in detail in the Water Quality Action Plan)

B.11: National Marine Sanctuary Permits

Establish permits (e.g., for researchers, educators, emergency response personnel, salvors, and salvage operators) to conduct activities otherwise prohibited within the Sanctuary; facilitate simplified permitting of research activities.
(Completed in Year 1)

Activity 1- Establish Permitting Program. This strategy will allow researchers, educators, and others to conduct prohibited activities if those activities will: 1) further research and monitoring in the Sanctuary; 2) further the educational, natural, or historical resource value of the Sanctuary; or 3) assist in managing the Sanctuary. Permits will be monitored and their provisions enforced. The permitting program will enable oversight of the research occurring within the Sanctuary. In addition, for those research activities occuring in the Sanctuary that are not prohibited, there is a voluntary research registry.

See §922.166 of the regulations in the Regulatory Action Plan for details on the permit requirements.

■*Existing Program Implementation*. Research permits for the Looe Key and Key Largo National Marine Sanctuaries are currently issued by NOAA's Sanctuaries and Reserves Division. The FDEP and Monroe County also issue permits for certain activities within their jurisdiction.

■*Implementation*. Research permitting is essential, and will be conducted by Sanctuary staff and coordinated with the FDEP. All permitting will be conducted by the on-site Sanctuary manager, and permit possession will be enforced by Sanctuary staff. Research must be allowed to continue with minimal disruption following implementation of the Management Plan. When determining research to be conducted, the potential for damage will be compared to the expected benefits of the results. Research that may result in resource alteration must be of the highest quality and considered highly beneficial to the Sanctuary. Permitting will not require substantial resources, and should be maintained regardless of funding changes. The results of permitted research will be evaluated through peer review.

■*Schedule.* This activity has been completed.

W.28: Regional Database

Establish a regional database and data management system for recording research results and biological, physical, and chemical parameters associated with Sanctuary monitoring programs. *(Priority Level High, High Level of Action in Year 1, 12 Months to Complete, 75% Funding Available for Full Implementation)*

This strategy is described in detail in the Water Quality Action Plan.

W.29: Dissemination of Findings

Develop a program to synthesize and disseminate scientific research and monitoring results, including an information exchange network, conferences, and support for the publication of research findings in peer-reviewed scientific journals.
(Priority Level Medium, Low Level of Action in Year 1, 60+ Months to Complete, <50% Funding Available for Full Implementation)

This strategy is described in detail in the Water Quality Action Plan.

Strategy W.32: Establish Technical Advisory Committee

Establish a Technical Advisory Committee for coordinating and guiding research activities for both NOAA and EPA.
(This strategy has been completed)

This strategy is described in detail in the Water Quality Action Plan.

Monitoring

This group is composed of strategies that establish monitoring programs for Sanctuary resources. This group includes the three major monitoring strategies (Water Quality, Ecological Monitoring, and Fisheries Monitoring), and two strategies designed to enhance monitoring techniques. All of these strategies will be implemented in year 1.

Monitoring is essential to achieve the primary goal of resource protection. The purpose of monitoring is to first, establish a baseline of resources, processes, and functioning of the ecosystem against which standards for resource protection can be measured, and, second, to assess the status and trends of the ecological resources. Monitoring provides a means to anticipate future problems before they require expensive solutions. The objectives of the monitoring program are to:

Monitoring Strategies

F.6: Fisheries Sampling
- Evaluate and modify existing census programs
- Initiate a fishery pre-recruitment monitoring effort

W.20: Monitoring
(This strategy is described in detail in the Water Quality Action Plan)

W.33: Ecological Monitoring
- Hire a research and monitoring coordinator
- Establish an ecological information system
- Conduct status and trends assessment
- Establish a fisheries ecological monitoring and research component
- Establish a data management protocol
- Develop a periodic report on Sanctuary health
- Establish a volunteer monitoring program

Z.2: Ecological Reserves
- Develop baseline data
- Monitor ecological reserves
- Utilize ecological reserves as controls
- Utilize as a research area

Z.3: Sanctuary Preservation Areas
- Develop baseline data
- Monitor SPAs
- Utilize SPAs as controls
- Utilize as a research area

Z.5: Special-Use Areas
- Develop baseline data
- Monitor SUAs
- Utilize SUAs as controls
- Utilize as a research area

- utilize the Sanctuary Preservation Areas and Ecological Reserves as primary monitoring areas;
- establish an ongoing and open dialogue between scientists, managers, and the public to facilitate an efficient and responsive monitoring program;
- coordinate with the Environmental Protection Agency (EPA)/Florida Department of Environmental Protection (FDEP) Water Quality Monitoring Program to maximize the use of limited resources;
- establish an effective feedback mechanism between research and monitoring in order to maximize the use of limited resources;
- assess the status and trends of corals, fish, plankton, seagrasses, mangroves, and benthic organisms;
- assess the overall health of the ecosystem; and
- provide information for the development of a predictive model of the Florida Keys ecosystem.

Monitoring efforts in the Sanctuary will focus on the Sanctuary Preservation Areas and Ecological Reserves. These zones were established for the purpose of protecting biological resources and ecosystem processes; as such, their effectiveness can only be determined by monitoring the status and trends of biological resources within and outside of the zones.

Strategy F.6: Fisheries Sampling

Enhance the resolution of existing commercial and recreational fisheries-dependent and independent sampling programs to provide statistics on catch and effort. This will be accomplished by establishing statistical areas based on “completeness criteria” including scientific need. Initiate fisheries independent sampling programs to measure the pre-recruitment of economically important species within the statistical areas. Regulations will be developed and implemented in accordance with the FMFC and the protocols for consistent regulations in strategy F.1. *(Priority Level High, High Level of Action in Year 1, 36+ Months to Complete, <50% Funding Available for Full Implementation)*

Activity 1-Evaluate and Enhance Existing Census Programs. Existing commercial landing and recreational creel census programs will be evaluated and enhanced to provide statistically based management information for regulating take. This includes the assessment and modification of information types and mandatory versus voluntary information. To increase the resolution of the programs, statistical areas will be established to provide information on catch and effort. The number of areas will be based on "completeness criteria," including scientific need.

■*Implementation*. The FDEP will have the primary responsibility for implementing this activity. The National Marine Fisheries Service (NMFS), National Park Service (NPS), the South Atlantic and Gulf of Mexico Fishery Management Councils (SAFMC and GMFMC), and the Florida Marine Fisheries Commission (FMFC) will provide primary support.

■*Schedule.* This activity will have a high level of action in year 1 for evaluation and recommendations. It will require 12 months to complete. Funding for enhancement does not exist, and no schedule has been determined.

Activity 2-Initiate a Fishery Pre-recruitment Monitoring Effort. A fisheries pre-recruitment monitoring effort will be initiated for the long-term prediction of fishery stocks for Sanctuary-level management. This effort will be independent of commercial monitoring activities; FDEP has begun implementation of fishery pre-recruitment monitoring efforts for other areas in the state. Several statistical areas will be established, and this activity will evaluate and implement the programs to that level.

■*Existing Program Implementation*. The FDEP has partially implemented a statewide fisheries pre-recruitment monitoring program that will include the Sanctuary.

■*Implementation*. The FDEP will have the primary responsibility for implementing this activity, as part of their current fisheries monitoring program. Any regulations derived from this information will be developed by the FMFC. No funding is available for Sanctuary-wide monitoring.

■*Schedule.* This activity will have a medium level of action in year 1. It will require 36+ months to complete.

W.20: Monitoring

Conduct a long-term, comprehensive monitoring program as described in the EPA Water Quality Protection Program.
(Priority Level High, Low Level of Action in Year 1, 60+ Months to Complete, <50% Funding Available for Full Implementation)

This strategy is described in detail in the Water Quality Action Plan.

Strategy W.33: Ecological Monitoring

Develop and implement a Sanctuary-wide, intensive ecosystem monitoring program. The objective of the program will be to monitor the status of various biological and ecological indicators of system components throughout the Sanctuary and adjacent areas in order to discern the local and system-wide effects of human and natural disturbances and assess the overall health of the Sanctuary.

This strategy will establish a comprehensive, long-term monitoring program throughout the Sanctuary and adjacent areas that will have three purposes: 1) to supply resource managers with information on the status of the health of living resources and the ecosystem; 2) to determine causal relationships related to management decisions; 3) and to evaluate the effectiveness of management actions such as zoning implementation.

The Ecological Monitoring Program will be fully integrated with the Water Quality Monitoring Program through the Technical Advisory Committee, and will include: a temporal and spatial ecological information system based on current knowledge; status and trends assessments of corals, fishes, seagrasses, benthic organisms, algae, and mangroves; a fisheries ecology monitoring and research component to examine community composition and function within the Sanctuary's habitats; a data analysis, management, and dissemination protocol; a periodic report on Sanctuary health; and a volunteer monitoring program.
(Priority Level High, Medium Level of Action in Year 1, 60+ Months to Complete, <50% Funding Available for Full Implementation)

■*General Implementation*. NOAA will be responsible for the overall implementation of the Ecological Monitoring Program, working with the EPA, FDEP, academic and nongovernmental organizations (NGOs), and the TAC. NOAA will have the lead responsibility for implementing most activities, but the FDEP will be responsible for establishing an ecological information system (Activity 2) and data analysis, management, and dissemination protocol (Activity 5).

■*General Relationship to Other Strategies*. Integration of the Ecological Monitoring Program and the Water Quality Protection Program will be achieved through the management committee specified in the Water Quality Protection Program. The TAC will be

used by NOAA to assist in the design and prioritization of the Research and Monitoring Program. The Sanctuary Superintendent will serve on the management committee that coordinates and facilitates the efforts of the TAC.

■*General Schedule*. The Ecological Monitoring Program will have a medium level of action in year 1. It will require 60+ months to complete.

Activity 1-Hire a research and monitoring coordinator. A research and monitoring coordinator is needed to develop and maintain the Monitoring Program, coordinate research activities, oversee the permitting of research, assist in maintaining and updating the ecological information system, and act as a liaison with the Water Quality Protection Program, FDEP/FMRI, National Undersea Research Center, and other organizations.

■*Existing Program Implementation.* Currently, a Sanctuary program specialist serves as the Sanctuary research coordinator.

■*Implementation*. NOAA and the FDEP will collaborate on hiring the coordinator.

■*Schedule*. This activity will have no action in year 1. It will require 6 months to complete.

Activity 2-Establish an Ecological Information System. Spatial and temporal information about ecological resources will be incorporated into an existing Federal or State geographic information system (GIS). Information that summarizes benthic habitats, species distributions, species life histories, etc. will be included in this system. This is essential baseline data for an effective ecological monitoring program. Information will be derived from existing sources such as the Minerals Management Service/ Marszalek maps and the NOAA/FDEP benthic habitat maps.

■*Existing Program Implementation.* The FDEP has several projects underway that should meet this need. For example, it is currently establishing a marine geographic information system that will include information on the Keys. Monroe County is also developing a GIS for land-use analysis, with some marine applications. In addition, NOAA is developing spatial and temporal information for the Keys in its GeoCOAST GIS Facility.

■*Implementation*. The FDEP will be responsible for implementing this activity. It will be accessible by the Sanctuary staff over the Internet.

International Coral Monitoring Efforts

- The United Nations' Environment Program, in cooperation with several international organizations, has initiated a planning process for establishing a global coral ecosystem (including associated seagrass and mangrove ecosystems) monitoring network. Researchers in Australia have designed and tested a prototype sampling methodology for this effort.
- In the Caribbean region, CARICOMP is a program of the Intergovernmental Oceanographic Commission and UNESCO, involving 21 marine laboratories in 16 countries, whose purpose is to standardize methodologies for monitoring corals, seagrasses, and mangroves.
- The Nature Conservancy is compiling a database on habitat classifications and threatened coral species in the Caribbean region.
- The Sanctuary's Ecological Monitoring Program will adopt established international guidelines for monitoring corals, seagrasses, and mangroves, and the Sanctuary may be a candidate for a sampling site or training center for the global network.

■*Schedule*. This activity will have a high level of action in year 1. It will require 24 months to complete.

Activity 3-Conduct Status and Trends Assessments of Corals, Fishes, Seagrasses, Benthic Organisms and Algae, and Mangroves. Biological indicators for each of these biotic components will be selected by NOAA, with assistance from the TAC, and will be monitored intensively. Some indicators being considered are:

- coral cover: overall increase in living coral of 5%, or a total of 30% cover for specific areas;
- coral diversity: no significant decline in existing levels of diversity with the increase in overall percent cover described above;
- coral indices: percent of coral as a function of fleshy algae biomass will increase, and percent of living coral tissue as a function of dead tissue in massive corals will increase to greater than 55 percent;
- coral recruitment: increase in successful recruitment of coral as reflected in size distribution curves;

- fish: increase in numbers of ecologically important species, such as cleaning gobies, while a high diversity of feeding guilds is maintained.

- shellfish: spiny lobster population is maintained at optimum sustainable yield;

- algae: decrease in percent of macro-algae cover and canopy height and decrease in extent and frequency of algal blooms;

- sponges: increase in abundance and biomass of sponges;

- sedimentation: decline in rates of deposition of sediments along the coral reef tract.

A baseline survey of the indicators will be conducted over a two-year period beginning in 1997. A status and trends report of indicator conditions will then be compiled on a periodic basis.

■*Existing Program Implementation.* A number of monitoring programs are already operating in the Sanctuary. For example, in 1994 the Water Quality Monitoring Program commenced, which includes water quality, seagrass and coral/hardbottom components. The University of Miami's Center for Marine and Environmental Analysis is undertaking a major, 6-year, multimillion dollar effort to model various aspects of the South Florida environment, including the development of indicators.

■*Implementation.* NOAA will be responsible for implementing this activity, but the FDEP will play a primary role in implementation. Academic institutions will provide additional assistance. The TAC will help NOAA choose the appropriate indicators.

■*Schedule.* This activity will have a high level of action in year 1. It will require 24+ months to complete.

Activity 4-Establish a Fisheries Ecology Monitoring and Research Component to Examine Community Composition and Function within the Sanctuary's Habitats. Fisheries are an important component of the Keys' ecosystem, both in terms of use values and ecological function. For example, grazing by herbivorous reef fish provides an important balancing force in controlling algal growth on corals. Overharvesting of herbivorous reef fish upsets this balance. Monitoring fish population dynamics, as well as studying life histories, should focus on answering questions about the effects of exploitation and the relationship between fish species and the areas they inhabit, particularly concerning recruitment. Results of the Monitoring Program may be used by fishery resource and Sanctuary managers to develop population, community, and ecosystem-level models.

■*Existing Program Implementation*. The NMFS has taken a yearly census of fish populations for 10 years at the Key Largo and Looe Key National Marine Sanctuaries. Since 1986, the FDEP/FMRI has administered a fishery-dependent monitoring program, including such things as the snapper-grouper complex, pompano, dolphin, mackerel, and spiny lobster. The FMRI has also conducted a recreational site survey in Monroe County since 1986, revealing information about fishing activity, geographic location, habitat use, and catch composition.

■*Implementation.* NOAA will select the indicator species that will represent both commercially and functionally important species, as well as the major habitats of the Sanctuary (i.e., coral reefs, seagrasses, mangroves, hardbottom, etc). All life history stages of the indicator species should be monitored. Once indicator species are chosen, NOAA will establish a sampling regime, based on the FDEP's benthic habitat maps, that will coincide as much as possible with the water quality sampling regime. Management zones, specifically Sanctuary Preservation Areas and Ecological Reserves, will be included in the sampling regime (see strategies Z.2 and Z.3). Sampling strategies for adult reef fishes should use a nondestructive visual technique such as that developed by the NMFS for the Biscayne National Park. Sampling began in 1994.

■*Schedule.* This activity will have a medium level of action in year 1. It will require 24+ months to establish.

Activity 5-Establish a Data Analysis, Management, and Dissemination Protocol. Establish a regional database and data management system for recording research results and biological, physical, and chemical parameters associated with Sanctuary monitoring programs. Develop a program to disseminate scientific research results, including an information exchange network, conferences, and support for the publication of research findings in peer-reviewed scientific journals.

For information on the implementation schedule of this activity, see strategies W.28 (Regional Database) and W.29 (Dissemination of Findings).

Activity 6-Develop a Periodic Report on Sanctuary Health. Develop a periodic report on Sanctuary Health. A report will be produced periodically to communicate to the public and policymakers the current status of Sanctuary resources. The report should be as simple and straightforward as possible and utilize a consistent format from issue to issue.

■*Implementation*. NOAA will produce the report with the assistance of other agencies, scientists, and the public. The TAC will be used for scientific peer review.

■*Schedule*. This activity will have no action in year 1. It will require 12 months to complete and will be done on a periodic basis.

Activity 7 - Establish a Volunteer Monitoring Program. Volunteer monitoring, if carried out by trained individuals, presents a viable and cost-effective means of collecting data on the status and trends of various ecological indicators.

■*Existing Program Implementation*. The Nature Conservancy (TNC), in cooperation with NOAA, has established a volunteer monitoring program for marine benthic communities in the Keys.

■*Implementation*. TNC, in cooperation with NOAA, should continue to take the responsibility for developing and implementing a volunteer monitoring program.

■*Schedule*. This will be a continuous activity throughout the duration of the program.

This strategy is also included in the Volunteer and Water Quality action plans.

Strategy Z.2: Ecological Reserves

These areas are designed to encompass large, contiguous diverse habitats. They are intended to provide natural spawning, nursery, and permanent residence areas for the replenishment and genetic protection of marine life, and to protect and preserve all habitats and species. These reserves are intended to protect areas that represent the full range of diversity of resources and habitats found throughout the Sanctuary. The intent is to meet these objectives by limiting consumptive activities, while continuing to allow activities that are compatible with resource protection. This will provide the opportunity for these areas to evolve in a natural state, with a minimum of human influence. These zones will protect a limited number of areas that represent the diverse habitats within the Sanctuary, and that provide important habitat for sustaining natural resources such as fish and invertebrates. These areas have been selected to protect and enhance biodiversity and provide natural spawning, nursery, or permanent residence areas that will serve to replenish stocks of all species, particularly those not protected by fishery management regulations.
(Priority Level High, Medium Level of Action in Year 1, 36+ Months to Complete, <50% Funding Available for Full Implementation)

Activity 1-Develop Baseline Data. Before monitoring begins, a baseline survey of existing resources in each Ecological Reserve must be conducted. The surveys will characterize the status of important marine species and their habitat.

■*Implementation*. NOAA will be the lead agency responsible for implementing this activity. The NMFS and FDEP will provide support in implementing this activity.

■*Schedule*. This activity will have a high level of action in year 1. It will require 24 months to complete.

Activity 2-Monitor Ecological Reserves. Research and monitoring activities will be conducted in these areas to provide important information for comparing the effects of natural processes and consumptive activities on species and habitats. These ecological monitoring studies will determine if the area's biodiversity and productivity are being adequately protected by the exclusion of consumptive activities. Based on the results of this activity, the five-year update of the Management Plan will consider expanding, modifying, or eliminating these zones.

■*Implementation*. NOAA will be the lead agency responsible for implementing this activity. The FDEP and EPA will provide primary support.

■*Schedule*. This activity will have a medium level of action in year 1. It will require 36+ months to complete.

Activity 3-Utilize Ecological Reserves as Controls. Ecological Reserves will be utilized as controls to determine the effects of consumptive and nonconsumptive activities in disturbed areas. Based on the results of this activity, the five-year update of the Management Plan will consider expanding, modifying, or eliminating these zones.

■*Existing Program Implementation*. Some consumptive activities are currently limited in Key Largo and Looe Key National Marine Sanctuaries, and these sites will be used to establish controls for ecological reserves.

■*Implementation*. NOAA will be the lead agency responsible for implementing this activity. The FDEP and EPA will provide primary support.

■*Schedule*. This activity will have a medium level of action in year 1. It will require 36+ months to complete.

Activity 4-Utilize Ecological Reserves as Research Areas. Ecological Reserves will provide scientists, resource managers and the public with an opportunity to observe and study a naturally functioning ecosystem with minimal human disturbance. Researchers may be permitted to conduct non-invasive experiments within the reserves to address management issues such as: a) the impacts to habitats and their recovery from physical damage, as well as the effectiveness of restoration actions; b) distinguishing human impacts from natural variability; c) establishing biologically based standards for the sustainable use of the Sanctuary; and d) understanding key ecological processes in order to develop criteria for recognizing ecological change. Based on the results of this activity, the five-year update of the Management Plan will consider expanding, modifying, or eliminating these zones.

■ *Existing Program Implementation.* Some consumptive activities are currently limited in Key Largo and Looe Key National Marine Sanctuaries.

■ *Implementation.* NOAA will be the lead agency responsible for implementing this activity. The FDEP and EPA will provide primary support.

■ *Schedule.* This activity will have a medium level of action in year 1. It will require 36+ months to complete.

The process to prioritize and implement zone marking is discussed in the Zoning Action Plan. The regulations for Sanctuary Preservation Areas are included in the Regulatory Action Plan.

Strategy Z.3: Sanctuary Preservation Areas

These zones will focus on the protection of shallow, heavily used reefs where conflicts occur between user groups, and where concentrated visitor activity leads to resource degradation. They are designed to enhance the reproductive capabilities of renewable resources, protect areas that are critical for sustaining and protecting important marine species, and reduce user conflicts in high-use areas. This will be accomplished through a prohibition of consumptive activities within these areas. They have been chosen based on the status of important habitat, the ability of a particular area to sustain and protect the habitat, the level of visitor use, and the degree of conflict between consumptive and nonconsumptive users. The actual size and location of these zones have been determined by examination of user patterns, aerial photography, and ground-truthing of specific habitats.
(Priority Level High, Medium Level of Action in Year 1, 36+ Months to Complete, <50% Funding Available for Full Implementation)

Activity 1-Develop Baseline Data. Before monitoring begins, a baseline survey of existing resources in each SPA must be conducted. The surveys will characterize the status of important marine species and their habitat.

■*Implementation*. NOAA will be the lead agency responsible for implementing this activity. The NMFS and FDEP will provide support in implementing this activity.

■*Schedule*. This activity will have a high level of action in year 1. It will require 24 months to complete.

Activity 2-Monitor SPAs. Research and monitoring activities will be conducted in these areas to provide important information for comparing the effects of natural processes and consumptive activities on species and habitats. These ecological monitoring studies will determine if the area's diversity and productivity are being adequately protected.

■*Implementation*. NOAA will be the lead agency responsible for implementing this activity. The FDEP and EPA will provide primary support.

■*Schedule*. This activity will have a medium level of action in year 1. It will require 36+ months to complete.

Activity 3-Utilize SPAs as Controls. SPAs will be used as controls to determine the effects of consumptive and nonconsumptive activities in disturbed areas.

■*Existing Program Implementation*. Some consumptive activities are currently limited in the Key Largo and Looe Key National Marine Sanctuaries.

■*Implementation*. NOAA will be the lead agency responsible for implementing this activity. The FDEP and EPA will provide primary support.

■*Schedule*. This activity will have a medium level of action in year 1. It will require 36+ months to complete.

Activity 4-Utilize SPA's as Research Areas. Researchers may be permitted to conduct noninvasive experiments within the SPA's to address management issues such as: a) the impacts to habitats and their recovery from physical damage, as well as the effectiveness of restoration actions; b) distinguishing human impacts from natural variability; c) establishing biologically-based standards for the sustainable use of the Sanctuary, and d) understanding key ecological processes in order to develop criteria for recognizing ecological change. Based on the results of this activity, the five-year update of the Management Plan will consider expanding, modifying, or eliminating these zones.

■*Existing Program Implementation.* Research has been conducted in many of the SPAs, such as Looe Key and Conch Reef.

■*Implementation.* NOAA will be the lead agency responsible for implementing this activity. The FDEP and academic institutions will provide primary support.

■*Schedule.* This activity will have a medium level of action in year 1. It will require 36+ months to complete.

Strategy Z.5: Special-Use Areas

This strategy establishes zones to set aside areas for scientific research and educational purposes, restoration, monitoring, or to establish areas that confine or restrict activities such as personal watercraft operations and establish live-aboard mooring fields. These areas will minimize impacts on sensitive habitats and reduce user conflicts. Special management programs (e.g., monitoring, research, Special-use Permits and restoration) can be conducted without impediment in these areas. They can be used to set aside areas for specific uses, such as long-term research and monitoring, and/or minimizing the adverse environmental effects of high-impact activities. *(Priority Level Medium, Low Level of Action in Year 1, 12+ Months to Complete, <50% Funding Available for Full Implementation)*

Activity 1-Develop Baseline Data. Before monitoring begins, a baseline survey of existing resources in each Special-use Area (SUA) must be conducted. The surveys will characterize the status of important marine species and their habitat.

■*Implementation.* NOAA will be the lead agency responsible for implementing this activity. The NMFS and FDEP will provide support in implementing this activity.

■*Schedule.* This activity will have a high level of action in year 1. It will require 24 months to complete.

Activity 2-Monitor SUAs. Research and monitoring activities will be conducted in these areas to provide important information for comparing the effects of natural processes and consumptive activities on species and habitats. These ecological monitoring studies will determine if the area's diversity and productivity are being adequately protected.

■*Implementation.* NOAA will be the lead agency responsible for implementing this activity. The FDEP and EPA will provide primary support.

■*Schedule.* This activity will have a medium level of action in year 1. It will require 36+ months to complete.

Activity 3-Utilize SUAs as Controls. Some SUAs will be used as controls to determine the effects of consumptive and nonconsumptive activities in disturbed areas.

■*Existing Program Implementation.* Some consumptive activities are currently limited in the Key Largo and Looe Key National Marine Sanctuaries.

■*Implementation.* NOAA will be the lead agency responsible for implementing this activity. The FDEP and EPA will provide primary support.

■*Schedule.* This activity will have a medium level of action in year 1. It will require 36+ months to complete.

Activity 4-Utilize SUA's as Research Areas. Researchers may be permitted to conduct non-invasive experiments within the SUAs to address management issues such as: a) the impacts to habitats and their recovery from physical damage; as well as the effectiveness of restoration actions; b) distinguishing human impacts from natural variability, c) establishing biologically-based standards for the sustainable use of the Sanctuary; and d) understanding key ecological processes in order to develop criteria for recognizing ecological change. Based on the results of this activity, the five-year update of the Management Plan will consider expanding, modifying, or eliminating these zones.

The process to prioritize and implement zone marking is discussed in the Zoning Action Plan. The regulations for Special-Use Areas are included in the Regulatory Action Plan.

Fisheries Impacts

Fisheries impacts strategies include seven fisheries-related strategies that will provide for basic research on fisheries management techniques, aquaculture, the impacts of artificial reefs, and harvesting methods.

Fisheries Impacts Strategies

F.3: Stocking
• Assess impacts from fish stocking

F.4: Aquaculture Alternatives
• Assess, develop, and promote aquaculture alternatives

F.7: Artificial Reefs
• Assess impacts from artificial reef development

F.10: Bycatch
• Assess impacts from harvesting methods

F.11: Gear/Method Impacts
• Conduct research on low-impact fishing gear and methods

F.14: Spearfishing
• Assess impacts on fish populations
• Determine incidental habitat damage

F.15: Sponge Harvest
• Assess impacts of sponge harvest methods

Strategy F.3: Stocking

Any ongoing or proposed stocking activities within the Sanctuary must be permitted. Develop a permitting policy for stocking Sanctuary waters that addresses genetic and other biological concerns for both fauna and flora, including seagrass. Assess existing research on the impacts of stocking on the genetic integrity of native stocks. Conduct research on natural stock recovery and its role in maintaining genetic integrity. Conduct a reevaluation of stocking options.
(Priority Level Low, No Action in Year 1, 36 Months to Complete, No Funding Available for Full Implementation)

Activity 1-Assess Impacts from Fish Stocking. The research will build on native stock integrity research conducted elsewhere to determine the effects of fish stocking on the genetic integrity of native species within the Sanctuary. The extent to which changes in the genetic integrity of native stocks have occurred or are likely to occur, and the effects of these changes on abundance, distribution, and life histories, will be determined. Research results will be used to develop and implement regulations governing stocking activities.

■*Existing Program Implementation*. This activity is an existing research priority of the FDEP.

■*Implementation*. The FDEP and NMFS will be primarily responsible for implementing this activity. The Florida Marine Fisheries Commission (FMFC) will develop regulations regarding stocking. This activity is necessary before stocking activities can be considered to restore depleted fisheries. Funding changes will not affect this activity.

■*Schedule.* This activity will have no action in year 1. It will require 36 months to complete.

Strategy F.4: Aquaculture Alternatives

Assess, develop, and promote aquaculture alternatives for all commercially harvested marine species. Support efforts to eliminate the harvest and landing of wild live rock.
(Priority Level Low, No Action in Year 1, 36+ Months to Complete, <50% Funding Available for Full Implementation)

Activity 1-Assess, Develop, and Promote Aquaculture Alternatives. This activity will reduce the fishing pressures on commercially harvested marine life and satisfy the commercial demand for these species. This is a long-term effort designed to identify and develop aquaculture techniques and promote the development of environmentally sound aquaculture operations.

■*Existing Program Implementation*. This is an existing priority of the Sea Grant Program, Florida Department of Agriculture and Consumer Services (FDACS), and FDEP.

■*Implementation*. The Sea Grant Program, the Florida Department of Agriculture and Consumer Services (FDACS), and FDEP will be primarily responsible for implementing this activity as part of their current research programs. FDEP will assist in the implementation of this activity.

■ *Schedule*. This activity will have no action in year 1. It will require 36+ months to complete.

Strategy F.7: Artificial Reefs

Conduct research on the impacts of artificial reefs on fish and invertebrate populations for long-term management including location, size, materials, etc. Monitor and evaluate habitat modification caused by the installation of marine structures. Assess and develop regulations for artificial reef construction and evaluate habitat suitability for artificial reefs.
(Priority Level Low, No Action in Year 1, 48+ Months to Complete, <50% Funding Available for Full Implementation)

Activity 1-Assess Impacts from Artificial Reef Development. The effects of artificial reefs on fish abundance, community composition, and Sanctuary resources will be assessed. Appropriate artificial reef locations, based on habitat suitability will be determined. Volunteers will provide assistance.

■*Existing Program Implementation*. The FDEP is currently reviewing the impacts and benefits of artificial reefs, and is developing design criteria.

■*Implementation*. The FDEP will be primarily responsible for implementing this activity as part of their current artificial reef assessment program. Any regulations derived from this information will be developed by the FMFC. Monroe County and the Sea Grant Program are also cooperating in this activity.

Changes in Sanctuary funding will not affect this activity. It will be performed by the cooperating agencies, the FMFC, and the Sanctuary staff.

■*Schedule.* The activity will have no action in year 1. It will require 48+ months to complete.

This strategy is also included in the Volunteer and Regulatory action plans.

Strategy F.10: Bycatch

Conduct an assessment of harvesting methods used that generate bycatch. Develop and implement regulations to reduce the effects of current fishing practices on nontargeted species.
(Priority Level Low, No Action in Year 1, 48+ Months to Complete, <25% Funding Available for Full Implementation)

Activity 1-Assess Impacts from Harvesting Methods. The impacts of harvesting methods on species composition and abundance will be determined, as will the indirect impacts on other species and the environment. The extent of the problem will be assessed, and research will be conducted on the impacts of existing fishing methods and gear. Based on research results, regulations will be developed and implemented to reduce the bycatch of incidental species and undersized targeted species.

■*Existing Program Implementation*. The FMFC, the SAFMC, and the GMFMC are actively involved in this activity.

■*Implementation*. The three fisheries organizations currently involved in this activity will share the primary responsibility for implementation. Sanctuary staff, the NMFS, FDEP, and Sea Grant Program will also cooperate in implementation efforts. Sanctuary staff will actively assist in research on fisheries practices affecting the area's resources. The level of participation will depend on the availability of additional field staff.

■*Schedule.* The activity will have no action in year 1. It will require 48+ months to compete.

Strategy F.11: Gear/Method Impacts

Conduct research on alternative fishing gear and methods that minimize impacts on habitat. Implement a voluntary program to encourage the use of low-impact gear and methods. Implement regulations to require the use of low-impact gear and methods in priority areas. Characterize harvesting stresses affecting outer and inshore reefs and hardbottom ecosystems.
(Priority Level Low, No Action in Year 1, 48+ Months to Complete, <25% Funding Available for Full Implementation)

Activity 1-Conduct Research on Low-Impact Fishing Gear and Methods. This activity will facilitate research to develop gear designs and types that minimize impacts to corals, hardbottom, seagrasses, and other habitat and species. Biodegradable fishing line, traps, and buoy lines are examples of gear types that would be researched. Modified trap designs would also be considered. Fishing methods, including resource handling and gear placement, would be researched to develop methods and gear that minimize impacts to resources while maintaining efficiency. Volunteers will provide assistance.

■*Existing Program Implementation*. The FMFC, SAFMC, and GMFMC are actively involved in this activity.

■*Implementation*. The three fisheries organizations will continue to have the primary responsibility for this high-priority activity. Sanctuary staff, the NMFS, FDEP, and the Sea Grant Program are also cooperating in this activity.

Changes in Sanctuary funding will not affect this activity. It will be performed by the cooperating agencies, and should be reflected in the examination of fisheries monitoring data.

■*Schedule.* The activity will have no action in year 1. It will require 48+ months to complete.

This strategy is also included in the Volunteer Action Plan.

Strategy F.14: Spearfishing

Conduct an assessment of spearfishing practices and impacts to develop and implement regulations in high-priority areas.
(Priority Level Low, No Action in Year 1, 36 Months to Complete, 0% Funding Available for Full Implementation)

Activity 1-Assess Impacts on Fish Populations. Conduct research to determine the effects of spearfishing on species population and abundance.

■*Implementation*. The FDEP will be the lead agency responsible for implementation, with primary support from the NMFS, the SAFMC, GMFMC, and the FMFC.

■*Schedule*. The strategy will have no action in year 1. It will require 36 months to complete.

Activity 2-Determine Incidental Habitat Damage. Conduct research to determine the effects of spearfishing on the habitat due to incidental contact.

■*Implementation*. The FDEP will be the lead agency responsible for implementation, with primary support from the NMFS, the SAFMC, GMFMC, and the FMFC.

■*Schedule*. The strategy will have no action in year 1. It will require 24 months to complete.

This strategy is also included in the Regulatory Action Plan. (Spearfishing will be prohibited in Ecological Reserves and Sanctuary Preservation Areas.)

Strategy F.15: Sponge Harvest

Develop and conduct a research program to assess the impacts of current sponge harvest methods on the resource and the habitats in which they occur. Develop and implement regulations throughout the Sanctuary.
(Priority Level Medium, Medium Level of Action in Year 1, 36 Months to Complete, <75% Funding Available for Full Implementation)

Activity 1-Assess Impacts of Sponge Harvest Methods. This strategy includes research and assessment activities to determine which methods have a low adverse impact on both species and habitat, and to identify areas that exhibit low abundance, low recovery rates, and habitat damage. The activity supports the development and implementation of regulations governing sponge harvest.

■*Implementation*. The FDEP will be primarily responsible for implementing this activity. The FMFC, SAFMC, and GMFMC will also participate.

Changes in Sanctuary funding will not affect the activity. Funding will be performed by the cooperating agencies and fisheries councils.

■*Schedule.* The activity will have a medium level of action in year 1. It will require 36 months to complete.

Special Studies

Environmental assessment strategies will result in the assessment of environmental conditions within the Sanctuary. One of these strategies, Habitat Restoration (B.2), is high-priority and will be implemented in the short-term to provide research into restoration techniques.

Special Studies Strategies

B.2: Habitat Restoration
- Develop stocking policy related to habitat restoration
- Conduct a program of restoration research

R.5: Carrying Capacity
- Assess impacts of recreation activities and estimate user carrying capacities

W.5: Water Quality Standards
(This strategy is described in detail in the Water Quality Action Plan)

W.18: Pesticide Research
(This strategy is described in detail in the Water Quality Action Plan)

W.24: Florida Bay Influence
(This strategy is described in detail in the Water Quality Action Plan)

Strategy B.2: Habitat Restoration

Conduct a program of restoration research at representative habitat sites within the Sanctuary; develop a restoration plan and implement restoration in severely impacted areas. Monitor recovery processes. *(Priority Level Medium, Medium Level of Action in Year 1, 24+ Months to Complete, 50-74% Funding Available for Full Implementation)*

Activity 1-Develop and Implement a Stocking Policy Related to Restoration Research. Develop and implement a policy on stocking related to habitat restoration. Organisms need to be local genetic stock.

■*Existing Program Implementation*. FDEP has a draft stocking policy for the Florida Keys that will be used as a starting point.

■*Implementation*. Sanctuary staff and the FDEP will be jointly responsible for implementing this activity.

■ *Schedule.* The activity will have a medium level of action in year 1. It will require 12 months to complete.

Activity 2 - Conduct a Program of Restoration Research. Enhancing mangrove and seagrass habitats and coral transplanting are examples of restoration activities, but other techniques will be developed. A restoration plan will be implemented in severely impacted areas. Recovery processes (e.g., recruitment and survivability) will be monitored following stress events (e.g., vessel groundings), and an extensive demonstration project will be developed for mitigation and restoration techniques following physical disturbances or chronic nutrient inputs. Emergency or long-term restoration zones may be established to allow sufficient resource recovery. Volunteers will provide assistance.

■*Existing Program Implementation.* Limited coral restoration efforts and subsequent monitoring programs are underway as cooperative efforts among the Sanctuary staff, the FDEP, and the NPS. These efforts are funded by research grants and damage settlements. A response team has been established to assess damage quickly.

■*Implementation.* Sanctuary staff and the FDEP will be jointly responsible for implementing this high-priority strategy. Additional assistance will be sought

from Monroe County, the NMFS, U.S. Army Corp of Engineers (USACE), U.S. Fish and Wildlife Service (FWS), the Florida Game and Fresh Water Fish Commission (FGFWFC), and the research community.

Court judgements and settlements from groundings will fund restoration efforts and subsequent monitoring programs. A contingency fund would be available to initiate restoration efforts, since settlement funds are not likely to be made immediately available.

Since restoration activities are largely funded by damage settlements, they would not be affected by changing budgets (court judgements or settlement funds will not be diverted from their intended purpose). Follow-up monitoring of restoration efforts will evaluate the program's success.

■*Schedule.* The activity will have a medium level of action in year 1. It will require 24+ months to complete.

This strategy is also included in the Volunteer Action Plan.

Strategy R.5: Carrying Capacity

Conduct a program to study and implement carrying-capacity limits for recreational activities by: 1) assessing the effects of recreational and boating activities on Sanctuary resources; 2) establishing recreational user carrying capacities that minimize wildlife disturbances and other adverse impacts on natural resources; and 3) enforcing carrying-capacity limits in high-use areas and for highly sensitive habitats throughout the Sanctuary.
(Priority Level Medium. This strategy will have a low level of action in year 1, 48+ Months to Complete, <50% Funding Available for Full Implementation)

Activity 1-Assess Impacts of Recreational Activities and Estimate User Carrying Capacities. This activity will assess the impacts of recreation activities on Sanctuary resources to provide a basis for anticipating problems associated with specific activities and the development of management actions to eliminate/reduce impacts. Impacts such as wildlife disturbance (especially of commercially important and threatened/endangered species), changes in ecosystem balance, habitat degradation, and those associated with activities such as boating, fishing, diving, etc. will be included. The research-only areas at Eastern Sambos and Tennessee Reef will serve as the primary sites for conducting carrying capacity research, specifically on water quality impacts versus user impacts. These research-only areas can be compared to other heavily used reefs such as Western Sambos and Looe Key. It is anticipated that once the research is completed, carrying-capacity limits will be established by instituting regulations that require the use of buoys in high-use areas and for highly sensitive habitats throughout the Sanctuary.

■*Implementation.* Sanctuary staff will have the primary responsibility for implementing this activity in the Sanctuary, with the assistance of the FDEP, FWS, and numerous other agencies. The USACE will be conducting a complementary carrying capacity study for Monroe County. Overuse of Sanctuary resources is one of the major management concerns, and a policy on acceptable use levels must be established based on the research conducted. This activity will require a major commitment of resources, and could be impacted by budget reductions.

■*Schedule.* This activity will have no action in year 1. It will require 48+ months to complete.

Strategy W.5: Water Quality Standards

Develop and implement water quality standards, including biocriteria, appropriate to Sanctuary resources.
(Priority Level Low, No Action in Year 1, 60+ Months to Complete, <50% Funding Available for Full Implementation)

This strategy is described in detail in the Water Quality Action Plan.

Strategy W.18: Pesticide Research

Develop and implement a research program to assess and investigate the impacts of, and alternatives to, current pesticide practices. Modify the Mosquito Control Program as necessary on the basis of research findings.
(Priority Level Low, No Action in Year 1, 36+ Months to Complete, <50% Funding Available for Full Implementation)

This strategy is described in detail in the Water Quality Action Plan.

Strategy W.24: Florida Bay Influence

Conduct research to understand the effect of water transport from Florida Bay on water quality in the Sanctuary.
(Priority Level High, High Level of Action in Year 1, 48 Months to Complete, <50% Funding Available for Full Implementation)

This strategy is described in detail in the Water Quality Action Plan.

Predictive

This strategy provides research allowing resource managers to assess the potential impact of various management strategies. The Predictive Models strategy, for example, establishes hydrodynamic water quality models and coupled, landscape-level ecological models that will be used to predict and evaluate the outcome of in-place and proposed water quality management strategies.

Predictive Strategies

W.21: Predictive Models
(This strategy is described in detail in the Water Quality Action Plan)

Strategy W.21: Predictive Models

Develop phased hydrodynamic/water quality models and coupled, landscape-level ecological models to predict and evaluate the outcome of in-place and proposed water quality management strategies.
(Priority Level Medium, High Level of Action in Year 1, 12+ Months to Complete, <50% Funding Available for Full Implementation)

This strategy is described in detail in the Water Quality Action Plan.

Implementation

This section explains how the strategies in the Research and Monitoring Action Plan will be implemented. The institutions responsible for each activity, and those agencies that will provide some level of assistance, are identified. In addition, the planned level of activity in year 1, months to complete, funding availability, cost estimates, staff requirements, and the geographic focus for each strategy/activity are provided. The process used to evaluate the effectiveness of the monitoring program as it evolves over time is described.

Responsible Institutions. The Research and Monitoring Plan will be implemented by a coordinated framework of Federal, State, and local agencies in cooperation with academic and research institutions. In most cases, academic institutions should take the lead in implementing strategies and/or activities that deal with predictive modeling or research. NOAA and the FDEP, however, have the lead responsibility for overall program implementation. The EPA and FDEP will provide leadership in implementing many research and monitoring strategies. Table 18 lists the responsible institutions and their level of responsibility in each strategy/activity.

Prioritization of Implementation. The Research and Monitoring Action Plan includes the 23 strategies in Alternative III with a research and /or monitoring component. The highest-ranking strategies (based on overall priority) are Monitoring, Replenishment Reserves, and Sanctuary Preservation Areas. Each of these strategies includes major research and monitoring efforts and is critical to the ultimate success of the Sanctuary. In addition, 12 strategies within the Research and Monitoring Program are either high or medium priority level. Strategies in these priority levels are expected to be initiated within year 1 of the adoption of the final plan, and are generally designed to develop information to evaluate water quality and ecosystem health. However, they will also result in information that can be used in zoning, boating, and fisheries assessments.

Schedule. Twelve strategies in the plan will be implemented in year 1, focusing on ecological and water quality monitoring; developing a regional database and data management system; establishing a research and monitoring component of the Sanctuary's management zones and assessing the influence of Florida Bay on Sanctuary resources. A strategy establishing an advisory committee for coordinating and guiding research activities (W.32) was completed prior to year 1. All other strategies will be implemented after year 1 (Table 19). Several strategies, such as WQ Monitoring and Ecological Monitoring, include continuous activities and are expected to continue indefinitely.

Cost. The estimated cost of implementing each strategy is given in Table 19. Two cost figures are shown for each strategy: capital; and operations and maintenance. The capital cost figure represents the amount of funding required to enable the purchase of equipment (boats, computers, etc.), construction of buildings and related facilities, computer equipment, land acquisition and other start-up costs. Operations and maintenance includes salaries, travel, rent, utilities, upkeep, supplies (e.g., fuel, paper, etc.), and other administrative costs.

Geographic Focus. All research and monitoring strategies apply to the entire Sanctuary. However, some of the strategies may include components that are applicable to specific areas in the Keys.

Personnel. The staff required to implement the Research and Monitoring Program will be a mix of personnel from various agencies and organizations identified in Table 18. In addition, scientists from various universities, research institutions, and environmental firms may be involved on a long- or short-term basis. For example, personnel from the EPA or FDEP will be responsible for implementing many of the strategies. However, for those strategies, Sanctuary personnel will provide assistance in directing the component activities. The remaining strategies will be directed by NOAA/FDEP personnel dedicated solely to research and monitoring activities.

Sanctuary Employees. Research and monitoring activities will require three full-time NOAA employees; a coordinator ($40,000 per year), and two assistants ($30,000 per year). The staff will be distributed among the three offices in Key Largo, Marathon, and Key West. Table 19 lists the total number of personnel likely to be involved in implementing each strategy.

Volunteers. Volunteers will provide assistance in implementing several research and monitoring strategies. Volunteer assistance has been targeted for the Habitat Restoration (B.2), Artificial Reefs (F.7), Gear/Method Impacts (F.11), WQ Monitoring (W.20), and Ecological Monitoring (W.33) strategies. A complete description of volunteer assignments for each research and monitoring strategy is included in

the Volunteer Action Plan. A Sanctuary volunteer coordinator will be responsible for directing all volunteer activities associated with research and monitoring.

Contingency Planning for Changing Budget. In the event of reduced or insufficient funding, the Program's focus will be modified to allow the implementation of the most important research and monitoring strategies. Only priority strategies (or a subset of the priority strategies) will be implemented in this case. Although the overall intent of the Research and Monitoring Program will not be achieved, this approach will permit research and monitoring activities that focus on critical Sanctuary issues. In addition, the scale and scope of individual strategies could be reduced, thereby preserving additional management strategies. For example, the number of monitoring stations included in strategy W.33 (Ecological Monitoring) could be reduced.

Evaluating Program Effectiveness. NOAA will conduct a periodic evaluation (approximately every three years) to determine the effectiveness of research and monitoring activities. The evaluation will identify the strategies/activities that are ineffective, and those that have not been adequately addressed. New strategies and activities within existing strategies will be established as the Program evolves. The objective is to optimize staff and resources in conducting research and monitoring to protect the ecosystem of the Sanctuary.

Table 18. *Agencies/Organizations Identified for Implementing Strategies/Activities*

Strategy/Activity	Agencies/Organizations																			
	NOAA-Sanctuary	NOAA-NMFS	EPA	FWS	NPS	USCG	USGS	USACE+Navy	SAFMC	GMFMC	FDEP	FGFWFC	FDCA	FDACS	FMFC	FDOC	SFWMD	Monroe County	Municipalities	Academia	Sea Grant	NURC	TAC	NGO
RESEARCH MANAGEMENT																								
B.11 National Marine Sanctuary Permits																								
Establish Permitting Program	●			○	○						●							○						
W.28 Regional Database	*Refer to Water Quality Action Plan*																							
W.29 Disseminate Findings	*Refer to Water Quality Action Plan*																							
W.32 Advisory Committee	*Refer to Water Quality Action Plan*																							
MONITORING																								
F.6 Fisheries Sampling																								
Evaluate and Modify Existing Census Programs		◍			◍				◍	◍	●				◍						○			
Initiate a Fishery Pre-recruitment Monitoring Effort											●				◍						○			
W.20 Monitoring	*Refer to Water Quality Action Plan*																							
W.33 Ecological Monitoring																								
Hire a Research and Monitoring Coordinator	●										◍													
Establish an Ecological Information System	◍										●								○					
Conduct Status and Trends Assessment	●		◍								◍								○				○	
Establish a Fisheries Ecology Monitoring and Research Component			●								◍													
Establish a Data Management Protocol											●												○	
Develop an Index on Sanctuary Health	●	○	○								◍								○		○		○	
Establish a Volunteer Monitoring Program	◍																							●
Z.2 Ecological Reserves																								
Develop Baseline Data	●	◍									○													
Monitor Reserves	●		○								○													
Utilize Reserves as Controls	●		○								○													
Utilize Reserves as Research Areas	●		◍								◍													
Z.3 Sanctuary Preservation Areas																								
Develop Baseline Data	●	◍									○													
Monitor SPAs	●		○								○													
Utilize SPAs as Controls	●		○								○													
Utilize SPAs as Research Areas	●		◍								◍													
Z.5 Special-Use Areas																								
Develop Baseline Data	●	◍									○								○					
Monitor SUAs	●		○								○								○					
Utilize SUAs as Controls	●		○								○								○					
Utilize SUAs as Research Areas	●		◍								◍								○					

● Lead ◍ Primary Role ○ Assist

Table 18. *Agencies/Organizations Identified for Implementing Strategies/Activities (cont.)*

Strategy/Activity	Agencies/Organizations																				
	NOAA-Sanctuary	NOAA-NMFS	EPA	FWS	NPS	USCG	USGS	USACE+Navy	SAFMC	GMFMC	FDEP	FGFWFC	FDCA	FDACS	FMFC	FDOC	SFWMD	Monroe County	Municipalities	Academia	Sea Grant	NURC	TAC	NGO
FISHERIES IMPACTS																								
F.3 Stocking																								
Assess Impacts from Fish Stocking		●			◐				◐	◐	●				◐				○		○	○		
F.4 Aquaculture Alternatives																								
Assess, Develop, and Promote Aquaculture Techniques		◐							◐	◐	◐			●	○	○					●			
F.7 Artificial Reefs																								
Assess Impacts from Artificial Reefs		◐							○	○	●				○		◐				◐			
F.10 Bycatch																								
Assess Impacts from Harvesting Methods	◐	◐							●	●	◐				●						○			
F.11 Gear/Method Impacts																								
Conduct Research on Low-Impact Fishing Gear and Methods		◐							●	●	◐				●				○		◐			
F.14 Spearfishing																								
Assess Impacts on Fish Populations		○							○	○	●				○									
Determine Incidental Habitat Damage		○							○	○	●				○									
F.15 Sponge Harvest																								
Assess Impacts of Sponge Harvest Methods				○	○	○			◐	◐	●				◐						◐			
SPECIAL STUDIES																								
B.2 Habitat Restoration																								
Develop Stocking Policy	●	○									●													
Conduct a Program of Restoration Research	●	○		○			○				●	○						○		○				
R.5 Carrying Capacity																								
Assess Impacts to Recreation Activities and Estimate User Carrying Capacities	●	○		◐	○		◐				◐	○						○	○					
W.5 Water Quality Standards									*Refer to Water Quality Action Plan*															
W.18 Pesticide Research									*Refer to Water Quality Action Plan*															
W.24 Florida Bay Influence									*Refer to Water Quality Action Plan*															
PREDICITIVE STRATEGIES																								
W.21 Predictive Models									*Refer to Water Quality Action Plan*															

● Lead ◐ Primary Role ○ Assist

Abbreviations: NOAA, National Oceanic and Atmospheric Administration; NMFS, National Marine Fisheries Service; EPA, U.S. Environmental Protection Agency; FWS, U.S. Fish and Wildlife Service; NPS, National Park Service; USCG, U.S. Coast Guard; USGS, U.S. Geological Survey; USACE, U.S. Army Corp of Engineers; SAFMC, South Atlantic Fisheries Management Council; GMFMC, Gulf of Mexico Fisheries Management Council; FDEP, Florida Department of Environmental Protection; FGFWFC, Florida Game and Fresh Water Fish Commission; FDCA, Florida Department of Consumer Affairs; FDACS, Florida Department of Agriculture and Consumer Services; FMFC, Florida Marine Fisheries Commission; FDOC, Florida Department of Commerce; SFWMD, South Florida Water Management District; NURC, National Underwater Research Center; TAC, Technical Advisory Council; NGO., Nongovernment Organizations.

Table 19. *Requirements for Implementation*

Strategy/Activity	Overall Sanctuary Priority Level +	Implementation: Planned Level of Activity in Year 1	Implementation: Months to Complete	Implementation: Funding Available to Complete	Cost to Complete: Total Capital ($1,000)	Cost to Complete: Annual Operations/ Maintenance ($1,000)	Geographic Focus	# of Personnel
RESEARCH MANAGEMENT								
B.11 National Marine Sanctuary Permits	*	High	<12	100%	10-99	10-99	SW	2
W.28 Regional Database			*Refer to Water Quality Action Plan*					
W.29 Disseminate Research Findings			*Refer to Water Quality Action Plan*					
W.32 Advisory Committee			*Refer to Water Quality Action Plan*					
MONITORING								
F.6 Fisheries Sampling	High	High	36+	50-74%	1000-5000	1000-5000		11-25
Evaluate and Enhance Existing Census Programs	High	High	12	50-74%	NC	10-99	SW	
Initiate a Fishery Pre-recruitment Monitoring Effort	Medium	Medium	36+	50-74%	1000-5000	100-999	SW	
W.20 Monitoring			*Refer to Water Quality Action Plan*					
W.33 Ecological and Research Monitoring	High	Medium	60+	<50%	100-999	1000-5000		11-25
Hire a Research and Monitoring Coordinator	Medium	None	5	<50%	NC	10-99	SW	
Establish an Ecological Information System	High	High	24	50-74%	NC	100-999	SW	
Conduct Status and Trends Assessment	High	High	24+	<50%	100-999	100-999	SW	
Establish a Fisheries Ecology Monitoring & Research Component	High	Medium	24+	<50%	100-999	100-999	SW	
Establish a Data Management Protocol	High	None	12	75-99%	NC	10-99	SW	
Develop a Periodic Report on Sanctuary Health	Low	None	24+	<50%	10-99	10-99	SW	
Establish a Volunteer Monitoring Program	High	High	C	100%	10-99	10-99	SW	
Z.2 Ecological Reserves	High	Medium	36+	<50%	100-999	1000-5000		3-5
Develop Baseline Data	High	High	24	<50%	100-999	100-999	SW	
Monitor Reserves	Medium	Medium	36+	<50%	10-99	100-999	SW	
Utilize Reserves as Controls	Low	Medium	36+	<50%	10-99	10-99	SW	
Utilize Reserves as Research Areas								
Z.3 Sanctuary Preservation Areas	High	Medium	36+	<50%	100-999	1000-5000		3-5
Develop Baseline Data	High	High	24	<50%	100-999	100-999	SW	
Monitor SPAs	Medium	Medium	36+	<50%	10-99	100-999	SW	
Utilize SPAs as Controls	Low	Medium	36+	<50%	10-99	10-99	SW	3-5
Utilize SPAs as Research Areas								
Z.5 Special-Use Areas	High	Medium						
Develop Baseline Data	High	High	24	<50%	100-999	100-999	SW	
Monitor SUAs	Medium	Medium	36+	<50%	10-99	100-999	SW	
Utilize SUAs as Controls	Low	Medium	36+	<50%	10-99	10-99	SW	
Utilize SUAs as Research Areas								

Abbreviations: SW, Sanctuary Wide; UK, Upper Keys; C, Continuous.

+ The priority levels for activities should not be compared across strategies–they only represent the relative importance of activities contained within a strategy.

++ Strategies with an "* " for Overall Sanctuary Priority Level are already existing programs and will be completed in Year 1.

Table 19. *Requirements for Implementation (cont.)*

Strategy/Activity	Overall Sanctuary Priority Level+	Implementation: Planned Level of Activity in Year 1	Implementation: Months to Complete	Implementation: Funding Available to Complete	Cost to Complete: Total Capital ($1,000)	Cost to Complete: Annual Operations/ Maintenance ($1,000)	Geographic Focus	# of Personnel
FISHERIES IMPACTS								
F.3 Stocking	Low	None	36		<10	100-999		1-2
Assess Impacts from Fish Stocking		None	36		<10	100-999	SW	
F.4 Aquaculture Alternatives	Low	None	36+	<50%	<10	100-999		1-2
Assess, Develop, and Promote Aquaculture Techniques		None	36+	<50%	<10	100-999	SW	
F.7 Artificial Reefs	Low	None	48+	<50%	10-99	10-99		1-2
Assess Impacts from Artificial Reefs		None	48+	<50%	10-99	10-99	SW	
F.10 Bycatch	Low	None	48+	<25%	<10	10-99		1-2
Assess Impacts from Harvesting Methods		None	48+	<25%	<10	10-99	SW	
F.11 Gear/Method Impacts	Low	None	48+	<25%	10-99	100-999		3-5
Conduct Research on Low-Impact Fishing Gear and Methods		None	48+	<25%	10-99	100-999	SW	
F.14 Spearfishing	Low	None	36	0%	10-99	10-99		1-2
Assess Impacts on Fish Populations	High	None	36	0%	10-99	10-99	SW	
Determine Incidental Habitat Damage	Medium	None	24	0%	10-99	10-99	SW	
F.15 Sponge Harvest	Medium	Medium	36	<75%	<10	10-99		1-2
Assess Impacts of Sponge Harvest Methods		Medium	36	<75%	<10	10-99	SW	
SPECIAL STUDIES								
B.2 Habitat Restoration	Medium	Medium	24+	50-74%	100-999	100-999		5-10
Develop Stocking Policy		High	12	100%	<10	0	SW	
Conduct a Program of Restoration Research		Medium	24+	50-74%	100-999	100-999	SW	
R.5 Carrying Capacity	Medium	Low	48+	<50%	100-999	1000-5000		5-10
Assess Impacts to Recreation Activities and Estimate User Carrying Capacities		Low	48+	<50%	100-999	1000-5000	SW	
W.5 Water Quality Standards			*Refer to Water Quality Action Plan*					
W.18 Pesticide Research			*Refer to Water Quality Action Plan*					
W.24 Florida Bay Influence			*Refer to Water Quality Action Plan*					
PREDICITIVE STRATEGIES								
W.21 Predictive Models	High		*Refer to Water Quality Action Plan*					

Abbreviations: SW, Sanctuary Wide; UK, Upper Keys; C, Continuous.

+ The priority levels for activities should not be compared across strategies–they only represent the relative importance of activities contained within a strategy.

++Strategies with an "* " for Overall Sanctuary Priority Level are already existing programs and will be completed in Year 1.

Submerged Cultural Resources Action Plan

This action plan identifies and describes the suite of activities for the management and protection of submerged cultural resources within the Florida Keys National Marine Sanctuary. The activities described in this plan address resource protection, multiple uses, inventory, research and education and are derived from the Submerged Cultural Resources Management strategies, public comments, and other record sources. The action plan is the result of a careful balancing of resource protection and facilitating compatible multiple uses. The plan outlines the time required for implementation, level of program activity in year 1, the funding available for full implementation, institutions responsible for implementation, and range of costs for full implementation (Table 20). The Action Plan also contains the SCR Agreement among NOAA, the State and the Advisory Council on Historic Preservation providing further detail on how historic resources within the Sanctuary will be managed.

Introduction

NOAA is committed to protecting and preserving the natural resources within its national marine sanctuaries, and is equally committed to its stewardship and trustee responsibilities for the historical resources in these areas. Such resources are defined as those "possessing historical, cultural, archaeological, or paleontological significance, including sites, structures, districts, and objects significantly associated with or representative of earlier people, cultures, and human activities and events" (15 CFR 922.2 (c)). In this action plan, the terms *historical resources , cultural resources,* and *submerged cultural resources (SCRs)* are used interchangeably. Within the nation's national marine sanctuaries, these resources include shipwrecks that are part of both U.S. and world history, as well as the remains of submerged prehistoric cultures. See FEIS Affected Environment Cultural and Historic Resources.

The Sanctuary's submerged cultural resources encompass a broad historical range. Because of the Keys' strategic location on early European shipping routes, the area's shipwrecks reflect the history of the entire period of discovery and colonization. This richness of historical resources brings a corresponding responsibility for protecting resources of national and international interest. Accordingly, the resources should be managed for public benefit and enjoyment, while the historical-cultural heritage is preserved for the future. Long-term protection requires a precautionary approach to historical resource management, particularly when cultural information and/or the artifacts may be destroyed or lost intentionally or unintentionally through various direct and indirect activities. The Federal Archaeological Program or equivalent standards of conservation, cataloguing, display, curation, and publication must be assured before the excavation of historically significant resources is permitted. Such projects are expensive and labor-intensive, requiring specialists in the fields of archaeology, conservation, and museum work and historic shipwreck research and recovery. NOAA and the State will explore all public and private partnerships in fulfilling SCR management and will consider private sector implementation, if it is determined to be in the public's interest.

General Policy

NOAA's primary policy is to protect sanctuary resources, including SCRs. NOAA must also manage the Sanctuary and its resources, including SCRs, to facilitate multiple uses of the Sanctuary which are determined to be compatible with resource protection. Compatible uses include research, education, recreation, fishing and other commercial uses. This Action Plan addresses the controversial issue of commercial treasure salvage. The Plan is the result of a long public process, including scoping meetings, workshops, and consideration of numerous and diverse public comments, including the Sanctuary

Table 20. *Summary of Submerged Cultural Resources Strategies*

Page	Strategies	Overall Sanctuary Priority Level	Planned Level of Action in Year One	Months to Complete	Funding for Full Implementation	Number of Activities to be Undertaken	Number of Institutions
175	R.1 SCR Management	Medium	Low	24	<50%	5	5

Advisory Council. In consultation with the State, which owns abandoned shipwrecks in 65% of the Sanctuary, and consistent with the Abandoned Shipwreck Act, commercial treasure salvage of abandoned shipwrecks has been determined not to be a compatible use in areas where there is coral, seagrass and other significant natural resources. However, in other areas relatively devoid of these significant natural resources, commercial treasure salvage will be permitted for objects of low to moderate historical significance, provided that the recording and reporting of recovery operations, as well as the curation of representative samples of artifacts are conducted consistent with the Programmatic Agreement for SCR Management, as well as Federal Archaeological Program (FAP) or equivalent standards. The FAP was developed by the National Park Service (NPS) by Presidential Order, and includes a collection of historical and archaeological resource protection laws to which Federal managers adhere. The National Historic Preservation Act (NHPA) requires Federal agencies to develop programs to inventory and evaluate cultural historic resources. Section 106 of the NHPA requires that each recovery permit be reviewed by the State Historic Preservation Office and the Advisory Council on Historic Preservation. Permits within the scope, and which adhere to all of the provisions of the Programmatic Agreement for SCR Management, need not go through additional NHPA 106 process.

The Abandoned Shipwreck Act (ASA) requires that a state's management practices protect shipwrecks, natural resources, and habitat areas, and guarantee recreational access to shipwreck sites. The ASA Guidelines prohibiting commercial salvage in marine sanctuaries are being followed in zoned areas, and in areas where there is coral, seagrass and other significant natural resources. Commercial salvage will only be permitted for objects of low to moderate historical significance in areas relatively devoid of significant natural resources. There will be no commercial salvage of SCRs of high historical significance. The ASA also provides for private-sector recovery conducted in an archaeologically- and environmentally- sound manner. Thus, SCR management will also preserve selected shipwrecks in the Sanctuary for research and recreation purposes. Other shipwrecks may be more appropriate for recovery and preservation in museums with public access. Finally, the plan provides for the dispersal of certain recovered resources to private parties. Private profit is available through public display, as well as from the sale of gold, silver, jewels, and other objects of little or no historical significance after proper archaeological recording, analysis and reporting. The Programmatic Agreement for SCR Management provides further details on the criteria, and process for decisions on which SCRs should be preserved in situ and which SCRs would be considered permissible for recovery.

How the Plan is Organized. This action plan outlines the proposed approach for developing and implementing a program to manage submerged cultural resources in the Sanctuary. The plan is composed of the SCR Management strategy (R.1), and includes its component activities and subactivities. It is organized into three sections: an introduction, a description of strategies, and a discussion of implementation procedures.

Background

Management Strategies. Each strategy has been assigned an estimated "activity level" for year 1 (high, medium, low, or none). This activity level is an estimation of the planned level of action that will occur in the first year after the Sanctuary Management Plan is adopted. In addition, the time required, costs of implementation, and funding availability (Federal, State, local, and private) have been estimated for all strategies. The component activities within each strategy, and the institutions responsible for implementing them, have been identified.

The strategies for the Management Plan, which includes the Submerged Cultural Resources Action Plan and all other action plans combined, have been grouped into three priority levels, based on their relative importance or feasibility. A strategy's priority level is based on factors such as available funding, costs, personnel requirements, timing, levels of existing implementation, and existing legislative/ regulatory authority. The high priority level includes the 16 most important strategies. The medium priority level contains 36 strategies that represent the next level of importance to the sanctuary and will have some level of activity in year one. Low priority items contain the remaining strategies in the Management Plan. Those strategies planned for completion in or before year one do not have a priority level.

SCR Strategies. The SCR Management strategy is in the medium priority level. It is an important strategy, as it forms the basis of the Sanctuary's Submerged Cultural Resources Program. It is composed of five activities: 1) SCR protection and management; 2) establish SCR inventory; 3) SCR research and education; 4) ensure permit compliance

Existing Programs

The Division of Historical Resources (Florida Department of State) has conducted an archaeological field school; participated in archaeological sportdiving workshops; established the San Pedro Underwater Archaeological Preserve; granted permits for archaeological inventories in the Upper and Middle Keys; and cooperated with other agencies in permitting and law enforcement activities. Before the Sanctuary was established, the Division granted contracts to search for and recover artifacts from historic shipwreck sites in State waters. Many of these activities will continue, and some will be expanded within this program.

In addition, NOAA's National Marine Sanctuary Program has managed the submerged cultural resources at the Key Largo, Looe Key, and Florida Keys national marine sanctuaries in a manner consistent with the provisions of the Federal Archaeological Program. Projects conducted to date include remote sensing studies, literature searches, and limited field research and recovery by private groups under permits. Within these sanctuaries, submerged cultural resource management has encouraged public access, research, education, and recreation consistent with the goals of site protection and conservation. These activities and others will be continued in the Florida Keys National Marine Sanctuary.

through enforcement; 5) ensure interagency coordination (Programmatic Agreement for SCR Management).

Relationship to Other Action Plans. The SCR regulations are included in the Regulatory Action Plan. In addition, this plan relies on the implementation of the Enforcement Action Plan, the Education Action Plan, and other action plans.

Goals and Objectives

National Goals. The national goals of the Submerged Cultural Resources Management Program are to:

- protect SCRs and facilitate multiple uses compatible with resources protection, including the provision of access for recreation, research, education and compatible commercial uses;
- provide information for the conservation and management of submerged cultural resources in national marine sanctuaries and national estuarine research reserves;
- conduct, promote, and coordinate research and monitoring of submerged cultural resources in the nation's sanctuaries and reserves; and
- enhance public awareness and education programs through the study of cultural resources in the nation's sanctuaries and reserves.

Sanctuary Goals. The Sanctuary has a trustee responsibility for protecting the cultural resources within its boundaries for current users and future generations. Because cultural resources are nonrenewable, decisions affecting these resources must be made with a precautionary approach, and only after careful and deliberate analyses of the potential consequences on long-term preservation.

The goals of the Florida Keys National Marine Sanctuary's Submerged Cultural Resources Program are to:

- gather sufficient information about the nature and extent of the area's cultural resources to allow managers to make informed decisions about resource protection and management;
- interpret the history and culture of the Keys for the public;
- allow/permit private-sector participation research, documentation, recovery, and curation of cultural resources; and
- to develop a community-based stewardship for cultural resources in the Sanctuary.

Sanctuary Objectives. To achieve these goals, the following objectives should be accomplished in a reasonable and cost effective manner:

- inventory the Sanctuary's submerged cultural resources in a manner consistent with Federal requirements and standards;
- provide a resource database to fully inform managers and the public about the area's submerged cultural resources to the extent consistent with public resource protection and business confidentiality;

- interpret the Sanctuary's submerged cultural resources for the public through on-site and land-based exhibits and accompanying materials such as brochures and videos;

- develop public partnerships for the research, interpretation, and management of submerged cultural resources; and

- foster and enhance a stewardship ethic for cultural resources among Sanctuary users.

The activities within the Submerged Cultural Resources Management strategy represent the initial stages of the Sanctuary's Cultural Resources Management Program.

Description of Strategies

Strategy R.1: SCR Management

Develop and implement a program to protect and manage submerged cultural resources consistent with the NMSA, the ASA and Federal Archaeological Program standards through regulations, permits, education, and research. Inventory submerged cultural resources and assess survey and extraction techniques within the Sanctuary. Require permitting throughout the Sanctuary. However, no permits will be issued for salvage or recovery in sensitive areas; i.e., Sanctuary Preservation Areas, Ecological Reserves, Wildlife Management Areas, Existing Management Areas, and other areas where there is coral, seagrass or other significant natural resources. No commercial salvage will be permitted for sites of high historical significance.
(Priority Level Medium, Low Level of Action in Year 1, ongoing)

Activity 1 SCR Protection and Management . The Sanctuary regulations, ASA guidelines, and FAP standards/practices have been developed to address the survey, research, recovery, and dispensation of certain objects, and will be implemented consistent with Federal and State archaeological policies. Additional Sanctuary guidelines, as well as site-specific management plans, including zoning, may be developed based on the significance of the SCR and the need for protection and managed access. The development of Sanctuary specific archaeological guidelines and model permits is also being considered. The establishment of an Advisory Committee for SCR management consistent with the ASA guidelines will also be considered.

In order to protect SCRs, removal without a permit is prohibited. Non-intrusive access is not prohibited and does not require a permit. To facilitate access and multiple use, and ensure it's compatible with resource protection, there is a sanctuary permit system. Private recovery may occur under a Sanctuary permit. The decision of whether to grant such permits will be based upon a balancing of the public's interest using criteria in the regulations for all permits, as well as the factors and criteria set forth in the regulations for SCR permits which are further detailed in the SCR Agreement. The site's historical/cultural value and significance, its recreational value, the potential environmental impact of the proposed activity, the professional qualifications of the applicants, the proposed methods of research/recovery/conservation, and the public benefits of the proposed activity are some of the factors considered by NOAA, in consultation with the State.

Applications that provide for conservation of SCRs in museums or similar structures of public access for research, education, or public viewing enjoyment will be given priority over applications where some of the objects are dispersed. When the applicant plans to disperse objects in the private market, disposition of artifacts will be considered on a case-by-case basis consistent with ASA guidelines, and with the SCR Agreement. Where the applicant has arranged for private conservation, long-term public display, guaranteed public access, and public interpretation of artifacts and data, the disposition of objects may be adjusted accordingly. Proposals where the entire collection will be conserved in private museums, but the SCRs will be readily available for research and public access, will be encouraged. No permits will be issued for excavation in areas where coral, seagrass meadows, or other significant natural habitats exist.

The Sanctuary Program requires permits for the conduct of activities prohibited by sanctuary regulations, or that otherwise may adversely affect Sanctuary resources. Such permits may only be granted in accordance with existing law and Sanctuary policies. NOAA encourages Sanctuary uses that do not adversely affect Sanctuary resources (including archaeological information) or interfere with other Sanctuary uses. A survey and inventory permit is not required for remote sensing activities, but one will generally be required before considering the issuance of a research and recovery permit. One of the factors considered in granting a research and recovery permit is whether the applicant demonstrated his or her professional and scientific abilities in the survey-inventory permit. An archaeological research/recovery permit is necessary for the removal of historical resources. The historic resources must be maintained in a museum or similar institution where public access for research, education and viewing enjoyment is provided. A deaccession /transfer permit is required to privatize the public resources recovered under a research/recovery permit. The deaccession/transfer permits shall also be subject to the requirements for special-use permits. Such removal of the public's sanctuary resources requires a substantial justification of public interest, consistent with the purposes and policies of the Sanctuary as set forth in the SCR Agreement and the ASA guidelines. All permits are evaluated based on a variety of

factors, including potential environmental and cultural resource impacts.

■ *Implementation*. NOAA's Sanctuary Program, FDHR, and legal staff have worked together to develop a framework for SCR management of submerged lands within the Sanctuary consistent with the NMSA, the ASA guidelines, and State law.

■ *Schedule*. The regulations, SCR Agreement and some of the guidelines have been completed. Subsequent guidelines, model permits, and other activities discussed below will be considered. This activity will have a high level of action in year 1. It will require 12+ months to complete.

Subactivity 1-Create an SCR Field Unit. A field unit will be established to conduct field research and coordinate permitted research activities.

■ *Implementation*. NOAA will be the lead agency responsible for implementing this subactivity. The FDHR will provide assistance.

■ *Schedule*. This subactivity will have a high level of action in year 1. Depending on funding, it may require 6 months to a year or more to complete. Contracting archaeological services in the field is being considered as an interim measure.

Subactivity 2-Monitoring For SCR Site Degradation. Will seek long-term monitoring of selected SCR sites to determine whether environmental conditions and human use affect site integrity.

■ *Implementation*. NOAA will be the lead agency responsible for implementing this subactivity. The FDHR will provide assistance.

■ *Schedule* - This subactivity will have a low level of action for year 1. It will be on-going.

Activity 2 - Establish SCR Inventory. Compile existing literature into a computerized bibliographic database. Survey and identify site locations and specific site characteristics including name, age, integrity, and historical and cultural significance. Compile an electronic database of site information.

■ *Existing Program Implementation.* NOAA, the Florida Division of Historical Resources (FDHR), and nonprofit organizations have completed some survey and inventory activities. Together they have compiled and organized data on the location, identity, and significance of certain historical shipwrecks. The Cultural and Historic Resources section of the Description of the Affected Environment chapter (Volume II) should be consulted for additional information. The SCRs currently identified, as well as those to be discovered, will be protected and managed in accordance with the Plan and regulations.

■ *Implementation.* NOAA will be the lead agency responsible for establishing a cultural resources inventory for the Sanctuary. This effort will build on existing work by the State and others. The NPS, Florida Department of Environmental Protection (FDEP), and FDHR will provide assistance in implementing the components of this activity.

■ *Schedule*. The inventory of all SCRs is a long-term management goal and the activity will be conducted in a continuous manner until completed.

Subactivities. Implementing this activity will depend on several subactivities that will help generate the information for inclusion in the inventory:

Subactivity 1-Use SCR Information Developed in Permits, Authorizations or Certifications. The regulations prohibit the conduct of certain activities in the Sanctuary. Part of the permit process generally includes assessment of the natural and cultural resources in the area under permit consideration. In addition, the Plan provides for public and private surveys and inventories of SCRs.

■ *Implementation*. NOAA will be the lead agency responsible for implementing this subactivity in consultation with the FDHR.

■ *Schedule*. This subactivity will have a medium level of action in year 1. This subactivity will be continuous.

Subactivity 2-Survey and Collect Anecdotal Information. The community knowledge base will be tapped through surveys of fishermen, treasure hunters, and others with local knowledge; a program of professional/amateur public participation will be developed. This information will be incorporated into the cultural resource inventory.

■ *Implementation*. NOAA will be the lead agency responsible for implementing this subactivity. The FDEP and FDHR will provide assistance.

■ *Schedule*. This subactivity will have a high level of action in year 1. It will require 12 months to complete.

Subactivity 3-Utilize Volunteer Assistance in Cultural Resources Inventory. The Sanctuary's volunteer coordinator, using local volunteers, will assist Sanctuary staff in collecting existing information; locating unrecorded sites; recording and documenting sites; assessing site significance; and developing sites for improved public access, interpretation, and protection (see the Volunteer Action Plan).

■ *Implementation*. The Sanctuary's volunteer coordinator will implement this subactivity. The NPS and FDHR will provide assistance.

■ *Schedule*. This subactivity will have a high level of action in year 1. It will require six months to complete.

Subactivity 4-Public Participation Projects Inventory. Submerged cultural resources inventory projects will be conducted by research and educational institutions (using local volunteers). The objective is to involve the public in the inventory phase of Sanctuary archaeological investigations.

■ *Implementation*. NOAA will be the lead agency responsible for implementing this subactivity. The FDHR will provide assistance.

■ *Schedule*. This subactivity will have a low level of action in year 1. It will be continuous.

Subactivity 5-Develop a Site Database. A central database of all shipwreck information will be maintained by the Sanctuary, in cooperation with the Florida Site File at the FDHR. Projects will be designed that are appropriate for grant funding by the FDHR, the Coastal Zone Management Program, and other sources. The data collected for non-sensitive sites may also be incorporated with other geological, biological, and census data into a geographic information system (GIS) that will be used to analyze relationships between these resources, and to facilitate their management.

■ *Implementation*. NOAA will be the lead agency responsible for implementing this subactivity. The NPS, FDEP, and FDHR will provide assistance.

■ *Schedule*. This subactivity will have a medium level of action in year 1. It will be continuous.

Activity 3 - SCR Research and Education

Subactivity 1-Develop a Scientific Research Study Program. The Sanctuary Program will encourage and coordinate scientific studies by recognized research groups and institutions. This information will enhance the existing knowledge base on submerged cultural resources in the Keys.

■ *Implementation*. NOAA will be the lead agency responsible for implementing this subactivity. The NPS will provide primary support. The FDEP, FDHR, and the State Historic Preservation Officer (SHPO) will provide assistance.

■ *Schedule*. This subactivity will have a medium level of action in year 1. This subactivity will be continuous.

Subactivities. The activity is composed of several subactivities. First, a series of public workshops will be held to identify topics and projects of community interest. Second, a volunteer training program will be established to provide a mechanism for general public involvement in SCR research. Third, Sanctuary staff will coordinate with university field schools to generate research projects and facilitate public involvement. Fourth, Sanctuary staff will apply appropriate management tools, such as scientific investigation, underwater "parks," or a field school, to specific sites to provide basic knowledge of the resource. Finally, an interpretive exhibit of the archaeological sites and their historic context will be developed to provide information to the community at large.

Subactivity 1-Public Participation Projects Management. A series of projects will be developed that are designed to involve the public in the long-term management of SCRs and promote stewardship through public involvement.

■ *Implementation*. NOAA will be the lead agency responsible for implementing this subactivity. The FDHR will provide assistance.

■ *Schedule*. This subactivity will have a low level of action in year 1. It will be continuous.

Subactivity 2-Volunteer Training Program. A volunteer training program will be established to provide a mechanism for general public involvement in SCR research, documentation, and management.

■ *Implementation*. The Sanctuary's volunteer coordinator will be responsible for implementing this subactivity. The NPS and FDHR will provide assistance.

■ *Schedule*. This subactivity will have a low level of action in year 1. It will require 12 months to complete.

Subactivity 3-Coordinate with University Field Schools. Archaeological research in the Sanctuary will be facilitated by providing scientific, logistical, and other support.

■ *Implementation*. NOAA and the FDHR will be the lead agencies responsible for implementing this subactivity. The FDEP will provide assistance.

■ *Schedule*. This subactivity will have a medium level of action in year 1. It will be continuous.

Subactivity 4-Develop a "Shipwreck Trail." By selecting and interpreting a selection of shipwrecks, a "shipwreck trail" will be developed to provide an on-water and on-land interpretive exhibit for the public.

■ *Implementation*. The FDHR will be the lead agency responsible for implementing this subactivity. NOAA and the NPS will provide assistance.

■ *Schedule*. This subactivity will have a low level of action in year 1. It will require 12 months to complete.

Subactivity 5-Develop an Interpretive Exhibit. An interpretive exhibit of the archaeological sites and their historic context will be developed to provide the public with information about SCRs in the Sanctuary.

■ *Implementation*. The FDHR will be the lead agency responsible for implementing this subactivity. NOAA and the NPS will provide assistance.

■ *Schedule*. This subactivity will have a low level of action in year 1. It will require 12 months to complete.

Activity 4-Ensure Permit Compliance through Enforcement. Ensure compliance with statutes, rules, Sanctuary regulations, and permits through intensive on-site patrols by authorized law enforcement officers.

■*Existing Program Implementation*. Within the Key Largo and Looe Key national marine sanctuaries, Federal laws and regulations are enforced by State officers cross-deputized with Federal authority. Within the State territorial boundary, State laws and regulations are enforced by the Florida Marine Patrol.

■*Implementation*. NOAA, the State of Florida, and other agencies will be cross-deputized with Sanctuary law enforcement authority. Sanctuary and other pertinent regulations and laws will be enforced jointly, with an emphasis on public education as a tool for compliance (see the Enforcement Action Plan). Officers will receive training to facilitate this interpretive role (see the Education Action Plan).

■*Schedule*. This activity will have a high level of action in year 1. It will require 24 months to complete.

Subactivities. There are two subactivities within Activity 4: 1) cross-deputization; and 2) an SCR training program.

Subactivity 1-Cross-deputize Law Enforcement Officers. This is described in the Cross-deputization strategy (B.12) within the Enforcement Action Plan.

Subactivity 2-Develop an SCR Educational Program for Law Enforcement Personnel. This program will be part of a standardized training program for cross-deputized enforcement agencies. The training program is included in the Training/Workshops/ School Programs strategy (E.4) within the Education Action Plan.

Activity 5-Ensure Interagency Coordination. Ensure comprehensive coordination among all appropriate Federal, State, and local agencies involved in, and responsible for, the management of SCRs through the implementation of the SCR Agreement.

■*Existing Program Implementation*. Within the Key Largo and Looe Key national marine sanctuaries, no coordination between NOAA and the FDHR is required, as these are Federal waters and the State lacks jurisdiction. However, the two agencies cooperate by sharing information, advice, equipment, and staff. In addition, the two agencies have developed a close working relationship in State-owned portions of the Sanctuary, where the Division holds title to abandoned SCRs and NOAA has a management responsibility as a co-trustee.

■*Implementation*. NOAA and the FDHR will enter into the proposed MOU (as recommended in the Abandoned Shipwreck Act) covering the management of SCRs within the Sanctuary. The terms of the MOU, as well as components of the final Management Plan, specify the responsibilities and roles of various parties to ensure the timely and effective coordination of activities involving SCRs.

■*Schedule*. This activity will have a high level of action in year 1. It will require 12 months to complete.

Implementation

This section explains how the SCR Action Plan will be implemented. The institutions responsible for each activity, including subactivities, as well as those agencies that will provide some level of implementation assistance, are identified. The planned level of activity in year 1, months required to complete, funding availability, cost estimate, staff and equipment requirements, and geographic focus for each activity and subactivity are provided. Contingencies for a changing budget are also discussed. Finally, the process used to evaluate the effectiveness of the SCR Management Program as it evolves over time is provided.

Responsible Institutions. NOAA and the FDHR are the agencies primarily responsible for implementing the SCR Management Plan. NOAA and the State of Florida will jointly manage Sanctuary resources, while the Division will retain title to abandoned shipwrecks on State-owned submerged lands. If excavation is involved, permission may also be required from the FDEP (e.g., dredge and fill permit and consent to use State lands) and the U.S. Army Corps of Engineers (e.g., dredge and fill permit), depending on location of site. Table 21 lists the responsible institutions and their level of responsibility in each activity.

The DHR, through its Bureau of Archaeological Research, has developed a range of SCR management tools that can be usefully applied within the Sanctuary. The Division's role, although sometimes regulatory, typically involves management activities such as inventory, assessment, research, education, public interpretation, and grant assistance for historic preservation projects.

NOAA's primary role will be to protect SCRs through the permitting program and enforcement, as well as to provide overall policy direction and coordinate research by outside institutions and individuals. In this capacity, NOAA will ensure that research is well-designed and consistent with Sanctuary Program policies. NOAA will also work with the State to inventory Sanctuary resources in a manner consistent with the Federal archaeological program and the ASA guidelines.

Prioritization. Each subactivity included in this plan is ranked as either high, medium, or low priority. The ranking signifies the level of importance of each subactivity, and provides guidance for the timing of implementation. The priority levels should not be compared across activities. They only indicate the relative importance of the subactivities contained within an activity.

Schedule. Table 22 lists the estimated time required for the implementation of each activity and subactivity included in the SCR Action Plan. The number of months required to complete each activity and subactivity is also provided.

Cost. The estimated cost of implementing each activity is shown in Table 22. The costs represent the sum of Sanctuary staff salaries; equipment and supplies; services; and other requirements necessary for implementation. Because each activity must be addressed independently, costs were calculated in a similar manner and cannot be totalled down the column. Costs are divided into total capital cost, and annual operations and maintenance cost.

Table 21. *Agencies Identified for Implementing Strategies/Activities*

Strategy/Activity	Agencies: NOAA-Sanctuary	NPS	FDEP	FDHR	SHPO
R.1 SCR MANAGEMENT					
Activity 1. SCR Protection and Management					
Create an SCR Field Unit	●			○	
Monitoring for SCR Site Degredation	●			○	
Activity 2. Establish SCR Inventory	●	○	○	○	
Use SCR Information Developed in Permits, Authorizations or Certifications	●			○	
Survey and Collect Anecdotal Information	●		○	○	
Utilize Volunteer Assistance in Cultural Resources Inventory	●	○		○	
Public Participation Projects Inventory	●			○	
Develop a Site Database	●	○	○	○	
Activity 3. SCR Research and Education	●		○	◍	○
Develop Scientific Research Study Program	●	○	○	○	
Public Participation Projects Management	●			○	
Volunteer Training Program	●	○		○	
Coordinate With University Field Schools	●		○	●	
Develop a "Shipwreck Trail"	○	○		●	
Develop an Interpretive Exhibit	○	○		●	
Activity 4. Ensure Permit Compliance through Enforcement					
Cross-deputization of Law Enforcement Officers	*Refer to Enforcement Action Plan*				
Develop SCR Educational Program for Law Enforcement Personnel	*Refer to Education Action Plan*				
Activity 5. Ensure Interagency Coordination	●	○	○	○	

● Lead ◍ Primary Role ○ Assist

Abbreviations: NOAA, National Oceanic and Atmospheric Administration; NPS, National Park Service; FDEP, Florida Department of Environmental Protection; FDHR, Florida Division of Historical Resources; SHPO, State Historic Preservation Officer.

As no active archaeology studies are currently being conducted at either the Key Largo or Looe Key national marine sanctuaries, no cost figures are available to project base FKNMS cost figures. Therefore, all cost figures are estimates based on NPS projects, State projects, and contractor quotes for jobs of similar specification.

Geographic Focus. Although SCRs may be discovered anywhere in the Sanctuary, there are areas of known concentration and high probability. These are in shallow water, especially in proximity to shipping routes, on and near reefs, in historically used channels, and near historical sources of freshwater. Management will focus on selected shipwreck sites, with the particular characteristics of a site determining the types of management tools needed. "High-probability" areas must be delineated, but only after more data is collected, and a comprehensive inventory of submerged cultural resources is completed.

Personnel. Three staff members are necessary to implement the activities outlined in this plan. Core personnel will include an archaeologist and two trained archaeological technicians. Two additional personnel may be required for oversight of special-use permits that allow the sale or dispensation of some gold, silver, and jewels. The archaeologist position will probably be at the GS-11/13 level (approximately $30,000 to $45,000 annually). The secondary support staff will most likely be at the GS-7/9 level (approximately $20,000 to $25,000 annually).

Equipment. To ensure the success of the SCR Management Plan, sufficient equipment will be

Table 22. *Requirements for Implementation*

Strategy/Activity	Overall Sanctuary Priority Level	Implementation			Cost to Complete		Geographic Focus
		Planned Level of Action in Year 1	Months to Complete	Funding Available to Complete	Total Capital ($1,000)	Annual Operions/ Maintenance ($1,000)	
R.1 SCR MANAGEMENT	Medium	Low	24	<50%	100-999	100-999	
Activity 1. SCR Protection and Management	High	High	18+	<50%	100-999	100-999	
Create an SCR Field Unit	High	High	6	<50%	10-99	10-99	SW
Monitoring for SCR Site Degredation	High	Low	6	<50%	10-99	10-99	SW
Activity 2. Establish SCR Inventory	High	High	12+	<50%	10-99	10-99	
Use SCR Information Developed in Permits, Authorizations or Certifications	Low	Low	C	<50%	<10	<10	SW
Survey and Collect Anecdotal Information	Low	Low	12	<50%	<10	<10	SW
Utilize Volunteer Assistance in Cultural Resources Inventory	Low	Medium	C	<50%	<10	<10	SW
Public Participation Projects Inventory	Low	Low	12	<50%	<10	<10	SW
Develop a Site Database	Low	Low	12	<50%	<10	<10	SW
Activity 3. SCR Research and Education	High	High	18	<50%		10-99	
Develop a Scientific Research Study Program		Medium					
Public Participation Projects Management		Low					
Volunteer Training Program		Low					
Coordinate With University Field Schools		Medium					
Develop a "Shipwreck Trail"		Low					
Develop an Interpretive Exhibit		Low					
Activity 4. Ensure Permit Compliance through Enforcement							
Cross-deputization of Law Enforcement Officers		*Refer to Enforcement Action Plan*					
Develop SCR Educational Program for Law Enforcement Personnel		*Refer to Education Action Plan*					
Activity 5. Ensure Interagency Coordination	High	High	12	<50%		<10	SW

Abbreviations: SW, Sanctuary-wide.

Note: The priority levels for subactivities should not be compared across activities–they only represent the relative importance of activities contained within a strategy.

required so sites can be reached and investigated in a reasonable response time. Such equipment would include a boat and trailer for use throughout the Sanctuary. Standard safety and diving gear should be complemented by surveying, remote sensing, position-finding, and shallow-excavation equipment, as well as the archaeological equipment necessary for underwater recording and recovery activities. Although the quantity and capability of equipment will vary based on the tasks to be accomplished, a minimum inventory response capability should be maintained. The cost of this equipment, based on the use of a government surplus or seized vessel and medium-quality diving and surveying equipment, will be approximately $100,000. This includes vessel refurbishment and maintenance costs. Two additional boats of approximately 20 feet in length may be required for oversight of private recovery operations. If government surplus vessels are used, an additional $30,000 may be required to refurbish and outfit these vessels, and an additional $10,000 will be required for surveying, diving, and documentation equipment.

Computer equipment, video and photographic cameras, and drafting equipment will also be required. This equipment (plus the basic office equipment for a staff of three) could cost as much as $100,000, depending on the level of technological sophistication. However, the bulk of this expenditure is a one-time outlay, and would not be required in subsequent years. The annual operating budget, including salaries, is expected to be $140,000.

Contingency Planning for a Changing Budget. If funding is below projected levels, cuts could be made in staffing and equipment purchases. Part-time positions within the private recovery supervision program could potentially be filled by other staff members after the fulfillment of a rudimentary training program in archaeological methods. An observer may be required on private recovery vessels at all times to ensure compliance with Sanctuary regulations and permit conditions. One of the two core staff technicians could be shared with the biology/damage assessment staff, as both positions require underwater mapping and other documentation skills.

In addition, costs for remote sensing equipment could be reduced or eliminated by hiring contractors to complete this work. However, an in-house capability is more desirable, as contracted work may be slowed by the competitive bidding process, and the fact that jobs may be grouped together to make the most efficient use of the contractor's time.

Evaluating Program Effectiveness. The best method of evaluating Program effectiveness is to measure accomplishments against the stated goals and objectives. This will be done in-house and with a review interval that is proportional to the complexity of the tasks undertaken. Examples of items to be evaluated include: the number of participants engaged in volunteer programs; the number of field schools conducted; the number of school programs and public exhibits; and the number of presentations given to external groups.

Another means of assessing the SCR Management Program is through a review committee of qualified archaeologists. The "peer review" principle is well-established in academia, and can be applied to the cultural resources program at little or no cost. The review committee would consist of archaeologists with graduate training in archaeology, relevant experience, and/or a track record of scholarly publication. The quality of work produced during the evaluation period would be emphasized, with particular attention paid to the reports generated both within the program and by permit holders. The committee would also evaluate site protection, paying particular attention to the Sanctuary's legislative mandate and how effectively it has been fulfilled during the review period.

In addition, the data collected during the previous year would be inventoried, and data would be checked for consistency and veracity. Consistency would be measured across projects, and site plans, remote sensing data, and photo documentation would be compared to ensure uniformity. Data veracity would be checked by selecting projects at random and attempting to duplicate the results. Examples could include duplicating (on a limited scale) remote sensing runs and verifying submitted site maps. If serious discrepancies are found, the quality assurance aspects of the program would be reevaluated.

The final tangible measure of the Program will be a review of the publications generated during the five-year duration of the initial Sanctuary Management Plan. This is critical to ensure that the program fulfills its role within the professional community.

Programmatic Agreement for SCR Management Among NOAA, The Advisory Council on Historic Preservation, and the State of Florida

The Florida Keys National Marine Sanctuary (Sanctuary) was established to provide comprehensive protection to the marine environment in the Florida Keys and comprehensive management of the use of the Sanctuary and its resources, including historical resources.

The Secretary of Commerce, through the National Oceanic and Atmospheric Administration (NOAA) and in consultation with the State of Florida, developed a comprehensive management plan which facilitates multiple use of the Sanctuary resources consistent with the primary objective of resource protection.

The purpose of this Programmatic Agreement is to jointly develop a policy for the protection and management of historic resources in the Florida Keys National Marine Sanctuary by the Co-Trustees, the State of Florida, and NOAA that the Advisory Council on Historic Resources (Council) agrees is in compliance with sections 106 and 110 of the National Historic Preservation Act (NHPA).

Management and protection of the historic resources in the Florida Keys National Marine Sanctuary shall be administered in accordance with the Florida Keys National Marine Sanctuary Protection Act (FKNMSPA), the National Marine Sanctuaries Act (NMSA), and the Abandoned Shipwreck Act (ASA). Management actions consistent with this agreement would satisfy NOAA's Section 106 responsibility for all individual undertakings affecting the historic resources within the Florida Keys National Marine Sanctuary. The SCR Agreement also addresses NOAA's Section 110 inventory responsibilities.

I. References and Authorities

The Sanctuary was established under the Florida Keys National Marine Sanctuary and Protection Act, Public Law No. 101-605, 104 Stat. 3089 (Nov. 16, 1990). Section 5(a) of the FKNMSPA expressly provides that the Florida Keys National Marine Sanctuary be managed under all applicable provisions of the NMSA, as amended, 16 U.S.C. 1431 et seq. NOAA enters into this Agreement pursuant to the FKNMSPA and the NMSA.

The Abandoned Shipwreck Act, 43 U.S.C. 2101-2106, transferred title to abandoned shipwrecks on states' submerged lands to the states. Under the ASA, states are to manage the abandoned shipwrecks in a manner which protects shipwreck sites, guarantees public access to divers and others, and allows for appropriate public- and private-sector recovery of shipwrecks consistent with the protection of historical values and environmental integrity of the shipwrecks and sites. The State of Florida enters this Agreement pursuant to Chapter 267 of the Florida Statutes, in which title to abandoned historic resources on state-owned or state-owned sovereignty submerged lands is vested in the Division of Historical Resources of the Florida Department of State for the purposes of administration and protection.

The designation of the Sanctuary does not alter the State of Florida's title to abandoned shipwrecks on State submerged lands. However, upon designation NOAA and the State share co-trustee responsibilities for natural and historic resources within the State portions of the Florida Keys National Marine Sanctuary.

The Abandoned Shipwreck Act Guidelines, 55 Fed. Reg. 50116 (December 4, 1990; ASA Guidelines), provide advice to the states and Federal agencies on how to effectively manage abandoned shipwrecks on submerged lands under their ownership or control. The ASA Guidelines provide for private-sector participation in shipwreck research projects and recovery of shipwrecks when such activities are in the public interest.

II. Definitions

Archeological Recovery - A process of systematic artifact recovery and mapping of shipwreck sites.

Artifact - an object made or manipulated by man. Artifacts commonly found at archaeological sites may have one or more of the following qualities:

1. Historic - an object associated with historical events;
2. Aesthetic- a work of art or craft;
3. Religious - iconic, ceremonial;
4. Functional - a tool, utensil, etc.;
5. Modified Commodity;

6. Food Product Used for Subsistence - butchered animal bones, seeds, corn cobs, etc.

Artifact Scatter Pattern - The stratigraphic and horizontal distribution of scattered artifacts, ballast deposits, and ship remains which archaeologically indicate the events (e.g., the wrecking of a vessel; natural occurrences such as currents or storms; salvage activities; and/or other processes) surrounding the sinking and progressive disintegration of a shipwreck site. .

Commercial Salvage - the search for and recovery of shipwrecks and/or artifacts using archaeological recovery techniques and historical documentation to maximize the intrinsic value of the finds. It is to be distinguished from treasure hunting, which involves recovery without regard for archaeological context and historical significance.

Crafted Items - materials made of metals, stones, or other materials that have functional, aesthetic, cultural, historical, or religious significance or value.

Debris Field - an area of artifacts that were scattered and deposited through: 1) the wrecking or sinking of a vessel; 2) natural occurrences such as currents or storms; 3) salvage activities; and 4) other processes.

Duplicative Artifacts - a group of artifacts that are similar or identical in nature.

Historical - possessing historical, cultural, archaeological, or paleontological significance, including sites, structures, districts, and objects significantly associated with or representative of earlier people, cultures, and human activities, and events.

Historical Association - the interrelationship of discovered objects to one another and to their surrounding environment, and which provides the cultural context of the site.

Historical Interest - capable of providing scientific or humanistic understandings of past human behavior, cultural adaptation, and related topics through the application of scientific and scholarly techniques such as controlled collection, analysis, interpretation, and explanation.

Historic Resource - any material remains of human life or activities which are at least 50 years of age and which are of historical interest.

Identical Artifacts - artifacts made of identical material, of same content and weight, made in the same mold, having the same marks, stamps, designs. They are often manufactured assembly style with machinery.

In Situ - A Latin term meaning “in the original position.”

Material Remains - physical evidence of human habitation, occupation, use or activity, including the site, location or context in which such evidence is situated

Modified Raw Materials - commodities that have been reduced to a concentrated state. Such items indicate cultural activity in the shape, size, markings, and content of the artifact. This includes ingots, pigs, and bullion.

Primary Archeological Deposit - a shipwreck artifact assemblage stabilized by in-situ ballast, hull structure and overlying bottom deposits, or a combination thereof, which defines the original location and orientation of the bulk of a historic shipwreck’s material remains. These deposits represent non-random distribution patterns that include personal effects, cargo, and ship’s supplies reflecting human behavior in different shipboard activity areas.

Raw Materials - commodities that are in a natural state save for marks from cutting, breaking, or separating for transport. Such items are of historical interest due to tool marks, use and wear marks or patterns, size breakdown for transport, metal, or mineral composition.

Secondary Archeological Deposit - scattered artifacts derived from the break-up of a vessel following its sinking and progressive break-up of the hull under prevailing local hydrological conditions. The contextual associations within these derived artifacts are largely determined by oceanographic variables (wind, waves and currents) within a short time following the sinking of the vessel.

Similar Artifacts - artifacts made from the same materials for the same functional purpose. These artifacts may vary slightly in composition, weight, size, stamps and marks, wear patterns, color, design, etc. These may often be items made by handcraft.

Tertiary Archeological Deposit - artifacts transported from their original position on the sea floor through continual re-deposition within the regular erosion sedimentation cycle characteristic of shallow offshore coastal processes.

III. Management of Historic Sanctuary Resources

NOAA and the State of Florida agree that the comprehensive management plan for the Florida Keys National Marine Sanctuary should have uniform policies and regulations for the management of resources throughout the Sanctuary which are consistent with the provisions of the NMSA, the ASA, and the ASA Guidelines. The Sanctuary will be managed to protect natural and historical resources, including abandoned shipwrecks, for present and future generations. The management will also facilitate access for research, education, and recreational enjoyment in a manner which is consistent with the primary objective of resource protection.

The management plan for the Florida Keys National Marine Sanctuary does not terminate valid Federal admiralty rights to certain shipwrecks that were in existence prior to the designation of the Sanctuary by Congress on November 16, 1990, pursuant to valid orders of Federal Admiralty Courts.

A. Inventory and Documentation of Historical Shipwrecks

1. The survey and inventory of SCRs, including historical shipwrecks, is necessary for proper SCR management and is required under Section 110 of the NHPA. NOAA and the State of Florida will seek all appropriate public and private means of continuing to survey the FKNMS and prepare a shipwreck inventory of all known shipwrecks and other SCR sites within the Sanctuary.

2. Information obtained from literary research, survey and research permit reports, site maps and photographs shall be used to supplement the shipwreck inventory. The shipwreck inventory will provide a database to aid resource managers in proper management of historical resources within the FKNMS. All shipwrecks shall also be reported to the Florida Site File at the Florida Division of Historical Resources. The shipwreck inventory shall, at a minimum, contain the following information:

a. Popular name and, when known, the vessel name, if different;

b. Vessel size, type, and age;

c. When known, the wreck date and function at the time of the wreck incident;

d. Location, including whether it is in a zoned area or areas of coral, seagrass, or other natural/historical significance;

e. The integrity and degree of dispersal of the shipwreck;

f. Whether it is buried or encrusted in coralline formations;

g. Whether it is listed in, or eligible for listing in, the National Register of Historic Places, or is eligible for listing as, or is, a National Historic Landmark;

h. The site form recorded in the Florida Site File; and

i. Whether the site is State-owned or subject to preexisting rights of access under admiralty law.

3. Any newly discovered shipwrecks or any new information pertaining to listed shipwrecks brought to the attention of NOAA or the State of Florida shall immediately be included in the shipwreck inventory and, where appropriate, the Florida Site File. NOAA and the State of Florida shall annually review the progress of the shipwreck inventory and shall make recommendations for the following year's work.

4. All information relating to each vessel including field notes, historical information, photographs, videotapes, site maps, drawings, inventory forms, and reports shall be maintained together and be deposited, when possible, in both the NOAA central repository and the Florida Site File. All such documentation shall be available to the public for interpretive and educational purposes.

B. Resource Protection

NOAA and the State of Florida agree that in order to protect natural and historic sanctuary resources, the Sanctuary regulations will prohibit the unauthorized removal or injury of historical resources and the unauthorized alteration of the seabed. Applications for permits involving activities which may injure historical resources will be reviewed by the State Historic Preservation Office, and NOAA. Permits which strictly adhere to the Sanctuary regulations, and this SCR Agreement, are also deemed to be in compliance with Section 106 of the National Historic Preservation Act, and do not require approval of the Advisory Council on Historic Preservation. Permits

which are outside of the scope of this SCR Agreement, in whole or in part, are subject to Section 106 review.

C. Public Access

1. NOAA and the State of Florida agree to allow public access to historic resources which does not harm the natural or historic qualities of these resources. Sport divers shall have access to publicly owned shipwrecks having recreational value. Such access may be further facilitated through the placement of marker buoys and anchor moorings and through the distribution of information at dive shops and marinas.

2. NOAA and the State of Florida agree that generally, any person should be able to freely and without a permit dive on, photograph, or otherwise use and enjoy publicly owned shipwrecks, including historical shipwrecks and shipwrecks whose historical significance has not yet been evaluated, provided that the use or activity does not involve disturbing or removing parts or portions of the shipwreck, its immediate environment, coral, seagrass, and other natural resources.

3. NOAA and the State of Florida agree that there may be instances in which access to certain shipwrecks should be limited. Decisions to limit, monitor, or prohibit public access to shipwrecks shall be made on a case-by-case basis, be practical, and fairly administered. NOAA and the State of Florida may seek comments from various interested groups prior to imposing restrictions on public access to shipwrecks. Generally, public access to shipwrecks shall be regulated, including zoning, when:

a. A shipwreck is extremely fragile and in danger of collapsing;

b. A shipwreck is suffering extensive deterioration or attrition due to prior access;

c. A permittee who is recovering a shipwreck under a valid permit requests that access be regulated during the term of the permit;

d. A shipwreck site presents an unacceptable risk to human safety and the visitor does not assume full responsibility for his or her safety; or

e. A shipwreck is subject to sovereign immunity and the applicable Federal government agency or foreign nation provides instructions on regulating public access to the shipwreck. In the absence of specific instructions from the applicable sovereign, under customary international law, access by any U.S. national to shipwrecks entitled to sovereign immunity is prohibited. When a sovereign grants permission, it generally limits access to named individuals for specified purposes. As a matter of policy, the U.S. Navy does not abandon its vessels, and permission is generally not given to access, or salvage, sunken Navy vessels.

4. NOAA and the State of Florida agree that public access to historical resources removed from the Sanctuary shall be maintained through curation and display agreements consistent to the maximum extent practicable with 36 CFR Part 79.

D. Education

1. NOAA and the State of Florida agree that in order to responsibly manage historical resources in the FKNMS, a public education program shall be developed to facilitate the understanding of these resources, their significance in maritime history, and the importance of their preservation.

2. Public education will be facilitated through public workshops, field trips, volunteer projects.

3. NOAA and the State of Florida shall work toward establishing a system of underwater parks and underwater shipwreck trails where public access shall be encouraged. Recovery shall be prohibited in these areas.

4. The volunteer coordinator will develop an educational program for public volunteers to participate in gathering historical information for the shipwreck inventory.

5. To the extent practicable, recovered artifacts shall be placed in museums for public display and interpretation. Museums shall also develop interpretive programs that help illustrate the background and history of the recovered artifacts.

E. Permits

1. NOAA and the State of Florida agree that non-intrusive surveys of historical resources are encouraged and will not require a survey/inventory permit. However, no archaeological research/recovery permit will be granted unless and until the applicant has gone through the survey/inventory process success-

fully or can otherwise demonstrate his or her professional abilities and that research/recovery is worthy of consideration by NOAA and the State.

2. Consistent with the policies of the National Marine Sanctuary Program and the Federal Archaeological Program, NOAA and the State of Florida prefer that SCRs are preserved *in situ*. Because historic resources are an irreplaceable non-renewable resource, they should remain in the sanctuary for research, education and the viewing enjoyment of the public for present and future generations, unless and until there is a substantial public interest justification for their removal.

3. Requests for the archaeological recovery of historic shipwrecks and their associated artifacts shall be jointly reviewed and approved by NOAA and the State of Florida in accordance with this agreement and the permitting procedures found in the FKNMSPA implementing regulations. Deaccession/transfer permits are for commercial salvage and have been determined to be Special-use permits, and are therefore also subject to the requirements and conditions for Special-use permits.

4. The proposed recovery activity must be in the public interest and should, at a minimum, further archaeological knowledge. For example, to facilitate research, education, public access and other management objectives for the FKNMS, the ASA, and the ASA Guidelines, decisions will be made on a case-by-case basis by weighing and balancing the values and uses a particular shipwreck may have, the potential benefits to be derived from the proposed recovery activity, and the potential adverse effects of the proposed recovery activity. Only those public and private sector recovery activities that are in the best interests of the public should be authorized. To help determine whether a proposed public or private sector activity is in the best interest of the public, in addition to the factors/criteria in the sanctuary regulations and elsewhere in this agreement, consistent with the ASA guidelines, NOAA and the State will also consider the following:

a) Is the SCR owned by the State; or is it subject to sovereign immunity or other sovereign interest, i.e., Florida, U.S., or Foreign government?

b) What are the SCR's current and potential value and uses? Is recovery consistent with those values and uses? Will it enhance those values and uses? Will it irrevocably damage or destroy any of those values and uses?

c) Is the SCR listed in, or eligible for, inclusion in the National Register of Historic Places? Is it a National Historic Landmark?

d) Will the proposed recovery result in a nomination to the Secretary of Interior to list the SCR in the National Register of Historic Places or result in a recommendation for designation as a National Historic Landmark?

e) Will the proposed recovery result in the acquisition of new historical information or verify historical documentation?

f) Is the SCR threatened? Is it being damaged or destroyed by natural processes (such as erosion), or by human activity (intentional or unintentional)? Is the threat imminent and unavoidable?

g) Will the area be restored to its original condition?

h) Will recovery impede navigation?

5. The permit applicant, named principal investigator or supervisor of operations, must meet, at a minimum, the following qualifications to carry out the activity:

a. Hold a graduate degree in anthropology or archaeology, or equivalent training and experience;

b. Completed at least 12 months of experience in research concerning archaeological resources of the pertinent period, meaning that applicants proposing to study historic shipwrecks should have one year of experience in historic shipwreck research, etc.;

c. Demonstrate the ability to plan, equip, staff, organize, and supervise the type and scope of the proposed activity;

d. Demonstrate the ability to carry out research to completion, as evidenced by timely completion of theses, research reports, or similar documents; and

e. Completed at least 16 months of professional experience and/or specialized training in archaeological field, laboratory, or library research, administration, or management, including at least four months experience and/or specialized training in the kind of activity being proposed.

6. The permit applicant, named principal investigator, or supervisor of operations must directly supervise all permitted activities and participate in all recovery operations.

7. Permit applications to recover historical resources shall, at a minimum, include the following information:

a. A research plan describing in detail specific research objectives;

b. A statement of the project's research significance;

c. A detailed operational plan including description of the proposed methods to be used for excavation, recovery, and storage of artifacts and related materials on site;

d. An analysis of the extent and nature of potential environmental impacts to Sanctuary resources;

e. A plan for site restoration and remediation;

f. A statement of compliance with the Federal archaeological program Executive Order 11593 and federal statutes cited therein, and implementing regulations and guidelines);

g. A signed agreement with an appropriate conservation facility detailing a plan for the conservation, curation and public display of artifacts consistent with Federal law (36 CFR Part 79);

h. A signed agreement with a repository, i.e., museum, archaeological center, laboratory or storage facility managed by a university, college, museum, other educational or scientific institution, Federal, State or local government agency, to provide professional, systematic and accountable curatorial services on a long-term basis. Agreements shall, at a minimum, include:

1. A statement that identifies who owns and has jurisdiction over the collection;

2. A statement of work to be performed by the repository, including how the artifacts will be stored, assessed, preserved, maintained, exhibited, and conserved; and

3. A statement of the responsibility of the permittee.

i. A plan for the storage and public availability of records related to the research project and the artifacts;

j. A separate statement of the professional qualifications for each personnel member who will conduct the activities involved in the project, signed and certified by that personnel member; and

k. Any other information that may be determined necessary on a case-by-case basis.

8. The permittee shall submit a final report detailing the research plan, methodologies, field operations, and research findings.

9. A permittee authorized to excavate and recover an historical shipwreck may:

a. Make presentations on the results of the recovery activity and the archaeological findings in public forums;

b. Prepare scientific and nontechnical, popular publications; and

c. Make artifacts and other materials recovered from the shipwreck available for future study, public interpretation, and public exhibition.

10. NOAA or the State of Florida may periodically monitor permitted recovery activities to ensure that they are in compliance with all terms and conditions of the permit.

11. NOAA or State of Florida officials who monitor permitted activities shall have the authority to immediately suspend the permit if it appears the activity is not in compliance with the conditions and terms of permit. Once work is suspended, work may not resume until NOAA and the State have conducted a thorough review and notified the permittee of their findings.

12. Any person applying for a permit must demonstrate their financial ability for the proposed activity. In cases where NOAA and the State are concerned about the financial ability to complete the project, a performance bond or other security to cover costs associated with the recovery, conservation and final report may be required in order to approve the

permit. The terms of the performance bonds shall be deemed fulfilled when the recovery activity is completed in compliance with the permit, the recovered items are properly conserved and analyzed, and the final report submitted pursuant to subparagraph (E)(8) is jointly reviewed and approved by NOAA and the State of Florida.

13. The permittee, at his or her expense, shall provide secure storage of artifacts. NOAA and State approval of the storage facility may include the waiver of the insurance requirements.

F. Survey/Inventory Permits

1. NOAA and the State of Florida agree that to adequately protect historical resources within the FKNMS it will be necessary to develop a detailed understanding of the number, nature, location, and historical significance of shipwrecks in the FKNMS.

2. To assess the number, nature, location, and historical significance of shipwrecks in the FKNMS, nonintrusive surveys of historical resources are encouraged. Survey/inventory activities that are nonintrusive, do not include any excavation, removal, or recovery of historical resources, and do not result in destruction of, loss of, or injury to Sanctuary resources or qualities, do not require a permit. However, if a survey/inventory activity will involve test excavations or removal of artifacts or materials for evaluative purposes, a Survey/Inventory of Historical Resources permit is required.

3. Applications to conduct surveys shall contain a description of the methodology to be employed. Preference shall be given to applications for survey/inventory permits that propose employing superior scientific methodologies and techniques, i.e., the use of magnetometers, side-scan sonar, sub-bottom profilers, and remotely operated vehicles, if appropriate for the area being surveyed. No more than one permit will be issued for a particular site for a particular period of time. The duration of permits should not exceed five years.

4. Authorized survey activities shall be conducted according to the following minimum requirements:

a. Surveys should be conducted systematically, with sufficiently close lane spacing to provide accurate, detailed coverage of the survey area;

b. Surveys should be conducted by a team that includes, at a minimum, persons trained or experienced in the conduct of marine surveys, the use of remote sensing equipment, and the examination and analysis of remote sensing readings for the purpose of identifying shipwrecks.

c. The location of a shipwreck should be recorded on a map using a standard coordinate system.

5. All SCRs located during a remote-sensing survey should be groundtruthed through seabed inspection, either by remotely operated vehicle or divers. Shipwrecks should be examined to determine the nature, extent and integrity of the wrecked vessel, surviving cargo, and associated scattered wreckage, and to locate any visible human remains.

6. SCRs shall be examined in a nondestructive and nondisturbing manner. Determinations of a shipwreck's type, age, condition, and, when possible, specific identity shall be made without test excavations or removal of artifacts or other materials.

7. When test excavations are necessary or artifacts or other materials must be removed, i.e., if the shipwreck is embedded or encrusted, the amount to be excavated or removed shall be as limited as possible to make evaluations, and be done using archaeological methods. Any artifacts or other materials recovered from historic shipwrecks shall be conserved by a nautical conservator.

8. All tapes, equipment readings, field notebooks, and logs generated during surveys shall be collated and archivally saved for future study.

9. Survey reports that describe the areas surveyed, survey methods used, and the results of the survey shall be prepared and published. Copies of the reports shall be submitted to NOAA and the State of Florida.

G. Research/Recovery Permits

1. NOAA and the State of Florida agree that research involving excavation, recovery or other intrusive activities will be prohibited, unless authorized and strictly regulated by a research/recovery or deaccession/transfer Special-use Permit issued pursuant to section H.

2. Based upon the need to protect natural and historical resources, and the potential use of the resource for research, education, recreation, or other

public or private uses, use of historic resources *in situ* is preferred.

3. Recovery of historical resources may be appropriate if NOAA and the State of Florida determine that such activity is in the public interest and that the removal of historical resources may be necessary or appropriate to protect the resource, preserve historical information and/or fulfill other NMSA purposes, such as land based research, education, public access and appreciation.

4. Recovery of historical resources will only be permitted as part of research to preserve the historic information for public use.

5. NOAA and the State of Florida will jointly determine whether intrusive research/recovery should be permitted on a case by case basis, weighing and balancing the values and uses a particular shipwreck may have, the potential public benefits to be derived from the proposed recovery, and the potential adverse effects to be caused by the proposed activity. Only those recovery activities for which a public interest is demonstrated and that further the purposes and policies of the NMSA and FKNMSPA shall be authorized.

6. To determine whether a proposed recovery activity is in the public interest, NOAA and the State of Florida shall, at a minimum, consider the public interest consideration set forth in E.4 and the following:

a. The shipwreck's current and potential future values and uses and whether the proposed recovery is consistent with or enhances such values and uses;

b. The archaeological or historical significance of the shipwreck site;

c. The structural integrity of the shipwreck site and the potential adverse effects that may result from the proposed recovery; and

d. The environmental impacts of the proposed recovery activity.

7. For any research/recovery activity proposed within the FKNMS, the artifacts and material remains that are recovered from the shipwreck site shall remain public resources, unless transfer of title has occurred pursuant to a permit described in section H.

H. Deaccession/Transfer Special-use Permits

1. NOAA and the State of Florida agree that based upon the potential use of historical resources for research, maintaining recovered resources together at one location as a collection is preferred. However, agreements for the curation and display of recovered historical resources may provide for distribution of artifacts in order to fulfill resource protection, research, education or other purposes of the Sanctuary.

2. The following types of artifacts are historical resources and shall remain Sanctuary resources and shall not be unconditionally transferred to the private sector, unless the NOAA Marine Archaeologist and the State archaeologist (NOAA/State archaeologists) determine that the artifact is no longer of historical interest pursuant to paragraphs 11-13:

a. All portions of shipwrecks, which are of archaeological interest and at least 50 years old, including, but not limited to, armaments, apparel, tackle, and cargo;

b. Any material remains, if they are at least 50 years old and reflect past human life or activities, or have social, cultural, archaeological, aesthetic, or religious significance with regard to past human life or activities, found within or as part of a shipwreck, in the debris field of a shipwreck, or in an historical context. This includes, but is not limited to, any portion or piece of crafted items, modified raw materials, natural-state raw materials, food products, and paleontological remains.

3. NOAA and the State of Florida agree that there may be instances in which certain historical resources are no longer of historical interest and, therefore, may be transferred into private ownership.

4. NOAA and the State of Florida agree that if the NOAA/State archaeologists determine that an object is not an historical resource, pursuant to 2(a) or 2(b), it may be available to the party that recovered it pursuant to a valid Sanctuary permit.

5. NOAA and the State of Florida agree that if certain artifacts or portions of a collection of artifacts become available for transfer to the private sector, all of the artifacts shall have first been conserved, analyzed, interpreted in a published report, and in each instance, representative samples retained for research, education, or public display.

6. NOAA and the State of Florida agree that transfer of artifacts may occur only after field operations and laboratory analysis are completed and the final report is approved by the NOAA/State archaeologists.

7. NOAA and the State of Florida agree that to the extent possible, the items transferred shall be preserved and maintained as an intact collection and shall be made available for future study, public interpretation, and exhibition.

8. NOAA and the State of Florida agree that as a condition of transfer of ownership of artifacts, information on the recovery activity and the archaeological findings shall be disseminated by the permittee to the scientific community and the public.

9. NOAA and the State of Florida agree that after an artifact has been conserved, analyzed, and interpreted in a published report, the NOAA/State archaeologists may determine that the significant historical information has been preserved and that the artifact is no longer necessary for providing additional significant scientific or humanistic understanding of past human behavior, cultural adaptation, and related topics. In such an instance, the artifact may become available for transfer to the private sector.

10. NOAA and the State of Florida agree that the following items, if determined by the NOAA/State archaeologists to be randomly deposited and found outside of a shipwreck, shipwreck debris field, or historical association and determined by the NOAA/State archaeologists to have no future potential for indicating any hitherto unknown or indefinite historical resource, shall not be of historical interest and may be transferred to the private party that recovered it under the terms of a valid permit. Such items include:

a. Unworked minerals and rocks;

b. Modified raw materials (ingots, bullion, pigs);

c. Coins, gems, projectiles.

To determine whether the artifact may be available for transfer to the private sector, the NOAA/State Archaeologists shall consider the factors listed in paragraphs 11-13.

11. The following criteria shall be applied to determine whether an artifact is of historical significance:

a. Items with no archaeological association are usually of low historical interest;

b. An intact collection is usually of higher historical value then unrelated artifacts;

c. Identical artifacts are usually of low historical interest when a representative sample is retained in public ownership;

d. Similar artifacts are usually of low historical interest when a sample representing all types is retained in public ownership;

e. Items of unmodified raw material are usually of low historical interest when a sample representing the full range of variation is retained in public ownership;

f. Items of modified raw material are usually of moderate historical interest;

g. Items that are rare or unique are of high historical interest;

h. Items that have future potential for archaeological, historical, cultural, or scientific research are of high historical interest.

12. The NOAA/State archaeologist shall determine the final disposition of artifacts as follows:

a. Certain artifacts of high historical interest, or overriding cultural or scientific importance are not available for transfer of title;

b. All artifacts are available for loan or other uses short of ownership as means of generating revenue provided the permit con ditions have been satisfied and artifacts are properly cared for;

c. Items that are recovered illegally, or in violation of a permit or condition thereof are not available for transfer of title;

d. Certain artifacts of low historical interest may be available for transfer of title.

13. The decision to transfer title is to be made by the NOAA/State archaeologists pursuant to the following criteria:

a. Items of low historical interest regardless of age may be transferred;

b. Items greater than 50 years of age, and having moderate historical interest, may be

transferred, provided that no such artifacts shall be conveyed until all conditions of a deaccession/transfer permit have been satisfied and representative samples have been retained;

c. Items of high historical interest shall not be transferred.

Volunteer Action Plan

This action plan identifies and describes the volunteer activities that will be implemented through a variety of strategies in the Florida Keys National Marine Sanctuary. The activities and strategies within the plan are derived from Alternative III, the most-balanced of the mid-range management alternatives. For each strategy, the component volunteer activities, existing level of program implementation, and organizations or individuals that will be responsible for implementing and conducting any new programs are outlined (Table 23). As volunteers are not paid staff, funding levels have not been included. Also, because the rate and level of volunteer activity implementation will be based largely on the implementation of other strategy components, scheduling information is not currently available. Finally, although the plan includes the most complete set of volunteer activities, only a subset will be implemented in the first year of Sanctuary operation. They are, however, still expected to be a significant component of the Sanctuary management process.

Introduction

Volunteer activities and programs are critical to the success of many boating, recreation, fishing, water quality, and education strategies in the Sanctuary Management Plan. Based on the lack of funding available to implement a variety of strategy components, and the success of the volunteer programs at both the Key Largo and Looe Key National Marine Sanctuaries, volunteers are seen as a valuable Sanctuary resource.

In addition to supporting management activities in the Sanctuary, the Volunteer Program will also help coordinate assistance in other Sanctuary-related tasks (e.g., administrative and office work), and will allow other agencies and groups in the state to work together in solving common management and administrative problems.

Developing an Integrated Program. The Volunteer Program will be the focal point for determining the timing, source, type, and degree of volunteer assistance provided for each strategy in this plan. It will be used to develop an organized method for providing volunteer assistance to the various public and private institutions involved in implementing strategies within the Sanctuary. Accordingly, volunteer efforts will be planned, deliberate actions designed to accomplish specific management objectives.

A volunteer coordinator position was established in 1992 through a national cooperative agreement between NOAA and The Nature Conservancy (TNC), and is jointly funded by the two organizations. The coordinator will be responsible for implementing the Volunteer Program, and will work directly with the Sanctuary Superintendent to coordinate all volunteer activities. The coordinator will also be responsible for ensuring that the volunteer components of each strategy are fulfilled. This will require interaction with the individuals (e.g., Sanctuary staff, interagency personnel, and others) responsible for implementing the other components of the strategies in this plan.

How the Plan is Organized. This action plan is organized in three sections: an introduction, description of strategies, and a discussion of implementation considerations. The introduction provides background information on the Volunteer Program and provides a brief summary of volunteer programs already in place at the Sanctuary. It also summarizes the goals and objectives of existing and proposed volunteer activities.

The strategy description section groups volunteer activities based on whether they are components of boating, fishing, recreation, research and monitoring, or education strategies. A volunteer program for administrative support is also described, and related activities currently in place are summarized. In addition, the agencies or organizations responsible for implementing the volunteer activities are identified for each strategy.

The final section discusses some considerations for implementing the plan. It emphasizes the supporting role of volunteers in strategy implementation, and how these efforts will be organized.

While the implementation schemes of many strategies in the Management Plan require volunteer assistance to be fully successful, the implementation scheme for specific strategies is only described in detail in the appropriate action plan.

Background

Requirements of the Volunteer Program. The type of volunteer participation implemented will depend on the strategy to be completed. Although Keys-wide

community participation will be encouraged, selected activities will require specific technical skills. Volunteers that are certified divers, for example, may be asked to be "buddy divers," or boat owners may be asked to help implement certain on-water activities. Volunteers with boat maintenance and repair or carpentry skills will also be needed to complete the activities within some strategies.

Facilities. The Volunteer Coordinator's office is currently located at the Sanctuary Administrative Office in Marathon. It is considered centrally located, and it is expected that the office remain there. Additional temporary work space for volunteers is needed, and sites in Key West, Marathon, and Key Largo will be considered when new space allocations are made. Each location should have two desks and a computer.

Personnel. The Volunteer Program has grown rapidly since its inception in 1992. Because of the territory covered, as well as the diversity of projects included, additional support staff will be required to assist the Volunteer Coordinator.

The strategies for the Management Plan, which includes the Volunteer Action Plan and all other action plans combined, have been grouped into three priority levels, based on their relative importance or feasibility. A strategy's priority level is based on

Table 23. *Summary of Strategies and General Sanctuary Support Items Requiring Volunteer Assistance*

Page		Strategies	Overall Sanctuary Priority Level +	Planned Level of Action in Year 1	Associated Action Plans
197	**Boating**				
197	B.1	Boat Access[1]	*	--	Channel Marking, Mooring Buoy
197	B.2	Habitat Restoration	Low	None	Research & Monitoring
197	B.3	Derelict Vessels	Low	None	
198	B.4	Channel/Reef Marking	High	Low	Channel/Reef Marking, Regulatory
198	B.9	Visitor Registration	Low	None	
198	B.10	Damage Assessment	Medium	Medium	
199	**Fishing**				
199	F.7	Artificial Reefs	Low	None	Regulatory, Research & Monitoring
199	F.9	Gear Removal	Low	None	
199	F.11	Gear/Method Impacts	Low	None	Research & Monitoring
200	**Recreation**				
200	R.1	SCR Management	Medium	Low	Regulatory, Submerged Cultural Resources
200	R.2	Recreation Survey	Low	None	
201	**Education and Outreach**				
201	E.1	Printed Materials	High	Low	Education and Outreach
201	E.2	Audio-Visual Materials	Medium	Low	Education and Outreach
202	E.3	Signs/Displays/Exhibits	Medium	Low	Education and Outreach
202	E.4	Training/Workshops/School Programs	Medium	Low	Education and Outreach, Water Quality
202	E.5	PSAs	Medium	Low	Education and Outreach
203	E.7	Promotional	Medium	Low	Education and Outreach
203	E.10	Public Forum	Medium	Low	Education and Outreach
203	E.11	Special Events	Medium	Low	Education and Outreach
204	**Research and Monitoring**				
204	W.20	Monitoring	High	Low	Research & Monitoring, Water Quality
204	W.33	Ecological Monitoring	High	Low	Research & Monitoring, Water Quality
205	**General FKNMS Support**				
205		Office Support		*Not Applicable*	
205		Computer Support		*Not Applicable*	
205		Marine and Dock Maintenance		*Not Applicable*	
205		Fundraising		*Not Applicable*	
205		Inter-organizational Volunteer Coordination		*Not Applicable*	
205		Group Leaders		*Not Applicable*	
205		Boat Captains		*Not Applicable*	
206		Special Projects		*Not Applicable*	

+ Strategies with an "*" for Overall Sanctuary Priority Level are already existing programs and/or will be completed in the first year of sanctuary operation.

1 Much of this strategy will be completed prior to year 1, however, it includes an activity that will continue indefinitely.

Existing Programs

The National Marine Sanctuary Program has a history of using volunteers to assist with activities ranging from maintenance tasks to public education programs at both the Key Largo and Looe Key national marine sanctuaries. Volunteers currently help with office support, vessel and vehicle maintenance, underwater cleanup efforts, data entry and database development, festival and special booth interpretive activities, mooring buoy installation and maintenance, and special request response projects. In addition, they act as visiting group leaders, boat captains, and aerial and on-water interpreters. Based on the success of these existing programs, it is expected that volunteer assistance in these and other program areas will be an integral part of the Florida Keys National Marine Sanctuary Program.

Sanctuary Management Assistance. The Sanctuary's volunteer coordinator is currently working with Sanctuary management to establish a framework for implementing education and outreach, research and monitoring, and other management strategies with a volunteer component. Volunteers are also visiting businesses and other sites in the Keys to determine their interest in displaying Sanctuary materials, are interviewing businesses about their knowledge of the Sanctuary program, and are developing a list of questions commonly asked about the Sanctuary. Existing volunteer programs that contribute to Sanctuary management but are not specific Sanctuary programs include boat and marina surveys; the monitoring of corals, rocky intertidal areas, sponges, algae, mangroves, and Florida Bay salinity; and the delivery of dive cards to dive shops. The Nature Conservancy has developed a Florida Bay Watch program that will use volunteers to collect water samples.

Program Under Development. In addition to these activities, a major volunteer program is currently under development. It is a cooperative effort between the Sanctuary Program and the Professional Association of Dive Instructors (PADI), using the association's expertise to develop a more-comprehensive diver training program that will lead to improvements in environmental monitoring techniques. Modules of the PADI program currently being considered would focus on fish identification, artificial reef monitoring, reef cleanups, and marine archaeology. After the development and application of a pilot project, the program will be used as the prototype for similar programs in other national marine sanctuaries.

factors such as available funding, costs, personnel requirements, timing, levels of existing implementation, and existing legislative/regulatory authority. The high priority level includes the 16 most important strategies. The medium priority level contains 36 strategies that represent the next level of importance to the sanctuary and will have some level of activity in year one. Low priority items contain the remaining strategies in the Management Plan. Those strategies planned for completion in or before year one do not have a priority level.

Volunteer Strategies. Volunteers will help implement 21 management strategies. Strategy B.1, Boat Access, is an existing program and will be completed in year 1. The two highest-ranking strategies (both high priority level) requiring volunteer assistance are Channel Marking (B.4) and Monitoring (W.20). Other high priority level strategies requiring volunteer assistance include Printed Materials (E.1) and Ecological Monitoring (W.33). In addition, nine medium priority level strategies will require volunteer assistance, and each will have some level of activity in year 1. The seven remaining strategies with a volunteer component are a low priority level, and are not expected to be implemented in year 1.

Types of Volunteer Assistance. This plan describes the level and type of assistance that each strategy with a volunteer component is expected to have. However, volunteer needs may change based on strategy modifications. In addition, the type of effort currently expected may not be required during implementation, and a different type of effort may be required once a strategy is in place. Also, volunteers may be useful in implementing strategies not currently included in this plan, and they will help complete a number of additional tasks, including office and computer support and Sanctuary maintenance activities. They will also assist other agencies and organizations with programs that complement the Sanctuary Program's goals.

Relationship to Other Action Plans. Because of the nature of the education strategies, volunteers will provide a useful, economical, and efficient means of strategy implementation. Volunteers will also assist in activities that are components of the Channel/Reef Marking, Enforcement, Mooring Buoy, Research and Monitoring, and Water Quality action plans. As noted previously, the details of the overall implementation schemes for the strategies in these action plans can be found in the specific plan. This action plan only describes the volunteer assistance expected to be required for each strategy.

Goals and Objectives

Sanctuary Goals. One goal of the Volunteer Program is to support efforts to improve public education and awareness about the Sanctuary. Another is to provide information to Sanctuary managers to allow them to make more informed decisions and update the overall Management Plan. Volunteers also provide a mechanism for involving the community in Sanctuary activities, and represent a valuable resource to accomplish a variety of additional Sanctuary tasks. Because of limited funding, volunteer assistance will be critical to the ultimate success of many Sanctuary strategies. Volunteers will assist in a variety of Sanctuary activities including research and monitoring, education and outreach programs, underwater projects, Sanctuary representation at certain events and functions, and office/administrative tasks.

Another goal of the Sanctuary Volunteer Program is to develop a strategy to target recruitment of volunteers. The strategy will propose approaches to generating interest in the Program; explore sources to recruit from (i.e. community groups, churches, neighborhood associations, other volunteer groups, government agencies); encourage schools to start nature clubs from which volunteers may be recruited; and explore ways to appeal to potential volunteers with a diversity of interests and skills. The strategy will define training areas, qualifications (such as boating and diving skills or research knowledge), and who will provide the new volunteer's training. The new strategy will provide recognition for the volunteers that will help keep them involved and interested and put a high priority in providing them a sense of stewardship.

Sanctuary Objectives. The overall objective of the Volunteer Program is to develop a system of public involvement in supporting the Sanctuary Program in a "hands-on" manner. Volunteers will support many Sanctuary activities that would otherwise not be accomplished as efficiently.

Description of Strategies

Boating

Six boating strategies have a volunteer component. Volunteers will help with boater surveys, underwater habitat restoration projects, the removal and disposal of abandoned and derelict vessels, channel/reef marking, and other activities.

Boating Strategies

B.1: Boat Access
- Assist in a public-access survey

B.2: Habitat Restoration
- Serve as "buddy divers" and underwater assistants

B.3: Derelict Vessels
- Assist in a survey of abandoned and derelict vessels

B.4: Channel/Reef Marking
- Help map channel/waterway marking areas

B.9: Visitor Registration
- Serve as registrars for the Sanctuary

B.10: Damage Assessment
- Assist the damage assessment team

Strategy B.1: Boat Access

Conduct a survey to assess public and private boat access throughout the Sanctuary.

• ***Assist in Updating Public-Access Survey***. Volunteers will assist in updating information to be included in the marine facilities database.

■*Implementation.* The Volunteer Coordinator will be responsible for organizing volunteer assistance. The Florida Department of Environmental Protection (FDEP) will be the lead agency responsible for implementing this activity. NOAA and Monroe County will provide support.

The implementation scheme for this strategy is described in the Channel/Reef Marking Action Plan. The strategy is also included in the Mooring Buoy Action Plan.

Strategy B.2: Habitat Restoration

Conduct a program of restoration research at representative habitat sites within the Sanctuary; develop a restoration plan and implement restoration at severely impacted areas. Monitor recovery processes.

• ***Serve as "Buddy Divers" and Underwater Assistants***. The Keys population contains many individuals with a scientific background. Volunteers will assist researchers with habitat restoration by becoming "buddy divers" and underwater assistants.

■*Existing Program Implementation.* For several years, volunteers have helped with scientific research projects at the Key Largo and Looe Key national marine sanctuaries by acting as "buddy divers" on an ad-hoc basis.

■*Implementation.* The Volunteer Coordinator will be responsible for implementing this activity. Overall, NOAA and the FDEP will be the lead agencies responsible for strategy implementation. Various nongovernmental organizations (NGOs) will assist in implementation.

The implementation scheme for this strategy is described in the Research and Monitoring Action Plan.

Strategy B.3: Derelict Vessels

Develop a removal and disposal plan for derelict and abandoned vessels throughout the Sanctuary, streamline the existing permitting process, and require the removal of derelict and abandoned vessels throughout the Sanctuary.

Assist in a Survey of Abandoned and Derelict Vessels. Volunteers will assist in surveying for derelict vessels and recording information about the location, type, size, and weight of such vessels.

■*Existing Program Implementation.* Volunteers, especially boat captains, have contacted representa-

tives of the Key Largo and Looe Key national marine sanctuaries when derelict vessels have been identified.

■*Implementation.* The Volunteer Coordinator will administer this activity. Overall, the FDEP will be primarily responsible for strategy implementation. Monroe County, NOAA, and NGOs will aid in implementation efforts.

Strategy B.4: Channel/Reef Marking

Establish a channel/waterway marking system throughout the Sanctuary.

• ***Help Map Marking Areas.*** Volunteers will assist in assessing boater-use and impact levels. They will also help develop a standardized marking system, determine the criteria used to evaluate which channels will be marked, and install channel/reef markers.

■*Implementation.* The Volunteer Coordinator will administer this activity. Overall, NOAA and Monroe County will share the lead responsibility for strategy implementation. The U.S. Coast Guard (USCG) and the FDEP will provide secondary implementation support.

The implementation scheme for this strategy is described in the Channel/Reef Marking Action Plan. This strategy is also included in the Regulatory Action Plan.

Strategy B.9: Visitor Registration

Establish a voluntary visitor registration program to assess user activity in the Sanctuary.

• ***Serve as Registrars for the Sanctuary.*** Volunteers will work with Sanctuary staff at marinas, local chambers of commerce, visitor centers, Sanctuary offices, and other Federal, State, and local agencies to conduct surveys of areas visited most frequently, and types of visitor activities. The goal is to evaluate Sanctuary-use patterns.

■*Existing Program Implementation.* Sanctuary officers have informally gathered information on visitor-use patterns for the past 17 years.

■*Implementation.* The Volunteer Coordinator will administer this activity. Overall, NOAA will be the lead agency responsible for implementing this strategy. The FDEP will provide secondary implementation support.

Strategy B.10 Damage Assessment

Establish damage assessment standards for vessel groundings in the Sanctuary.

• ***Provide Assistance to Damage Assessment Team.*** Volunteers will assist the damage assessment team by helping with equipment, measurements, and other activities related to underwater damage assessment activities.

■*Existing Program Implementation.* NOAA and the FDEP are currently planning to establish damage assessment procedures.

■*Implementation.* The Volunteer Coordinator will administer this activity. Overall, NOAA will be the lead agency responsible for implementing this strategy. The FDEP will provide secondary implementation support.

Fishing

Three fishing strategies have a volunteer component. Volunteers will assist in research activities and on-water programs.

Fishing Strategies

F.7: Artificial Reefs
- Assist in data collection

F.9: Gear Removal
- Assist in gear removal

F.11: Gear/Method Impacts
- Assist with research on low-impact fishing gear

Strategy F.7: Artificial Reefs

Conduct research on the impacts of artificial reefs on fish and invertebrate populations for long-term management, including location, size, materials, etc. Monitor and evaluate habitat modification caused by the installation of marine structures. Assess and develop regulations for artificial reef construction, and evaluate habitat suitability for artificial reefs.

• ***Assist in Data Collection.*** Volunteers will assist researchers in gathering information on the impacts of artificial reef development on fish and invertebrate populations. They will also help compile information about habitat modifications resulting from artificial reef construction.

■*Existing Program Implementation.* An ongoing Sanctuary/Professional Association of Dive Instructors (PADI) project involves training volunteer divers in underwater data-collection techniques. Training divers in artificial reef data-collection techniques is one element of the project. NOAA, the PADI, Florida Sea Grant, and other NGOs are involved in developing this project.

■*Implementation.* The Volunteer Coordinator will administer this activity. Overall, the FDEP will be the lead agency responsible for implementing this strategy. The National Marine Fisheries Service (NMFS), Monroe County, and Florida Sea Grant will provide secondary implementation support.

The implementation scheme for this strategy is described in the Research and Monitoring Action Plan.

Strategy F.9: Gear Removal

Develop a program for the removal of lost or out-of-season fishing gear, and implement in all areas of the Sanctuary.

• ***Assist in Gear Removal.*** As soon as the areas considered high-priority for cleanup have been identified and removal methods determined, volunteers will assist in removing abandoned fishing gear and traps. This activity will complement the general underwater cleanups that occur several times a year.

■*Existing Program Implementation.* The ongoing Sanctuary/PADI project includes a gear-removal component.

■*Implementation.* The Volunteer Coordinator will administer this activity. Overall, NOAA will be the lead agency responsible for strategy implementation. The process for developing and implementing regulations is described in the Regulatory Action Plan.

Strategy F.11: Gear/Method Impacts

Conduct research on alternative fishing gear and methods that minimize impacts on habitat. Implement a voluntary program to encourage the use of low-impact gear and methods. Implement regulations to require the use of low-impact gear and methods in priority areas. Characterize harvesting stresses affecting outer and inshore reefs and hardbottom ecosystems.

• ***Assist with Research on Low-Impact Fishing Gear.*** Volunteers will assist Sanctuary staff by researching the use of low-impact fishing gear and methods.

■*Implementation.* The Volunteer Coordinator will administer this activity. The South Atlantic and the Gulf of Mexico fisheries management councils and the Florida Marine Fisheries Commission (FMFC) will share the lead responsibility for strategy implementation. The FDEP and NMFS will provide secondary implementation support.

The implementation scheme for this strategy is described in the Research and Monitoring Action Plan.

Recreation

Two recreation strategies have a volunteer component. They will primarily involve data-collection efforts.

Recreation Strategies

R.1: SCR Management
- Assist in inventorying submerged cultural resources
- Volunteer training program

R.2: Recreation Survey
- Assist in implementing the recreation survey

Strategy R.1: SCR Management

Develop and implement a program to manage submerged cultural resources. Conduct an inventory of submerged cultural resources and assess survey and extraction techniques within the Sanctuary. Require permitting throughout the Sanctuary.

• ***Assist in Inventorying of Submerged Cultural Resources.*** Volunteers will assist Sanctuary staff in compiling an inventory of submerged cultural resources, and will assist researchers in compiling specific site data (including name, age, integrity, and historical significance). Volunteers will also help develop a shipwreck survey and a comprehensive bibliography.

■*Existing Program Implementation.* The ongoing Sanctuary/PADI project includes a module for inventorying and mapping SCRs.

■*Implementation.* The Volunteer Coordinator will administer this activity. Overall, NOAA will be the lead agency responsible for strategy implementation.

• ***Volunteer Training Program.*** A volunteer training program will be established to provide a mechanism for general public involvement in SCR research, documentation, and management.

■*Implementation.* The Volunteer Coordinator will administer this activity. Overall, the National Park Service (NPS) and Florida Division of Historical Resources (FDHR) will share responsibility for strategy implementation.

The implementation scheme for this strategy is described in the Submerged Cultural Resources Action Plan. This strategy is also included in the Regulatory Action Plan.

Strategy R.2: Recreation Survey

Establish a routine survey of recreational activities and use levels within the Sanctuary through a survey of charter and recreational-for-hire vessels, intercept surveys at access points and launch sites, and periodic field surveys.

• ***Assist in Implementing the Recreation Survey.*** Volunteers will help conduct a survey to determine types, levels, users, and locations of recreation activities within the Sanctuary. They also will assist in interviewing captains of charter and recreational-for-hire vessels and the general public at access points, launch sites, and on the water. The survey will collect information on operator and safety equipment and visitor behaviors, such as the use of gloves and buoyancy vests.

■*Existing Program Implementation.* Volunteers have interviewed commercial boat captains as part of the recreation survey.

■*Implementation.* The Volunteer Coordinator will implement and administer this activity. Overall, NOAA will be the lead agency responsible for strategy implementation.

Education and Outreach

Every education and outreach strategy (except E.6) has a volunteer component, and volunteer assistance is critical to the success of the Sanctuary's Education and Outreach Program.

Strategy E.1: Printed Materials

Develop printed materials to promote public awareness of the impact of their activities, both land and water-related, on the Sanctuary's resources and environmental quality. Promote the proper use of equipment used for these activities in order to minimize adverse impacts to natural resources. Materials will include brochures, posters, newsletters, contributions to periodicals, environmental nautical charts, color environmental atlases, and a color periodical. Distribute materials in bulk to high-interception locations (e.g., marinas, boat ramps, dive shops, other businesses, etc.), and include bulk mailings as a means of distribution.

• ***Assist Sanctuary Staff in Developing and Distributing Printed Materials.*** Volunteers will assist the Education and Outreach Program staff by gathering references and developing artwork for printed materials. They will also help distribute the materials to high-interception locations. In addition, volunteers may provide the translations for multilingual materials.

■*Existing Program Implementation.* Volunteers have assisted with the production of printed materials and the distribution of brochures.

■*Implementation.* The Volunteer Coordinator will administer this activity. Overall, NOAA will be the lead agency responsible for implementing this strategy. The FDEP will provide secondary implementation support.

The implementation scheme for this strategy is described in the Education and Outreach Action Plan.

Strategy E.2: Audio-Visual Materials

Inventory and use existing videos, films, and audio-visual environmental education materials portraying activities in the Florida Keys and their impacts on Sanctuary resources. Produce a limited number of audios/videos to address gaps in available materials, and to address major activities including boating, fishing, diving, etc. Materials will be available at Sanctuary offices and will be distributed to key locations (dive shops, etc.) throughout South Florida.

Assist in Developing the Audio-Visual Library and Audio-Visual Products. Volunteers will help assemble available audio-visual environmental education materials, and will also assist in producing a limited number of audios/videos to address gaps in available materials. The goal is to create a library for use by the public, private organizations, and Sanctuary staff.

■*Existing Program Implementation.* Volunteers are currently assisting the staff at the Key Largo National Marine Sanctuary by cataloging videos and assembling a slide library.

■*Implementation.* The Volunteer Coordinator will administer this activity. Overall, NOAA will be the

Education and Outreach Strategies

E.1: Printed Materials
- Assist Sanctuary staff in developing and distributing printed materials

E.2: Audio-Visual Materials
- Assist in developing the audio/video library and audio and video products

E.3: Signs/Displays/Exhibits
- Assist in developing and installing Sanctuary signs/displays/exhibits

E.4: Training/Workshops/School Programs
- Assist in training, workshops, and school programs

E.5: PSAs
- Assist in developing public service announcements

E.7: Promotional
- Assist in developing promotional materials

E.10: Public Forum
- Assist in preparing for public meetings
- Volunteers speakers bureau
- Assist with Sanctuary watch hot line

E.11: Special Events
- Assist at trade shows and special events

lead agency responsible for implementing this strategy. The FDEP will provide secondary implementation support.

The implementation scheme for this strategy is described in the Education and Outreach Action Plan.

Strategy E.3: Signs/Displays/Exhibits

Develop signs/displays at high-use areas, all public and some private boat ramps, and some public beach access areas, to inform participants in water-based activities of regulations and environmentally sound practices, provide navigation information, and promote awareness of nearby sensitive areas. Portable displays will also be produced with information on Sanctuary resources, regulations, environmental quality, etc. Most of the signs will be multilingual. Targeted multimedia displays will be developed with information and impacts on the Sanctuary relevant to the activity targeted. A number of wayside exhibits will be installed.

Develop a user-friendly computer system containing information on regulations, access, recreational sites, environmental etiquette, etc. for visitor use at selected sites throughout the Sanctuary within five years.

• ***Assist in Developing and Installing Sanctuary Signs/Displays/Exhibits.*** Volunteers will assist the Education and Outreach Program staff in producing and installing multilingual signs and static displays and will advise staff on the placement of the signs and displays. They will also help set up and take down traveling exhibits, and will compile information for the development of a user-friendly computer system.

■*Implementation.* The Volunteer Coordinator will administer this activity. Overall, NOAA will be the lead agency responsible for implementing this strategy. The FDEP will provide secondary implementation support.

The implementation scheme for this strategy is described in the Education and Outreach Action Plan.

Strategy E.4 Training/Workshops/School Programs

Develop opportunities for instruction and training. This will include programs conducted by teachers, Sanctuary staff, and volunteers. Training programs (e.g., Coral Reef Classroom, submerged cultural resources, etc.) will also be provided for teachers, environmental professionals, business owners and operators, and law enforcement officials.

• ***Assist in Training, Workshops, and School Programs.*** This activity will result in a formal training program for new volunteers, involving basic education/orientation about the marine Sanctuary program, as well as task-oriented training that will enable volunteers to assist with in-school presentations and on-site programs.

■*Existing Program Implementation.* The Sanctuary's Volunteer Program Coordinator currently assists with the Sanctuary Program orientation.

■*Implementation.* The Volunteer Coordinator will administer this activity. Overall, NOAA will be the lead agency responsible for implementing this strategy. The FDEP will provide secondary implementation support.

• ***Deliver Education Message at the Resource.*** Volunteers located at popular sites where the public is likely to access the resource will help to deliver resource education and interpretation at the site of the resource (i.e., Team O.C.E.A.N.).

■*Existing Program Implementation.* Currently education staff provide program orientation and support for this activity. Sanctuary vessels are made available for this activity.

■*Implementation.* Overall, NOAA will be the lead agency responsible for implementing this strategy. The FDEP will provide secondary implementation support.

The implementation scheme for these strategies are described in the Education and Outreach Action Plan. A component of this strategy is also included in the Water Quality Action Plan.

Strategy E.5: PSAs

Establish a program to promote Sanctuary goals and activities through public service announcements (PSAs) in South Florida, with some national and international public exposure, that presents an overview of the Sanctuary, its resources, and their ecological significance for routine distribution to radio, cable television stations, and newspapers. Develop editorial/contributions for other printed media. Funds will be spent on routine media exposure. PSAs would focus on participants in water-related and other activities that affect the Sanctuary (boaters, divers, household etc.). These materials will also be organized into a press packet.

• ***Assist in Developing PSAs.*** Volunteers will help produce multilingual public service announcements for radio and television, and will translate materials for printed media. Spanish-speaking volunteers, for example, will assist in producing PSAs broadcast in Spanish on Miami television and radio stations. Volunteers will also help compile and distribute a press packet.

■*Implementation.* The Volunteer Coordinator will administer this activity. Overall, NOAA will be the lead agency responsible for implementing this strategy. The FDEP and NGOs will provide secondary implementation support.

The implementation scheme for this strategy is described in the Education and Outreach Action Plan.

Strategy E.7: Promotional

Promote educational materials, including bilingual materials and other information about the Sanctuary and its resources, at existing Sanctuary offices and local chambers of commerce. Establish interagency visitor centers with the U.S. Department of Interior (USDOI) and the Florida DEP.

• ***Assist in Developing Promotional Materials.*** Volunteers will help establish visitor booths/displays in Sanctuary offices, chambers of commerce, and at an interagency visitor center. They will also help identify other no-cost/low-cost spaces to display educational materials.

■*Existing Program Implementation.* Volunteers currently assist the education staff at the Key Largo National Marine Sanctuary office by displaying brochures for walk-in visitors.

■*Implementation.* The Volunteer Coordinator will administer this activity. Overall, NOAA will be the lead agency responsible for implementing this strategy. The FDEP will provide secondary implementation support.

The implementation scheme for this strategy is described in the Education and Outreach Action Plan.

Strategy E.10 Public Forum

Establish a program to ensure public involvement throughout South Florida in Sanctuary activities by holding public meetings and promoting Sanctuary awareness to extracurricular groups.

• ***Assist in Preparing for Public Meetings.*** Volunteers will help Sanctuary staff organize public meetings, and will help develop a limited number of printed materials to support presentations to external organizations (4-H clubs, scouts, etc.) and NGOs.

■*Existing Program Implementation.* Volunteers currently help Sanctuary staff compile information packets for Advisory Council meetings.

■*Implementation.* The Volunteer Coordinator will administer this activity. Overall, NOAA will be the lead agency responsible for implementing this strategy. The FDEP will provide secondary implementation support.

• ***Form a Volunteer Speakers Bureau.*** Selected volunteers will be recruited and trained to deliver public programs to groups in South Florida. They will provide information about the Sanctuary to a wider range of groups than the staff can currently reach.

■*Implementation.* The Volunteer Coordinator will administer this activity. Overall, NOAA will be the lead agency responsible for implementing this strategy. The FDEP will provide secondary implementation support.

The implementation scheme for this strategy is described in the Education and Outreach Action Plan.

Strategy E.11: Special Events

Organize, support, and/or participate in special events (e.g., trade shows, expositions, grand openings, etc.) that allow for the exchange of Sanctuary information. The Sanctuary will cosponsor a number of conferences and workshops, with selected sole sponsorship of some events. This would include a "Sanctuary Awareness Week" and a "grand opening" to the Sanctuary. The Sanctuary Program would cosponsor other "awareness" events/weeks (e.g., National Fishing Week, etc.).

• ***Assist at Trade Shows and Special Events.*** Volunteers will assist Sanctuary staff at trade shows, local festivals, and special events.

■*Implementation.* The Volunteer Coordinator will administer this activity. Overall, NOAA will be the lead agency responsible for implementing this strategy. The FDEP will provide secondary implementation support.

The implementation of this strategy is described in the Education and Outreach Action Plan.

Research and Monitoring

Two research and monitoring strategies have a volunteer component. Volunteers will assist Sanctuary staff with many of the research activities in each strategy.

Research and Monitoring Strategies

W.20: Monitoring
- Provide monitoring assistance

W.33: Ecological Monitoring
- Assist in the monitoring program

Strategy W.20: Monitoring

Conduct a long-term, comprehensive monitoring program as described in the EPA Water Quality Protection Program.

• ***Provide Monitoring Assistance.*** Volunteers will assist with the monitoring program to obtain information on the status and trends of the Sanctuary's water quality parameters and biological resources. This will include collecting samples for evaluating water column and sediment parameters. Volunteers will also help sample seagrass, hardbottom, and mangrove communities.

■*Existing Program Implementation.* The Nature Conservancy has developed a Florida Bay Watch program to incorporate volunteer efforts into a water-sampling program.

■*Implementation.* The Volunteer Coordinator will administer this activity. Overall, EPA and the FDEP will be the lead agencies responsible for implementing this strategy.

The implementation scheme for this strategy is described in the Water Quality Action Plan.

Strategy W.33: Ecological Monitoring

Develop and implement a Sanctuary-wide, extensive ecosystem monitoring program. The objective of the program will be to monitor the status of various biological and ecological indicators of system components throughout the Sanctuary and adjacent areas, in order to discern the local and system-wide effects of human and natural disturbances, and assess the overall health of the Sanctuary.

• ***Assist in the Monitoring Program.*** Volunteers will help collect data on the status and trends of various ecological indicators. Volunteers will collect “presence and absence” data to provide fisheries researchers with additional information.

■*Existing Program Implementation.* The Atlantis Dive Center in Key Largo is currently conducting a volunteer training program that teaches fish identification and data-collection techniques, as well as how to achieve high data confidence. In addition, The Nature Conservancy has developed and implemented a volunteer diver training program to compile information on the location and health of certain coral species, and the Sanctuary/PADI cooperative project has a module which includes benthic monitoring. Additionally, Reef Relief is currently conducting a photo-monitoring program on corals in the Lower Keys.

■*Implementation*: The Volunteer Coordinator will administer this activity. Overall, NOAA will be the lead agency responsible for implementing this strategy. The FDEP will provide secondary implementation support.

The implementation scheme for this strategy is described in the Research and Monitoring Action Plan.

General FKNMS Support

Volunteer assistance is an integral part of many Sanctuary activities not associated with specific strategies. Volunteers will assist with general office and computer support tasks, maintenance activities, fundraising, and other important program elements as detailed below.

General Support Items

- Office support
- Computer support
- Marine and dock maintenance
- Fundraising
- Inter-organizational volunteer coordination
- Group leaders
- Boat captains
- Special projects

Office Support. Volunteers will provide general administrative support at the Sanctuary offices, including answering telephones, copying materials, preparing mailings, greeting visitors, and other duties as assigned.

■*Existing Program Implementation.* Volunteers are currently assisting staff at the offices with general administrative activities.

■*Implementation.* The Volunteer Coordinator will administer this activity. Overall, NOAA will be the lead agency responsible for administrative activities.

Computer Support. Volunteers will assist with data entry at several Sanctuary offices. Databases are updated on a daily or weekly basis, and volunteers will help develop databases or modify programs as requested by Sanctuary staff.

■*Existing Program Implementation.* Volunteers currently help the staff update their education database.

■*Implementation.* The Volunteer Coordinator will administer this activity. Overall, NOAA will be the lead agency responsible for office databases.

Marine and Dock Maintenance. Volunteers will help with marine maintenance and dock maintenance activities, including mooring buoy installation, repairs, and cleaning; vehicle maintenance; boat maintenance; grounds maintenance; and storage shed and dock area cleaning.

■*Existing Program Implementation.* Volunteers currently help marine mechanics with vehicle, vessel, and dock maintenance.

■*Implementation.* The Volunteer Coordinator will administer this activity. Overall, NOAA will be the lead agency responsible for marine maintenance activities and dock maintenance at Sanctuary offices.

Fundraising. Volunteers will help with fundraising activities, including researching what grants are available and providing assistance in developing grant proposals.

■*Existing Program Implementation.* Volunteers currently assist Sanctuary staff in reading the Federal Register on a weekly basis to identify available funding sources.

■*Implementation.* The Volunteer Coordinator will administer this activity. Overall, NOAA will be the lead agency responsible for fundraising activities.

Inter-organizational Volunteer Coordination. Volunteers will coordinate with staff from other government agencies and NGOs involved in Sanctuary activities. The goal is to provide volunteer assistance for projects administered by other agencies and organizations that support the Sanctuary.

■*Implementation.* The Volunteer Coordinator will administer this activity.

Group Leaders. Volunteers will be recruited and trained to lead specific projects conducted by groups visiting the Keys.

■*Existing Program Implementation.* Volunteers trained by Sanctuary staff currently lead some Sanctuary projects. Volunteers also lead group reef cleanups, and train and lead others in underwater environmental monitoring efforts.

■*Implementation.* The Volunteer Coordinator will administer this activity.

Boat Captains. Volunteers will be trained to operate Sanctuary vessels.

■*Existing Program Implementation.* Volunteers piloting Sanctuary vessels for visiting researchers and other volunteer programs.

■*Implementation.* The Volunteer Coordinator will administer this activity.

Special Projects. Volunteers will be contacted on an as-needed basis for special projects and one-time Sanctuary events.

■*Existing Program Implementation.* Each summer, dive shops and volunteers are contacted to help monitor when coral spawns.

■*Implementation.* The Volunteer Coordinator will administer this activity.

Implementation

The purpose of the plan is to explain that volunteer efforts will be planned, deliberate actions designed to accomplish specific management objectives. All volunteer efforts will be organized and directed by a Sanctuary volunteer coordinator. However, the Volunteer Program is not a stand-alone component of the Sanctuary Program, and its success depends on its full integration into all Sanctuary programs and activities. All strategies in this plan will be implemented by a mix of agencies and organizations, some local and some national, as detailed in the action plans containing the specific strategies. The Coordinator will ensure that the volunteer portions of the strategies are implemented. This will require that the Coordinator work with Sanctuary staff, other agencies, and NGOs to implement volunteer activities. In cooperation with these agencies and groups, the timing, scope, and scale of volunteer effort for each strategy will be determined.

An implementation schedule is not included for each of the activities. Volunteer assistance will be used as much as possible within the boundaries of strategy implementation schedules described in the respective action plans. In addition, because these actions are voluntary, requiring little or no resources, funding data are not included (aside from the general information listed below). Cost estimates and personnel estimates are also excluded from this plan, since they are not appropriate and/or are already accounted for in the implementing action plans. Funding data and cost and personnel estimates are specified in the action plans listed at the end of each strategy description.

Not all of the volunteer activities listed in this plan will be implemented in year 1. Elements of certain strategies will begin in year 1 (e.g., volunteers inventorying visitor centers and businesses desiring Sanctuary displays), and Sanctuary managers will play a major role in determining priorities when several strategies need to be implemented simultaneously.

The Sanctuary's Volunteer Program will be funded jointly by NOAA and The Nature Conservancy. In 1992 the program budget was $48,300 and included the salary of the Volunteer Coordinator, travel, supplies, equipment (including a computer), and uniforms. In 1993, the program budget was $56,200. As the Program grows, the funding needs will increase. The Program demands are already increasing, and additional staff are needed to support the growing number of volunteers. NOAA and The Nature Conservancy must continue to support the Volunteer Program at a level that enables the necessary volunteer resources to be provided to the Sanctuary Program.

Water Quality Action Plan

The purpose of this action plan is to describe the suite of activities—including corrective actions, monitoring, and research—that are proposed to deal with water quality problems in the Florida Keys National Marine Sanctuary. Each activity is derived from the set of management strategies included in Alternative III. Although this is the final set of water quality activities for the Sanctuary, only a subset may be implemented due to a limited budget. The Water Quality Protection Program Document should be consulted for detailed information about water quality activities in the Keys. Table 24 summarizes key information about the implementation of water quality strategies.

Introduction

Recognizing the critical role of water quality in maintaining Sanctuary resources, Congress directed the U.S. Environmental Protection Agency (EPA) and the State of Florida to develop a Water Quality Protection Program for the Sanctuary. The purpose of the Program is to "recommend priority corrective actions and compliance schedules addressing point and nonpoint sources of pollution to restore and maintain the chemical, physical, and biological integrity of the Sanctuary, including restoration and maintenance of a balanced, indigenous population of corals, shellfish, fish and wildlife, and recreational activities in and on the water" (Florida Keys National Marine Sanctuary and Protection Act). In addition to corrective actions, the Act also requires the development of a water quality monitoring program and provision of opportunities for public participation in all aspects of developing and implementing the Program. This action plan is an abbreviated version of information contained within the Water Quality Protection Program Document.

How the Plan is Organized. This action plan outlines the Sanctuary's proposed water quality activities according to the set of strategies included within the Preferred Alternative. The strategies provide a mechanism for achieving the goals of the Program. The plan is organized into three sections: 1) Introduction, 2) Description of Strategies, and 3) Implementation.

The introduction summarizes the goals and objectives of the Water Quality Action Plan and provides background on the development of the Plan.

The description of strategies section summarizes strategies grouped according to nine themes:

- Florida Bay/external influences;
- domestic wastewater;
- stormwater;
- marinas and live-aboards;
- landfills;
- hazardous materials;
- mosquito spraying;
- canals; and
- research/monitoring.

To the extent possible, each strategy is broken down into its component activities. Activity descriptions discuss existing program implementation (if any), the parties responsible for implementation (responsible agency, primary role, or assisting role), and a proposed schedule for implementation.

The implementation section details how the entire group of strategies comprising the Water Quality Action Plan will be implemented. It summarizes priorities, implementing agencies, schedules, costs, geographic focus, personnel and equipment requirements, contingency planning for changing budgets, and how Program effectiveness will be evaluated.

Background

The strategies for the Management Plan, which includes the Water Quality Action Plan and all other action plans combined, have been grouped into three priority levels, based on their relative importance or feasibility. A strategy's priority level is based on factors such as available funding, costs, personnel requirements, timing, levels of existing implementation, and existing legislative/regulatory authority. The high priority level includes the 16 most important

Table 24. *Summary of Water Quality Strategies*

Page		Strategies	Overall Sanctuary Priority Level +	Planned Level of Action in Year 1 (FY 94) ++	Months to Complete	Funding for Full Implementation	Number of Activities to be Undertaken	Number of Institutions
210		**Florida Bay/External Influence**						
210	W.19	Florida Bay Freshwater Flow	High	Medium	36+	100%	2	10
212	W.24	Florida Bay Influence	High	High	48	<50%	3	5
212		**Domestic Wastewater**						
213	W.1	OSDS Demonstration Project	High	High	36	100%	2	5
214	W.2	AWT Demonstration Project	Medium	Low	36	<50%	2	4
214	W.3	Wastewater Management Systems	High	High	36	<50%	4	8
216	W.4	Wastewater Disposal, City of Key West	High	Low	48	<50%	2	6
217	W.5	Water Quality Standards	Medium	None	60+	<50%	2	4
217	W.6	NPDES Program Delegation	*	--	24	100%	1	2
217	W.7	Resource Monitoring of Surface Discharges	Low	Low	36	100%	1	2
218	W.8	OSDS Permitting	Low	None	36	100%	3	3
219	W.9	Laboratory Facilities	Low	None	36	<50%	2	3
220		**Stormwater**						
220	W.11	Stormwater Retrofitting	Medium	Low	60+	<50%	2	4
220	W.12	Stormwater Permitting	*	--	0	100%	1	5
221	W.13	Stormwater Management	Medium	Medium	24	100%	2	7
222	W.14	Best Management Practices	Medium	Low	36	<50%	1	8
222		**Marinas and Live-Aboards**						
223	B.7	Pollution Discharges	Medium	Medium	48	<50%	5	5
224	Z.5	Special-use Areas	Medium	Low	12+	<50%	3	5
225	L.1	Marina Pump-Out	High	Low	60	<50%	3	8
225	L.6	Mobile Pump-Out	Medium	None	36	<50%	1	2
226	L.2	Marina Sitings and Design	Low	None	36	100%	1	3
226	L.3	Marina Operations	Medium	None	36	<50%	3	5
227	E.4	Training/Workshops/School Programs	Medium	Medium	24	<50%	1	2
228		**Landfill**						
228	L.7	SWD Problem Sites	Medium	None	60+	<50%	3	3
229		**Hazardous Material**						
229	W.15	HAZMAT Response	Medium	Low	36	<50%	3	5
230	W.16	Spill Reporting	Low	Low	24	<50%	2	3
231	L.10	HAZMAT Handling	Medium	None	36	?	1	4
231		**Mosquito Spraying**						
231	W.17	Mosquito Spraying	High	High	12	75-99%	4	2
232	W.18	Pesticide Research	High	None	36+	<50%	3	3
233		**Canals**						
233	W.10	Canal WQ	High	Low	60	<50%	8	5
235		**Research and Monitoring**						
236	W.20	Monitoring	High	High	60+	<50%	4	2
237	W.21	Predictive Models	High	Low	12+	<50%	2	4
237	W.22	Special Studies: Wastewater Pollutants	High	Low	36	<50%	1	4
238	W.23	Special Studies: Other Pollutants and WQ Problems	Medium	None	36	75-99%	4	6
238	W.28	Regional Database	High	High	12	100%	3	3
239	W.29	Dissemination of Findings	Medium	Low	60+	<50%	4	3
240	W.32	Technical Advisory Committee	*	--	0	100%	1	3
240	W.33	Ecological Monitoring Program	High	Refer to Research and Monitoring Action Plan				

+ Strategies with an "*" for Overall Sanctuary Priority Level are already existing programs and/or will be completed in the first year of sanctuary operation.

++ Began October 1, 1993

strategies. The medium priority level contains 36 strategies that represent the next level of importance to the Sanctuary and will have some level of activity in year one. Low priority items contain the remaining strategies in the Management Plan. Those strategies planned for completion in or before year one do not have a priority level.

Water Quality Strategies. The Water Quality Action Plan contains 37 strategies. Three of these (NPDES Program Delegation (W.6), Stormwater Permitting (W.12), and Technical Advisory Committee (W.32), will be completed within the first year of Sanctuary operation (Table 24). Of the remainder, 14 are high priority level, 15 are medium priority level, and 15 are low priority level. Consequently, 29 water quality strategies that are included in this plan are expected to be initiated within the first year of Sanctuary operation.

The action plan strategies will be implemented by a combination of Federal, State, and local agencies (Table 25). The EPA and the Florida Department of Environmental Protection (FDEP) will have lead roles in the implementation of most strategies included in this plan. Others, however, such as the South Florida Water Management District (SFWMD), Monroe County, the Florida Department of Health and Rehabilitative Services (FDHRS), and the U.S. Coast Guard (USCG), will have a lead role in implementing selected strategies included within this Plan.

It is expected to cost $275 million to $495 million to implement all of the strategies included in this plan (Table 26). However, much of this total (>$200 million) is accounted for by two very expensive strategies: Wastewater Management Systems (W.3) and Stormwater Retrofitting (W.11). Excluding these two strategies, the total cost of all strategies is $34 million to $55 million. Funding for the Program will come from a combination of public (Federal, State, and local) and private institutions. Eighteen government institutions are identified as potential participants in this Program (Table 25).

Relationship to Other Action Plans. Many of the strategies within this plan also appear in other action plans. This is a result of the need to establish separate components (i.e., research, education, volunteer) in Sanctuary management. In addition to having a water quality thrust, a strategy may have a research, education, or volunteer component. If a strategy appears in more than one action plan, this is noted at the end of the strategy/activity description. In most cases, the complete description only appears in one action plan.

Goals and Objectives

The Florida Keys National Marine Sanctuary is the first to include a Water Quality Protection Program. The purpose of the Program is specified in the Florida Keys National Marine Sanctuary and Protection Act:

> recommend priority corrective actions and compliance schedules addressing point and nonpoint sources of pollution to restore and maintain the chemical, physical, and biological integrity of the Sanctuary, including restoration and maintenance of a balanced, indigenous population of corals, shellfish, fish and wildlife, and recreational activities in and on the water.

The Program's goals are the protection and improvement of Sanctuary water quality and enhancement of living resources. The Water Quality Protection Program proposes many activities to achieve these goals, such as reducing anthropogenic loading (wastewater and stormwater) to Sanctuary waters. In addition to corrective actions, the Program also includes development of a water quality monitoring program and a special studies program, as well as a provision for opportunities for public participation in all aspects of the Program's development and implementation.

Existing Programs

The Florida Keys National Marine Sanctuary is the first to have a Water Quality Protection Program. There are no existing programs at the Key Largo or Looe Key National Marine Sanctuaries that focus specifically on water quality, although Sanctuary education programs typically include water quality among the many environmental issues they address.

Many of the strategies included in the Water Quality Action Plan involve the modification of existing programs operated by one or more of the agencies with jurisdiction over water quality in the Florida Keys. Other strategies involve entirely new programs, but these would necessarily build upon the existing regulatory/management framework. Further information about existing programs operated by agencies and institutions with jurisdiction over water quality in the Florida Keys is provided in the Water Quality Protection Program Phase II Report, available from the U.S. Environmental Protection Agency.

Where appropriate, descriptions of strategies and activities in the Water Quality Action Plan include a section describing “Existing Program Implementation.”

As specified in the Act, the Water Quality Protection Program was developed by the EPA and the FDEP, working in close coordination with the National Oceanic and Atmospheric Administration. The Program was developed in two phases. During Phase I, information was compiled and synthesized on the status of the Sanctuary's natural environment. Priority problems were identified through this literature review, and through consensus of technical experts and other participants in technical workshops. Phase II focused on developing options for corrective action, developing a water quality monitoring program and associated research/special studies program, and developing a public education and outreach program. Findings from Phases I and II were incorporated into the Water Quality Protection Program Document. Options for corrective action, research, monitoring, and education presented in the Program Document were incorporated into the strategies included in this action plan.

Description of Strategies

Florida Bay/External Influence Strategies

Severe water quality and ecological problems have developed in Florida Bay in recent years, and the Bay is now in a state of crisis. Problems include a massive seagrass die-off; phytoplankton blooms; sponge die-offs; mangrove die-backs; and all of the potential cascading ecological effects of these phenomena. Since 1987, much of Florida Bay has been affected by a massive, unprecedented seagrass die-off that has left tens of thousands of acres of denuded sediments. Through the resulting sediment suspension and nutrient release, the seagrass die-off may be the cause of massive phytoplankton blooms which have affected the Bay during recent years. Sponge die-offs caused by phytoplankton blooms may have serious impacts on juvenile spiny lobsters, which reside by day under sponges for protection from predation.

Most scientists believe that recent ecological problems in Florida Bay are the result of long-term reduction in freshwater flow from the Everglades. The mechanism has not been documented, but high salinities per se and a long-term change from an estuarine to a marine system may be contributing factors.

These problems in Florida Bay must be viewed as a potential threat to water quality and resources in the Sanctuary. Water quality and natural resources in Florida Bay are tightly linked to those of the Sanctuary. The need for action to deal with water delivery problems in Florida Bay has been strongly stressed by workshop participants and other scientists during the development of the Water Quality Protection Program. Two strategies were developed to address this issue: one (W.19) would have the Steering Committee for the Water Quality Protection Program take a leading role in working to restore historical freshwater flow to Florida Bay; the other (W.24) would conduct research that will further document the influence of Florida Bay on water quality and biological resources in the Sanctuary. The research on Florida Bay influence should supply additional scientific evidence to support the need for action.

Strategy W.19: Florida Bay Freshwater Flow

The Steering Committee for the Water Quality Protection Program shall take a leading role in restoring historical freshwater flow to Florida Bay, which is now in a state of crisis. In addition, Sanctuary representatives shall work with appropriate Federal, State, and local agencies to ensure that restoration plans and surface-water improvement and management plans for South Florida and the Everglades are compatible with efforts to maintain water quality within the Sanctuary.
(Priority Level High, Medium Level of Action in Year 1, 36+ Months to Complete, 100% Funding Available for Full Implementation)

Activity 1-Establish a Leading Role for the Steering Committee. The Steering Committee for the Water Quality Protection Program includes high-level representatives of all relevant agencies, and can

Florida Bay/External Influence Strategies

W.19: Florida Bay Freshwater Flow
- Establish leading role for the Steering Committee
- Participate in a review/revision of water management strategies

W.24: Florida Bay Influence
- Conduct historical assessment
- Conduct circulation studies
- Conduct ecological studies

therefore take a leading role in water management issues affecting Florida Bay, including restoring historical freshwater flow. Both short- and long-term solutions must be pursued at high levels of management in both State and Federal agencies.

■*Implementation.* The responsible agencies will be the EPA and FDEP, which administer the Water Quality Protection Program. All other agencies represented on the Steering Committee will have a primary role, including NOAA, the National Park Service (NPS), the U.S. Fish and Wildlife Service (FWS), the U.S. Army Corps of Engineers (USACE), the Florida Department of Community Affairs (FDCA), the SFWMD, and the Florida Keys Aqueduct Authority (FKAA).

■*Schedule*. This activity has been completed.

Activity 2-Participate in a Review/Revision of Water Management Strategies. Sanctuary representatives shall participate in the review and revision of restoration plans and water management plans for Florida Bay and adjacent areas to ensure that these proposals and/or actions will enhance and complement water quality improvement efforts undertaken in the Sanctuary. These plans include, but are not limited to, the Shark River Slough GDM, C-111 basin, Taylor Slough Restoration, West Dade Wellfield, US 1 widening, National Park Service Everglades Restoration Plan, Lower East Coast Water Supply Plan, and Everglades Surface Water Management and Improvement Plan.

■*Implementation.* The Management Committee of the Water Quality Protection Program is responsible for

Ongoing Efforts to Restore the South Florida Ecosystem

During the same time that this Management Plan was developed, several Federal and State initiatives were begun, largely at the urging of Sanctuary Advisory Council members, to restore the entire South Florida ecosystem, from the Kissimmee River through the Florida Keys.

South Florida Ecosystem Restoration Task Force

In June 1993, Secretary of the Interior Bruce Babbit implemented an interagency initiative to address the environmental problems in South Florida and Florida Bay. In September 1993, an Interagency Agreement on South Florida Ecosystem Restoration was signed, formally establishing the South Florida Ecosystem Restoration Task Force. The members of the Task Force are the assistant secretaries of the Departments of Agriculture, the Army, Commerce, Interior, Justice, and the Environmental Protection Agency. Plans are to include the Federal Highway Administration in the Agreement during the restoration effort. In addition, the State of Florida and the Tribes are members of the Task Force. A list of the current membership is included in Appendix B. The agreement specified that the Task Force do the following:

- agree on the Federal objectives for restoring the South Florida ecosystem;
- promote the establishment of an ecosystem-based science program that utilizes the strengths of public and private entities and includes research, inventory, monitoring, and modeling;
- support the development of appropriate multi-species recovery plans for threatened and endangered species and other species proposed for listing as threatened or endangered; and
- encourage the expedited implementation of projects, programs, and activities included in the coordinated plans for the environmental restoration and maintenance of the South Florida ecosystem.

The ultimate objective of the Task Force is to develop a restoration plan for the entire South Florida ecosystem.

The Task Force established an 11-member Interagency Working Group to formulate and recommend management policies, strategies, plans, programs, and priorities for ecosystem restoration and maintenance to the Task Force.

Science Plan for Florida Bay

The development of a comprehensive research and monitoring plan for Florida Bay, another interagency effort, has been occurring at the same time as the development of the FKNMS Draft Management Plan/EIS, Water Quality Protection Program, and the South Florida Ecosystem Restoration Report. In January 1993, the Everglades National Park research staff convened an interagency group of managers and scientists to review their research plan for Florida Bay. This group informally became the Florida Bay Interagency Working Group, with the responsibility for developing the Science Plan for Florida Bay that was released in April 1994. The final draft of this plan was developed by scientists from the National Park Service, National Biological Survey, NOAA, South Florida Water Management District, and Florida Department of Environmental Protection, following a series of interagency reviews.

Governor's Commission for a Sustainable South Florida

By Executive Order, Florida Governor Lawton Chiles established a "Commission for a Sustainable South Florida" on March 3, 1994. The Commission, which has representatives from various local, State, and Federal agencies, the Tribes, as well as other public and private interests in the region, was created to "develop recommendations and public support for regaining a healthy South Florida ecosystem with a sustainable economy and communities."

administering water quality management in the Sanctuary. The responsible agencies will be the EPA and FDEP, which administer the Water Quality Protection Program. NOAA will have a primary role because of its overall responsibility for managing the Sanctuary. The main agencies involved in water management decisions for the Everglades and Florida Bay are the NPS, SFWMD, and USACE. As the State land-planning agency for a designated Area of Critical State Concern, the FDCA is also likely to be involved. Other primary agencies are the FWS and Monroe County.

■*Schedule*. This activity will have a medium level of action in year 1. It will require 36+ months to complete.

Strategy W.24: Florida Bay Influence

Conduct research to understand the effect of water transport from Florida Bay on water quality and resources in the Sanctuary.
(Priority Level High, High Level of Action in Year 1, 48 Months to Complete, <50% Funding Available for Full Implementation)

Activity 1-Conduct an Historical Assessment. This activity will involve an historical assessment of Everglades/Florida Bay/Florida Keys hydrology, as it has affected water quality and biological communities in the Sanctuary. It will clarify the role of freshwater inflows and water quality from the Everglades and other freshwater discharges to the southwest shoreline of Florida, to Florida Bay and the Sanctuary. The activity will examine the effects of structural modifications and changes in timing and volume of freshwater releases from existing structures, as well as land-based practices affecting the water quality of runoff.

■*Implementation.* The SFWMD and the NPS will be the responsible agencies for this strategy. Assistance will be provided by USACE, which has historical data concerning water management activities affecting the Everglades and Florida Bay.

■*Schedule*. This activity will have a high level of action in year 1. It will require 12 months to complete.

Activity 2-Conduct Circulation Studies. This activity will involve circulation studies to estimate present-day, long-term net transport and episodic transport from Florida Bay to the Sanctuary. Studies of groundwater flow may be included.

■*Implementation.* The EPA and FDEP will be the responsible agencies for this strategy.

■*Schedule*. This activity will have a high level of action in year 1. It will require 48 months to complete.

Activity 3-Conduct Ecological Studies. This activity will involve studies to document ecological impacts, if any, of Florida Bay waters on Sanctuary communities including seagrasses, coral reefs, nearshore hardbottom communities, and potentially endangered or threatened species. Documentation of potential impacts could provide a stronger basis for action to restore historical freshwater flow to Florida Bay.

■*Implementation.* The EPA and the FDEP will be the responsible agencies for this strategy.

■*Schedule*. This activity will have a low level of action in year 1. It will require 36 months to complete.

This strategy is also included in the Research and Monitoring Action Plan.

Domestic Wastewater Strategies

This section describes strategies for reducing pollution from land-based sources of domestic wastewater. Pollution sources include cesspits, on-site disposal systems (OSDS), package plants, and municipal treatment plants. Strategies for reducing wastewater pollution from live-aboard boaters are covered in the Marina and Live-aboard section of this action plan.

The first two domestic wastewater strategies (W.1 and W.2) are demonstration projects that would provide information to decide among options for the main engineering strategy (W.3) for wastewater management systems outside Key West.
Strategy W.4 is also an engineering strategy, but is applicable only to Key West. The remaining domestic wastewater strategies involve management activities designed to reduce pollution by developing water quality standards (including biocriteria) specific to the Florida Keys, and making the regulatory/management system work more efficiently.

Domestic Wastewater Strategies

W.1: OSDS Demonstration Project
- Select alternate OSDS and test locations
- Conduct an OSDS demonstration project

W.2: AWT Demonstration Project
- Select specific technology and test location
- Conduct AWT pilot project

W.3: Wastewater Management Systems
- Establish inspection/compliance programs for cesspits, OSDS, and package plants
- Evaluate development of nutrient reduction targets
- Develop sanitary wastewater master plan
- Implement master plan

W.4: Wastewater Disposal, City of Key West
- Evaluate Disposal and reuse options
- Upgrade effluent disposal

W.5: Water Quality Standards
- Develop and evaluate indicators
- Develop water quality standards

W.6: NPDES Program Delegation
- Delegate NPDES program

W.7: Resource Monitoring of Surface Discharges
- Require resource monitoring

W.8: OSDS Permitting
- Improve interagency coordination
- Combine OSDS permitting responsibilities
- Monitor revised OSDS rules

W.9: Laboratory Facilities
- Conduct feasibility study
- Establish interagency laboratory

Strategy W.1: OSDS Demonstration Project

Conduct a demonstration project to evaluate innovative alternate, nutrient-removing OSDS.
(Priority Level High, High Level of Action in Year 1, 36 Months to Complete, 100% Funding Available for Full Implementation)

This strategy will provide information to help determine the appropriate role, if any, of alternate OSDS (septic systems) in wastewater management in the Keys. Although some alternate OSDS designs appear promising, it is not appropriate to proceed with broad-scale installation of these systems until an independent evaluation has been conducted.

Activity 1-Select Alternate OSDS and Test Locations. Alternate OSDS designs will be reviewed, and appropriate systems will be selected for evaluation. Suitable test locations will be selected.

■*Implementation*. The Florida Department of Health and Rehabilitative Services (FDHRS) will be the responsible agency for this activity. Other primary agencies involved will be the EPA, FDEP, FDCA, and Monroe County.

■*Schedule*. This activity has been completed.

Activity 2-Conduct an OSDS Demonstration Project. Alternate OSDS designed for nutrient removal would be installed and maintained in a manner consistent with actual residential use. Influent, effluent, and groundwater quality (both background and "down-gradient") would be monitored at regular intervals for at least a year. In addition to nutrient-removal efficiency, the study would evaluate maintenance and inspection requirements to keep units operating properly.

■*Existing Program Implementation*. Congress provided $500,000 in additional funds to EPA's fiscal year 1993 budget for the Water Quality Protection Program to be used for demonstration projects. This was used to initiate the OSDS Demonstration Project (strategy W.1) before the fiscal year 1994 starting point for this action plan.

■*Implementation*. The FDHRS will be the responsible agency for this activity. Other primary agencies involved will be the EPA, FDEP, FDCA, and Monroe County.

■*Schedule*. This activity will have a low level of action in year 1. It will require 36 months to complete.

Strategy W.2: AWT Demonstration Project

Conduct a pilot project to evaluate installation of a small, expandable AWT plant to serve an area of heavy OSDS use with associated water quality problems.
(Priority Level Medium, Low Level of Action in Year 1, 36 Months to Complete, <50% Funding Available for Full Implementation)

This strategy will provide information to help decide whether elimination of OSDS would improve water quality in areas believed to be degraded by OSDS-related nutrients. Existing OSDS in the test area would be connected to a small package plant providing advanced wastewater treatment (AWT), which includes nutrient removal. The project will also provide information about the long-term performance of small AWT systems and septic tank effluent pumps or other collection systems. Both conventional and innovative technologies will be considered.

Activity 1-Select Specific Technology and Test Location. Different technologies for AWT will be reviewed and appropriate systems will be selected for evaluation. Preferably, the test area will be one where water quality problems believed to be related to OSDS nutrients have already been identified. In addition, the location should be appropriate for eventual expansion of the AWT package plant to a community or subregional plant if the test proves successful.

■*Implementation.* The FDHRS will be the responsible agency for this activity. The EPA, FDEP, and Monroe County will be involved as primary agencies.

■*Schedule*. This activity will have no action in year 1. It will require 12 months to complete.

Activity 2-Conduct an AWT Pilot Project. A small, expandable AWT package plant will be installed to serve an area where there is high-density OSDS use in close proximity to confined waters. Initial background groundwater and surface water monitoring will be conducted, and plant influent and effluent will then be monitored for at least one year after the plant is in operation. Groundwater and surface-water monitoring will be continued for three to five years. Most facilities constructed for the project could be incorporated into a larger system if results are favorable.

■*Implementation.* The FDHRS will be the responsible agency for this activity. The EPA, FDEP, and Monroe County will be involved as primary agencies.

■*Schedule*. This activity will have no action in year 1. It will require 36 months to complete.

Strategy W.3: Wastewater Management Systems

Establish authority for and implement inspection/enforcement programs to identify all cesspits, and enforce existing standards for all OSDS and package plants. Evaluate the development of targets for reductions in wastewater nutrient loadings necessary to restore and maintain water quality and Sanctuary resources. Develop and implement a Sanitary Wastewater Master Plan that evaluates options for upgrading existing systems beyond current standards or constructing community sewage treatment plants, based on nutrient reduction targets, cost and cost effectiveness, reliability/compliance considerations, and environmental and socioeconomic impacts.
(Priority Level High, High Level of Action in Year 1, 36+ Months to Complete, <50% Funding Available for Full Implementation)

Activity 1-Establish Inspection/Compliance Programs for Cesspits, OSDS, and Package Plants. This activity would establish on-site inspection programs to identify all cesspits and ensure that OSDS and package plants are in compliance with existing standards. Inspection/enforcement programs for OSDS and package plants would ensure that these systems are operating properly, reducing nutrient loading to groundwater. Cesspits identified through this activity would eventually be replaced with an approved OSDS or a connection to a community wastewater treatment plant, as determined by the Sanitary Wastewater Master Plan (described in Activity 3). This would reduce nutrient loading to groundwater and eliminate health hazards from untreated sewage. Because development and implementation of the Sanitary Wastewater Master Plan is a long-term process, Monroe County should develop an interim response policy to address non-compliance wastewater treatment systems as part of this activity. This activity will also include a public education/outreach component which would inform the public about ways to assess and improve existing wastewater treatment systems.

■*Implementation.* The FDHRS will be the responsible agency. Other primary agencies involved will be the EPA, FDEP, Monroe County, and the City of Key West.

■*Schedule*. This activity will have a high level of action in year 1. It will require 36 months to complete.

Activity 2-Evaluate Development of Nutrient Reduction Targets. The goal of this activity is to identify and evaluate alternative strategies for developing nutrient reduction targets for wastewater and stormwater in the Sanctuary. The information will help the EPA and the State of Florida to determine whether nutrient reduction targets should be developed and if so, how development should proceed.

■*Implementation. The EPA and FDEP will conduct this activity.*

■ *Schedule*. This activity is in progress and will require 12 months to complete.

Activity 3-Develop Sanitary Wastewater Master Plan. This activity will develop a Sanitary Wastewater Master Plan to evaluate options for wastewater treatment developed in the EPA Water Quality Protection Program Phase II Report. The options (using the numbering system in that report) are as follows:

- **W3a:** Upgrade existing systems to current standards
- **W3b:** Upgrade package plants to AWT;
- **W3c:** Upgrade package plants to AWT and OSDS to alternate nutrient-removing systems;
- **W3d:** Construct AWT plants for Key Largo and Marathon (the two most populous communities in the Upper and Middle Keys), and extend the service area for the Key West treatment plant to adjacent areas of the Lower Keys, to treat 52 percent of wastewater flows outside the City of Key West;
- **W3e:** Construct seven community wastewater treatment plants for the most densely populated areas, to treat 73 percent of wastewater flows outside the City of Key West;
- **W3f:** Construct 12 community wastewater treatment plants, to treat 94 percent of wastewater flows outside the City of Key West; and
- **W3g:** Construct three subregional wastewater treatment plants, to treat 94 percent of wastewater flows outside the City of Key West.

Currently, these options can be evaluated partially on the basis of estimated cost, cost effectiveness, nutrient reduction, and reliability of the technologies involved. However, the options should also be evaluated in light of the nutrient reduction targets which may be developed under Activity 2. In addition, information about the nutrient removal capacity, cost and cost effectiveness, and reliability of alternate, nutrient-removing OSDS and various conventional and innovative AWT technologies needs to be considered; this information will come from the OSDS Demonstration Project (strategy W.1) and the AWT Demonstration Project (strategy W.2). Environmental and socioeconomic impacts must also be analyzed. The Sanitary Wastewater Master Plan will also specify details of costs, schedules, service areas, etc. for implementation. The master plan should investigate the feasibility of wastewater utility districts and other alternative funding mechanisms.

■*Implementation.* FDEP and EPA will be the responsible agencies. FDHRS and Monroe County will also be involved as primary agencies.

■*Schedule*. This activity will have no action in year 1. It will require 36 months to complete.

Activity 4-Implement a Master Plan. This activity will implement the preferred wastewater treatment option specified in the Sanitary Wastewater Master Plan developed under Activity 3. The eventual preferred option cannot be identified at this time. However, two options are discussed below as examples.

Option W3d-Construct Two Community Plants. Advanced wastewater treatment plants would be constructed for Key Largo and Marathon (the two most populous communities in the Upper and Middle Keys), and the service area for the Key West treatment plant would be extended to adjacent areas of the Lower Keys. This would provide a high level of treatment for about 52 percent of the wastewater flows outside Key West. Estimated Keys-wide reductions in wastewater nutrient loadings are 43 percent for total nitrogen, and 28 percent for total phosphorus. Much greater reductions (80 to 91 percent for nitrogen and 50 to 83 percent for phosphorus) would be achieved in the Key Largo and Marathon service areas, where cesspits, OSDS, and package plants would be replaced by the new community plants.

■*Implementation.* The responsible agency for this option has not been determined. Prior to constructing community wastewater treatment plants, it will be necessary to identify an agency to serve as a wastewater utility. Candidates include the Florida Keys Aqueduct Authority (FKAA), which already has the authority, and Monroe County (administrative capability only, or both administrative and operational capabilities). Other primary agencies likely to be involved are the EPA, FDEP, FDCA, and the Florida Department of Transportation (FDOT). The FDHRS may have an assisting role.

■*Schedule*. This activity will have no action in year 1. Time to complete is unknown.

Option W3b-Upgrade Package Plants to AWT. All package plants would be upgraded to AWT. Coupled with elimination of cesspits and enforcement of existing standards for OSDS, this option would reduce wastewater nutrient loadings to groundwater Keys-wide by about 27 percent for nitrogen and 24 percent for phosphorus. The cost would be much less than for option W3d. However, this option would not provide any additional nutrient reduction from OSDS (including cesspits eventually replaced by OSDS), which are the leading source of wastewater nutrients.

■*Implementation.* The FDEP and EPA will be the responsible agencies. Monroe County will also be involved as a primary agency, and the FDHRS may have an assisting role.

■*Schedule*. This activity will have no action in year 1. Time to complete is unknown.

Strategy W.4: Wastewater Disposal, City of Key West

Upgrade effluent disposal for the City of Key West wastewater treatment plant. Evaluate deep-well injection, including the possibility of effluent migrating through the boulder zone into Sanctuary waters. Evaluate options for the re-use of effluent, including irrigation and potable re-use. Discontinue use of ocean outfall and implement deep-well injection, aquifer storage, and/or re-use. Implement nutrient reduction technologies for effluent prior to disposal or re-use.

(Priority Level High, Low Level of Action in Year 1, 48 Months to Complete, <50% Funding Available for Full Implementation)

Activity 1-Evaluate Disposal and Re-use Options. Before use of the ocean outfall is discontinued, both the environmental aspects of deep-well injection and the economics of effluent re-use need to be evaluated thoroughly. Studies of deep well injection need to investigate the possibility of effluent migrating through the boulder zone into Sanctuary waters. Re-use options to be evaluated include irrigation and further treatment to produce potable water. Re-use for local irrigation may be limited due to the small number of application sites. Re-use for irrigation in areas outside the Florida Keys would be considered only if it were proposed for unincorporated Monroe County. Potable re-use, although requiring costly treatment, might be cost-effective in the long term, considering the current cost of treating and pumping in drinking water from Florida City.

■*Implementation*. The responsible agency will be the City of Key West or possibly FKAA (if selected as the Keys-wide wastewater utility). Other primary agencies involved will be the FDEP, EPA, FDCA, and Monroe County.

■*Schedule*. This activity will have a low level of action in year 1. It will require 12 months to complete.

Activity 2-Upgrade Effluent Disposal. Use of the ocean outfall would be discontinued (except in emergencies), and effluents would be disposed of through deep-well injection, aquifer storage, and/or re-use as appropriate based on results of the preceding activity. This strategy would reduce direct nutrient loadings to surface waters from the Key West wastewater treatment plant.

■*Implementation*. The responsible agency will be the City of Key West or possibly FKAA (if selected as the Keys-wide wastewater utility). Other primary agencies involved will be the FDEP, EPA, FDCA, and Monroe County.

■*Schedule*. This activity will have no action in year 1. It will require 48 months to complete.

Strategy W.5: Water Quality Standards

Develop and implement water quality standards, including biocriteria, appropriate to Sanctuary resources.
(Priority Level Medium, No Action in Year 1, 60+ Months to Complete, <50% Funding Available for Full Implementation)

Activity1-Develop and Evaluate Indicators. This activity will identify and evaluate indicators (biochemical and ecological measures to provide early warning of widespread ecological problems) in each type of ecosystem. Examples are tissue C:N:P ratios, alkaline phosphatase activity, and shifts in community structure by habitat. These measures could be incorporated into the Water Quality Monitoring Program, and could provide the basis for resource-oriented water quality standards (biocriteria) for the Sanctuary.

■*Implementation.* The EPA and FDEP will be the responsible agencies for this strategy through the Research/Special Studies Program. In addition to the FDEP and EPA, NOAA/National Marine Fisheries Service (NMFS) may have a role in this research.

■*Schedule*. This activity will have a low level of action in year 1. It will require 36 months to complete.

Activity 2-Develop Water Quality Standards. This activity will develop water quality standards, including nitrogen and phosphorus standards and biocriteria, appropriate to Sanctuary resources (corals and seagrasses). This activity will reduce impacts of pollution on Sanctuary resources by determining water quality conditions to ensure resource protection. The intent is to implement water quality standards as guidance in determining permitted discharge limitations. Outstanding Florida Waters (OFW) standards will be used until research indicates that new, more stringent regulations are necessary.

■*Implementation.* The responsible agency for changes to the state's water quality standards will be FDEP. The FDEP would need to initiate formal rule-making in accordance with Chapter 120FS - Administrative Procedures Act. Once enacted, the new standards would be implemented at the time new permits were being issued or existing permits reissued. Other primary agencies involved in developing the standards will be the EPA and FDHRS.

■*Schedule*. This activity will have no action in year 1. It will require 60+ months to complete.

This strategy is also included in the Research and Monitoring Action Plan.

Strategy W.6: NPDES Program Delegation

Delegate administration of the National Pollutant Discharge Elimination System (NPDES) program for Florida Keys dischargers to the State of Florida.
(Completed in Year 1)

Activity 1-Delegate the NPDES Program. Under this activity, the EPA delegated NPDES permitting authority to the State of Florida, as has been done in many other states. This simplifies the permitting process for surface water dischargers by removing the need to apply for permits from both the EPA and FDEP.

■*Implementation.* This activity was implemented by the EPA and FDEP in 1995. The EPA administers the NPDES permitting program and has the authority to delegate it to the states. FDEP submitted an application to the EPA to have the program delegated. The two agencies entered into a memorandum of understanding (MOU) defining agency roles and responsibilities for NPDES permitting in Florida.

■*Schedule*. This activity has been completed.

This strategy is also included in the Regulatory Action Plan.

Strategy W.7: Resource Monitoring of Surface Discharges

Require all NPDES-permitted surface dischargers to develop resource monitoring programs, including biological monitoring where appropriate.
(Priority Level Low, Low Level of Action in Year 1, 36 Months to Complete, 100% Funding Available for Full Implementation)

Activity 1-Require Resource Monitoring. This activity would help to evaluate environmental impacts of point source discharges by requiring all

NPDES-permitted surface dischargers to develop resource monitoring programs. This could be accomplished in one of two ways. One way would be for EPA to eliminate the baseline exemption for resource monitoring under the Ocean Discharge Program, as it applies to the Florida Keys. All surface dischargers, except the City of Key West sewage treatment plant, are currently exempted from developing resource monitoring programs because the end of their discharge pipe does not extend beyond the baseline (the mean low-tide line). A second way to accomplish the same goal would be for the FDEP, through the State of Florida's permitting authority, to require resource monitoring when individual NPDES permits come up for renewal. This approach probably would be easier, because it can be accomplished under existing rules. Eliminating EPA's baseline exemption would require a Federal rule change.

■*Implementation.* The EPA and FDEP are the responsible agencies for this activity. The EPA could eliminate the baseline exemption as it applies to the Florida Keys. Alternatively, the FDEP could require resource monitoring as individual NPDES permits come up for renewal. The FDEP has the authority to require biological/resource monitoring under existing NPDES regulations.

■*Schedule*. This activity will have a low level of action in year 1. It will require 36 months to complete.

Strategy W.8: OSDS Permitting

Improve interagency coordination for industrial wastewater discharge permitting. Combine OSDS permitting responsibilities in one agency for commercial establishments, institutions, and multi-family residential establishments utilizing injection wells. *(Priority Level Low, No Action in Year 1, 36 Months to Complete, 100% Funding Available for Full Implementation)*

Activity 1-Improve Interagency Coordination. This strategy would improve coordination among the EPA, FDEP, and local government relative to industrial wastewater discharge permitting and tracking (the FDHRS is included for special cases, such as seafood processing plants discharging into septic systems). At present, much of the interagency coordination and tracking is handled through a series of memoranda of agreement (MOAs) and MOUs. These agreements would be reviewed, evaluated, and revised specifically for the Florida Keys. This could also indirectly reduce wastewater pollution by refining and simplifying the OSDS permitting process, and increasing funds for compliance monitoring and enforcement.

■*Implementation.* The responsible agency will be the FDEP, which will work through the Intergovernmental Coordinating Council to review existing MOAs and MOUs. Other primary agencies involved will be the EPA and FDHRS. No new rules or governmental structures will be required to implement this activity.

■*Schedule*. This activity will have no action in year 1. It will require 24 months to complete.

Activity 2-Combine OSDS Permitting Responsibilities. This activity would combine FDEP and FDHRS permitting responsibilities for commercial establishments, institutions, and multi-family residential establishments into one agency. Currently, for commercial establishments, institutions, and multi-family residential uses with total daily flows of less than 5,000 gallons, the Monroe County Public Health Unit is authorized to permit the aerobic treatment unit and the filter unit, whereas the FDEP permits the injection well (borehole). However, effluent from these aerobic systems does not meet the more stringent wastewater treatment standards of the FDEP.

■*Implementation.* The FDEP would be the responsible agency, working closely with the FDHRS. The two agencies would enter into an MOU delineating their respective roles and responsibilities. The agencies would need to agree on establishing the same level of treatment requirements for existing and new or innovative OSDS units to be permitted in the Florida Keys. Once agreement is reached, the administrative rules regarding the quality of wastewater being discharged into injection wells would be amended.

■*Schedule*. This activity will have no action in year 1. It will require 36 months to complete.

Activity 3-Monitor Revised OSDS Rules. This activity will involve designing and implementing a monitoring program to determine the effectiveness of recent revisions in Part II of Chapter 10D-6 Florida Administrative Code (FAC). Effective March 1992, the FDHRS implemented two key rule changes specifically targeting the Florida Keys. One change makes the use of Class V underground injection wells (boreholes) an option of last resort. The other requires the placement of a 12-inch-thick (at a

minimum) filter layer of quartz sand below the drainfield absorption surface of the OSDS. Data are needed to evaluate whether these changes are achieving their desired effect.

■*Implementation.* The responsible agency will be the FDHRS, with primary responsibility assigned to the Environmental Administrator of the State Health Office. The Monroe County Public Health Unit Environmental Health Section would provide field staff. The change requires a 12-inch-thick filter layer of quartz sand, so it will be necessary to find homeowners with existing OSDS who are willing to serve as a control group.

■*Schedule*. This activity will have no action in year 1. It will require 36 months to complete.

Strategy W.9: Laboratory Facilities

Evaluate the feasibility of, and if appropriate, establish an interagency laboratory capable of processing monitoring and compliance samples.
Priority Level Low, No Action in Year 1, 36 Months to Complete, <50% Funding Available for Full Implementation)

Activity 1-Conduct Feasibility Study. This activity would evaluate the feasibility of creating an interagency laboratory facility in the Keys for processing compliance monitoring samples. Neither the FDEP nor the FDHRS has FDHRS-certified (or equivalent) laboratory facilities in the Keys. Because of quality control considerations (holding times), it is difficult or impossible to ship compliance/enforcement samples to Tallahassee for analysis, and use of contracted private laboratory facilities is expensive. The agencies should jointly evaluate the feasibility of establishing a laboratory facility certified by FDHRS or by the quality assurance section of FDEP. The laboratory would be located in the FDEP office building in Marathon and would not process toxics or status and trends samples from the water quality monitoring program.

■*Implementation.* The FDEP would be the responsible agency, working with the FDHRS and possibly Monroe County.

■*Schedule*. This activity will have no action in year 1. It will require 36 months to complete.

***Activity 2-Establish Interagency Laboratory*.** Depending on the outcome of Activity 1 this activity would create an interagency laboratory facility for processing compliance monitoring samples.

■*Implementation.* The FDEP would be the responsible agency, working with the FDHRS and possibly Monroe County.

■*Schedule*. This activity will have no action in year 1. It will require 36 months to complete.

Stormwater Strategies

This section describes four strategies for reducing pollution from stormwater runoff in the Keys. The first (W.11) would involve engineering modification of hot spots to control pollutants in stormwater runoff. The next two strategies (W.12 and W.13) work together to require enactment of stormwater management ordinances and master plans that would cover the entire Keys. The fourth (W.14) involves the development and implementation of widely used Best Management Practices and a public education program to reduce pollutants entering stormwater runoff.

Stormwater Strategies

W.11: Stormwater Retrofitting
- Inventory stormwater hot spots
- Retrofit hot spots and portions of US 1

W.12: Stormwater Permitting
- Eliminate permitting threshold

W.13: Stormwater Management
- Develop and enact stormwater ordinances and master plans on a continuing, county-wide basis
- Petition EPA to include the Florida Keys in the stormwater NPDES program

W.14: Best Management Practices
- Develop and Implement Best Management Practices and a public education program

Strategy W.11: Stormwater Retrofitting

Identify and retrofit stormwater hot spots using Best Management Practices, such as grass parking, swales, pollution control structures, and detention/ retention facilities. Control stormwater runoff in areas handling toxic and hazardous materials. Install swales and detention facilities along limited sections of US 1.
(Priority Level Medium, Low Level of Action in Year 1, 60+ Months to Complete, <50% Funding Available for Full Implementation)

Activity 1-Inventory Stormwater Hot Spots. This activity would involve identifying stormwater hot spots for possible engineering modification (retrofitting). Currently, no hot spots specifically attributable to stormwater runoff have been identified, although stormwater runoff may be a contributing factor in some identified hot spots.

■*Implementation.* Monroe County will be the responsible agency. Other primary agencies involved will be the FDEP, Florida Department of Transportation (FDOT), and SFWMD.

■*Schedule*. This activity will have a low level of action in year 1. It will require 12 months to complete.

Activity 2-Retrofit Hot Spots and Portions of U.S. 1. This activity will involve using grass parking, swales, pollution control structures, and detention/ retention facilities to control pollutants in stormwater runoff. Hot spots would be identified in Activity 1. Swales and detention facilities would be installed along portions of US 1. Engineering actions would be taken to control stormwater runoff in areas handling toxic and hazardous materials.

■*Implementation.* Monroe County will be the responsible agency for stormwater retrofitting. Other primary agencies involved will be the FDEP, FDOT, and SFWMD.

■*Schedule*. This activity will have no action in year 1. It will require 60+ months to complete.

Strategy W.12: Stormwater Permitting

Require that no development in the Florida Keys be exempted from the stormwater permitting process. *(Completed in Year 1)*

Activity 1-Eliminate Permitting Threshold. The SFWMD, which currently has primary responsibility for stormwater permitting in the Florida Keys, exempts developments of fewer than 10 acres in size, or two acres of impervious surface, from having to obtain a stormwater permit. Most developments in the Keys fall below this threshold. Local governments are in the process of developing stormwater management ordinances and/or stormwater management master plans. This strategy would require that local government ordinances and master plans cover all developments, with no exemptions from the stormwater permitting process.

■ *Existing Program Implementation.* Monroe County's stormwater management ordinance is in place and addresses everything that falls below the SFWMD permitting threshold. The City of Key West's Land Development Regulations also address developments that fall below the SFWMD permitting threshold.

■*Implementation.* Each local government (Monroe County and the municipalities) will be responsible for implementing its own ordinance within its jurisdictional limits. As the State land planning agency for a designated Area of Critical State Concern, the FDCA has an oversight responsibility to ensure that local development regulations adequately protect the area's natural resources and are consistent with those of their neighbors. The SFWMD will provide technical assistance in the development of stormwater ordinances and master plans.

■*Schedule*. This activity is in progress.

Strategy W.13: Stormwater Management

Require local governments to enact and implement stormwater management ordinances and comprehensive stormwater management master plans. Petition the EPA to include the Florida Keys in the stormwater NPDES program, if adequate stormwater management ordinances and administrative capability to manage such ordinances are not in place by a certain date.
(Priority Level Medium, Medium Level of Action in Year 1, 24 Months to Complete, 100% Funding Available for Full Implementation)

This strategy would help to reduce stormwater pollutant loadings (e.g., sediment, toxics, and nutrients) by requiring local governments to develop stormwater management ordinances and master plans. Currently, there is little regulation of stormwater runoff in the Keys. Many developments were constructed before SFWMD stormwater permitting requirements were in place or, if constructed more recently, they fell below the acreage thresholds for those regulations. Monroe County recently passed a stormwater ordinance, and other local governments are either developing ordinances and/or have stated in their comprehensive plans that stormwater management master plans will be developed.

Activity 1-Develop and Enact Stormwater Ordinances and Master Plans on a Continuing, County-Wide Basis. Under this activity, local governments would enact ordinances and master plans to control pollutants in stormwater runoff.

■*Implementation.* Each local government (Monroe County and the municipalities) will be responsible for developing its own stormwater management ordinance. Subsequent modifications to each ordinance may be necessary once each local government adopts its stormwater management master plan. Under authorities of Sections 163.3161 and 380.05 FS, the FDCA has responsibility for ensuring that programs and regulatory rules enacted by local governments in Monroe County are consistent with the legislative growth management principles described in the above-mentioned sections of the Florida Statutes. The SFWMD may provide technical assistance in the development of stormwater ordinances and master plans.

■*Schedule*. This activity will have a medium level of action in year 1. It will require 12 months to complete.

Activity 2-Petition EPA to Include the Florida Keys in the Stormwater NPDES Program. This activity would provide an alternate means of controlling stormwater pollutants in the Keys. It would be implemented only if adequate local stormwater-management ordinances, and administrative capability to manage such ordinances, are not in place by the deadlines established under Activity 1.

■*Implementation.* The responsible agency will be the FDEP, which would petition the EPA to include the Keys in the stormwater NPDES program for separate municipal storm sewer systems. Monroe County (including its municipalities) currently falls below the population threshold that would trigger the county's inclusion in the stormwater NPDES program. However, states may petition EPA to include a local government in the program.

■*Schedule*. This activity will have no action in year 1. It will require 24 months to complete.

Strategy W.14: Best Management Practices

Institute a series of Best Management Practices and a public education program to prevent pollutants from entering stormwater runoff.
(Priority Level Medium, Low Level of Action in Year 1, 36 Months to Complete, <50% Funding Available for Full Implementation)

Activity 1-Develop and Implement Best Management Practices and a Public Education Program. This activity would reduce pollution from stormwater runoff through a variety of programs, including street sweeping; ordinances aimed at controlling fertilizer application on public and private landscaping; collection locations and a public education program for the proper use and disposal of fertilizers, pesticides, motor oil, and other hazardous chemicals; and strenuous litter-control programs.

■*Implementation.* The responsible agencies would be local governments (Monroe County and the municipalities). Other primary agencies involved would be the FDEP, FDCA, and SFWMD. Educational aspects would be coordinated with the educational staffs of the Sanctuary (NOAA) and the SFWMD. In addition, the FDACS would be involved with respect to fertilizers and pesticides.

■*Schedule*. This activity will have a low level of action in year 1. It will require 36 months to complete.

Marina and Live-Aboard Strategies

This section describes strategies/activities to reduce pollution from marinas and live-aboard boaters. Seven strategies have been developed to help reduce pollution from marinas and live-aboards. Five would attempt to reduce pollution by restricting discharges and educating the public (strategy B.7), concentrating live-aboards in areas where wastewater treatment facilities can be provided (strategy Z.5), and increasing the availability of pump-out facilities (strategies L.1 and L.6). Strategy L.2 would evaluate interagency cooperation for marina permitting. Strategy L.3 would reduce pollution from marina operations. The last strategy (E.4) would reduce

Marina and Live-Aboard Strategies

B.7: Pollution Discharges
- Implement the 1994 Florida Clean Vessel Act
- Evaluate the need for no-discharge zones
- Establish no-discharge zones
- Develop and Implement a public education program
- Change environmental crimes category

Z.5: Special-use Areas
- Evaluate feasibility of mooring fields
- Establish criteria for mooring fields
- Establish mooring fields

L.1: Marina Pumpout
- Develop plan for sewage discharge elimination
- Require marina pump-out facilities
- Enforce pump-out use

L.6: Mobile Pumpout
- Establish mobile pump-out service

L.2: Marina Siting and Design
- Improve interagency cooperation in marina permitting

L.3: Marina Operations
- Establish containment areas for boat maintenance
- Encourage marina owners to participate in environmentally-oriented organizations
- Encourage marina owners to provide a user manual with local environmental information

E.4: Training/Workshops/School Programs
- Expand environmental awareness program

pollution from boaters and marinas in general, by expanding an existing education/environmental awareness program.

Additional data concerning pollutant concentrations in water and sediments of marinas and live-aboard areas will be collected through the Water Quality Monitoring Program described in strategy W.20. These data should indicate the severity and extent of water quality problems, and whether there is a need for further pollution-control measures.

Strategy B.7: Pollution Discharges

Reduce pollution discharges (e.g., sanitary wastes, debris, and hydrocarbons) from vessels by implementing the 1994 Florida Clean Vessel Act and developing a public education program. Change the environmental crimes category associated with discharges from felony to civil offense, thereby removing the need to prove criminal intent. *(Priority Level Medium, Medium Level of Action in Year 1, 48 Months to Complete, <50% Funding Available for Full Implementation)*

Activity 1-Implement the 1994 Florida Clean Vessel Act. The Florida Clean Vessel Act prohibits boaters from discharging raw sewage into state waters, effective October 1, 1994. In addition, all vessels 26 feet or more in length with an enclosed cabin and berthing facilities are required to have a toilet on board. Houseboats and floating structures must, by October 1, 1996 have permanently installed toilets attached to Type III marine sanitation devices, or directly connect their toilets to shoreside plumbing. Full implementation and enforcement of the Clean Vessel Act would reduce sewage pollution of Sanctuary waters.

■*Implementation.* The agency responsible for enforcing the Clean Vessel Act is the Florida Marine Patrol (FMP). NOAA will work with the EPA and the State to phase in the implementation of the Clean Vessel Act for Federal waters after full public review of the draft rules and public hearings, prior to issuance of final regulations. The Sanctuary regulations prohibit all marine sanitation discharges in the Ecological Reserves and Sanctuary Preservation Areas.

■*Schedule*. This activity will have a low level of action in year 1. This activity will require 12 months to complete.

Activity 2-Evaluate the Need for No-discharge Zones. A study would be conducted to evaluate the need for no-discharge zones in the Florida Keys, particularly in areas where live-aboard vessels congregate and there is a history of water quality violations. Aspects that should be considered include water circulation, concentration of boats in the area, percentage of boats with Type I or II marine sanitation devices, and impacts on fishing and swimming areas.

■*Implementation.* The EPA would be the responsible agency in evaluating the need for no-discharge zones. Other primary agencies involved would be the USCG, NOAA, and the FDEP. Monroe County will have an assisting role.

■*Schedule*. This activity will have a low level of action in year 1. It will require 12 months to complete.

Activity 3-Establish No-discharge Zones. Based on the findings of the study described under Activity 2, the EPA would designate no-discharge zones in accordance with provisions of marine sanitation devices where live-aboard vessels congregate, and there is a history of water quality violations.

■*Implementation.* The EPA would be the responsible agency in designating the no-discharge zones. The legislative mechanism to implement this activity is in place. Enforcement procedures and responsibilities need to be worked out if the activity is to be effective. The FDEP and Monroe County will have an assisting role.

■*Schedule*. This activity will have no action in year 1. It will require 48 months to complete.

Activity 4-Develop and Implement a Public Education Program. This activity would create a program to educate the boating public about ways to reduce pollution from vessels. The program would include providing information about the Clean Vessel Act and other regulations affecting discharges from vessels.

■*Implementation.* The lead agency will be FMP, with assistance from the EPA and NOAA.

■*Schedule*. This activity will have a low level of action in year 1. This activity will require 12 months to complete.

Activity 5-Change the Environmental Crimes Category. This activity would change the environmental crimes category associated with discharges from a felony or misdemeanor to a civil offense, thereby removing the need to prove criminal intent. Currently, it is difficult to prove criminal intent for actions such as accidentally discharging fuel or pumping out a shipboard sewage holding tank. Therefore, in practice, law enforcement officers focus more attention on other crimes that require a less rigorous burden of proof. Making environmental crimes a civil, rather than criminal, offense would lead to an increased level of enforcement of environmental laws. Civil penalties could take the form of major fines for such accidents, without considering the intent of the individual involved.

■*Implementation.* The responsible agency will be the FMP. Implementation would require changes in the Florida Statutes and Florida Administrative Code (FAC). NOAA and Monroe County may have an assisting role.

■*Schedule*. This activity will have no action in year 1. It will require 36 months to complete.

This strategy is also included in the Regulatory Action Plan.

Strategy Z.5: Special-use Areas

This strategy establishes zones to set aside areas for scientific research and educational purposes, restoration, monitoring, or to establish areas that confine or restrict activities such as personal watercraft operations and live-aboard mooring fields. These areas will minimize impacts on sensitive habitats and reduce user conflicts. Special management programs (e.g., monitoring, research, Special-use Permits, and restoration) can be conducted without impediment to these areas. They can be used to set aside areas for specific uses such as long-term research and monitoring and/or minimizing the adverse environmental effects of high-impact activities.
(Priority Level Medium, Low Level of Action in Year 1, 12+ Months to Complete, <50% Funding Available for Full Implementation)

Activity 1-Evaluate Feasibility of Mooring Fields. This activity would evaluate the feasibility of establishing mooring fields in places having significant concentrations of live-aboard vessels. The feasibility study would evaluate whether mooring fields could be used in conjunction with shore-based or mobile pumpout facilities to provide an effective means of controlling waste discharges from live-aboard boats.

■*Implementation.* The Sanctuary will be the lead agency. Local government (Monroe County and/or City of Key West) may have an assisting role, depending on the location of the mooring field(s).

■*Schedule*. This activity will have a low level of action in year 1. It will require 12 months to complete.

Activity 2-Establish Criteria for Mooring Fields. This activity would define criteria for designating mooring fields, based on the feasibility study conducted in Activity 1.

■*Implementation.* The Sanctuary will be the lead agency. Local government (Monroe County and/or City of Key West) may have an assisting role, depending on the location of the mooring field(s).

■ *Schedule.* This activity will have no action in year 1. It will require 12 months to complete.

Activity 3-Establish Mooring Fields. Depending on the outcome of Activities 1 and 2, this activity would establish designated mooring fields or anchorage areas in places having significant concentrations of live-aboard vessels.

■ *Implementation.* The Sanctuary will be the responsible agency for designating mooring fields. The FDEP and USCG would assist in implementing this activity by providing sufficient technical expertise and jointly processing required permits. Legal designation of mooring fields requires a permit or land lease from the FDEP's Bureau of Submerged Lands and Preserves. It also requires a USCG permit because it affects navigable waters. The FDEP conducts environmental inspections of selected sites and issues resource evaluations and impact assessments. Local government (Monroe County and/or City of Key West) may have an assisting role, depending on the location of the mooring field(s).

■ *Schedule.* This activity will have no action in year 1. It will require 36 months to complete.

This strategy is also included in the Regulatory, Research and Monitoring, and Zoning action plans.

Strategy L.1: Marina Pumpout

Require marinas that have pump-out requirements to install pump-out facilities.
(Priority Level High, Low Level of Action in Year 1, 60 Months to Complete, <50% Funding Available for Full Implementation)

This strategy will eliminate marina live-aboard vessels as a source of pollution in the Sanctuary. Though live-aboards within marinas may be a minor contributor to the total pollutant load, marinas are normally located in confined waters that may be more susceptible to the impacts of such loading. By requiring marinas to provide pump-out facilities, two problems will be resolved: 1) boats in marinas that don't currently pump out will be provided with the means to do so; and 2) boats that moor outside of marinas can take advantage of the increased number of pump-out facilities.

Activity 1-Develop a Plan for Sewage Discharge Elimination. This activity would develop a comprehensive plan to deal with the problem of sewage discharges from live-aboards and other boaters. The plan could include elements such as requiring all marinas to install pump-out facilities (Activity 2); enforcing pump-out use (Activity 3); establishing a mobile pump-out service (strategy L.6); establishing mooring fields (Activity 3 under strategy Z.5, Special-use Areas), and evaluating the treatment and disposal of pumped out wastewater. However, before these activities are undertaken, a comprehensive study of the options is needed to devise a coordinated approach.

■*Implementation.* This activity could be implemented by local government (Monroe County and the municipalities). The FDEP and FDCA (through its authority set out in Chapter 380 FS — Critical Area Program) would also have a primary role. The EPA and NOAA would assist.

■*Schedule*. This activity will have a low level of action in year 1. It will require 12 months to complete.

Activity 2-Require Marina Pump-out Facilities. This activity would require all marinas (10 or more slips, as defined by the State of Florida) to install pump-out facilities. This would greatly increase the number and accessibility of pump-out facilities in the Florida Keys. If pump-out facilities were more numerous and accessible, more people presumably would use them.

■*Implementation.* This activity could be implemented entirely by local government (Monroe County and the municipalities), which could pass ordinances requiring all marinas offering overnight docking to boats over a given length to have stationary or mobile equipment to pump the holding tanks of such vessels. The same option could be implemented at the State or even the Federal level, but implementation at these levels would be legislatively more complex, and would take substantially longer to put into practice. Monroe County will actively seek funding and coordinate with marinas to facilitate compliance.

■*Schedule*. This activity will have no action in year 1. It will require 36 months to complete.

Activity 3-Enforce Pump-out Use. This activity would enforce use of the expanded pump-out facilities developed under Activity 2 of this strategy, and the mobile pump-out service developed under Strategy L.6. A workable system of coordinated enforcement procedures has never been developed. Current pump-out usage is low, in part because existing pump-out facilities are few, and some are inaccessible to the public. One possible enforcement tool would involve issuing a large, visible sticker to all boats anchored in, or passing through, the Sanctuary. Each time a vessel's holding tanks were pumped out, the sticker would be stamped with the date and time. If the vessel had not had its holding tanks pumped out within a given length of time based on its size and carrying capacity, a citation would be issued.

■*Implementation*. Enforcement must be coordinated among the Sanctuary staff, FMP, and the Monroe County Sheriff's Department. In addition, "boating rights" representatives from the Keys need to be part of any discussions to implement enforcement measures. Coordination could be formalized through a series of MOUs or interlocal agreements.

■*Schedule*. This activity will have no action in year 1. It will require 60 months to complete.

Strategy L.6: Mobile Pumpout

Establish a mobile pump-out service through the local government, or a franchise with a private contractor, which would serve to pump out live-aboard vessels moored outside of marina facilities. Encourage the use of existing, and the

construction of additional, shore-side facilities such as dinghy docks, parking areas, showers, and laundries for use by live-aboards.
(Priority Level Medium, No Action in Year 1, 36 Months to Complete, <50% Funding Available for Full Implementation)

Activity 1-Establish a Mobile Pump-Out Service. This activity would establish a mobile pump-out service either through local government or a franchise arrangement with a private contractor.

■*Implementation.* Monroe County would be the responsible agency. No new legislation or legal authority is needed for the County to develop a mobile pump-out service. A prototype study could be conducted to determine how many live-aboard boaters in a given area would voluntarily subscribe to such a service. If the idea appeared to be economically viable, the County could advertise for suppliers of the service and sell franchises on a bid basis. The USCG would have an assisting role.

■*Schedule*. This activity will have no action in year 1. It will require 36 months to complete.

Strategy L.2: Marina Siting and Design

Conduct an assessment of marina (10 slips or more) compliance with current regulations and standards, including OSHA standards for marina operations. Evaluate interagency cooperation in marina permit review process, and initiate action to eliminate conflicts in agency jurisdictions. Improve marina siting criteria to ensure that only appropriate deep water access will be permitted, and to provide for the proper handling of noxious materials.
(Priority Level Low, No Action in Year 1, 36 Months to Complete, 100% Funding Available for Full Implementation)

Activity 1-Improve Interagency Cooperation in Marina Permitting. Marina operations are already subjected to numerous permits and permit review processes. This activity would evaluate interagency cooperation to simplify matters for the marina operator, allow the implementation of Best Management Practices, and help reduce pollution reaching adjacent coastal waters. The possibility of consolidating permitting requirements into a single, overall FDEP operating permit would be included in this evaluation.

■*Implementation.* The responsible agency will be the FDEP. The other primary agency involved will be the ACOE. The FDEP and ACOE should consider implementing a joint permitting process. Also, the FDEP needs to work with the EPA to make Florida a delegated state regarding NPDES stormwater discharge regulatory authority. This would avoid duplication in the permitting process.

■*Schedule*. This activity will have no action in year 1. It will require 36 months to complete.

Strategy L.3: Marina Operations

Reduce pollution from marina operations by establishing containment areas for boat maintenance, encouraging marina owners to participate in environmentally-oriented organizations such as the International Marina Institute, and encouraging marina owners to provide a user manual with local environmental information such as locations of pumpout facilities and trash receptacles.
(Priority Level Medium, No Action in Year 1, 36 Months to Complete, <50% Funding Available for Full Implementation)

Activity 1-Establish Containment Areas for Boat Maintenance. This activity would establish paved and curbed containment areas for boat maintenance activities such as hull scraping and repainting, mechanical repairs, fueling, and lubrication. It would create secondary containment, generally in the form of curbing or synthetic liners, for areas where significant quantities of hazardous or toxic materials are stored. Procedures to avoid or reduce fuel spillage during refueling operations would be evaluated.

■*Implementation.* The responsible agency will be the EPA, working with the FDEP. Local governments (Monroe County and the municipalities) may have an assisting role. The NPDES stormwater discharge rule is the mechanism to implement this activity. In 1990, the EPA enacted rules to control stormwater discharges from a variety of uses. The rule is known as the NPDES Permit Application Regulations for Stormwater Discharges. Marinas that are involved in boat maintenance activities (including vessel rehabilitation, mechanical repairs, painting, fueling, and lubrication) or equipment-cleaning operations are considered industrial activities according to 40 CFR 122.26. Therefore, all marinas involved in such activities must apply for an NPDES stormwater

permit. These permits require applicants to address how they plan to eliminate pollutants such as toxics from the stormwater runoff generated as a result of their marina activities. The applicants have to identify the Best Management Practices they intend to use. One alternative is to construct containment areas and restrict all marine repair and boat hull reconstruction to these areas.

■*Schedule*. This activity will have no action in year 1. It will require 36 months to complete.

Activity 2-Encourage Marina Owners to Participate in Environmentally-oriented Organizations such as the International Marina Institute.

■ *Implementation.* The responsible agencies will be Monroe County and the municipalities working with the FDEP.

■ *Schedule.* This activity will have no action in year 1. It will require 12 months to complete.

Activity 3-Encourage Marina Owners to Provide a User Manual with Local Environmental Information. The information could include locations of pumpout facilities and trash receptacles, as well as sensitive habitats.

■ *Implementation.* The responsible agencies will be Monroe County and the municipalities working with the FDEP.

■ *Schedule.* This activity will have no action in year 1. It will require 12 months to complete.

Strategy E.4: Training/Workshops/School Programs

Develop opportunities for instruction and training. This will include programs conducted by teachers, Sanctuary staff, and volunteers. Training programs (e.g., Coral Reef Classroom, etc.) will also be provided for teachers, environmental professionals, business owners and operators, and law enforcement officials.
(Priority Level Mediuim, Medium Level of Action in Year 1, 24 Months to Complete, <50% Funding Available for Full Implementation)

Activity 1-Expand the Environmental Awareness Program. The FMP already has an environmental awareness program that has produced significant results in the past. If this program were expanded, additional reductions in pollution could be expected.

■*Existing Program Implementation*. This activity would formalize and expand an existing activity - the FMP District 9 environmental education program. The program would be enhanced to heighten the environmental awareness of how human activities adversely affect water quality in the Keys.

■*Implementation.* The FDEP would be the responsible agency in expanding the existing program operated by the FMP. All that is required to expand the program is additional funding, and a management directive from the FDEP to improve and increase the range of its existing program. All public awareness programs should be coordinated with the educational efforts of the Sanctuary.

■*Schedule*. This activity will have a medium level of action in year 1. It will require 24 months to complete.

This strategy is also included in the Education/ Outreach and Volunteer action plans.

Landfill Strategies

This section describes strategies/activities to deal with potential pollution problems due to leaching from landfills. All landfill sites in the Florida Keys (with the exception of the Cudjoe Key expansion) were developed prior to current regulations requiring bottom liners and leachate collection. At many sites, filling with solid waste probably occurred below the water table in the early stages. Consistent with common practice at the time, there was probably little or no control over materials deposited in these landfills. These conditions indicate a significant potential for contamination of groundwater and surface waters from these inactive landfills.

Although the potential exists for problems, monitoring data do not indicate leaching or water quality degradation. Therefore, no corrective actions are proposed. However, two investigative activities are proposed under strategy L.7, SWD Problem Sites. These activities would involve searching for and assessing abandoned landfills and dumps (Activity 1), and intensifying existing monitoring programs around landfills (Activity 2) to ensure that no leaching into marine waters is occurring. Under Activity 3, remedial actions would be evaluated and implemented, but only if problems were discovered through Activities 1 or 2.

Landfill Strategies

L.7: SWD Problem Sites
- Conduct historical landfill search and assessment
- Intensify landfill monitoring
- Evaluate and implement remedial actions

Strategy L.7: SWD Problem Sites

Conduct an assessment to identify solid waste disposal sites that pose threats to water quality and/or sensitive areas, based on EPA's Water Quality Plan. Intensify existing monitoring programs around landfills to ensure that no leaching is occurring into marine waters. If problems are discovered, evaluate and implement appropriate remedial actions such as boring or mining, upgrading closure, collecting and treating leachate, constructing slurry walls, and excavating and hauling landfill contents. *(Priority Level Medium, No Action in Year 1, 60+ Months to Complete, <50% Funding Available for Full Implementation)*

Activity 1-Conduct a Historical Landfill Search and Assessment. Conduct a comprehensive search for abandoned landfills and dumps. Evaluate each site to determine if it contains hazardous materials or is causing environmental problems. According to knowledgeable state and local government personnel, there are a number of abandoned landfills and dumps, many on private property, within the Florida Keys. A comprehensive program needs to be set up to locate, map, and evaluate these historic casual dump sites to determine if they contain hazardous materials, or are causing environmental problems.

■*Implementation.* The responsible agency will be Monroe County, working with the FDEP. The U.S. Navy would have a primary role in dealing with landfills on its property. The EPA would have an assisting role.

■*Schedule*. This activity will have no action in year 1. It will require 36 months to complete.

Activity 2-Intensify Landfill Monitoring. Intensify existing monitoring programs around landfills to ensure that no leaching is occurring into marine waters. Identify and monitor old landfills that were never permitted, and therefore have no closure plans or closure permits. This activity would help ensure that existing monitoring programs are adequate to detect leaching from landfills. Monitoring data from landfills in the Florida Keys do not indicate that there is a leaching problem. However, the number of monitoring locations is small, and should be increased to ensure that no leaching is occurring around these landfills. In addition, this strategy would provide for monitoring of older landfills that are not currently being monitored. It should be noted that Monroe County is currently complying with all State and Federal monitoring guidelines.

■*Implementation.* The responsible agency will be identified. The U.S. Navy would have a primary role in dealing with landfills on its property. The EPA would have an assisting role.

■*Schedule*. This activity will have no action in year 1. It will require 36 months to complete.

Activity 3-Evaluate and Implement Remedial Actions. If problems are discovered, evaluate and

implement appropriate remedial actions such as boring or mining, upgrading closure, collecting and treating leachate, constructing slurry walls, and excavating and hauling landfill contents.

■*Implementation.* The responsible agency will be Monroe County, working with the FDEP. The U.S. Navy would have a primary role in dealing with landfills on its property. The EPA would have an assisting role.

■*Schedule*. This activity will have no action in year 1. It will require 60+ months to complete.

Hazardous Materials Strategies

This section describes strategies/activities to reduce the likelihood of pollution from spills of hazardous materials in and near the Keys. The current management arrangement appears to be functioning adequately; however, there are some actions that could be taken to further reduce the potential for accidental spills. These management strategies would enhance HAZMAT response (W.15), improve spill reporting (W.16), and develop an inventory of hazardous materials handling and use in the Keys (L.10).

Hazardous Materials Strategies

W.15: HAZMAT Response
- Develop and periodically revise Sanctuary spill contingency plan
- Improve coordination/cooperation
- Improve response/containment technologies

W.16: Spill Reporting
- Establish spill reporting system
- Establish and maintain Sanctuary spills database

L.10: HAZMAT Handling
- Conduct HAZMAT assessment/inventory

Strategy W.15: HAZMAT Response

Improve and expand oil and hazardous materials response programs throughout the Sanctuary. *(Priority Level Medium, Low Level of Action in Year 1, 36 Months to Complete, <50% Funding Available for Full Implementation)*

This strategy will reduce the chances that a spill of oil or other hazardous materials will have a significant negative impact on Sanctuary resources. This will be accomplished by improving coordination and cooperation among the Federal, State, and local agencies responding to spills; by encouraging improvements in response and containment technologies appropriate to the Keys; and by creating a spill contingency plan for the Sanctuary that includes crew and equipment staged in the Keys (possibly including skimmers). This strategy recognizes that spills of hazardous materials are handled independent of marine spills,

and improvement measures will be developed for both response programs.

Activity 1-Develop and Periodically Revise Sanctuary Spill Contingency Plan. This activity would involve creating and periodically revising spill contingency plan for the Sanctuary that includes crew and equipment staged in the Keys (possibly including skimmers). The plan should cover spills of a size not responded to by the USCG and should include training and education of a local response team. Marine HAZMAT response will be coordinated from the Marine Safety Office in Miami. Because spills of hazardous materials are handled independent of marine spills, improvement measures will be developed for both response programs.

■*Implementation.* The responsible agencies will be the USCG and FDEP. NOAA, Monroe County, and FDCA will assist.

■*Schedule*. This activity will have no action in year 1. It will require 36 months to complete.

Activity 2-Improve Coordination and Cooperation. This activity will involve improving coordination and cooperation among the Federal, State, and local agencies responding to spills.

■*Implementation.* The responsible agencies will be the USCG and FDEP. NOAA, Monroe County, and the FDCA will assist.

■*Schedule*. This activity will have a low level of action in year 1. It will require 12 months to complete.

Activity 3-Improve Response/Containment Technologies. This activity would encourage improvements in response and containment technologies appropriate to the Keys.

■*Implementation.* The responsible agencies will be the USCG and FDEP. NOAA, Monroe County, and FDCA will assist.

■*Schedule*. This activity will have no action in year 1. It will require 36 months to complete.

Strategy W.16: Spill Reporting

Establish a reporting system to ensure that all spills in and near the Sanctuary are reported to Sanctuary managers and managers of impacted areas within the Sanctuary. Establish a geo-referenced Sanctuary spills database.
(Priority Level Low, Low Level of Action in Year 1, 24 Months to Complete, <50% Funding Available for Full Implementation)

Activity 1 - Establish Spill Reporting System. This activity would establish a reporting system to ensure that all spills documented by various agencies (e.g., USCG, NOAA, FDEP) are reported to Sanctuary managers. Small spills in particular are underreported; they occur frequently, and therefore may have a significant cumulative effect on water quality in the Sanctuary.

■*Implementation.* The responsible agency will be the USCG. Other primary agencies involved are NOAA and the FDEP. The FDEP would assist in reporting land-based spills that might affect Sanctuary waters. The existing protocol for spill notification should be used. The National Response Center is to be notified of all spills.

■*Schedule*. This activity will have a low level of action in year 1. It will require 12 months to complete.

Activity 2-Establish and Maintain Sanctuary Spills Database. This activity would establish and maintain a geo-referenced database for the Sanctuary that could be used to keep track of information about spills (e.g., locations, quantities, types of material spilled, environmental impacts).

■*Implementation.* The responsible agency will be NOAA, with assistance from the FDEP and the USCG.

■*Schedule*. This activity will have no action in year 1. It will require 24 months to complete.

Strategy L.10: HAZMAT Handling

Conduct an assessment and inventory of hazardous materials handling and use in the Florida Keys including facilities, types and quantities of materials, and transport/movement. Add information to the FDEP/EPA/Monroe County geographic information system (GIS) database.
(Priority Level Medium, No Action in Year 1, 36 Months to Complete)

Activity 1-Conduct a HAZMAT Assessment/ Inventory. This activity would involve conducting an assessment and inventory of hazardous materials handling and use in the Florida Keys including facilities, types and quantities of materials, and transport/movement. Information will be added to the FDEP/EPA/Monroe County GIS database.

■*Implementation.* The responsible agency will be the FDEP. Other primary agencies involved will be the EPA, FDEP, and Monroe County (e.g., Monroe County Health Department maintains database on hazardous materials). The FDCA will have an assisting role.

■*Schedule*. This activity will have no action in year 1. It will require 36 months to complete.

Mosquito Spraying Strategies

This section describes strategies/activities to reduce pollution from pesticides used in mosquito spraying. There are no data indicating that the Mosquito Control Program is causing water quality problems in the Sanctuary. However, there is little existing information on environmental concentrations and/or effects of pesticides in the Sanctuary. Additional data concerning pesticide concentrations in sediments and biological tissue throughout the Sanctuary will be collected through the Water Quality Monitoring Program (strategy W.20).

Based on the considerations discussed above, strategies for major changes to the Mosquito Control Program are not appropriate at this time. Additional data from the Water Quality Monitoring Program (strategy W.20) will help to determine whether major changes are warranted. Two strategies are discussed below. The first (W.17) will involve making refinements to the existing program. The second (W.18) will involve conducting research on the impacts of pesticide use in the Keys, and alternative practices. Under strategy W.18, the mosquito control program could be modified depending on the research findings. Strategy W.18 also includes a field survey of the full suite of pesticides, herbicides, fungicides, etc. used in the Sanctuary.

Mosquito Spraying Strategies

W.17: Mosquito Spraying
- Review aerial spraying threshold
- Review flight plans and equipment
- Reconsider larvicide use
- Evaluate ultra-low-volume methods

W.18: Pesticide Research
- Research impacts and alternatives
- Modify mosquito control program
- Conduct field survey of pesticide and herbicide use

Strategy W.17: Mosquito Spraying

Refine the aerial mosquito spraying program to further reduce aerial spraying over marine areas.
(Priority Level High, High Level of Action in Year 1, 12 Months to Complete, 75-99% Funding Available for Full Implementation)

This strategy would seek to reduce the amounts of pesticides entering Sanctuary waters through refinement of the existing aerial spraying program. Ground spraying by truck is the current method of choice for controlling the adult mosquito population. However, aerial spraying is initiated when the mosquito population reaches a certain threshold as determined by mosquito landing counts at test sites. Although the Monroe County Mosquito Control District attempts to avoid marine areas during aerial spraying, the potential for pesticides to reach marine waters might be reduced through refinements in the program.

Activity 1-Review the Aerial Spraying Threshold. The threshold for initiating aerial spraying will be reviewed to determine whether it can be raised.

■*Implementation.* The responsible agency will be the Florida Department of Agriculture and Consumer Services (FDACS). Also, FDCA will have an assisting role.

■*Schedule*. This activity will have a high level of action in year 1. It will require 12 months to complete.

Activity 2-Review Flight Plans and Equipment. The aerial spraying program would be reviewed to determine whether the amount of spray released over water could be reduced through development of a more refined plan for flight lines, and the use of improved equipment.

■*Implementation.* The responsible agency will be the FDACS. Also, the FDCA will have an assisting role.

■*Schedule*. This activity will have a high level of action in year 1. It will require 12 months to complete.

Activity 3-Reconsider Larvicide Use. Ground spraying of larvicides in currently restricted areas will be reviewed as a means to reduce the need for aerial spraying of adult mosquito populations.

■*Implementation.* The FDACS should be the responsible agency to organize a meeting to discuss this issue. The FDCA will have an assisting role in this activity.

■*Schedule*. This activity will have a high level of action in year 1. It will require 12 months to complete.

Activity 4-Evaluate Ultra-Low-Volume Methods. This activity will involve evaluating the possibility of eliminating thermal fogs, which contain diesel oil. Ultra-low-volume (ULV) spraying techniques have been developed which do not use thermal fogs and therefore would eliminate this source of diesel oil in the environment. The use of these techniques would likely require some additional training of pilots.

■*Implementation.* The responsible agency will be the FDACS. Also, the FDCA will have an assisting role.

■*Schedule*. This activity will have a high level of action in year 1. It will require 12 months to complete.

Strategy W.18: Pesticide Research

Develop and implement an independent research program to assess and investigate the impacts of, and alternatives to, current pesticide practices. Modify the Mosquito Control Program as necessary on the basis of research findings. Conduct a field survey of pesticide and herbicide use in the Keys. *(Priority Level High, No Action in Year 1, 36+ Months to Complete, <50% Funding Available for Full Implementation)*

This strategy will establish an independent research program to identify the impacts that current spraying practices have on Sanctuary resources, and will identify alternative means of mosquito control. Because pesticides used in mosquito control are nonspecific to the larval stages of crustaceans, fish, and natural mosquito control predators, the effects of the chemicals used, and all of the application methods employed, need to be examined. In addition, the impact of housing patterns, design, and landscaping as they affect the demand for mosquito control needs to be investigated. The results of this research may be used to modify the Mosquito Control Program.

Activity 1-Research Impacts and Alternatives. A research program will be established to identify the impacts of current spraying practices on Sanctuary resources, and to identify alternative means of mosquito control.

■*Implementation.* The responsible agency will be the FDACS. The FDEP will also have a primary role regarding evaluations of pesticide toxicity. The FDCA may also have an assisting role. As the State land-planning agency for a designated Area of Critical State Concern, the FDCA has an oversight responsibility to ensure that local development regulations adequately protect the area's natural resources. FDACS will be responsible for ensuring that mosquito

control activities are addressed according to Chapter 388, F.S.

■*Schedule*. This activity will have no action in year 1. It will require 36 months to complete.

Activity 2-Modify the Mosquito Control Program. The results of the pesticide research program will be used to modify the existing Mosquito Control Program as necessary.

■*Implementation.* The responsible agency will be the FDACS. The FDEP will also be involved as a primary agency.

■*Schedule*. This activity will have no action in year 1. It will require 36+ months to complete.

Activity 3-Conduct Field Survey of Pesticide and Herbicide Use. This activity would involve a field survey of the full suite of pesticides, herbicides, fungicides, etc. used in the Keys.

■ *Implementation.* The responsible agency will be the FDACS. The FDEP will also be involved as a primary agency.

■ *Schedule.* This activity will have no action in year 1. It will require 12 months to complete.

This strategy is also included in the Research and Monitoring Action Plan.

Canal Strategies

This section describes strategies/activities to reduce water quality problems in canals. Although some of these problems are clearly linked to wastewater discharges (from septic tanks of homes lining the canals), others may be due to the physical structure and orientation of the canals. These factors can lead to low flushing and buildup of weed wrack, which consumes oxygen and releases nutrients as it decays. The strategy described here would inventory and characterize canals and investigate technologies to determine whether it would be worthwhile to implement corrective actions such as weed gates and bubblers, to improve water quality. Any plan for implementing such improvements would have to be developed in coordination with plans for dealing with wastewater pollution from septic tanks, which contributes to water quality problems in many canal systems.

Strategy W.10: Canal WQ

Evaluate and revise list of known hot spot canal systems. Inventory and characterize dead-end canals/basins and investigate alternative management strategies to improve their water quality. Revise FDEP permit criteria to allow alternative strategies to improve canal water quality. Identify and compile a list of technologies for canal restoration. Develop a community education and involvement program, and conduct a canal system restoration pilot project. Implement improvements (consistent with the strategies developed for wastewater and stormwater) in known hot spots throughout the Sanctuary. *(Priority Level High, Low Level of Action in Year 1, 60+ Months to Complete, <50% Funding Available for Full Implementation)*

Canal Strategies

W.10: Canal WQ

- Evaluate and revise Hot Spot list
- Inventory and characterize canals
- Develop and evaluate improvement strategies
- Revise FDEP permit criteria
- Identify and compile technologies
- Develop community education and involvement program
- Conduct canal system restoration pilot program
- Implement improvement strategies

Activity 1-Evaluate and Revise Hot Spot List. The SFWMD will conduct a hot spot workshop in early 1996 to evaluate and revise the existing list of hot spots.

■*Implementation.* The responsible agency will be SFWMD. Other agencies with primary roles will be the EPA, FDEP, Monroe County, and the City of Key West.

■*Schedule*. This activity will have a low level of action in year 1. It will require 12 months to complete.

Activity 2-Inventory and Characterize Canals. An inventory of dead-end canals and other confined water bodies will be conducted to identify areas where reduced circulation increases the risk of

depressed dissolved oxygen, retention of both dissolved and particulate pollutants and potential impacts on benthic and pelagic environments. Canals with water quality problems attributable mainly to their physical structure and orientation (e.g., allowing weed wrack buildup) rather than wastewater or stormwater pollutants would be targeted for improvements.

■ *Implementation*. The responsible agency will be the SFWMD. Other agencies with primary roles will be the EPA, FDEP, Monroe County, and the City of Key West.

■ *Schedule*. This activity will have no action in year 1. It will require 12 months to complete.

Activity 3-Develop and Evaluate Improvement Strategies. A comprehensive management plan will be developed for improving water quality in nearshore confined basins and canals. Potential methods of improving water quality (e.g., aeration, weed gates, and air curtains) will be tested in limited areas to determine whether widespread application is appropriate.

■ *Implementation*. The responsible agency will be the SFWMD. Other agencies with primary roles will be the EPA, FDEP, Monroe County, and the City of Key West.

■ *Schedule*. This activity will have no action in year 1. It will require 24 months to complete.

Activity 4-Revise FDEP Permit Criteria. This activity would revise FDEP permit criteria to allow selected canal water quality improvement strategies.

■ *Implementation*. The responsible agency will be SFWMD. Other agencies with primary roles will be the EPA, FDEP, Monroe County, and the City of Key West.

■ *Schedule*. This activity will have no action in year 1. It will require 12 months to complete.

Activity 5-Identify and Compile Technologies. This activity would identify and compile a list of technologies for improving water quality in canals.

■ *Implementation*. The responsible agency will be SFWMD. Other agencies with primary roles will be the EPA, FDEP, Monroe County, and the City of Key West.

■ *Schedule*. This activity will have no action in year 1. It will require 12 months to complete.

Activity 6-Develop Community Education and Involvement Program. This activity would involve developing a community education program, including citizens monitoring.

■ *Implementation*. The responsible agency will be SFWMD. Other agencies with primary roles will be the EPA, FDEP, Monroe County, and the City of Key West.

■ *Schedule*. This activity will have no action in year 1. It will require 12 months to complete.

Activity 7-Conduct Canal System Restoration Pilot Project.

■ *Implementation.* The responsible agency will be SFWMD. Other agencies with primary roles will be the EPA, FDEP, Monroe County, and the City of Key West.

■ *Schedule.* This activity will have no action in year 1. It will require 12 months to complete.

Activity 8-Implement Improvement Strategies. Effective improvement strategies identified through previous activities will be implemented in all canals and basins identified as hot spots.

■ *Implementation.* The responsible agency will be the SFWMD. Other agencies with primary roles will be the EPA, FDEP, Monroe County, and the City of Key West.

■ *Schedule.* This activity will have no action in year 1. It will require 60 months to complete.

Monitoring and Research/Special Studies Strategies

This section includes monitoring and research/special studies strategies designed to provide information for management decisions. Previously described strategies which require information from research/monitoring efforts are W.3 (Wastewater Management Systems), W.5 (Water Quality Standards), W.11 (Stormwater Retrofitting), and W.19 (Florida Bay Freshwater Flow).

Goals of the comprehensive monitoring program (strategy W.20) are the following:

- provide long-term, comprehensive information about the status and trends of water quality parameters and biological resources in the Sanctuary; and
- evaluate the effectiveness of remedial actions taken to reduce water pollution.

Goals of the Research/Special Studies Program (strategies W.21 to W.24) are to identify and understand cause/effect relationships involving pollutants, transport pathways, and the biological communities of the Sanctuary. The Research/Special Studies program is designed to do the following:

- Identify and document cause/effect linkages between specific pollutants, water quality problems, and ecological impacts;
- Improve understanding of Sanctuary ecosystems and develop predictive capabilities based on that understanding; and
- Develop innovative monitoring and research tools to detect pollutants, provide early warning of widespread ecological problems, and identify cause/effect relationships.

Other strategies in this section are applicable to both research/special studies and monitoring. These are W.28 (Regional Database), W.29 (Dissemination of Research Findings), and W.32 (Technical Advisory Committee). Strategy W.32 must be implemented first to provide technical oversight for the program. Strategy W.28 should also be implemented before specific special studies and monitoring efforts are undertaken.

Monitoring and Special Studies Strategies

W.20: Monitoring
- Develop monitoring implementation plan
- Select organization/institution to conduct monitoring
- Establish QA/QC authority and protocols
- Implement monitoring

W.21: Special Studies: Predictive Models
- Conduct a modeling workshop
- Develop a modeling implementation plan

W.22: Special Studies: Wastewater Pollutants
- Detect wastewater pollutants and ecological impacts

W.23: Special Studies: Other Pollutants and Water Quality Problems
- Estimate other pollutant loadings
- Identify causal linkages between pollutants and ecological impacts
- Develop and evaluate innovative monitoring tools
- Conduct research on global change

W.28: Regional Database
- Conduct user needs assessment
- Develop implementation plan
- Implement and maintain data management system

W.29: Dissemination of Findings
- Establish information exchange network
- Sponsor conferences
- Support journal publication
- Disseminate findings to the public

W.32: Technical Advisory Committee
- Establish technical advisory committee

W.33: Ecological Monitoring Program
(Refer to the Research and Monitoring Action Plan)

Strategy W.20: Monitoring

Conduct a long-term, comprehensive monitoring program as described in the EPA Water Quality Protection Program.
(Priority Level High, High Level of Action in Year 1, 60+ Months to Complete, <50% Funding Available for Full Implementation)

This strategy will provide long-term, comprehensive information about the status and trends of water quality parameters and biological resources in the Sanctuary. It will allow managers to identify or confirm problem areas and determine whether conditions are improving or degrading. In addition, remedial actions taken to reduce pollution will be monitored to evaluate their effectiveness. Water column parameters to be monitored include temperature, salinity, dissolved oxygen, pH, photosynthetically active radiation, turbidity, nutrients, chlorophyll-*a*, and alkaline phosphatase activity. Sediment parameters to be monitored include grain size, mineralogy, organic content, nutrients, metals, pesticides, PCBs, petroleum hydrocarbons, and sewage tracers. In addition to water and sediment sampling, biological monitoring of seagrass, hardbottom, and mangrove communities will be conducted. Seagrass communities and hardbottom communities (including offshore coral reefs and nearshore hardbottom areas) will be monitored by *in situ* sampling and remote sensing. Changes in the areal coverage of mangrove communities will be monitored by remote sensing.

Design of the comprehensive monitoring program is described in the EPA Water Quality Protection Program Phase II Report, Task 6. An Implementation Plan was subsequently developed which: 1) revised the Program based on available funding; and 2)-developed specific details of program design (e.g., locations of water quality, coral reef, and seagrass sampling locations).

- *Existing Program Implementation*. All of the preliminary activities described here have been completed, and monitoring is in progress.

- *General Implementation.* The responsible agencies for water quality monitoring will be the EPA and FDEP. In addition, the FDEP will be responsible for establishing and maintaining the scientific database generated through the Monitoring Program (see strategy W.28). Specific institutions, organizations, and/or individuals may be selected to conduct various aspects of the Program. These will be selected by the EPA and FDEP working with the Technical Advisory Committee (see strategy W.32).

- *General Cost.* The Monitoring Program is expected to cost about $5 million over the fiscal year 1994-98 planning period. This cost is for actual execution of the Program, and is not reflected in the costs of preliminary activities described below.

Activity 1-Develop a Monitoring Implementation Plan. This activity will develop an implementation plan that will: 1) revise the design of the Monitoring Program based on anticipated funding; and 2) describe specific steps to be taken in implementing the Program. Revision of the Program will probably involve some combination of reducing the scope of individual components (e.g., number of stations, transects, etc.) and prioritizing components to be funded first.

■*Schedule*. This activity has been completed.

Activity 2-Select Organizations/Institutions to Conduct Monitoring. This activity will involve selecting an organization or institution to conduct the monitoring program under the direction of the EPA, FDEP, and the Technical Advisory Committee.

■*Schedule*. This activity has been completed.

Activity 3-Establish Quality Assurance/Quality Control Authority and Protocols. This activity will involve designating a quality assurance/quality control (QA/QC) officer, developing QA/QC protocols for the Monitoring Program, and developing guidelines for researchers to prepare their own QA/QC plans for research projects.

■*Schedule*. This activity has been completed.

Activity 4-Implement Monitoring. This activity will involve conducting water quality, coral reef, and seagrass monitoring as described in the Implementation Plan developed in Activity 1.

■*Schedule*. This activity will have a low level of action in year 1. It will require 60+ months to complete.

This strategy is also included in the Research and Monitoring and Volunteer action plans.

Strategy W.21: Predictive Models

Develop phased hydrodynamic/water quality models and coupled, landscape-level ecological models to predict and evaluate the outcome of in-place and proposed water quality management strategies. *(Priority Level High, Low Level of Action in Year 1, 12+ Months to Complete, <50% Funding Available for Full Implementation)*

This strategy will develop predictive models which, used with appropriate scientific guidance, would allow resource managers to predict and evaluate the outcome of various management strategies (e.g., engineering actions to reduce wastewater nutrient loadings). Initial conceptual models would be developed, information needs identified, environmental data gathered, and quantitative models developed and refined over the long-term and on a continuous basis, to aid in management decisions.

- *General Schedule*. This is a long-term strategy that is expected to be ongoing through 1998.
- *Existing Program Implementation.* The University of Miami's Center for Marine and Environmental Analysis is undertaking a major, 6-year, multimillion dollar effort to model various aspects of the South Florida environment.

Activity 1-Conduct a Modeling Workshop. This activity will involve conducting a workshop to discuss modeling approaches, develop preliminary conceptual models, and define specific information needs for the models.

■*Implementation.* The responsible agencies will be the EPA and FDEP.

■*Schedule*. This activity will have a high level of action in year 1. It will require 12 months to complete.

Activity 2-Develop a Modeling Implementation Plan. This activity will involve developing an overall plan for developing predictive models focused on management needs. The plan will include discussion of preliminary conceptual models, data needs, data gathering, and model development and refinement. The plan will also discuss mechanisms for ensuring that the modeling effort remains closely tied to management needs.

■*Implementation.* The responsible agencies will be the EPA and FDEP. The NPS and SFWMD will have an assisting role because they are involved in model development for the Everglades and Florida Bay.

■*Schedule*. This activity will have a high level of action in year 1. It will require 12+ months to complete.

This strategy is also included in the Research and Monitoring Action Plan.

Strategy W.22: Wastewater Pollutants

Conduct special studies to document the fate and ecological impacts of wastewater pollutants. *(Priority Level High, Low Level of Action in Year 1, 36 Months to Complete, <50% Funding Available for Full Implementation)*

Activity 1-Detect Wastewater Pollutants and Ecological Impacts. This activity involves conducting special studies to: 1)establish pollutant loading thresholds above which biotic communities are adversely affected; 2)detect the presence of wastewater pollutants from OSDS, cesspits, package plant boreholes, and/or surface water dischargers and to determine the relative contributions of each to Sanctuary surface waters, groundwaters, and/or sediments; 3)document the transport of pollutants and describe the severity and extent of ecological impacts that can be specifically linked to these pollutants. The scope includes all sources of wastewater pollutants throughout the Sanctuary. Potential approaches include experimental studies (laboratory, mesocosm, *in situ* or combinations); eutrophication gradient studies; comparative studies of impacted and non-impacted sites; historical studies (sclerochronology, geological reconstruction); geographic comparisons (Keys vs. other areas); use of biochemical and ecological indicators such as tissue C:N:P ratios, alkaline phosphate activity, and shifts in community structure; use of sewage tracers; and high-frequency and/or spatially intensive water quality sampling.

■ *Implementation.* The EPA and FDEP will be the responsible agencies for this strategy. NOAA may also have a primary role, and Monroe County may assist.

■ *Schedule.* This activity will have a low level of action in year 1. It will require 36 months to complete.

This strategy is also included in the Research and Monitoring Action Plan.

Strategy W.23: Special Studies

Conduct special studies to document the fate and ecological impacts of non-wastewater pollutants, develop innovative monitoring tools, and examine the effects of global climate change on the organisms and ecosystems of the Keys.
(Priority Level Medium, No Action in Year 1, 36 Months to Complete, <50% Funding Available for Full Implementation)

Activity 1-Estimate Other Pollutant Loadings. This activity will involve documenting the locations and magnitudes of pollution inputs (other than wastewater) to the Sanctuary to better understand what areas are at risk. Sources will include those that are point, nonpoint, and external to the Sanctuary (e.g., permitted discharges, OSDSs, stormwater runoff, groundwater leachates, marinas, C-111, Biscayne Bay, Florida Bay, southwest Florida and oceanic fluxes and gyre-induced upwelling). Pollutants will include hydrocarbons, heavy metals, and pesticides. Load estimates will be based on the best available information, and will include engineering estimates where applicable.

■ *Implementation.* The EPA and FDEP will be the responsible agencies for this strategy. Assistance may be provided by NOAA, the NPS, and the SFWMD.

■ *Schedule.* This activity will have no action in year 1. It will require 36 months to complete.

Activity 2-Identify Causal Linkages Between Pollutants and Ecological Impacts. This activity will involve conducting research to identify and document causal linkages between non-wastewater pollutants and specific ecological problems.

■ *Implementation.* The EPA and FDEP will be the responsible agencies for this strategy. Assistance may be provided by NOAA, the NPS, and the SFWMD.

■ *Schedule.* This activity will have no action in year 1. It will require 36 months to complete.

Activity 3-Develop and Evaluate Innovative Monitoring Tools. This activity would identify and evaluate innovative monitoring tools and methodologies to detect pollutants and identify cause/effect relationships involving water quality and biological resources. New or modified monitoring tools and methodologies may be needed because of the unique biota and environmental conditions of the Sanctuary.

■ *Implementation.* The EPA and FDEP will be the responsible agencies for this strategy. NOAA will also have a primary role.

■ *Schedule.* This activity will have no action in year 1. It will require 36 months to complete.

Activity 4-Conduct Research on Global Change. This activity will involve research to examine the effects of stresses associated with global change on the ecosystem. Examples of stresses include temperature, salinity, frequency and intensity of storms, turbidity, sea level change, ultraviolet and visible radiation.

■ *Implementation.* NOAA will be the responsible agency. The EPA, FWS, and FDEP will provide assistance.

■ *Schedule.* This activity will have no action in year 1. It will require 36 months to complete.

This strategy is also included in the Research and Monitoring Action Plan.

Strategy W.28: Regional Database

Establish a regional database and data management system for recording research results and biological, physical, and chemical parameters associated with Sanctuary monitoring programs.
(Priority Level High, High Level of Action in Year 1, 12 Months to Complete, 100% Funding Available for Full Implementation)

Activity 1-Conduct User Needs Assessment. This activity will involve contacting agencies, institutions, and individuals likely to be involved in water quality

monitoring and/or research efforts, to determine their needs in terms of data products.

■ *Existing Program Implementation.* This activity has been completed.

■ *Implementation*. The FDEP will be the responsible agency. The EPA and NOAA will have a primary role in a committee that will oversee data management efforts.

■ *Schedule.* This activity has been completed.

Activity 2-Develop Implementation Plan. This activity will involve developing an implementation plan that addresses all aspects of data management for research and monitoring efforts, including information distribution, storage, archiving, and QA/QC of data input. The regional database will include biological, physical, and chemical parameters and instrument records, etc. The implementation plan will discuss existing databases and address issues including public access, volunteer data entry, GIS integration and compatibility, and integration of new and historical findings.

■ *Existing Program Implementation.* This activity has been completed.

■ *Implementation.* The FDEP will be the responsible agency. The EPA and NOAA will also have a primary role in a committee that will oversee data management efforts.

■ *Schedule.* This activity has been completed.

Activity 3-Implement and Maintain Data Management System.

■ *Implementation.* The FDEP will be the responsible agency. The EPA and NOAA will also have a primary role in a committee that will oversee data management efforts.

■ *Schedule.* This activity will have a low level of action in year 1. It will require 60+ months to complete.

This strategy is also included in the Research and Monitoring Action Plan.

Strategy W.29: Dissemination of Findings

Develop a program to synthesize and disseminate scientific research and monitoring results including an information exchange network, conferences, and support for the publication of research findings in peer-reviewed scientific journals.
(Priority Level Medium, Low Level of Action in Year 1, 60+ Months to Complete, <50% Funding Available for Full Implementation)

This strategy would help to disseminate information about research findings among scientists and resource managers and to the general public.

Activity 1-Establish an Information Exchange Network. This activity will develop a compendium of ongoing and planned research in the Sanctuary that will be updated periodically.

■*Implementation.* The EPA and FDEP will be the responsible agencies for this strategy. NOAA will have a primary role.

■*Schedule*. This activity will have a low level of action in year 1. It will require 12 months to complete.

Activity 2-Sponsor Conferences. This activity will involve sponsoring conferences to keep both scientists and managers abreast of research/monitoring results and existing/planned management actions.

■*Implementation.* The EPA and FDEP will be the responsible agencies for this strategy. NOAA will have a primary role.

■*Schedule*. This activity will have no action in year 1. It will require 60+ months to complete.

Activity 3-Support Journal Publication. This activity will involve funding the publication of research and monitoring findings in peer-reviewed scientific and management journals.

■*Implementation.* The EPA and FDEP will be the responsible agencies for this strategy. NOAA will have a primary role.

■*Schedule*. This activity will have no action in year 1. It will require 60+ months to complete.

Activity 4-Disseminate Findings to the Public. This activity would use existing mechanisms and continue to develop mechanisms to synthesize and disseminate findings of the research and monitoring programs to the public.

■ *Implementation*. The EPA, FDEP, and NOAA will be the responsible agencies for this strategy. NOAA's annual report will contain a synthesis of scientific findings written for the average citizen and will be distributed widely.

■ *Schedule.* This activity will have no action in year1. It will require 60+months to complete.

This strategy is also included in the Research and Monitoring Action Plan.

Strategy W.32: Technical Advisory Committee

Establish a technical advisory committee for coordinating and guiding research and monitoring activities by both the EPA and NOAA.
(Completed in Year 1)

Activity 1-Establish a Technical Advisory Committee. This activity will create a technical advisory committee as required by the National Marine Sanctuaries Program Amendments Act of 1992. The Technical Advisory Committee "shall be composed of scientists from Federal agencies, State agencies, academic institutions, private nonprofit organizations, and knowledgeable citizens." It will guide the process of setting priorities for research and monitoring for both the EPA and NOAA.

■*Existing Program Implementation*. This activity was completed during fiscal year 1993, prior to the starting date used in this action plan.

■*Implementation.* The EPA and FDEP will be the responsible agencies for this strategy. NOAA will have a primary role.

This strategy is also included in the Research and Monitoring Action Plan.

Strategy W.33: Ecological Monitoring Program

Develop and implement a Sanctuary-wide, intensive ecosystem monitoring program. The objective of the program will be to monitor the status of various biological and ecological indicators of system components throughout the Sanctuary and adjacent areas, in order to discern the local and system-wide effects of human and natural disturbances, and assess the overall health of the Sanctuary.

This strategy will establish a comprehensive, long-term monitoring program throughout the Sanctuary and adjacent areas that will have three purposes: to supply resource managers with information on the status of the health of living resources and the ecosystem; to determine causal relationships related to management decisions; and to evaluate the effectiveness of management actions such as zoning implementation.

The Ecological Monitoring Program will be fully integrated with the comprehensive monitoring program (water quality, coral reefs, seagrass), and will include a temporal and spatial ecological information system based on current knowledge; a Technical Advisory Committee to assist NOAA with the design and prioritization of the Research and Monitoring Program; status and trends assessments of corals, fishes, seagrasses, benthic organisms and algae, plankton, and mangroves; a fisheries ecology monitoring and research component to examine community composition and function within the Sanctuary's habitats; a sampling protocol; a data analysis, management, and dissemination protocol; a quality assurance/quality control protocol; the development of an index of Sanctuary health; and a volunteer monitoring program.
(Priority Level High, Medium Level of Action in Year 1, 60+ Months to Complete, <50% Funding Available for Full Implementation)

■*General Implementation*. NOAA will be responsible for the overall implementation of the Ecological Monitoring Program, working with EPA, FDEP, academic and nongovernmental organizations, and the Technical Advisory Committee. NOAA will have lead responsibility for implementing most activities, but the FDEP will be responsible for establishing an ecological information system (Activity 1) and data analysis, management, and dissemination protocol (Activity 6). The Technical Advisory Committee will

assist NOAA in establishing a sampling protocol (Activity 5).

■*General Relationship to Other Strategies*. Integration of the Ecological Monitoring program and the Water Quality Protection Program will be achieved through the Technical Advisory Committee (TAC) and Management Committee specified in the Water Quality Protection Program. The TAC will be used by NOAA to assist in the design and prioritization of the Research and Monitoring Program. The Sanctuary Superintendent will serve on the Management Committee which coordinates and facilitates the efforts of the TAC.

■*General Schedule*. The Ecological Monitoring Program will have a medium level of action in year 1. It will require 60+ months to complete.

This strategy is also included in the Research and Monitoring and Volunteer Action Plans. Refer to the Research and Monitoring Action Plan for a description of activities.

Implementation

This section explains how the Water Quality Action Plan will be implemented. The institutions responsible for each activity, and those agencies that will provide some level of assistance, are identified. In addition, the number of months required to complete, cost estimates, staff and equipment requirements, and the geographic focus of each activity are provided. The section concludes with a description of contingency planning for changing budgets, and the process used to evaluate the effectiveness of the Water Quality Action Plan as it evolves over time.

Responsible Institutions. The Water Quality Action Plan will be implemented by a coordinated framework of Federal, State, and local agencies. The EPA and FDEP, however, will have the lead responsibility in the overall implementation of the Plan. They will coordinate closely with NOAA, which has overall responsibility for implementing the Management Plan for the Sanctuary. Other agencies with lead responsibility for one or more activities are the USCG, FDHRS, FDCA, FDACS, FKAA (possibly), Monroe County, and the municipalities. In addition, the SFWMD has a primary or assisting role in several strategies. Table 25 lists the responsible institutions and their level of responsibility in each activity.

Priority Activities. Each activity included in the Water Quality Action Plan is ranked as high, medium, or low priority (Table 26). High-priority strategies (summarized in Table 27) are those that have the greatest urgency and are most likely to be implemented first. A strategy's priority is also based upon its projected effectiveness in reducing water quality problems in the Sanctuary. Strategies that would reduce pollution directly, provide information needed for critical decisions, or allow another high-priority strategy to be implemented are generally assigned a high priority. Strategies that might indirectly reduce pollution by making the management/regulatory system work more efficiently are generally assigned a low priority. However, some low-priority strategies might be implemented early if they are simple and inexpensive.

Schedule. Table 26 lists the estimated time required for the implementation of each strategy and activity included within the program. The number of months required to complete each strategy and activity is provided. For this action plan, year 1 is defined as beginning in fiscal year 1994, not in fall 1994 as in other action plans.

Cost. Table 26 also lists estimated costs to implement each strategy and its component activities. Costs are divided into capital cost, and annual operating and maintenance costs.

Most of the costs listed in the table are institutional costs for implementing the strategies, as developed at the "Institutional Arrangements and Approximate Costs Work Session" held in the Florida Keys on October 21-22, 1992. However, estimates for five strategies also include costs for upgrading, constructing, and/or maintaining facilities:

- W.1 (OSDS Demonstration Project);
- W.2 (AWT Demonstration Project);
- W.3 (Wastewater Management Systems);
- W.4 (Wastewater Disposal, City of Key West); and
- W.11 (Stormwater Retrofitting).

These costs are from the Phase II report of the EPA Water Quality Protection Program. Potential funding sources are also discussed in that report. Much more detailed information on costs and implementation requirements would have to be developed before these improvements were undertaken.

Based on the figures in Table 26, the estimated cost to implement all activities in the Water Quality Action Plan is between $290 million to $510 million. However, much of this total is accounted for by the following two very expensive strategies.

- W.3 (Wastewater Treatment Outside Key West): At a minimum, >$57 million to eliminate cesspits and upgrade OSDS (septic systems) to current standards. Plus, if chosen as the preferred wastewater treatment option, >$200 million to construct two community sewage plants serving Key Largo and Marathon.
- W.11 (Stormwater Retrofitting): $200 million to implement stormwater engineering modifications to hot spots and portions of US 1.

Because of the high costs involved, substantial data collection through prerequisite strategies will be necessary to enable decisions regarding implementation of either strategy.

The following are additional strategies costing $5 million or more:

- L.7 (SWD Problem Sites): >$10 million to implement remedial actions at landfill sites, if necessary. [Note: the most costly activity (remediation) is a low priority, because it would be implemented only if significant problems were detected through a landfill search and intensified monitoring.]
- W.4 (Wastewater Disposal, City of Key West): >$7 million to upgrade effluent disposal (using deep-well injection for a minimum estimate).
- W.33 (Ecological Monitoring Program): $5 million to $7 million to monitor the status and trends of various ecological indicators of ecosystem health.
- W.14 (Best Management Practices): >$5 million to implement best management practices for stormwater runoff.
- W.20 (Monitoring Program): About $7 million to monitor status and trends in water quality and biological resources.

Excluding the two very expensive strategies discussed above (W.3 and W.11), the total cost of all strategies is $34 million to $55 million. (This is based on the strategy costs listed in Table 26).

Geographic Focus. The geographic focus (Sanctuary-wide, Upper Keys, Middle Keys, or Lower Keys) for each activity is indicated in Table 26. Most of the activities are Sanctuary-wide in focus. The two demonstration projects (strategies W.1 and W.2) will be conducted in specific areas of the Upper or Middle Keys, but are intended to provide broadly applicable information. Strategy W.4 applies only to Key West.

Personnel. The staff required to implement the Water Quality Action Plan will be a combination of personnel from various agencies and organizations identified in Table 25. In addition, scientists from various universities, research institutions, and environmental firms may be involved in the Water Quality Monitoring Program (strategy W.20) and various research strategies (strategies W.21 to W.24). Volunteers may be involved in conducting portions of the Water Quality Monitoring Program, but their role has not yet been identified. The total number of personnel likely to be involved in implementing each strategy is listed in Table 26.

Equipment. A variety of equipment will be required to implement portions of the Water Quality Action Plan. Equipment needs cannot be summarized due to the variety and complexity of activities described. The following strategies are essentially administrative or “desktop” in nature, and should not require equipment purchase:

- W.5: Water Quality Standards
- W.6: NPDES Program Delegation
- W.7: Resource Monitoring of Surface Discharges
- W.8: OSDS Permitting
- W.12: Stormwater Permitting
- W.13: Stormwater Management
- W.16: Spill Reporting
- W.19: Special Studies: Florida Bay Freshwater Flow
- W.29: Dissemination of Findings
- W.32: Technical Advisory Committee

Contingency Planning for Changing Budgets. The Water Quality Action Plan includes a wide variety of strategies and activities that will be implemented by various agencies and funded through various mechanisms. A separate study of potential funding sources was conducted by the EPA, and is included in the Water Quality Protection Program Phase II Report. The EPA and FDEP, with guidance from the Technical Advisory Committee (established under strategy W.32), will be responsible for reprioritizing strategies and activities depending on the available funds.

Evaluating Program Effectiveness. The EPA and FDEP will report regularly to the Steering Committee on the effectiveness of program activities. Each strategy will be evaluated to determine whether it is being successfully implemented. The evaluation will identify those types of activities which may no longer be useful, and those which have not been adequately addressed. The Steering Committee will meet regularly to review and assess the EPA's and FDEP’s evaluation of Program implementation. As required by the National Marine Sanctuaries Program Amendments Act of 1992, the Steering Committee will submit a biennial report to Congress that will:

- summarize the progress of the Program;
- summarize any modifications to the Program and its recommended actions and plans; and
- incorporate specific recommendations concerning implementation of the Program.

Table 25. *Agencies/Organizations Identified for Implementing Strategies/Activities*

Strategy/Activity	Agencies/Organizations															
	NOAA	NMFS	EPA	USCG	USGS	NPS	FWS	USACE	FDEP	FDHRS	FDCA	FDACS	FDOT	SFWMD	FKAA	Monroe County	City of K W	Other Municip.
FLORIDA BAY/EXTERNAL INFLUENCE																		
W.19 Florida Bay Freshwater Flow																		
Establish Leading Role for Steering Committee	○		●		○	○	○		●		○			○	○			
Participate in Review/Revision of Water Management Strategies	○		●		○	○	○		●		○			○		○		
W.24 Florida Bay Influence																		
Conduct Historical Assessment					●		○							●				
Conduct Circulation Studies			●						●									
Conduct Ecological Studies			●						●									
DOMESTIC WASTEWATER																		
W.1 OSDS Demonstration Project																		
Select Alternate OSDS and Test Locations			○						○	●	○					○		
Conduct OSDS Demonstration Project			○						○	●	○					○		
W.2 AWT Demonstration Project																		
Select Specific Technology and Test Location			○						○	●						○		
Conduct AWT Pilot Project			○						○	●						○		
W.3 Wastewater Management Systems																		
Establish Inspection/Compliance Programs for Cesspits, OSDS, and Package Plants			○						○	●						○	○	
Evaluate Development of Nutrient Reduction Targets			●						●	○						○		
Develop Sanitary Wastewater Master Plan			●						●	○						○		
Implement Master Plan. Examples:																		
• W3d: Construct two community plants			○						○	○	○	○		●		●		
• W3d: Upgrade package plants to AWT			●						●	○						○		
W.4 Wastewater Disposal, City of Key West																		
Evaluate Disposal and Reuse Options			○						○		○			●		●	●	
Upgrade Effluent Disposal			○						○		○			●		○	●	
W.5 Water Quality Standards																		
Develop and Evaluate Indicators		○	●						●									
Develop Water Quality Standards			○						●	○								
W.6 NPDES Program Delegation																		
Delegate NPDES Program			●						●									
W.7 Resource Monitoring of Surface Discharges																		
Require Resource Monitoring			●						●									

● Lead ○ Primary Role ○ Assist

Table 25. *Agencies/Organizations Identified for Implementing Strategies/Activities (cont.)*

Strategy/Activity	NOAA	NMFS	EPA	USCG	USGS	NPS	FWS	USACE	FDEP	FDHRS	FDCA	FDACS	FDOT	SFWMD	FKAA	Monroe County	City of K W	Other Municip.
	Agencies/Organizations																	
DOMESTIC WASTEWATER (cont.)																		
W.8 OSDS Permitting																		
Improve Interagency Coordination			○						●	○								
Combine OSDS Permitting Responsibilities									●	○								
Monitor Revised OSDS Rules										●								
W.9 Laboratory Facilities																		
Conduct Feasibility Study									●	○						○		
Establish Interagency Laboratory									●	○						○		
STORMWATER																		
W.11 Stormwater Retrofitting																		
Inventory Stormwater Hot Spots									○				○	○		●		
Retrofit Hot Spots and Portions of US 1									○				○	○		●		
W.12 Stormwater Permitting																		
Eliminate Permitting Threshold											○			○		●	●	●
W.13 Stormwater Management																		
Develop and Enact Stormwater Ordinances and Master Plans											○			○		●	●	●
Petition the EPA to Include the Keys in the Stormwater NPDES Program			○						●									
W.14 Best Management Practices																		
Develop and Implement Best Management Practices and a Public Education Program	○								○		○	○		○		●	●	●
MARINAS AND LIVE-ABOARDS																		
B.7 Pollution Discharges																		
Implement the 1994 Florida Clean Vessel Act	○		○						●									
Evaluate the need for no-discharge zones	○		●	○					○							○		
Establish no-discharge zones	○		●	○					●							○		
Develop and Implement a Public Education Program	○		○						●									
Change Environmental Crimes Category	●								●							○		
Z.5 Special-use Areas																		
Evaluate Feasibility of Mooring Fields	●															○	○	
Establish Criteria for Mooring Fields	●															○	○	
Establish Mooring Fields	●		○						○							○	○	
L.1 Marina Pumpout																		
Develop Plan for Sewage Discharge Elimination	●		●	●					○		○					●	●	●
Require Marina Pumpout Facilities																●	●	●
Enforce Pumpout Use	○			●					○							○		
L.6 Mobile Pumpout																		
Establish Mobile Pumpout Service				●												●		
L.2 Marina Siting and Design																		
Improve Interagency Cooperation in Marina Permitting		●					○		●									

● Lead ○ Primary Role ○ Assist

Table 25. *Agencies/Organizations Identified for Implementing Strategies/Activities (cont.)*

Strategy/Activity	Agencies/Organizations																
	NOAA	NMFS	EPA	USCG	USGS	NPS	FWS	USACE	FDEP	FDHRS	FDCA	FDACS	FDOT	SFWMD	FKAA	Monroe County	City of K W	Other Municip.
MARINAS AND LIVE-ABOARDS (cont.)																		
L.3 Marina Operations																		
Establish Containment Areas for Boat Maintenance		●						◐							○	○	○	○
Encourage Owners to Participate in Environmentally-Oriented Organizations								◐							●	●	●	●
Encourage Owners to Provide User Manual								◐							●	●	●	●
E.4 Training, Workshops, and School Programs																		
Expand Environmental Awareness Program	◐							●										
LANDFILLS																		
L.7 SWD Problem Sites																		
Conduct Historical Landfill Search and Assessment			○					◐							●			
Intensify Landfill Monitoring			○					◐							●			
Evaluate and Implement Remedial Actions			○					◐							●			
HAZARDOUS MATERIALS																		
W.15 HAZMAT Response																		
Develop and Periodically Revise Sanctuary Spill Contingency Plan	○		●					●			○				○			
Improve Coordination and Cooperation	○		●					●			○				○			
Improve Response/Containment Technologies	○		●					●			○				○			
W.16 Spill Reporting																		
Establish Spill Reporting System	◐		●					◐										
Establish and Maintain Sanctuary Spills Database	●		○					○										
L.10 HAZMAT Handling																		
Conduct HAZMAT Assessment/ Inventory			◐					●			○				◐			
MOSQUITO SPRAYING																		
W.17 Mosquito Spraying																		
Review Aerial Spraying Threshold											○	●						
Review Flight Plans and Equipment											○	●						
Reconsider Larvicide Use											○	●						
Evaluate Ultra-low-volume Methods											○	●						
W.18 Pesticide Research																		
Research Impacts and Alternatives								◐			○	●						
Modify Mosquito Control Program								◐				●						
Conduct Field Survey of Pesticide and Herbicide Use								◐				●						
CANALS																		
W.10 Canal WQ																		
Evaluate and Revise Hot Spot List			◐					◐						●	◐	◐	◐	
Inventory and Characterize Canals			◐					●						◐	◐	◐	◐	
Develop and Evaluate Improvement Strategies			◐					●						◐	◐	◐	◐	
Revise FDEP Permit Criteria			◐					●						◐	◐	◐	◐	
Identify and Compile Technologies			◐					●						◐	◐	◐	◐	
Develop Community Education and Involvement Program			◐					●						◐	◐	◐	◐	
Conduct Canal System Restoration Pilot Project			◐					●						◐	◐	◐	◐	
Implement Improvement Strategies			◐					●						◐	◐	◐	◐	

● Lead ◐ Primary Role ○ Assist

Table 25. *Agencies/Organizations Identified for Implementing Strategies/Activities (cont.)*

Strategy/Activity	Agencies/Organizations															
	NOAA	NMFS	EPA	USCG	USGS	NPS	FWS	USACE	FDEP	FDHRS	FDCA	FDACS	FDOT	SFWMD	FKAA	Monroe County	City of K W	Other Municip.
MONITORING AND SPECIAL STUDIES																		
W.20 Monitoring																		
Develop Monitoring Implementation Plan			●						●									
Select Organization/Institution to Conduct Monitoring			●						●									
Establish QA/QC Authority and Protocols			●						●									
Implement Monitoring			●						●									
W.21 Predictive Models																		
Conduct a Modeling Workshop			●						●									
Develop a Modeling Implementation Plan			●		○				●				○					
W.22 Wastewater Pollutants																		
Detect Wastewater Pollutants and Ecological Impacts	◐		●						●						○			
W.23 Special Studies																		
Estimate Other Pollutant Loadings	○		●		○				●						○			
Identify Causal Linkages Between Pollutants and Ecological Impacts	○		●		○				●						○			
Develop and Evaluate Innovative Monitoring Tools	◐		●						●									
Conduct Research on Global Change	●		○				○		○									
W.28 Regional Database																		
Conduct User Needs Assessment	◐		◐						●									
Develop Implementation Plan	◐		◐						●									
Implement and Maintain Data Management System	◐		◐						●									
W.29 Dissemination of Findings																		
Establish Information Exchange Network	◐		●						●									
Sponsor Conferences	◐		●						●									
Support Journal Publication	◐		●						●									
Disseminate Findings to the Public	●		●						●									
W.32 Technical Advisory Committee																		
Establish Technical Advisory Committee	◐		●						●									
W.33 Ecological Monitoring Program	*Refer to Research and Monitoring Action Plan*																	

● Lead ◐ Primary Role ○ Assist

Abbreviations: NOAA, National Oceanic and Atmospheric Administration; NMFS, National Marine Fisheries Service; EPA, U.S. Environmental Protection Agency; USCG, U.S. Coast Guard; USGS, U.S. Geological Survey; NPS, National Park Service; FWS, U.S. Fish and Wildlife Service; USACE, U.S. Army Corp of Engineers; FDEP, Florida Department of Environmental Protection; FDHRS, Florida Department of Health and Rehabilitative Services; FDCA, Florida Department of Consumer Affairs; FDACS, Florida Department of Agriculture and Consumer Services; FDOT, Florida Department of Transportation; SFWMD, South Florida Water Management District; City of K.W., City of Key West; Other Municip., Other Municipalities.

Table 26. *Requirements for Implementation*

Strategy/Activity	Priority	Implementation: Planned Level of Activity in Year 1	Implementation: Months to Complete	Implementation: Funding Available to Complete	Cost to Complete: Institutional: Capital ($1,000)	Cost to Complete: Institutional: Operations/Maint. ($1,000)	Cost to Complete: Engineering/Facilities: Capital ($1,000)	Cost to Complete: Engineering/Facilities: Operations/ Maintenance ($1,000)	Geographic Focus	# of Personnel
FLORIDA BAY/EXTERNAL INFLUENCE										
W.19 Florida Bay Freshwater Flow	●	Medium	36+	100%	NC	10-99				1-2
Establish Leading Role for Steering Committee		Done	0	100%	NC	10-99			SW	
Participate in Review/Revision of Water Management Strategies		Medium	36+	100%	NC	10-99			SW	
W.24 Florida Bay Influence	●	High	48	<50%	NC	100-999+				3-5
Conduct Historical Assessment		High	12	<50%	NC	10-99			SW	
Conduct Circulation Studies		High	48	<50%	NC	100-999			SW	
Conduct Ecological Studies		Low	36	<50%	NC	100-999			SW	
DOMESTIC WASTEWATER										
W.1 OSDS Demonstration Project	●	High	36	100%	10-99	10-99	30-60	25-50		1-2
Select Alternate OSDS and Test Locations		Done	0	100%	NC	1-9			UK, MK	
Conduct OSDS Demonstration Project		Low	36	100%	10-99	10-99	30-60	25-50	UK, MK	
W.2 AWT Demonstration Project	●	None	36	<50%	10-99	10-99	300-600	17-33		1-2
Select Specific Technology and Test Location		None	12	<50%	NC	1-9			UK, MK	
Conduct AWT Pilot Project		None	36	<50%	10-99	10-99	300-600	17-33	UK, MK	
W.3 Wastewater Management Systems	●	High	36+	<50%	5,000-10,000	1,000-5,000	113,000-241,000	5,250		3-5
Establish Inspection/Compliance for Cesspits, OSDS, and Package Plants		High	36	<50%	NC	100-999	57,000	NC	SW	3-5
Evaluate Development of Nutrient Reduction Targets		High	12	<50%	NC	10-99			SW	
Develop Sanitary Wastewater Master Plan		None	36	<50%	NC	10-99			SW	
Implement Master Plan. Examples:		None	?	0%						
• W3d: Construct two community plants					5,000-10,000	1,000-5,000	184,000	5,250	SW	11-25
• W3d: Upgrade package plants to AWT					NC	10-99	56,000	400	SW	1-2
W.4 Wastewater Disposal, City of Key West	●	Low	48	<50%	NC	100-999	7,000	225		3-5
Evaluate Disposal and Reuse Options		Low	12	?	NC	100-999				
Upgrade Effluent Disposal		None	48	<50%			7,000	225	LK	
W.5 Water Quality Standards	○	Low	60+	<50%	NC	100-999				3-5
Develop and Evaluate Indicators		Low	36	<50%	NC	100-999			SW	
Develop Water Quality Standards		None	60+	<50%	NC	10-99			SW	
W.6 NPDES Program Delegation	*	Done	0	100%	NC	10-99				1-2
Delegate NPDES Program		Done	0	100%	NC	10-99			SW	
W.7 Resource Monitoring of Surface Discharges	*	Low	36	100%	NC	10-99				1-2
Require Resource Monitoring		Low	36	100%	NC	10-99			SW	

Abbreviations: SW, Sanctuary Wide; UK, Upper Keys; MK, Middle Keys; LK, Lower Keys.

Priority: ● = High ○ = Medium * = Low

Table 26. *Requirements for Implementation (cont.)*

Strategy/Activity	Priority	Implementation: Planned Level of Activity in Year 1	Implementation: Months to Complete	Implementation: Funding Available to Complete	Cost to Complete: Institutional: Capital ($1,000)	Cost to Complete: Institutional: Operations/Maint. ($1,000)	Cost to Complete: Engineering/Facilities: Capital ($1,000)	Cost to Complete: Engineering/Facilities: Operations/Maint. ($1,000)	Geographic Focus	# of Personnel
DOMESTIC WASTEWATER (cont.)										
W.8 OSDS Permitting	*	None	36	100%	NC	100-999				3-5
Improve Interagency Coordination		None	24	100%	NC	10-99			SW	
Combine OSDS Permitting Responsibilities		None	36	?	NC	10-99			SW	
Monitor Revised OSDS Rules		None	36	?	NC	10-99			SW	
W.9 Laboratory Facilities	*	None	36	<50%	10-99	100-999				3-5
Conduct Feasibility Study		None	12	<50%	10-99	10-99			MK	
Establish Interagency Laboratory		None	36	<50%	10-99	100-999			MK	
STORMWATER										
W.11 Stormwater Retrofitting	○	Low	60+	<50%	>10,000	>5,000	80,000	6,000		6-10
Inventory Stormwater Hotspots		Low	12	<50%	NC	10-99			SW	
Retrofit Hotspots and Portions of US 1		None	60+	0	>10,000	>5,000	80,000	6,000	SW	
W.12 Stormwater Permitting	○	Done	0	100%	NC	NC				None
Eliminate Permitting Threshold		Done	0	100%	NC	NC			SW	
W.13 Stormwater Management	○	Medium	24	100%	NC	100-999				1-2
Develop and Enact Stormwater Ordinances and Master Plans		Medium	12	100%	NC	100-999			SW	
Petition EPA to Include the Florida Keys in the Stormwater NPDES Program		None	24	100%	NC	10-99			SW	
W.14 Best Management Practices	○	Low	36	<50%	100-999	1,000-5,000				3-5
Develop and Implement Best Management Practices and Public Education Program		Low	36	<50%	100-999	1,000-5,000			SW	
MARINAS AND LIVE-ABOARDS										
B.7 Pollution Discharges	○	Low	36	<50%	NC	100-999				3-5
Implement 1994 Florida Clean Vessel Act		Low	12	?	NC	10-99			SW	
Evaluate the Need for No-discharge Zones		Low	12							
Establish No-discharge Zones		None	48							
Develop and Implement a Public Education Program		Low	12	?	NC	10-99			SW	
Change Environmental Crimes Categoriy		None	36	<50%	NC	10-99			SW	
Z.5 Special-Use Areas	○	Low	36	<50%	?	?				?
Evaluate Feasibility of Mooring Fields		Low	12	<50%	NC	10-99			SW	
Establish Criteria for Mooring Fields		None	12	<50%	NC	10-99			SW	
Establish Mooring Fields		None	36	<50%	?	?			SW	
L.1 Marina Pumpout	●	Low	60	<50%	NC	100-999				3-5
Develop Plan for Sewage Discharge Elimination		Low	12	100%	NC	10-99			SW	
Require Marina Pumpout Facilities		None	36	100%	NC	10-99			SW	
Enforce Pumpout Use		None	60	<50%	NC	10-99			SW	
L.6 Mobile Pumpout	○	None	36	<50%	NC	10-99				3-5
Establish Mobile Pumpout Service		None	36	<50%	NC	10-99			SW	
L.2 Marina Siting and Design	*	None	36	100%	NC	10-99				3-5
Improve Interagency Cooperation in Marina Permitting		None	36	100%	NC	10-99			SW	

Abbreviations: SW, Sanctuary Wide; UK, Upper Keys; MK, Middle Keys; LK, Lower Keys.

Priority: ● = High ○ = Medium * = Low

Table 26. *Requirements for Implementation (cont.)*

Strategy/Activity	Priority	Implementation: Planned Level of Activity in Year 1	Implementation: Months to Complete	Implementation: Funding Available to Complete	Cost to Complete: Institutional: Capital ($1,000)	Cost to Complete: Institutional: Operations/Maint. ($1,000)	Cost to Complete: Engineering/Facilities: Capital ($1,000)	Cost to Complete: Engineering/Facilities: Operations/Maint. ($1,000)	Geographic Focus	# of Personnel
MARINAS AND LIVE-ABOARDS (cont.)										
L.3 Marina Operations	◍	None	36	<50%	NC	10-99				3-5
Establish Containment Areas for Boat Maintenance		None	36	<50%	NC	10-99			SW	
Encourage Owners to Participate in Environmental Organizations		None	12	100%	NC	NC			SW	
Encourage Marina Owners to Provide User Manual with Local Environmental Information		None	12	100%	NC	NC			SW	
E.4 Training/Workshops/School Programs	◍	Medium	24	<50%	10	5				1-2
Expand Environmental Awareness Program		Medium	24	<50%	10	5			SW	
LANDFILLS										
L.7 SWD Problem Sites	◍	None	60+	<50%	<10	1,000-5,000				1-2
Conduct Historical Landfill Search and Assessment		None	36	<50%	NC	10-99			SW	
Intensify Landfill Monitoring		None	36	<50%	<10	10-99			SW	
Evaluate and Implement Remedial Actions		None	60+	<50%	<10	1,000-5,000			SW	
HAZARDOUS MATERIALS										
W.15 HAZMAT Response	◍	Low	36	<50%	10-99	100-999				1-2
Develop and Periodically Revise Sanctuary Spill Contingency Plan		None	36	<50%	10-99	10-99			SW	
Improve Coordination and Cooperation		Low	12	100%	NC	10-99			SW	
Improve Response/Containment Technologies		None	36	<50%	10-99	10-99			SW	
W.16 Spill Reporting	*	Low	24	<50%	<10	10-99				1-2
Establish Spill Reporting System		Low	12	?	NC	10-99			SW	
Establish and Maintain Sanctuary Spill Database		None	24	<50%	<10	10-99			SW	
L.10 HAZMAT Handling	◍	None	36	?	NC	10-99				1-2
Conduct HAZMAT Assessment/Inventory		None	36	?	NC	10-99			SW	
MOSQUITO SPRAYING										
W.17 Mosquito Spraying	●	High	12	75-99%	10-99	10-99				3-5
Review Aerial Spraying Threshold		High	12	75-99%	NC	10-99			SW	
Review Flight Plans and Equipment		High	12	75-99%	10-99	10-99			SW	
Reconsider Larvicide Use		High	12	75-99%	NC	10-99			SW	
Evaluate Ultra-low-volume Methods		High	12	75-99%	NC	10-99			SW	
W.18 Pesticide Research	●	None	36+	<50%	NC	100-999				3-5
Research Impacts and Alternatives		None	36	<50%	NC	100-999			SW	
Modify Mosquito Control Program		None	36+	<50%	?	?			SW	
Conduct Field Survey of Pesticide and Herbicide Use		None	12	<50%	NC	100-999			SW	
CANALS										
W.10 Canal WQ	●	Low	60+	<50%	100-999	100-999				1-2
Evaluate and Revise Hot Spot List		Low	12	<50%	NC	10-99			SW	
Inventory and Characterize Canals		None	12	<50%	NC	10-99			SW	
Develop and Evaluate Improvement Strategies		None	24	<50%	10-99	10-99			SW	
Revise FDEP Permit Criteria		None	12	100%	NC	10-99			SW	
Identify and Compile Technologies		None	12	<50%	NC	10-99			SW	
Develop Community Education and Involvement Program		None	12	<50%	NC	10-99			SW	
Conduct Canal System Restoration Pilot Project		None	12	<50%	100-999	100-999			SW	
Implement Improvement Strategies		None	60	<50%	100-999	100-999			SW	

Abbreviations: SW, Sanctuary Wide; UK, Upper Keys; MK, Middle Keys; LK, Lower Keys.
Priority: ● = High ◍ = Medium * = Low

Table 26. *Requirements for Implementation (cont.)*

Strategy/Activity	Priority	Implementation: Planned Level of Activity in Year 1	Implementation: Months to Complete	Implementation: Funding Available to Complete	Cost to Complete: Institutional: Capital ($1,000)	Cost to Complete: Institutional: Operations/Maint. ($1,000)	Cost to Complete: Engineering/Facilities: Capital ($1,000)	Cost to Complete: Engineering/Facilities: Operations/Maint. ($1,000)	Geographic Focus	# of Personnel
MONITORING AND SPECIAL STUDIES										
W.20 Monitoring	●	High	60+	<50%	NC	5,000+				3-5
Develop Monitoring Implementation Plan		Done	0	100%	NC	10-99			SW	
Identify Organization/Institution to Conduct Monitoring		Done	0	100%	NC	<10			SW	
Establish QA/QC Authority and Protocols		Done	0	100%	NC	10-99			SW	
Implement Monitoring		Low	60+	<50%	NC	5,000+			SW	
W.21 Predictive Models	●	High	12+	<50%	NC	100-999				3-5
Conduct Modeling Workshops		High	12	<50%	NC	10-99			SW	
Develop Modeling Implementation Plan		High	12+	<50%	NC	10-99			SW	
W.22 Wastewater Pollutants	●	Low	36	<50%	NC	100-999				3-5
Detect Wastewater Pollutants and Ecological Impacts		Low	36	<50%	NC	100-999			SW	
W.23 Special Studies	○	None	36	<50%	NC	100-999				3-5
Estimate Other Pollutant Loadings		None	36	<50%	NC	100-999			SW	
Identify Causal Linkages Between Pollutants and Ecological Impacts		None	36	<50%	NC	100-999			SW	
Develop and Evaluate Other Monitoring Tools		None	36	<50%	NC	100-999			SW	
Conduct Research on Global Change		None	36	<50%	NC	100-999			SW	
W.28 Regional Database	●	High	60+	<50%	<10	10-99				1-2
Conduct User Needs Assessment		Done	0	100%	NC	10-99			SW	
Develop Implementation Plan		Done	0	100%	<10	10-99			SW	
Implement and Maintain Data Management System		Low	60+	<50%	<10	10-99			SW	
W.29 Dissemination of Findings	*	Low	60+	<50%	<10	100-999				3-5
Establish Information Exchange Network		Low	12	<50%	<10	10-99			SW	
Sponsor Conferences		None	60+	<50%	NC	10-99			SW	
Support Journal Publication		None	60+	<50%	NC	10-99			SW	
Disseminate Findings to the Public		None	60+	<50%	NC	10-99			SW	
W.32 Technical Advisory Committee	●	Done	0	100%	NC	10-99				3-5
Establish Technical Advisory Committee		Done	0	100%	NC	10-99			SW	
W.33 Ecological Monitoring Program		*Refer to Research and Monitoring Action Plan*								

Abbreviations: SW, Sanctuary Wide; UK, Upper Keys; MK, Middle Keys; LK, Lower Keys.
Priority: ● = High ○ = Medium * = Low

Table 27. *Rationale for the High Priority Level of Water Quality Strategies*

Strategy/Activity	Rationale
FLORIDA BAY/EXTERNAL INFLUENCES	
W.19 Florida Bay Freshwater Flow • Establish Leading Role for Steering Committee • Participate in Review/Revision of Water Management Strategies	Addresses a potentially major, external influence on water quality in the Sanctuary. The Sanctuary must be involved in decisions affecting its jurisdiction.
W.24 Florida Bay Influence • Conduct Historical Assessment • Conduct Circulation Studies • Conduct Ecological Studies	Addresses a potentially major, external influence on water quality in the Sanctuary. Understanding Florida Bay influence must be considered in decisions regarding wastewater management systems (strategy W.3) and in restoring freshwater flow to Florida Bay (strategy W.19).
DOMESTIC WASTEWATER	
W.1 OSDS Demonstration Project • Select Alternate OSDS and Test Locations • Conduct OSDS Demonstration Project	Provides critical information for decisions regarding wastewater management systems (strategy W.3).
W.2 AWT Demonstration Project • Select Specific Technology and Test Location • Conduct AWT Pilot Project	Provides critical information for decisions regarding wastewater management systems (strategy W.3).
W.3 Wastewater Management Systems • Establish Inspection/Compliance Programs for Cesspits, OSDS, and Package Plants • Evaluate Development of Nutrient Reduction Targets • Develop Sanitary Wastewater Master Plan • Implement Master Plan	Will lead to major reductions in wastewater nutrient loading to Sanctuary waters through enforcing existing standards, upgrading existing systems, and/or constructing community wastewater plants.
W.4 Wastewater Disposal, City of Key West • Evaluate Disposal and Reuse Options • Upgrade Effluent Disposal	Directly reduces nutrient loadings to surface waters.
W.22 Wastewater Pollutants • Detect Wastewater Pollutants and Ecological Impacts	Provides critical information for decisions regarding wastewater management systems (strategy W.3). Provides critical information about cause/effect relationships linking wastewater pollutants and Sanctuary resources.
MARINAS AND LIVE-ABOARDS	
L.1 Marina Pumpout • Develop Plan for Sewage Discharge Elimination • Require Marina Pumpout Facilities • Enforce Pumpout Use	Develops and implements a coordinated plan to directly reduce nutrient loadings from live-aboards and other boaters, which can contribute to water quality degradation in confined waters.
MOSQUITO SPRAYING	
W.17 Mosquito Spraying • Review Aerial Spraying Threshold • Review Flight Plans and Equipment • Reconsider Larvicide Use • Evaluate Ultra-low-volume Methods	Reduces aerial spraying of pesticides, leading to reduced inputs of pesticides and diesel oil to the marine environment.
W.18 Pesticide Research • Research Impacts and Alternatives • Modify Mosquito Control Program • Conduct Field Survey of Pesticide and Herbicide Use	Evaluates alternatives to minimize impacts of current pesticide practices.

Table 27. *Rationale for the HIgh Priority Level of Water Quality Strategies (cont.)*

Strategy/Activity	Rationale
CANALS	
W.10 Canal WQ • Evaluate and Revise Hot Spot List • Inventory and Characterize Canals • Develop and Evaluate Improvement Strategies • Revise FDEP Permit Criteria • Identify and Compile Technologies • Develop Community Education and Involvement Program • Conduct Canal System Restoration Pilot Project • Implement Improvement Strategies	Addresses documented water quality degradation in canals.
MONITORING AND SPECIAL STUDIES	
W.20 Monitoring • Develop Monitoring Implementation Plan • Identify Organization/Institution to Conduct Monitoring • Establish QA/QC Authority and Protocols • Implement Monitoring	Provides critical data on long-term status and trends in water quality and biological resources for management decisions. The monitoring program is required by the Florida Keys National Marine Sanctuary and Protection Act.
W.21 Predictive Models • Conduct a Modeling Workshop • Develop a Modeling Implementation Plan	Provides critical guidance to resource managers.
W.22 Wastewater Pollutants • Detect Wastewater Pollutants and Ecological Impacts	(see above, Domestic Wastewater)
W.24 Florida Bay Influence • Conduct Historical Assessment • Conduct Circulation Studies • Conduct Ecological Studies	(see above, Florida Bay/External Influences)
W.28 Regional Database • Conduct User Needs Assessment • Develop Implementation Plan • Implement Data Management System	Data management is an integral part of all monitoring and special studies efforts; must be developed before field/lab work begins.
W.32 Technical Advisory Committee • Establish Technical Advisory Committee	Establishes technical (scientific and resource management) oversight for all monitoring and special studies efforts.
W.33 Ecological Monitoring Program	Provides critical information on the health of living resources and the ecosystem, causal relationships related to management decisions, and the effectiveness of management actions. The ecological monitoring program is required by the Florida Keys National Marine Sanctuary and Protection Act.

Zoning Action Plan

This action plan identifies the zoning strategies that will be implemented in the Sanctuary. The strategies in the plan are derived from Alternative III, the most balanced of the management alternatives. For each strategy, the time required for implementation, funding availability, level of activity in year 1, costs, and responsible parties are outlined. Maps showing the location of each zone are also included in this plan. Table 28 summarizes key information about zoning strategies.

Introduction

The consideration of temporal and geographic zoning to ensure protection of Sanctuary resources is mandated under Section 7 (a) (2) of the Florida Keys National Marine Sanctuary and Protection Act. Marine zoning is a management tool that has been used around the world to protect sensitive marine resources from overuse and to separate conflicting visitor uses. Marine zoning is being implemented in the Florida Keys National Marine Sanctuary to assist in the protection of the biological diversity of the marine environment in the Keys. In addition, marine zoning will disperse uses of the resources in such a way as to reduce user conflicts and lessen the concentrated impact to marine organisms on heavily used reefs. As a management tool, marine zoning allows the sanctuary to focus the majority of its management efforts on a small portion of the sanctuary while addressing water quality and habitat degradation in the broader unzoned portions of the area.

In addition to the Existing Management Areas in the Keys (national wildlife refuges, state parks, etc.), Wildlife Management Areas, Ecological Reserves, Sanctuary Preservation Areas, and Special-use Areas are established to ensure protection of Sanctuary resources. Each of these zone types is designed to reduce damage to resources and threats to environmental quality, while allowing uses that are compatible with resource protection. The zones will protect habitats and species by limiting consumptive and/or conflicting user activities, and allowing resources to evolve in a natural state, with minimum human influence. This plan outlines the process for establishing the zones. Prioritizing zone marking, marking zone boundaries, and managing zones are also each discussed.

The term *Ecological Reserves* replaces the term *Replenishment Reserves* in the FMP/EIS. NOAA has changed the name to reflect public concerns over the purpose of these areas, however, the objective and definition of this zone type remains the same. The main purpose of *Ecological Reserves* is to protect biodiversity by setting aside areas with minimal human disturbance. These zones will serve to protect and enhance the spawning, nursery or permanent resident areas of fish and other marine life. Hundreds of marine species are not protected by any form of management and the *Ecological Reserves* will provide protection and allow areas to return to their natural state. These areas will additionally protect the food and home of commercially and recreationally important species of marine life. The objective and definition of this zone type remains the same.

The five zone types which will be implemented in the Sanctuary are:

Wildlife Management Areas. These areas are established to minimize disturbance to especially sensitive wildlife populations and their habitats to ensure

Table 28. *Summary of Zoning Strategies*

Page		Strategies	Overall Sanctuary Priority Level+	Planned Level of Action in Year 1	Months to Complete	Funding for Full Implementation	Number of Activities to be Undertaken	Number of Institutions
259	**Zoning**							
259	Z.1	Wildlife Management Areas	*	High	--	75%	4	7
260	Z.2	Ecological Reserves	High	High	12+	<50%	3	3
261	Z.3	Sanctuary Preservation Areas	High	Medium	18+	<50%	4	4
263	Z.4	Existing Management Areas	*Refer to Regulatory Action Plan*					
263	Z.5	Special-use Areas	Medium	Low	12+	<50%	7	4

+ Strategies with an "*" for Overall Sanctuary Priority Level are already existing programs and/or will be completed in the first year of Sanctuary operation.

protection and preservation consistent with the Sanctuary designation and other applicable laws governing the protection and preservation of wildlife resources in the Sanctuary. Such areas would include bird nesting, resting, or feeding areas and turtle nesting beaches. Regulations governing access are designed to protect endangered or threatened species or their habitats, while providing opportunities for public use. Access restrictions include no-access buffer zones, no-motor zones, idle speed only/no wake zones, and closed zones. Twenty of the twenty-seven areas are under the management of the U.S. Fish and Wildlife Service and are contained in this plan as an integrated ecosystem management approach to resource protection. These areas are located within the Great White Heron, Key West, Key Deer, and Crocodile Lakes National Wildlife Refuges managed by the U.S. Fish and Wildlife Service.

Ecological Reserves. These areas are designed to encompass large, contiguous diverse habitats. They are intended to provide natural spawning, nursery, and permanent residence areas for the replenishment and genetic protection of marine life and to protect and preserve all habitats and species particularly those not protected by fishery management regulations. These reserves are intended to protect areas that represent the full range of diversity of resources and habitats found throughout the Sanctuary. The intent is to meet these objectives by limiting consumptive activities, while continuing to allow activities that are compatible with resource protection. This will provide the opportunity for these areas to evolve in a natural state, with a minimum of human influence. These zones will protect a limited number of areas that provide important habitat for sustaining natural resources such as fish and invertebrates.

The following is a list of criteria that was developed by the Sanctuary Advisory Council. These criteria were used to site the proposed Ecological Reserves in the DMP/EIS and were reconsidered along with public comment for this final plan.

- Consider areas of high habitat and species diversity representative of the Florida Keys marine ecosystem.
- Consider environmental and socio-economic impacts on other areas resulting from displacing existing uses.
- Consider long-term impacts from establishing ecological reserves in areas of critical economic value.
- Consider areas with good water quality.
- Consider socioeconomic impact on displaced user groups.
- Consider ownership of nearby waterfront property.
- Consider sufficient size to include range of habitats.
- Consider other areas within and adjacent to the Sanctuary with existing or proposed restrictions.
- Consider existing managed areas.

In addition to the aforementioned criteria, there are the statutory criteria under the FKNMSPA for protecting resources and facilitating multiple use, and under NEPA, for considering the environmental consequences including the socio-economic impacts.

Sanctuary Preservation Areas. These areas will focus on the protection of shallow, heavily used reefs where conflicts occur between user groups, and where concentrated visitor activity leads to resource degradation. They are designed to enhance the reproductive capabilities of renewable resources, protect areas critical for sustaining and protecting important marine species, and reduce user conflicts in high-use areas. This will be accomplished through a prohibition of consumptive activities within these areas. They have been chosen based on the status of important habitat, the ability of a particular area to sustain and protect the habitat, the level of visitor use, and the degree of conflict between consumptive and nonconsumptive users. The actual size and location of these zones have been determined by examination of user patterns, aerial photography, and ground-truthing of specific habitats.

The following is a list of criteria that was developed by the Sanctuary Advisory Council. These criteria were used to site the proposed Sanctuary Preservation Areas in the DMP/EIS and were reconsidered along with public comment for this final plan.

- Protect representative locations of the most rare habitats (i.e. reefs.)
- Consider long term impacts on areas of critical economic value.
- Protect areas that are buffered from poor water quality.

- Consider the accessibility of areas to fisherman and other user groups.
- Minimize conflicts.
- Provide geographic spread.
- Sufficient size to ensure viability.
- Research potential/control areas.

In addition to the aforementioned criteria, there are the statutory criteria under the FKNMSPA for protecting resources and facilitating multiple use, and under NEPA, for considering the environmental consequences including the socioeconomic impacts.

Existing Management Areas. This zone simply identifies areas that are managed by other agencies where restrictions already exist. These zones delineate the existing jurisdictional authority of other agencies (i.e., State parks, aquatic preserves, sanctuaries, and other restricted areas). Management of these areas within the Sanctuary may require additional regulations or restrictions to adequately protect resources. Any additional management measures will be developed and implemented in coordination with the agency having jurisdictional authority. Their function is not to establish another layer of bureaucracy, but to recognize established management areas and, at a minimum, to complement the existing management programs, ensuring cooperation and coordination with other agencies.

Special-use Areas. These zones are used to set aside areas for scientific research and educational purposes, restoration, monitoring, or to establish areas that confine or restrict activities such as commercial personal watercraft operations and establish live-aboard mooring fields. These areas will minimize impacts on sensitive habitats and reduce user conflicts. Special management programs (e.g., monitoring, research, special-use permits and restoration) can be conducted without impediment in these areas. They can be used to set aside areas for specific uses such as long-term research and monitoring and/or minimizing the adverse environmental effects of high-impact activities. These zones will be limited in their length of duration.

How the Plan is Organized. This action plan is organized in four sections: an introduction, description of strategies, a summary of implementation procedures, and a series of maps showing the various zones in the Sanctuary. The introduction summarizes the goals and objectives of the Zoning Program, and provides background information on planning efforts. The strategy description section groups activities by strategy, based on the five types of management zones. For each strategy and component activity, the priority level, funding availability, costs, and timing of implementation are summarized. The implementation section details how the strategies in the plan will be placed into action. The final section includes a map of each zone, and an accompanying description of the area.

Background

Management Strategies. Each strategy has been assigned an estimated activity level for year 1 (high, medium, low, or none) that represents an estimate of the planned level of action that will occur in the first year after the Management Plan is adopted. In addition, the time required for implementation, costs of implementation, and available funding (Federal, State, local, and private) have been estimated for each strategy. The component activities in each strategy, and the institutions responsible for implementing these activities, have also been identified.

The strategies for the Management Plan, which includes the Zoning Action Plan and all other action plans combined, have been grouped into three priority levels, based on their relative importance or feasibility. A strategy's priority level is based on factors such as available funding, costs, personnel requirements, timing, levels of existing implementation, and existing legislative/regulatory authority. The high priority level includes the 16 most important strategies. The medium priority level contains 36 strategies that represent the next level of importance to the Sanctuary and will have some level of activity in year one. Low priority items contain the remaining strategies in the Management Plan. Those strategies planned for completion in or before year one do not have a priority level.

Zoning Strategies. The strategies delineating Ecological Reserves and Sanctuary Preservation Areas are considered priority level 1. The activities described for those strategies will have a high level of action in year 1 for the Western Sambos Ecological Reserve and a medium level of action for selected Sanctuary Preservation Areas. The Special-use Areas strategy is considered high priority level, and will also have a low level of action in year 1. Wildlife Management Areas and Existing Management Areas will both be established in year 1 and, accordingly, have not been assigned a priority level.

NOAA will be the primary funding source for all strategies, except for marking Wildlife Management Areas in national wildlife refuges. The marking of these zones may have to be implemented gradually as funds become available for installation of markers.

Five-year Zoning Plan Review. The Sanctuary's zoning program will be evaluated in the five-year update of the Management Plan, the effectiveness of the zones will be determined, and consideration will be given to modifying or eliminating zones at this time.

Relationship to Other Action Plans. This plan describes the process of prioritizing zones for marking, obtaining the information necessary to mark boundaries, and the method of marking these boundaries. The associated regulations are described in the Regulatory Action Plan. In addition, research and monitoring will be conducted within Sanctuary Preservation Areas, Ecological Reserves, and Special-use Areas to provide information for better management. This may result in zone modifications as part of the continuous management process. These activities are described in the Research and Monitoring Action Plan. Finally, the establishment of live-aboard mooring fields as Special-use Areas is described in the Water Quality Action Plan. This activity would establish designated mooring fields or anchorage areas in places with significant concentrations of live-aboard vessels.

Goals and Objectives

Sanctuary Goals. Zoning is critical to achieving the Sanctuary's primary goal of resource protection. Its purpose is to protect and preserve sensitive components of the ecosystem by regulating within the zoned areas, while facilitating activities compatible with resource protection. Zoning will ensure that areas of high ecological importance will evolve in a natural state, with minimal human influence. Zoning will also promote sustainable use of the Sanctuary resources, and will protect areas representing diverse Sanctuary habitats and areas important for maintaining natural resources (e.g., fishes, invertebrates, etc.) and ecosystem functions.

Sanctuary Objectives. To achieve these goals, the following objectives must be accomplished:

- reduce stresses from human activities by establishing areas that restrict access to especially sensitive wildlife populations and habitats;
- protect biological diversity and the quality of resources by protecting large, contiguous diverse habitats that are intended to provide natural spawning, nursery, and permanent residence areas for the replenishment and genetic protection of marine life and to protect and preserve all habitats and species;
- minimize conflicting uses;
- protect Sanctuary resources and separate conflicting uses by establishing a number of non-consumptive zones in areas that are experiencing conflict between consumptive and non-consumptive uses and in areas that are experiencing significant population or habitat declines;
- eliminate injury to critical/sensitive habitats;
- disperse concentrated harvests of marine organisms;
- prevent heavy concentrations of uses that degrade Sanctuary resources;
- provide undisturbed monitoring sites for research activities by setting areas aside for scientific research, monitoring, and restoration; and
- provide control sites to help determine the effects of human activities on resources.

Description of Strategies

Zoning

This Final plan contains five strategies from Management Alternative III. The first zone type recognizes 27 Wildlife Management Areas. The second establishes one Ecological Reserve and commits NOAA to completing the establishment of a second within a two year time frame. The third establishes 18 Sanctuary Preservation Areas. The fourth identifies 21 Existing Management Areas, and the fifth designates four Special-use Areas.

Strategy Z.1: Wildlife Management Areas

This strategy establishes Wildlife Management Areas that restrict access to sensitive wildlife populations and habitats. Such areas include bird nesting, resting, or feeding areas, turtle nesting beaches, and other sensitive habitats. Restrictions prohibit use, modify the way areas are used or accessed, and specify time periods when use is prohibited. *(Completed in Year 1)*

Zoning Management Strategies

Z.1: Wildlife Management Areas
- Prioritize zone marking
- Determine boundaries on-site
- Place buoys/signs along zone boundaries
- Establish management responsibilities

Z.2: Ecological Reserves
- Determine boundaries on-site
- Place buoys along zone boundaries
- Establish management responsibilities

Z.3: Sanctuary Preservation Areas
- Prioritize zone marking
- Determine boundaries on-site
- Place buoys along zone boundaries
- Establish management responsibilities

Z.4: Existing Management Areas
(Refer to Regulatory Action Plan)

Z.5: Special-use Areas
- Prioritize zone marking
- Determine boundaries on-site
- Place buoys along zone boundaries
- Determine high-impact or user-conflict activities
- Determine appropriate zones for high-impact activities or user conflicts
- Determine permitting process
- Establish management responsibilities

This strategy includes 27 areas, 20 that are part of the Fish and Wildlife Service's (FWS) plan for managing backcountry portions of the Key West National Wildlife Refuge, Great White Heron National Wildlife Refuge, and Crocodile Lake Wildlife Refuge. The areas were established through a March 1993 agreement between the FWS and the Florida Department of Environmental Protection (FDEP). The FWS is currently marking the 20 areas with buoys and/or signs, and will administer these areas. NOAA, the FDEP, and Monroe County will be responsible for marking and managing the remaining seven areas. An additional WMA has been established in Eastern Lake Surprise (east of US 1) to manage vessel traffic in that area to protect the American Crocodile and West Indian manatees.

Activity 1-Prioritize Zone Marking. The boundaries of seven of the 27 areas will be identified and marked. Since not all zones can be marked concurrently, zone marking will be prioritized. The primary factors used to determine the order in which zones will be marked include season and proximity to human impacts. Boat-use survey data from the FDEP and The Nature Conservancy (TNC) will be used to determine use periods, and research requirements will also be considered.

■*Implementation.* NOAA will be the lead agency responsible for implementing this activity. The FWS, FDEP, National Audubon Society, and TNC will be consulted regarding species activities. The FDEP and TNC will be consulted for boat-use survey data.

■*Schedule.* This activity will be completed in year 1.

Activity 2-Determine Boundaries On-site. Accurate readings (NOAA and FWS sites) will be developed using aerial photography, global positioning system (GPS) receivers, and groundtruthing. Temporary markers will be placed at each corner of the sites to be identified and marked.

■*Existing Program Implementation.* NOAA and the Sanctuary Advisory Council have preliminary boundaries for five of the seven zones (excluding Pelican Shoal and Crocodile Lake) on nautical charts.

■*Implementation.* NOAA will be the lead agency responsible for implementing this activity. The National Audubon Society and the Florida Game and

Wildlife Management Areas

1. Sawyer Keys - Tidal creeks closed on south side.
2. East Harbor Key - No-access buffer zone (300 feet) around northernmost island.
3. Little Mullet Key - No-access buffer zone (300 feet) around island.
4. Upper Harbor Key - No-access buffer zone (300 feet) around island.
5. Little Crane Key - No-access buffer zone (300 feet) around island.
6. Boca Grande Key - South half of the beach closed.
7. Woman Key - Half of the beach and sand spit (southeast side) closed.
8. Horseshoe Key - No access buffer zone around main island.
9. Cottrell Key - No-motor zone (300 feet) around island.
10. Marquesas Keys -
    a. No-motor zones (300 feet) around three smallest islands;
    b. No-access buffer zone (300 feet) around one mangrove island;
    c. Idle speed only/no wake zone through one tidal creek.
11. Snipe Keys - Idle speed only/no wake zone in main creek. No-motor zone elsewhere.
12. Mud Keys - Idle speed only/no wake zone in two main creeks; two smaller creeks closed.
13. Big Mullet Key - No-motor zone (300 feet) around island.
14. Tidal Flat South of Marvin Key - No-access buffer zone.
15. West Content Keys - Idle speed only/no wake zone in selected tidal creeks and one no-access buffer zone.
16. East Content Keys - Idle speed only/no wake zones in tidal creeks.
17. Bay Keys - Idle speed only/no wake zone in tidal creeks and no-motor zone (300 feet) around one island.
18. Lower Harbor Keys - Idle speed only/no wake zone in selected tidal creeks.
19. Cayo Agua Keys - Idle speed only/no wake zone in tidal creeks.
20. ***Pelican Shoal*** - No-landing and no-access zone out to 50 meters from shore between April 1 and August 31.
21. Crocodile Lake - No-access buffer zone (100 feet) along shoreline between March 1 and October 1.
22. ***Rodriguez Key*** - No-motor zone on tidal flat.
23. ***Tavernier Key*** - No-motor zone on tidal flat.
24. ***Snake Creek*** - No-motor zone on tidal flat.
25. ***Cotton Key*** - No-motor zone on tidal flat.
26. ***Dove Key*** - No-motor zone on tidal flat, area closed around two small islands.
27. ***Eastern Lake Surprise*** - Idle speed only/no wake zone east of US 1.

Note: Areas in bold italics will be marked and managed by NOAA, the FDEP, and Monroe County. Crocodile Lake will be marked by NOAA and managed, along with the remaining sites, by the FWS.

Freshwater Fish Commission (FGFWFC) staff will provide secondary implementation support.

■*Schedule.* This activity will be completed in year 1.

Activity 3-Place Buoys/Signs Along Zone Boundaries. Boundary buoys and/or signs will be placed along the boundaries of each zone, based on Federal and State guidelines, and will show the restricted action for each site. The type of buoy or sign used will be determined by the substrate. The physical placement of the buoys/signs will require developing an agreement with the FDEP.

■*Existing Program Implementation.* The FWS is currently locating signs and/or buoys at the 19 sites for which it will have primary responsibility.

■*Implementation.* NOAA will be the lead agency responsible for implementing this activity. The FWS, FDEP, FGFWFC, and U.S. Coast Guard (USCG) will assist in implementation.

■*Schedule.* This activity will be completed in year 1.

Activity 4-Establish Management Responsibilities. NOAA, the FGFWFC, the FDEP, and Monroe County will manage seven of the 27 sites. The remaining 20 sites (including Crocodile Lake) will be managed by the FWS. All the areas will be managed to protect sensitive wildlife populations and habitats.

■*Implementation.* NOAA, the FGFWFC, the FDEP, and Monroe County will have the lead responsibility for managing the seven sites not within the FWS program. Although the FWS will be responsible for managing and marking all other sites, NOAA will be responsible for marking the Crocodile Lake site.

■*Schedule.* This activity will be continuous.

The regulations for Wildlife Management Areas are included in the Regulatory Action Plan.

Strategy Z.2: Ecological Reserves

Ecological Reserves are Sanctuary zones that encompass areas of contiguous, diverse habitats, within which uses are subject to conditions and prohibitions, including public use restrictions. These areas are designed to minimize human influences, to provide natural spawning, nursery, and permanent

residence areas for the replenishment and genetic protection of marine life, and also to protect and preserve natural assemblages of habitats and species within areas representing the full range of diversity of resources and habitats found throughout the Sanctuary.
(Priority Level High, High Level of Action in Year 1, 12+ Months to Complete)

This Final Plan establishes one Ecological Reserve in the Western Sambos. It also commits NOAA to determining the boundaries and identifying the effective date for final regulations of a second Ecological Reserve in the Dry Tortugas within two years.

In the DMP/EIS, NOAA proposed boundaries for a Replenishment Reserve (Ecological Reserve) in the Dry Tortugas based on distribution of significant resources with an attempt to minimize or avoid impacts to users . Public comment identified serious adverse economic impact which would result from implementation of the no-take regulations within the proposed boundary. Consequently, NOAA did not establish final boundaries for the Dry Tortugas Replenishment Reserve (Ecological Reserve) in the final management plan and regulations. However, NOAA is committed to finalizing the Ecological Reserve at the Dry Tortugas. NOAA intends to undertake a process to determine the final boundary for the Dry Tortugas Ecological Reserve in coordination with the National Park Service and recommends the inclusion of portions of the Dry Tortugas National Park. To identify the final boundary, NOAA and the National Park Service will use the information gathered as part of the public review of the draft management plan and hold workshops with users, agency representatives, environmental organizations, and the public. Prior to making a final decision, NOAA and the National Park Service will publish the final boundary for public comment.

Activity 1-Determine Boundaries On-site. Accurate boundary readings will be developed using aerial photography, GPS receivers, and groundtruthing. Temporary markers will be placed along the boundaries of the reserve.

■*Implementation.* NOAA will be the lead agency responsible for implementing this activity.

■*Schedule.* This activity will have a high level of action in year 1. It will require 6+ months to complete.

Activity 2-Place Buoys Along Zone Boundaries. Boundary buoy placement will be based on Federal and State guidelines. Buoys will be placed in one-mile increments along zone boundaries, and will be visible for one mile. The type of anchor device used will be determined by the substrate where the buoy is placed.

■*Implementation.* NOAA will be the lead agency responsible for implementing this activity. The FDEP and USCG will provide secondary implementation assistance. The USCG must approve all buoys.

■*Schedule.* This activity will have a high level of action in year 1. It will require 6+ months to complete.

Activity 3-Establish Management Responsibilities. The Sanctuary Superintendent will oversee all aspects of zone management, and will be responsible for ensuring that the first two activities (determining zone boundaries and placing buoys) are implemented. NOAA will establish a process for selecting the boundary of the Dry Tortugas Ecological Reserve. Sanctuary Managers will ensure that the public is educated about the zones and their restrictions, that all research and monitoring efforts are consistent with the goals of the Sanctuary, and that all regulations related to the zones are enforced. The Superintendent will coordinate with the FDEP, FMFC, and Monroe County in managing the zones.

■*Implementation*. NOAA, the FMFC, the FDEP, and Monroe County will have the lead responsibility for managing the Replenishment Reserves.

■*Schedule.* This activity will have a high level of action in year 1. It will be continuous.

The research and monitoring components of this strategy are described in the Research and Monitoring Action Plan. The regulations for Ecological Reserves are included in the Regulatory Action Plan.

Strategy Z.3: Sanctuary Preservation Areas

Sanctuary Preservation Areas are Sanctuary zones that encompass discrete, biologically important areas, within which uses are subject to conditions and prohibitions, including public use restrictions, to avoid concentrations of uses that could result in significant declines in species populations or habitat, to reduce conflicts between uses, to protect areas that are critical for sustaining important marine

species and habitats, or provide opportunities for scientific research.
(Priority Level High, High Level of Action in Year 1, 18+ Months to Complete)

This strategy establishes 18 Sanctuary Preservation Areas (SPAs), totalling approximately 1,651ha. The largest will be the Carysfort/South Carysfort Reef, and the smallest will be Dry Rocks and Cheeca Rocks. The proposed Western Sambos SPA was eliminated from the Final Plan with the establishment of the Western Sambos Ecological Reserve which encompasses a cross-section of the coral reef community, ranging from the nearshore hardbottoms, seagrass communities, patch reefs, mid-channel reef, offshore patch reefs, and the fore reef habitat at Western Sambos Reef.

NOAA has allowed catch and release fishing by trolling in four SPAs: Conch Reef; Alligator Reef; Sombrero Key; and Sand Key. This action will allow the activity of catch and release fishing to be compared with other SPAs where it is not allowed. In addition, the taking of ballyho for bait by net will be allowed by permit in all SPAs.

Activity 1-Prioritize Zone Marking. The boundaries for all zones will be identified and marked. Since not all zones can be marked concurrently, marking must be prioritized. The primary factors that will be used to determine the order in which zones will be marked include the level of current use, season, and relative threats to resources (e.g., vessel groundings). Boat-use survey data from the FDEP and TNC aerial census will be used to determine use periods, and the availability of existing monitoring data will also be considered.

Sanctuary Preservation Areas

■*Implementation.* NOAA will be the lead agency responsible for implementing this activity.

■*Schedule.* This activity will have a high level of action in year 1. It will require 6+ months to complete.

Activity 2-Determine Boundaries On-site. Accurate boundary readings of all sites will be determined using aerial photography, GPS receivers, and groundtruthing. Temporary markers will be placed at the corner of each zone.

■*Implementation.* NOAA will be the lead agency responsible for implementing this activity.

■*Schedule.* This activity will have a high level of action in year 1. It will require 6+ months to complete.

Activity 3-Place Buoys Along Zone Boundaries. Boundary buoys will be placed at the corner of each zone based on Federal and State guidelines, with the type of anchoring device determined by the substrate where the buoy is placed. The buoys will be visible for a half-mile.

■*Implementation.* NOAA will be the lead agency responsible for implementing this activity. The FDEP and USCG will assist in implementing this activity.

■*Schedule.* This activity will have a high level of action in year 1. It will require 9 months to complete.

Activity 4-Establish Management Responsibilities. The Sanctuary Superintendent will oversee all aspects of zone management, and will be responsible for ensuring that the first three activities (prioritizing zone marking, determining boundaries, and placing buoys) are implemented. Sanctuary Managers will ensure that the public is educated about the zones and their restrictions, that all research and monitoring efforts are consistent with the goals of the Sanctuary, and that all related regulations are enforced. The Superintendent will coordinate with the FDEP, the FMFC, and Monroe County in managing the zones and will work with the Mooring Buoy working group to install mooring buoys in these areas.

■*Implementation*. NOAA, the FMFC, the FDEP, and Monroe County will have the lead responsibility for managing the zones.

■*Schedule.* This activity will have a medium level of action in year 1. It will be continuous.

The research and monitoring components of this strategy are described in the Research and Monitoring Action Plan. The regulations for Sanctuary Preservation Areas are included in the Regulatory Action Plan.

Strategy Z.4: Existing Management Areas

Existing Management Areas are resource management areas currently managed by other agencies and where regulations already exist. Proposed Sanctuary regulations will supplement these authorities for comprehensive protection of resources. Any additional management measures that may be developed and implemented will be in coordination with the agency having jurisdictional authority.
(Completed in Year 1)

There are currently 21 Existing Management Areas within the Sanctuary. Fifteen are administered by the FDEP, four by the FWS, and two by NOAA.

Existing Management Areas

Federal
- National Oceanic and Atmospheric Administration
  - Key Largo National Marine Sanctuary
  - Looe Key National Marine Sanctuary
- U.S. Fish and Wildlife Service
  - Crocodile Lake National Wildlife Refuge
  - Great White Heron National Wildlife Refuge
  - Key West National Wildlife Refuge
  - National Key Deer Refuge

State
- Department of Environmental Protection
  - Division of Recreation and Parks
    - Bahia Honda State Park
    - Curry Hammock (undesignated)
    - Fort Zachary Taylor State Historic Site
    - Indian Key State Historic Site
    - John Pennekamp Coral Reef State Park
    - Key Largo Hammocks State Botanical Site
    - Lignumvitae Key State Botanical Site (includes Shell Key State Preserve)
    - Long Key State Recreation Area
    - San Pedro State Underwater Archaeological Site
    - Windley Key State Geological Site
  - Division of Marine Resources
    - Biscayne Bay and Card Sound Aquatic Preserve
    - Coupon Bight Aquatic Preserve
    - Lignumvitae/Indian Key Aquatic Preserve

Strategy Z.5: Special-use Areas

This strategy establishes zones to set aside areas for scientific research and educational purposes, restoration, monitoring, or to establish areas that confine or restrict activities such as personal watercraft operations and live-aboard mooring fields. These areas will minimize impacts on sensitive habitats and reduce user conflicts. Special management programs (e.g., monitoring, research, special-use permits and restoration) can be conducted without impediment to these areas. They can be used to set aside areas for specific uses such as long-term research and monitoring and/or minimizing the adverse environmental effects of high-impact activities.
(Priority Level Medium, Medium Level of Action in Year 1, 12+ Months to Complete, <50% Funding Available for Full Implementation)

Special-use Areas

This strategy initially establishes four zones designated for scientific research and monitoring. Those designated are Conch and Tennessee reefs in the Upper and Middle Keys, and Looe Key and Eastern Sambos in the Lower Keys.

The Eastern Sambos Research Only area replaces Pelican Shoals in the draft plan as a Research Only area. The Eastern Sambos was selected in order to provide a better research and monitoring site, while

simultaneously lessening the public impact of limiting access to the reef around Pelican Shoals.

Activity 1-Prioritize Zone Marking. The boundaries of the four research-only zones will be identified and marked. Since not all zones can be marked concurrently, marking will be prioritized. The primary factors that will be used to determine the order in which the zones will be marked will include the level of current use, season, and relative threats to resources (e.g., vessel groundings). Boat-use survey data from the FDEP and TNC will be used to determine use periods, and the availability of existing monitoring data will also be considered.

■*Implementation.* NOAA will be the lead agency responsible for implementing this activity.

■*Schedule.* This activity will have a medium level of action in year 1. It will require 6+ months to complete.

Activity 2-Determine Boundaries On-site. Accurate boundary readings of all sites will be determined using aerial photography, GPS receivers, and groundtruthing. Temporary markers will be placed at the corner of each zone.

■*Implementation.* NOAA will be the lead agency responsible for implementing this activity.

■*Schedule.* This activity will have a low level of action in year 1. It will require 6+ months to complete.

Activity 3-Place Buoys Along Zone Boundaries. Boundary buoys will be placed at the corner of each zone based on Federal and State guidelines, with the type of anchoring device determined by the substrate where the buoy is placed. The buoys will be visible for a half-mile.

■*Implementation.* NOAA will be the lead agency responsible for implementing this activity. The FDEP and USCG will assist in implementation.

■*Schedule.* This activity will have a medium level of action in year 1. It will require 9 months to complete.

Activity 4-Determine High-Impact Activities or User-Conflicts. This activity will determine which activities will have a high impact on Sanctuary resources. It will also identify those activities that result in major user conflicts. Zones may be developed for these activities if appropriate.

■*Implementation*. NOAA, the FDEP, and Monroe County will be jointly responsible for implementing this activity.

■*Schedule*. This activity will have a low level of action in year 1. It will require 12 months to complete.

Activity 5-Determine Appropriate Zones for High Impact or User-Conflict Activities. Based on the information developed in activity 4, management zones may be developed for high-impact and user-conflict activities.

■*Implementation*. NOAA, the FDEP, and Monroe County will be jointly responsible for implementing this activity.

■*Schedule*. No action is planned for year 1. It will require 12 months to complete.

Activity 6-Determine Permitting Process. The process for issuing permits for Special-use Areas will be determined, and the procedures for reviewing and approving permit applications will be defined.

■*Implementation*. NOAA, the FDEP, and Monroe County will be jointly responsible for implementing this activity.

■*Schedule*. No action is planned for year 1. It will require 12 months to complete.

Activity 7-Establish Management Responsibilities. The Sanctuary Superintendent will oversee all aspects of zone management, and will be responsible for ensuring that activities 1 to 6 are implemented. Sanctuary Managers will ensure that the public is educated about the zones and their restrictions, that all research and monitoring efforts are consistent with the objectives of the strategy, and that all related regulations are enforced.

■*Implementation*. NOAA, the FDEP, and Monroe County will be jointly responsible for implementing this activity.

■*Schedule*. This activity will have a low level of action in year 1. It will be continuous.

The regulations for Special-use Areas are included in the Regulatory Action Plan. A component of this strategy is also included in the Water Quality Action Plan.

Implementation

This section explains how the strategies in the zoning plan will be implemented. The institutions responsible for each activity, and those agencies that will provide some assistance, are identified. Zoning strategies are also ranked to indicate their overall Sanctuary priority level. In addition, the planned level of activity in year 1, months to complete, funding availability, cost estimates, staff requirements, and geographic focus of each strategy and activity are provided.

Responsible Institutions. The Zoning Plan will be implemented by the coordinated efforts of Federal, State, and local agencies in cooperation with non-profit institutions. NOAA has the lead responsibility for implementing the overall Program. The FDEP and the FMFC will provide primary support by managing several zones, and the FWS will be responsible for managing most Wildlife Management Areas. In addition, the FMFC, the USCG, Monroe County, and the National Audubon Society will help implement selected activities. Table 29 lists the participating institutions and their level of responsibility for implementing each activity.

Prioritization of Implementation. The Zoning Plan includes five strategies from Alternative III. The highest-ranking strategies are Ecological Reserves and Sanctuary Preservation Areas, which are included in the high priority level, based on their anticipated impact on Sanctuary resources. Wildlife Management Areas and Existing Management Areas are not included in a priority group, because they will be implemented completely or partially in year 1. The FWS has already established 20 Wildlife Management Areas in the Sanctuary. NOAA will be responsible for marking the remaining seven areas. The Special-use Area strategy is included in the high priority level.

Schedule. The Existing Management Areas and some Wildlife Management Areas strategies will be completed in year 1. The process of prioritizing and marking Sanctuary Preservation Areas and Ecological Reserves will begin in year 1, but marking will not be completed until after year 1. Zone management will be continuous, and an integral part of the Sanctuary management process. The Special-use Areas strategy will have only a medium level of action in year 1.

Table 29. *Agencies/Organizations Identified for Implementing Strategies/Activities*

Strategy/Activity	NOAA-Sanctuary	USFWS	USCG	FDEP/MFC	Monroe County	FGFWFC	Natl. Audubon
Agencies/Organizations							
Zoning							
Z.1 Wildlife Management Areas							
Prioritize Zone Marking	●	○		○			○
Determine Boundaries On-site	●						○
Place Buoys/Signs Along Zone Boundaries	●	○	○	○		◉	
Establish Management Responsibilities	●	●		●	●	◉	
Z.2 Ecological Reserves							
Determine Boundaries On-site	●			◉			
Place Buoys Along Zone Boundaries	●		○	○			
Establish Management Responsibilities	●			●	●		
Z.3 Sanctuary Preservation Areas							
Prioritize Zone Marking	●						
Determine Boundaries On-site	●						
Place Buoys Along Zone Boundaries	●		○	○			
Establish Management Responsibilities	●			●	●		
Z.4 Existing Management Areas *Refer to Regulatory Action Plan*							
Z.5 Special-Use Areas							
Prioritize Zone Marking	●						
Determine Boundaries On-site	●						
Place Buoys Along Zone Boundaries	●		○	○			
Determine High-Impact Activities or User-Conflicts	●			●	●		
Determine Appropriate Zones for High-Impact or User-Conflict Activities	●			●	●		
Determine Permitting Process	●			○	○		
Establish Management Responsibilities	●			●	●		

● Lead ◉ Primary Role ○ Assist

Abbreviations: NOAA, National Oceanic and Atmospheric Administration; USFWS, U.S. Fish and Wildlife Service; USCG, U.S. Coast Guard; FDEP, Florida Department of Environmental Regulation; FGFWFC, Florida Game and Freshwater Fish Commission; The Nature Conservancy; Natl. Audubon, National Audubon Society.

Cost. The estimated cost of implementing each strategy is given in Table 30. Based on the large number of buoys to be installed, Sanctuary Preservation Areas is expected to be the most costly strategy (it is included in the $10,000 to $99,000 category for capital and annual operations and maintenance costs). Approximately 80 buoys will be required to completely mark these zones. Because of the size of the Ecological Reserves, marking these areas will also be expensive. Assuming one buoy is installed every mile, about 10 buoys will be placed in this zone. Approximately 24 signs/markers will be placed

Table 30. *Requirements for Implementation*

Strategy/Activity	Overall Sanctuary Priority Level +	Implementation: Planned Level of Action in Year 1	Implementation: Months to Complete	Implementation: Funding Available to Complete	Cost to Complete: Total Capital ($1,000)	Cost to Complete: Annual Operations/ Maintenance ($1,000)	Geographic Focus	# of Personnel
ZONING								
Z.1 Wildlife Management Areas	*	High	12+	100%	10-99	10-99		6
Prioritize Zone Marking	High	High	3	100%	NC	<10	Z	
Determine Boundaries On-site	High	High	6	100%	<10	<10	Z	
Place Buoys/Signs Along Zone Boundaries	Medium	High	6	100%	10-99	<10	Z	
Establish Management Responsibilities	Low	High	C	100%	NC	10-99	Z	
Z.2 Ecological Reserves	**High**	High	12+	<50%	10-99	10-99		6
Determine Boundaries On-site	High	High	6+	<50%	<10	<10	Z	
Place Buoys Along Zone Boundaries	High	High	6+	<50%	10-99	<10	Z	
Establish Management Responsibilities	High	High	C	100%	NC	10-99	Z	
Z.3 Sanctuary Preservation Areas	**High**	High	18+	<50%	10-99	10-99		6
Prioritize Zone Marking	High	High	6+	100%	NC	<10	Z	
Determine Boundaries On-site	High	High	6+	<50%	<10	<10	Z	
Place Buoys Along Zone Boundaries	High	High	9	<50%	10-99	<10	Z	
Establish Management Responsibilities	Medium	Medium	C	100%	NC	10-99	Z	
Z.4 Existing Management Areas		*Refer to Regulatory Action Plan*						
Z.5 Special-Use Areas	**Medium**	Medium	12+	<50%	<10	10-99		6
Prioritize Zone Marking	High	Medium	6+	<50%	NC	<10	Z	
Determine Boundaries On-site	High	Medium	6+	<50%	NC	<10	Z	
Place Buoys Along Zone Boundaries	Medium	Medium	9	<50%	<10	<10	Z	
Determine High-Impact Activities or User-Conflicts	Low	Low	12	<50%	<10	<10	Z	
Determine Appropriate Zones for High-Impact or User-Conflict Activities	Low	None	12	<50%	NC	10-99	Z	
Determine Permitting Process	Low	None	12	<50%	NC	10-99	Z	
Establish Management Responsibilities	Low	Low	C	100%	NC	10-99	Z	

Abbreviations: C, Continuous; Z, Applies to Respective Zone.

+ Strategies with an "*" for Overall Sanctuary Priority Level are already existing programs and will be completed in Year 1.

Note: The priority levels for activities should not be compared across strategies–they only represent the relative importance of activities contained within a strategy.

in the Wildlife Management Areas. Each of these strategies is included in the $10,000 to $99,000 range for capital and annual operations and maintenance costs. Because the Special-use Areas strategy will evolve over time, the full cost of implementation is uncertain.

Geographic Focus. The activities in strategies only apply to their respective zones. Sanctuary Preservation Areas, reflecting their purpose of protecting heavily used reefs, are distributed on the Atlantic side of the Keys. The Western Sambos Ecological Reserve is located in the Lower Keys and a site will be in the Dry Tortugas. Wildlife Management Areas are concentrated in the backcountry, from Horseshoe Key to the Bay Keys, with a few in the Upper Keys. Existing Management Areas are distributed throughout the Sanctuary.

Staff. Overall, the Sanctuary Superintendent (NOAA) will have the lead responsibility for implementing all zoning strategies. However, a staff biologist and another staff member will be directly responsible for identifying and marking the zones. In addition, implementation will require the participation of personnel from various agencies and organizations, and private vendors will be contracted to assist in identifying and marking the various zones.

Contingency Plan for a Changing Budget. The level of funding for the Sanctuary Preservation Areas, Ecological Reserves, and Special-use Areas strategies is insufficient to fully implement these activities in year 1. Consequently, marking may be delayed or modified until funds are available.

Evaluating Program Effectiveness. NOAA will evaluate the effectiveness of the Zoning Program in its five-year update of the Management Plan. For example, research and monitoring on Ecological Reserves will be used to determine the degree to which the zones enhance biological diversity and increase the productivity of important marine life species. In order to accomplish this evaluation, NOAA will establish an interdisciplinary team including managers, scientists, affected users, and environmentalists. Also, because the Reserves will be used as control areas to help understand the impacts of water quality, pollution, and various human uses, their value in this capacity will be evaluated as well. Based on the results of these studies, NOAA will consider expanding, modifying, or eliminating Reserves. The success of the other zones will be evaluated at this time as well.

Zoning Maps

The maps in this section reflect the management zones for the Final management plan. The first map shows Ecological Reserves, Sanctuary Preservation Areas, Special-use Areas, and Wildlife Management Areas. Next, Existing Management Areas are shown on a single map. Following this are maps for each of the Ecological Reserves, Sanctuary Preservation Areas, and Special-use Areas. Finally, Wildlife Management Areas are mapped either individually or in groups, whichever best portrays the areas.

Final Zoning Plan

Zone Type

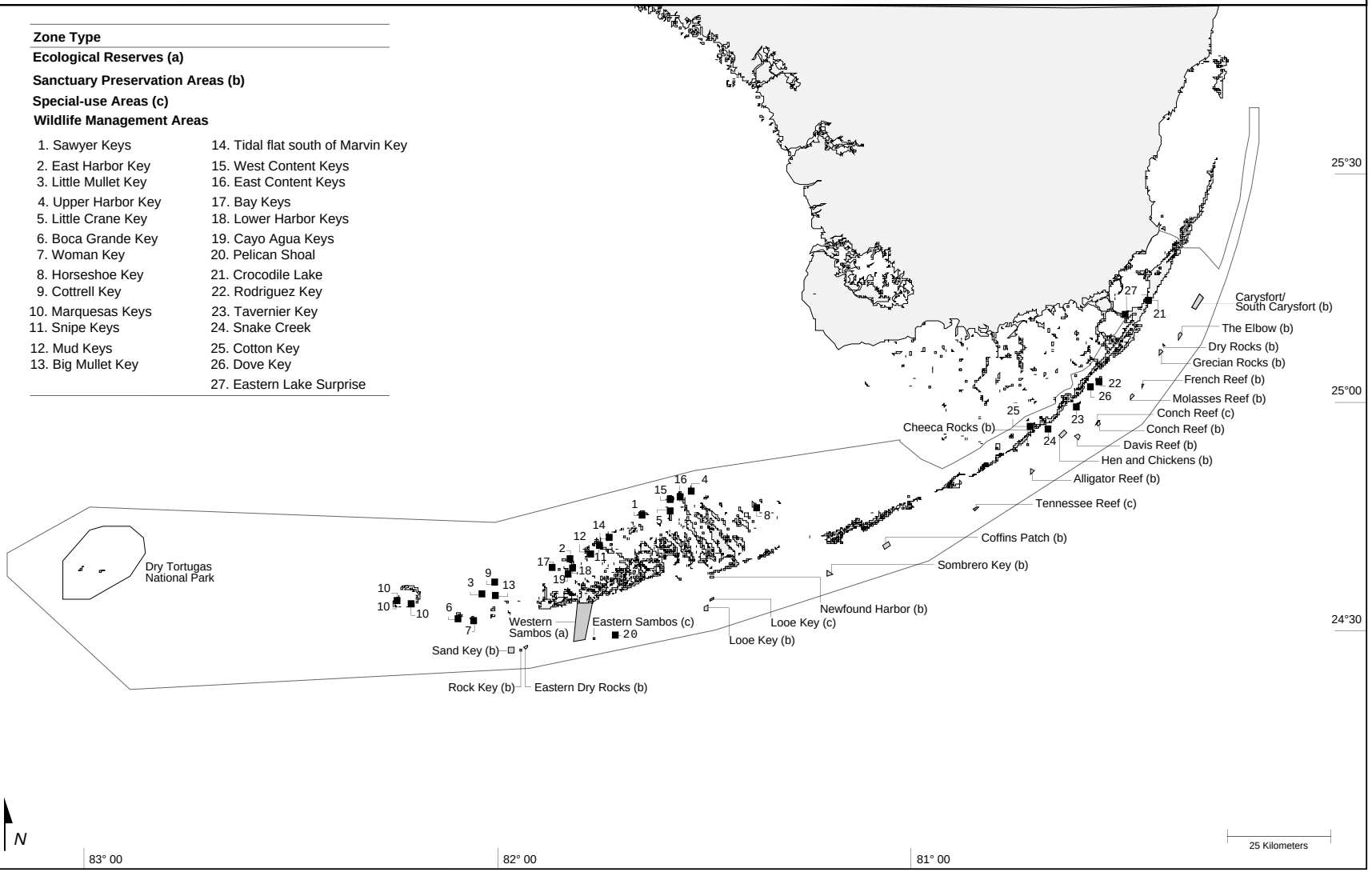
Ecological Reserves (a)

Sanctuary Preservation Areas (b)

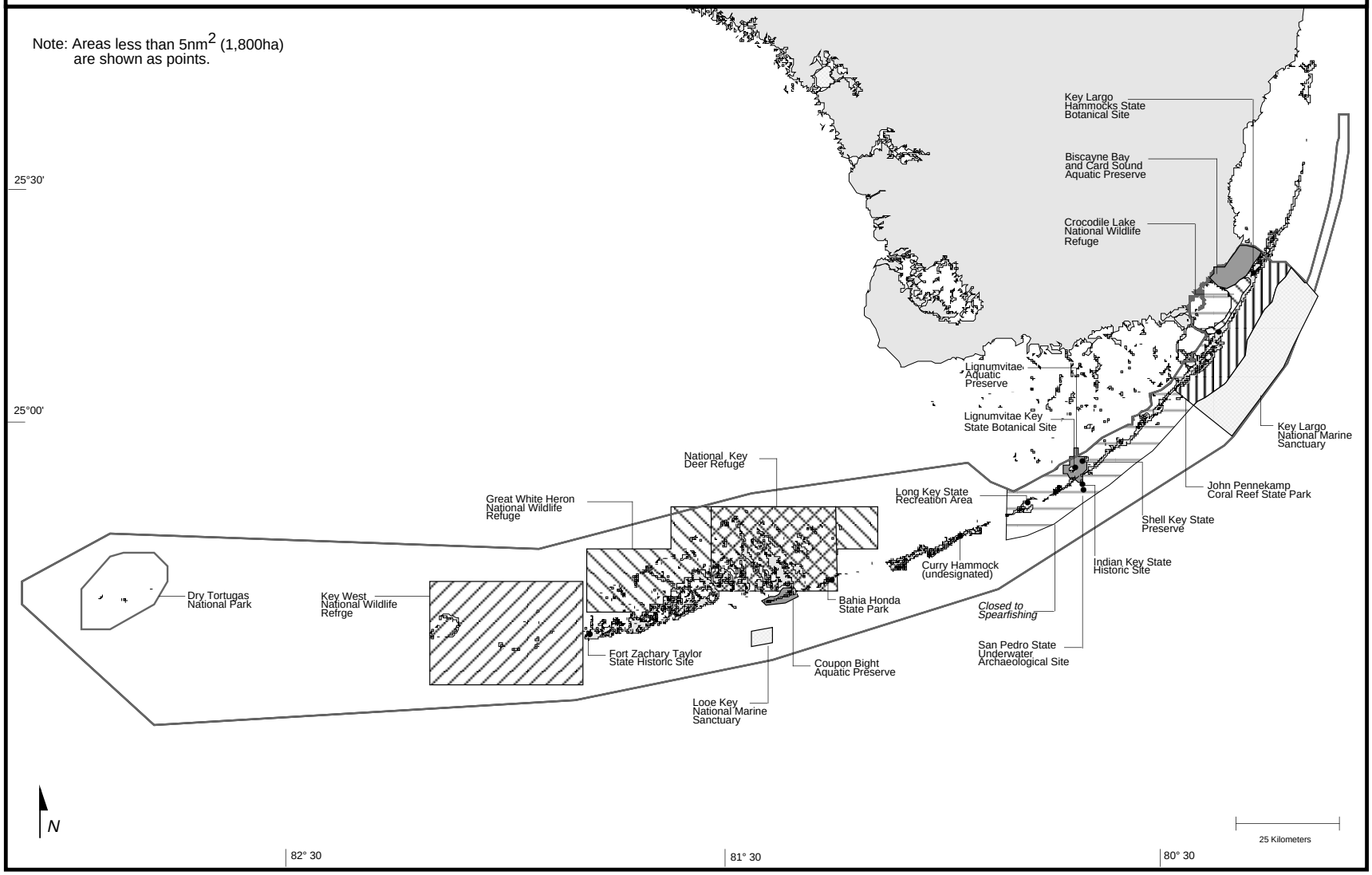
Special-use Areas (c)

Wildlife Management Areas

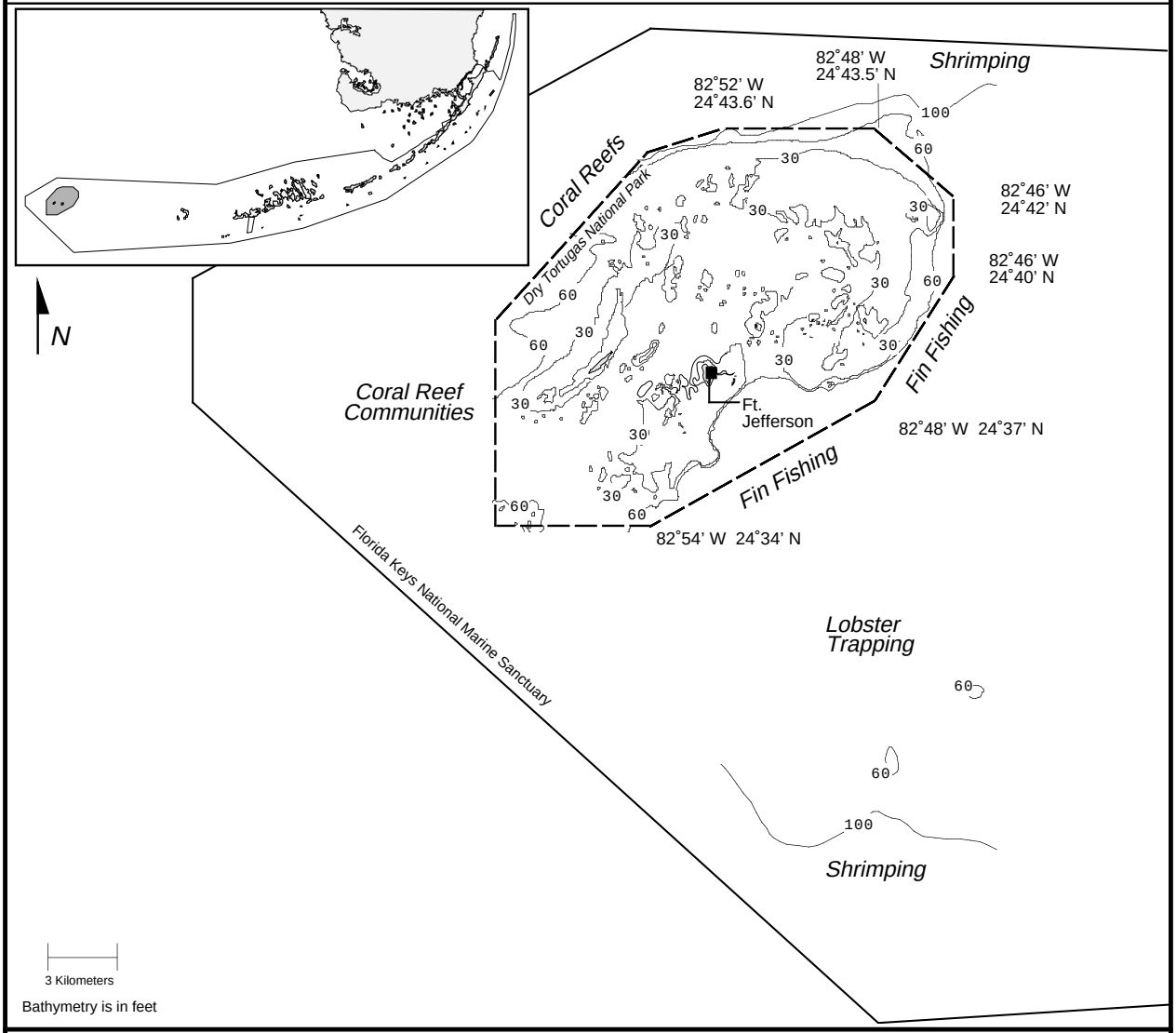
1. Sawyer Keys
2. East Harbor Key
3. Little Mullet Key
4. Upper Harbor Key
5. Little Crane Key
6. Boca Grande Key
7. Woman Key
8. Horseshoe Key
9. Cottrell Key
10. Marquesas Keys
11. Snipe Keys
12. Mud Keys
13. Big Mullet Key
14. Tidal flat south of Marvin Key
15. West Content Keys
16. East Content Keys
17. Bay Keys
18. Lower Harbor Keys
19. Cayo Agua Keys
20. Pelican Shoal
21. Crocodile Lake
22. Rodriguez Key
23. Tavernier Key
24. Snake Creek
25. Cotton Key
26. Dove Key
27. Eastern Lake Surprise



Proposed Zoning Alternative III: Existing Management Areas



Dry Tortugas Ecological Reserve Study Area



Description

The Dry Tortugas banks are located at the westernmost extent of the Keys. The area contains diverse habitats, including seagrass beds, coral reef habitats, (e.g., patch reefs, fore reefs, intermediate and deep reefs), and hardbottom areas.

NOAA did not finalize the establishment of the Dry Tortugas ER in the management plan and regulations. Rather, NOAA will postpone final establishment of the boundary of the Dry Tortugas ER until it undertakes a process, in coordination with the National Park Service to identify an appropriate final boundary for the Reserve. To identify the final boundary, NOAA and the National Park Service will use the information gathered as part of the public review of the draft management plan, and hold workshops with users, agency representatives, environmental organizations and the public. Prior to making a final decision, the proposed final boundary of the Dry Tortugas ER will be published for public comment.

Ecological Reserve: Western Sambos

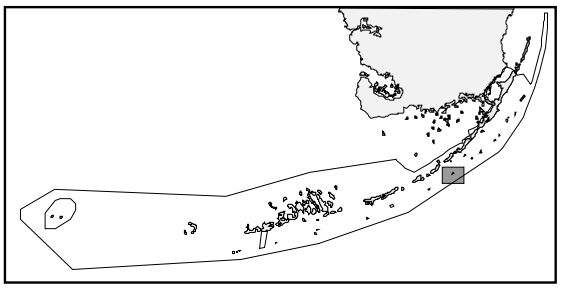
Description

The Western Sambos Ecological Reserve contains the greatest habitat diversity in the Lower Keys. Significant coral features include spur-and-groove formations, bank reefs, and nearshore patch reefs.

This reserve is rectangular, extending from the northern limit at the U.S. Naval Air Station property on Boca Chica seaward to the southern limit at the 60-foot depth contour. At the air station, the Ecological Reserve is approximately 2nm (4km) wide; at the southern edge it is approximately 1.5nm (2.8 km) wide. The area covered totals approximately 9nm^2, or about 3,000ha.

Some current users, including lobster fishermen, tropical marine-life collectors, and recreational and commercial fishermen, will be displaced to other areas. Some spearfishing activities will also be displaced. Areas outside the Ecological Reserve will be impacted some by the increased pressure from the displaced users.

Sanctuary Preservation Area: Alligator Reef



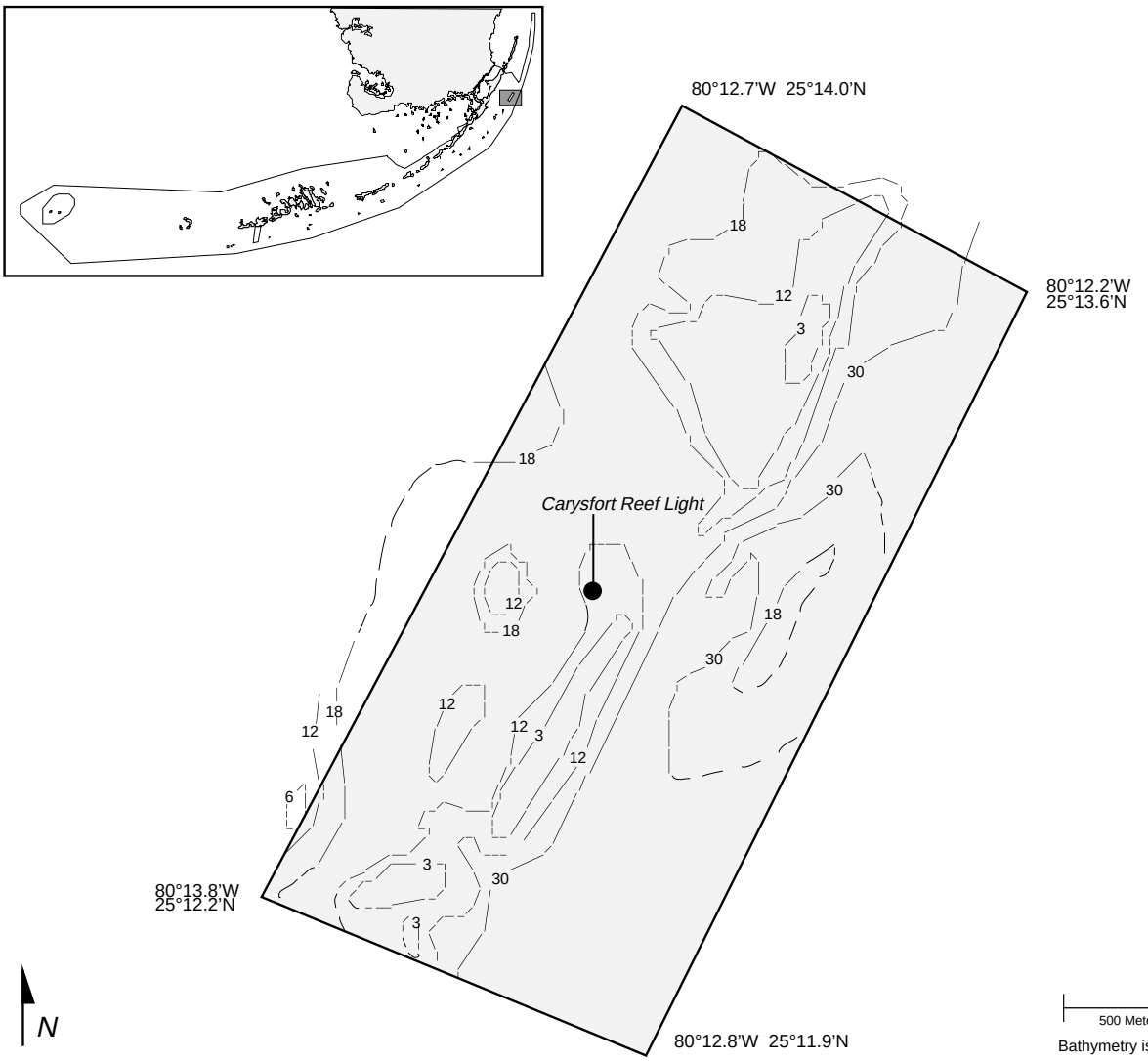
Description

Alligator Reef is a small bank reef with some transitional reef features. It is located between the shallow reefs of the Upper Keys and the deeper, drowned reefs of the Middle Keys, and lies approximately 3.5 nautical miles (7km) southeast of Upper Matecumbe Key.

The Alligator Reef Sanctuary Preservation Area (SPA) encompasses approximately 0.2nm^2, or about 60ha. It protects the drowned spur-and-groove system, reef crest, and a portion of the northeast rubble ridge.

Alligator Reef is easily accessible and mooring buoys are currently in place. The reef is heavily used for a variety of recreational and commercial purposes. Diving and snorkeling activities focus on the spur-and-groove system and reef crest. Commercial activities occur in the rubble areas and surrounding flats and include tropical fish collecting and ballyhoo fishing. The boundary separates these activities with minimal displacement of any user group. However, catch and release fishing by trolling is allowed in this SPA. Because of easy accessibility and heavy use, the area has poor research potential, except for comparison with other reefs.

Sanctuary Preservation Area: Carysfort/South Carysfort Reef



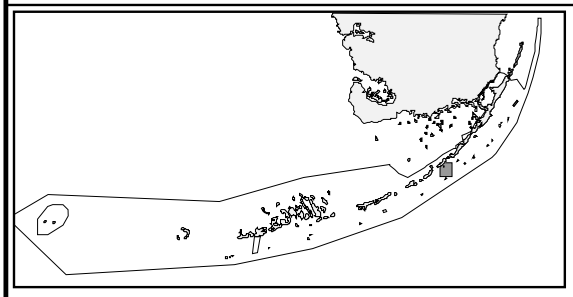
Description

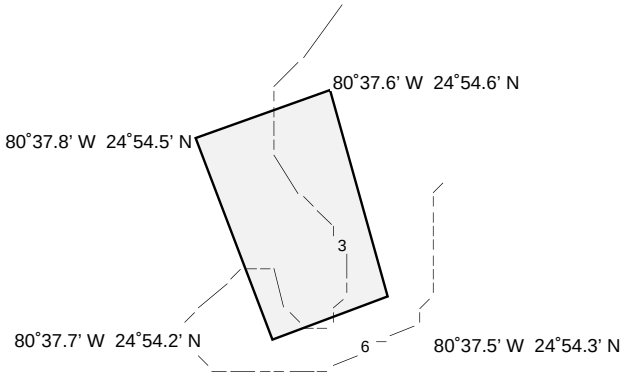
Carysfort Reef is one of the best developed reef systems in the Keys, and contains a wide variety of reef features including well-developed stands of elkhorn coral. Reef development is enhanced by the water quality, temperature, and salinities of the Gulf Stream, which sweeps close to the seaward edge of the reef. The historic Carysfort lighthouse is located near the center of this Sanctuary Preservation Area (SPA), which is approximately 5.6nm (10.5km) off the coast of Key Largo.

Carysfort/South Carysfort Reef is the largest of the SPAs, and encompasses approximately 1.5nm^2, or about 515ha. It is rectangular, and extends seaward of the main reef to the first trough. The SPA protects the rubble area behind the main reef, as well as some adjacent patch reefs.

Carysfort/South Carysfort Reef is accessible from the Ocean Reef community and from Card Sound through Angelfish Creek. Commercial diving and recreational fishing occur in the area, but there appears to be little conflict among users. Some lobster fishermen will be displaced to the surrounding areas. The Carysfort/South Carysfort Reef SPA has high research potential and is a good candidate for use as a control area.

Sanctuary Preservation Area: Cheeca Rocks





N

500 Meters

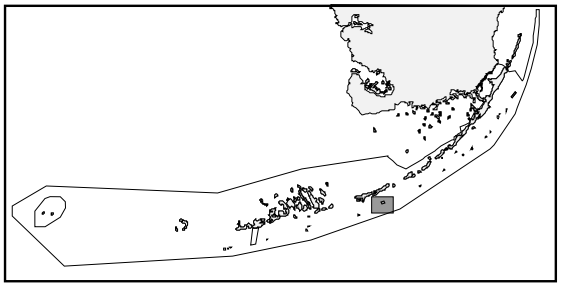
Bathymetry is in feet

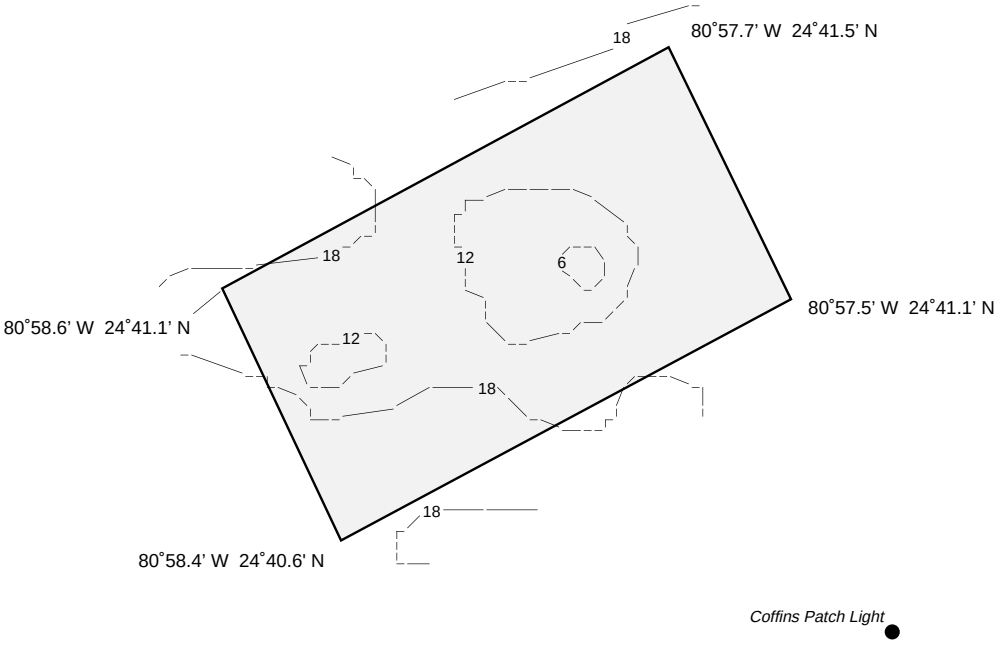
Description

The Cheeca Rocks Sanctuary Preservation Area (SPA) is the only area in the Middle Keys designated to protect inshore patch reefs. Cheeca Rocks is one of the smallest SPAs, encompassing approximately 0.05nm^2, or about 16ha. The area is approximately 0.5nm (1km) southeast of Upper Matecumbe Key.

Cheeca Rocks is easily accessible. The reefs are heavily used, especially by visitors to Cheeca Lodge. Primary uses include diving, snorkeling, and education activities. A few local tropical fish collectors use the area and will be displaced by the SPA, but there are no major consumptive users. The potential for research is poor due to heavy use.

Sanctuary Preservation Area: Coffins Patch





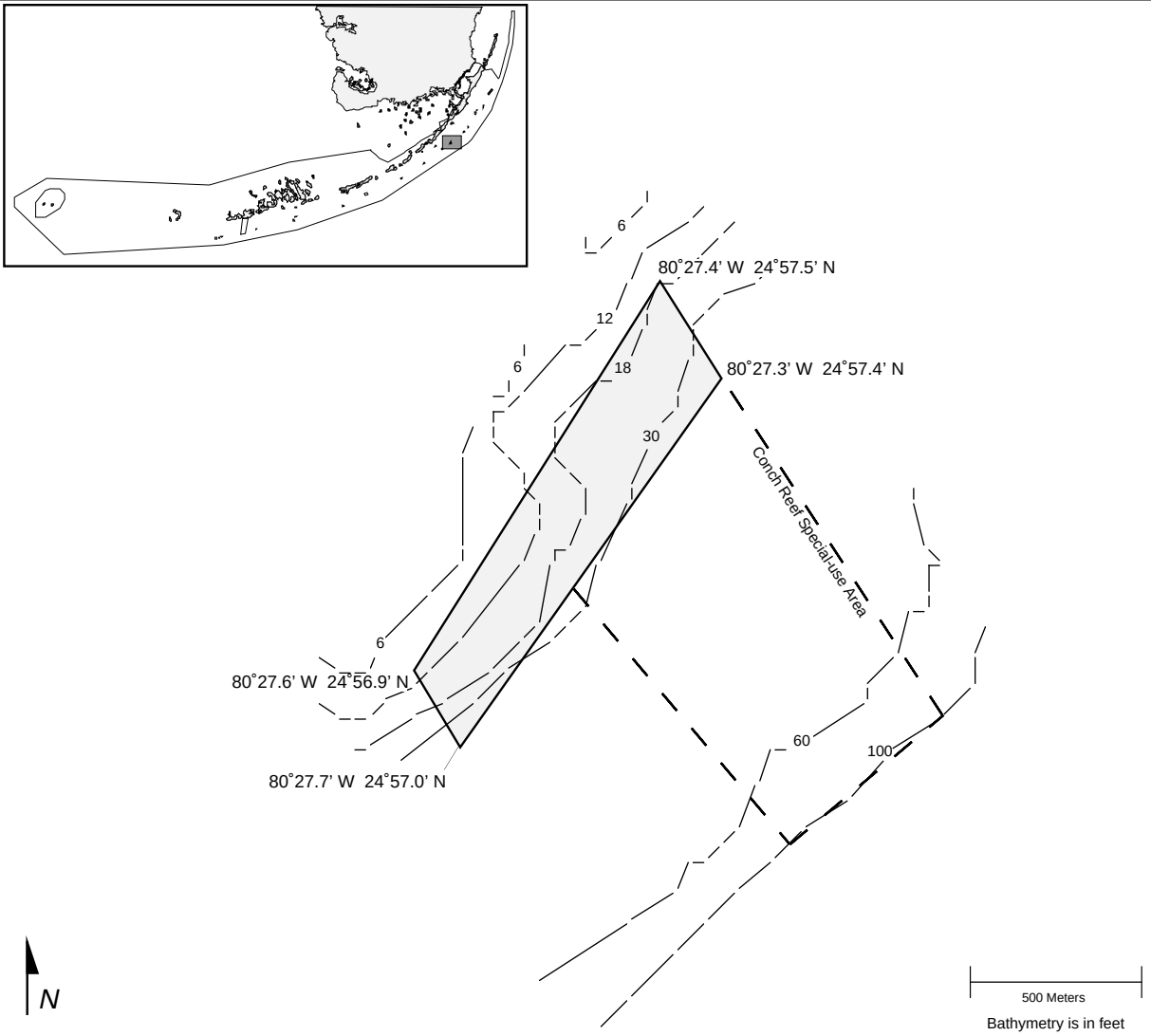
Description

Although Coffins Patch is fairly close to shore, it has the characteristics of an offshore patch reef system. The reef includes rare pillar coral and other coral species unique to the Keys. The Sanctuary Preservation Area (SPA) is approximately 4nm (7km) southeast of Key Colony Beach.

The SPA is rectangular and covers an area of approximately 0.4nm^2, or about 147ha. It includes the entire patch reef and some of the rubble field behind the main reef. Other inshore and offshore patch reefs in the surrounding area remain open.

The area is easily accessible, but no mooring buoys are currently in place. This is a low-use area visited by divers, recreational fishermen, treasure hunters, and souvenir collectors. Some tropical fish collecting occurs within and around the reef. Little, if any, displacement of users will occur since other patch reefs in the area will remain open for use.

Sanctuary Preservation Area: Conch Reef



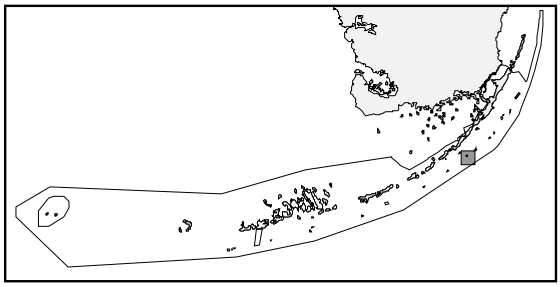
Description

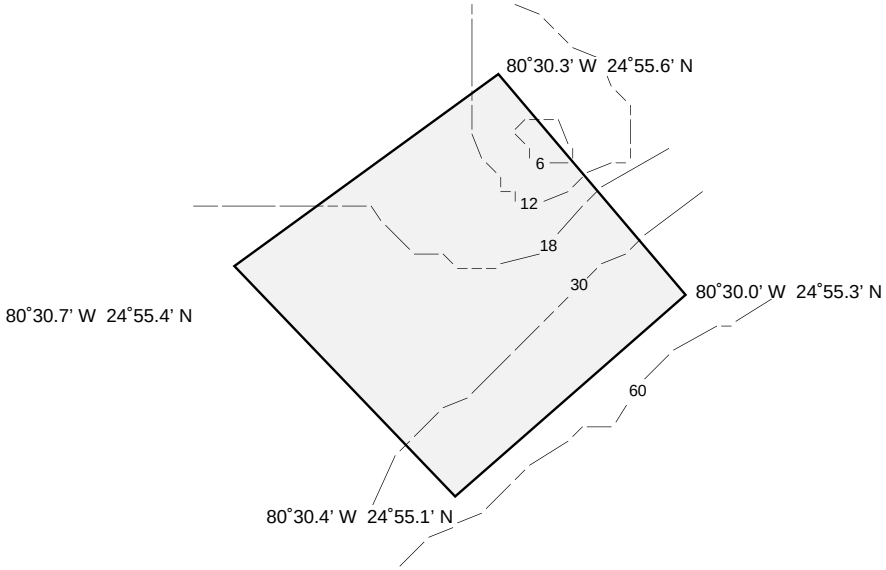
Conch Reef has one of the best developed reef wall systems in the Keys. It has good conch habitat and contains well-developed stands of rare pillar coral. The Sanctuary Preservation Area (SPA) is located approximately 5nm (9km) south of Tavernier Key.

The SPA is rectangular and covers and area of approximately 0.07nm^2, or about 23ha. It runs from the landward boundary to an approximate depth of 45 feet, and includes some of the reef wall. Catch and release fishing by trolling will be allowed in this SPA. The SPA is adjacent to a Special-use Area designated as "Research Only."

Conch Reef is easily accessible from Key Largo and is heavily used by divers, with some tropical fish collecting in the rubble zone. There is little user conflict because lobster fishermen operate away from the area of heavy diving activity. Recreational fishermen troll the reef wall in 160 to 180 feet of water.

Sanctuary Preservation Area: Davis Reef





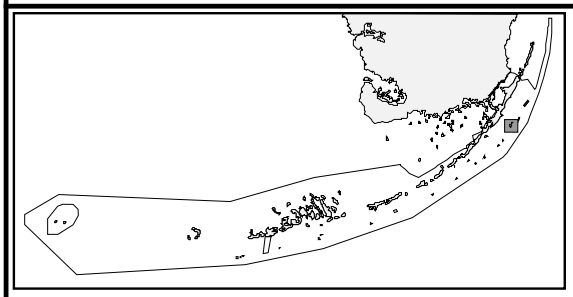
Description

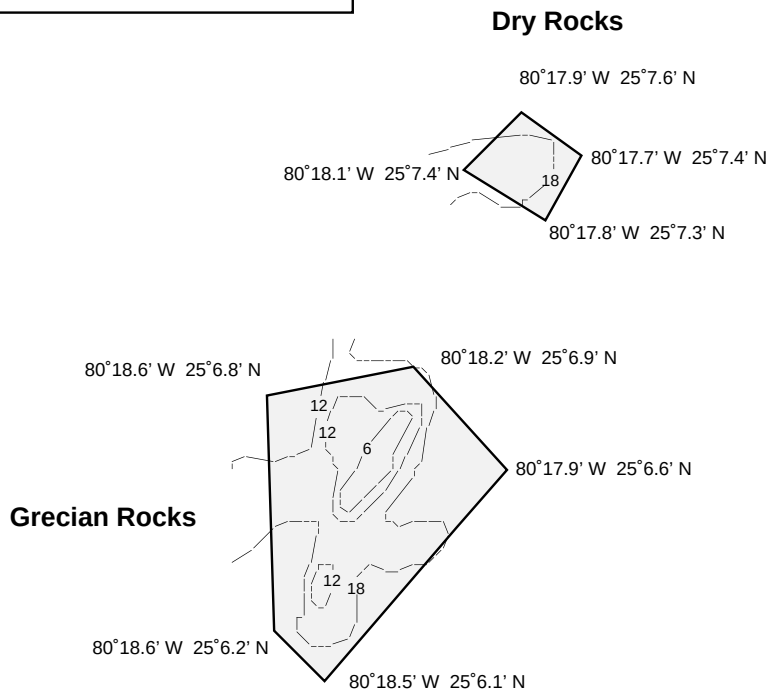
Davis Reef is a good example of a low-relief transitional reef containing well-developed gorgonian coral. The Sanctuary Preservation Area (SPA) is located approximately 4nm (7km) southeast of Plantation Key.

The SPA is a small, rectangular area covering approximately 0.2nm^2, or about 58 ha. Its presence will help protect the area's unique deepwater corals.

Davis Reef is easily accessible and heavily used. The area attracts a considerable number of divers from Islamorada, and is also used by recreational fishermen. There is some tropical fish collecting in the rubble areas, and commercial fishing is conducted offshore. There will be little displacement of current users. Because the area is heavily used, it has poor potential for research activities.

Sanctuary Preservation Area: Dry Rocks, Grecian Rocks





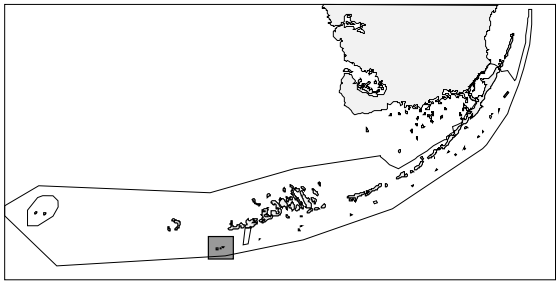
Description

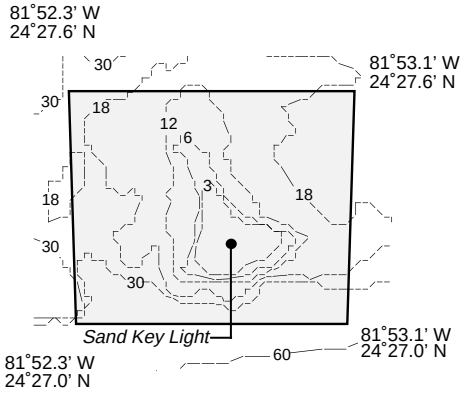
Dry Rocks and Grecian Rocks lie within the boundaries of the Key Largo National Marine Sanctuary. They both contain good stands of elkhorn coral, and Dry Rocks contains the statue "Christ of the Deep." The two Sanctuary Preservation Areas (SPAs) are ringed with mooring buoys.

Both SPAs are located seaward of White Banks and extend to an approximate depth of 30 feet. Dry Rocks SPA covers an area of approximately 0.05nm^2, or about 16ha. Grecian Rocks SPA covers an area of approximately 0.3nm^2, or about 107ha. Both areas capture the main reef features of the area.

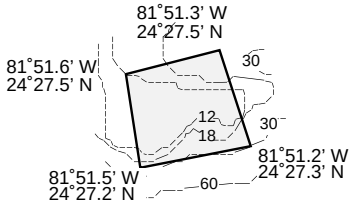
Dry Rocks and Grecian Rocks both have excellent accessibility and host a wide range of user activities including commercial diving, snorkeling, and fishing. The presence of the SPAs helps alleviate the extensive conflict that currently exist between fishermen and divers, with minimal displacement of either user group. Both areas have been degraded by heavy use, and warrant further protection. The SPAs will be good candidates for the application of carrying capacities and other research efforts.

Sanctuary Preservation Area: Eastern Dry Rocks, Rock Key, Sand Key



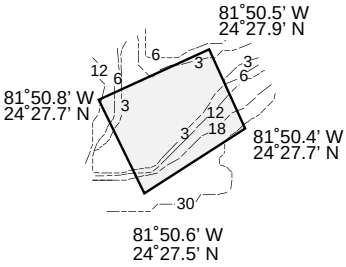


Sand Key



Rock Key

Eastern Dry Rocks



500 Meters

Bathymetry is in feet

Description

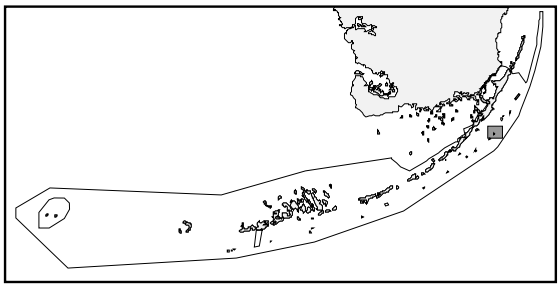
These three areas contain a concentration of important bank reef habitats within a small area. The three Sanctuary Preservation Areas (SPAs) are located approximately 5nm (10km) southwest of Key West.

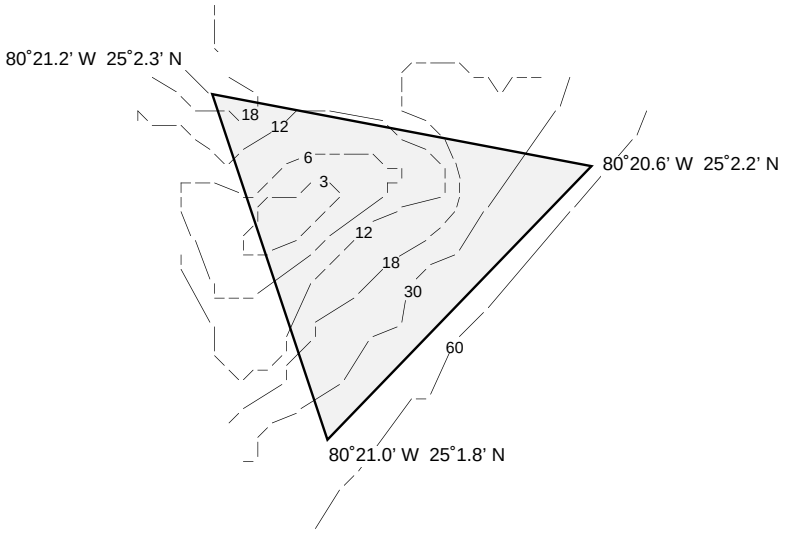
The largest of the three SPAs is Sand Key. The boundary for the Sand Key SPA extends seaward to between the 30- and 60-foot depth contour, but portions of the rubble ridge will be open to existing activities. Catch and release fishing by trolling is allowed in this SPA. The approximate area of this SPA is 0.5nm^2, or about 150ha.

At Rock Key and Eastern Dry Rocks, two small SPAs have been created using the reef crest and the 30-foot depth contour as boundaries. A depth of 4 feet along the reef flat marks the east and west boundaries of these two smaller SPAs. Both Rock Key and Eastern Dry Rocks have areas of approximately 0.1nm^2, or about 30ha.

The three reefs are easily accessible from Key West and are of high economic value. The area is considered very important for charter boat fishing, sportfishing, diving and lobster fishing. As a result, there are high user conflicts that SPAs will help to alleviate.

Sanctuary Preservation Area: French Reef





N

500 Meters

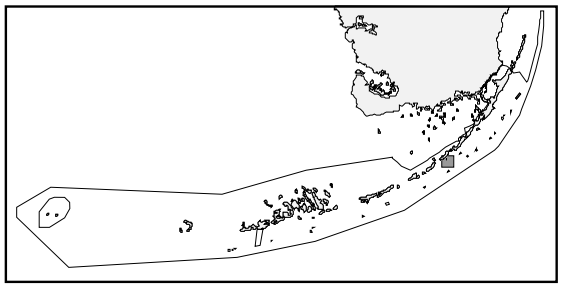
Bathymetry is in feet

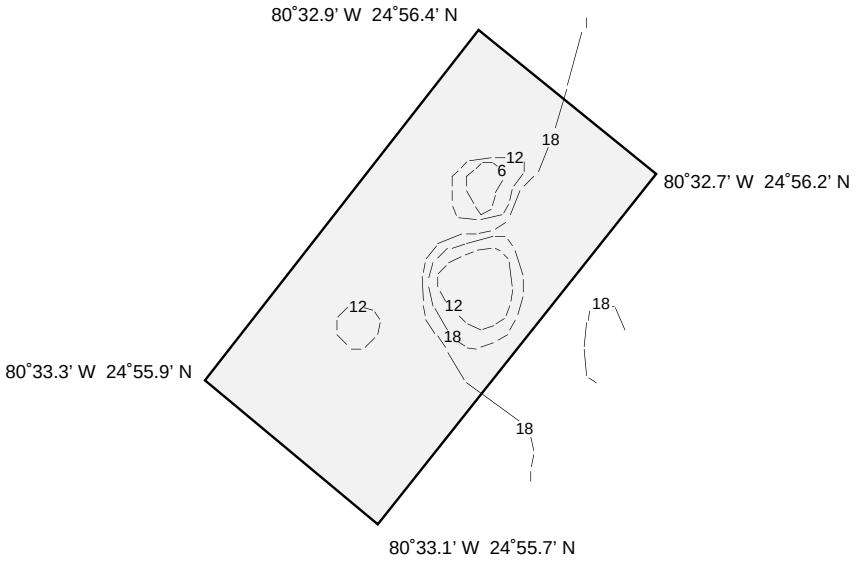
Description

French Reef contains many caves and arches within its spur-and-groove system. The Sanctuary Preservation Area (SPA) is north of Molasses Reef, approximately 6nm (11km) southeast of Key Largo.

The SPA is triangular and covers an area of approximately 0.1nm^2, or about 37ha. It includes an area from the rubble field to the 60-foot depth contour, and captures the caves and arches, while many of the lobster fishermen use the surrounding areas. The area's research potential is poor because of its easy access.

Sanctuary Preservation Area: Hen and Chickens





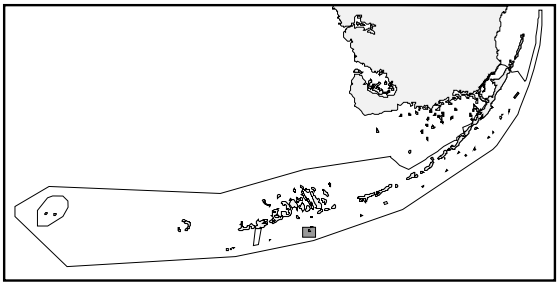
Description

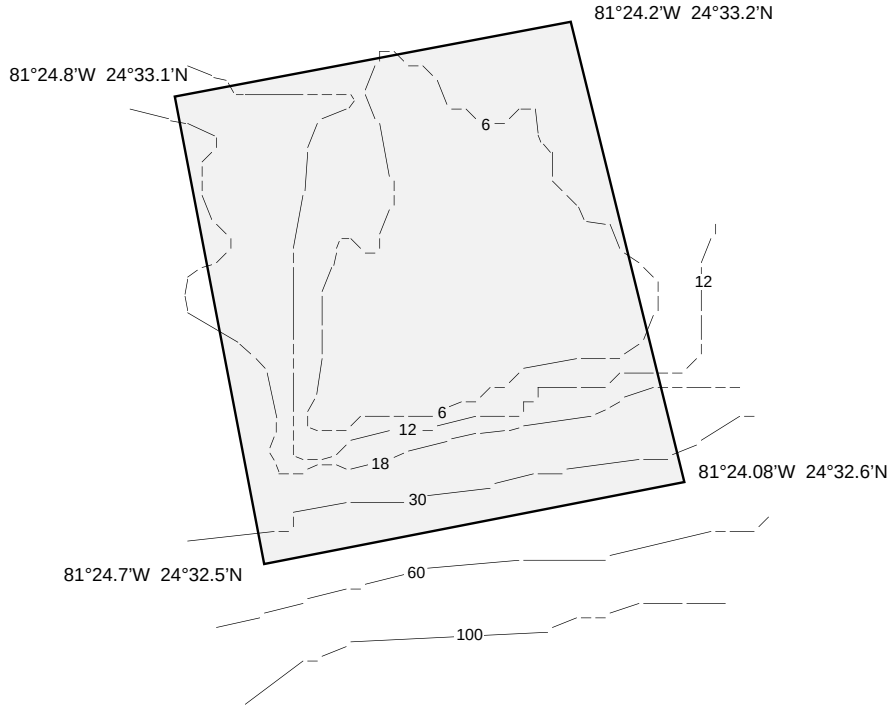
Hen and Chickens is a unique mid-channel patch reef complex with growths of star coral that are beginning to show signs of damage and decline. The Sanctuary Preservation Area (SPA) is approximately 2nm (4km) off of Plantation Key, in the middle of Hawk Channel.

The SPA is rectangular and covers approximately 0.2nm^2, or about 60ha. Its boundary encompasses the patch reef complex and the star coral.

Hen and Chickens is easily accessible, and currently has mooring buoys installed. The area is a high-use, low-conflict zone, except during the sport lobster season when it is heavily impacted and user conflicts may be numerous.

Sanctuary Preservation Area: Looe Key



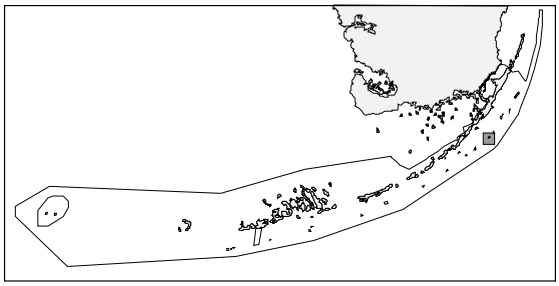


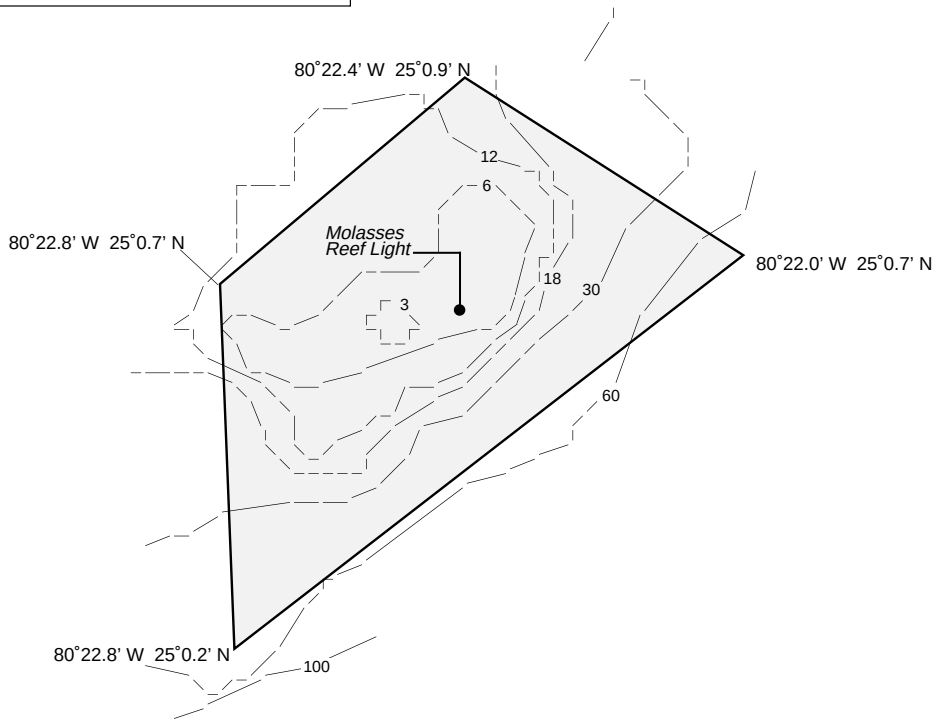
Description

The ecological importance of Looe Key has been established through the creation of Looe Key National Marine Sanctuary. The Sanctuary Preservation Area (SPA) expands the current core area of the Looe Key National Marine Sanctuary. The expanded area includes some of the transitional and intermediate reef features on the seaward side and a larger portion of the seagrass community and rubble field on the landward side of the reef. It is located approximately 5.5nm (10km) south of Ramrod Key and about 8nm (15km) southwest of Bahia Honda State Park.

The SPA is rectangular and extends seaward to the approximate 45-foot depth contour. It covers approximately 0.3nm^2, or about 115ha. Increasing the size of the protected area around Looe Key benefits the entire reef habitat and will have little effect on current users because of existing Sanctuary regulations.

Sanctuary Preservation Area: Molasses Reef





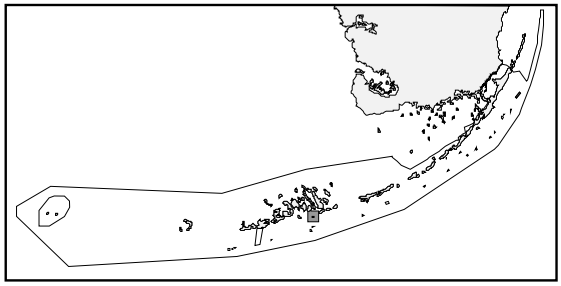
Description

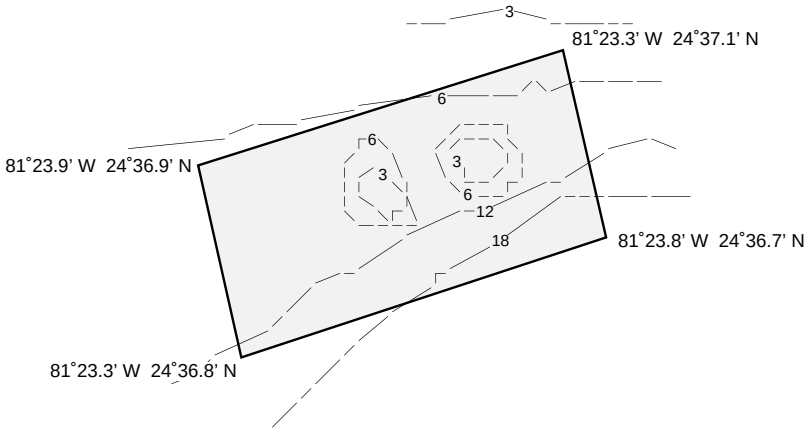
Molasses Reef contains a significant number of boulder corals, and has a well-developed spur-and-groove system that includes a deep wall. The Sanctuary Preservation Area (SPA) is located approximately 6nm (11km) southeast of Key Largo, near Rock Harbor.

The SPA includes a portion of the rubble field and extends to the 60-foot depth contour to protect the spur-and-groove system, the reef crest, and the deep wall. It covers an area of approximately 0.3nm², or about 90ha.

Molasses Reef is highly accessible, and is the most heavily visited reef in the Upper Keys for diving. Establishing the SPA reduces conflicts between recreational hook-and-line fishermen and divers.

Sanctuary Preservation Area: Newfound Harbor Key





N

500 Meters

Bathymetry is in feet

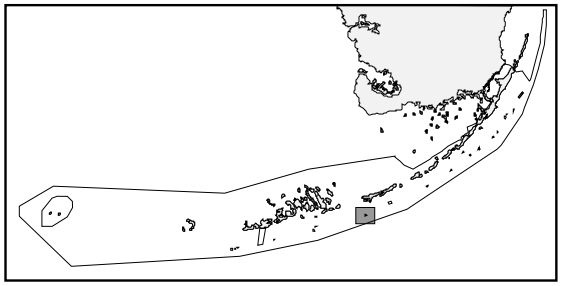
Description

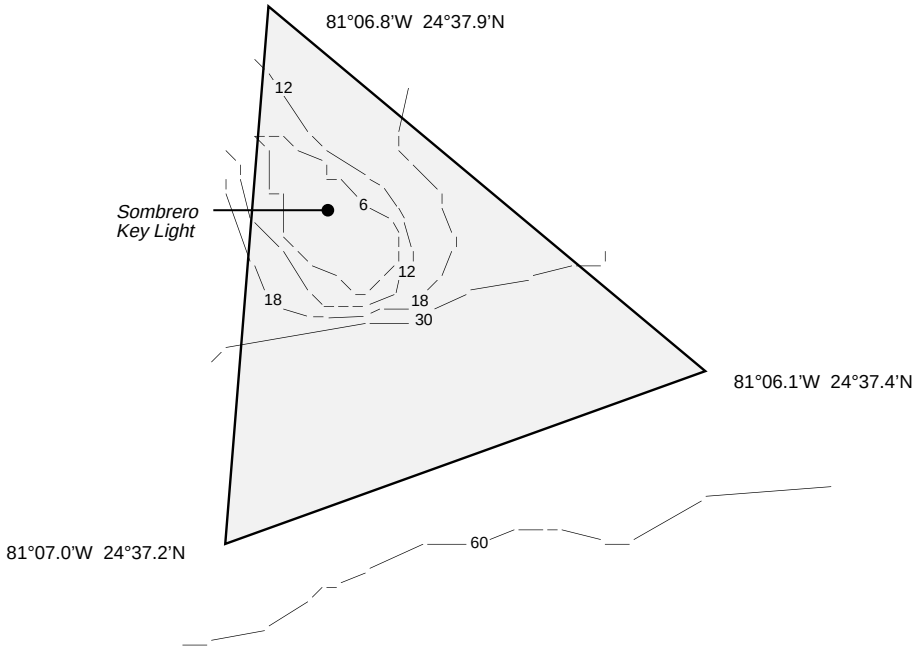
Newfound Harbor Key contains a series of nearshore patch reefs close to Newfound Harbor. The Sanctuary Preservation Area (SPA) is the only inshore patch reef complex protected in the Lower Keys. It is located less than 0.5nm (<1km) from the entrance to Newfound Harbor.

The SPA is rectangular and centered on two patch reefs along the shoreline near Newfound Harbor. The seaward boundary is the 18-foot depth contour and the landward boundary will allow boats and other watercraft sufficient passage along the shore. It covers an area of approximately 0.1nm^2, or about 40ha.

Newfound Harbor has good accessibility. Although a total number of users is small, it is a high-use area for bait fishing, spearfishing, and environmental education activities. Other nearshore patch reefs in the area will remain open to users.

Sanctuary Preservation Area: Sombrero Key





N

500 Meters

Bathymetry is in feet

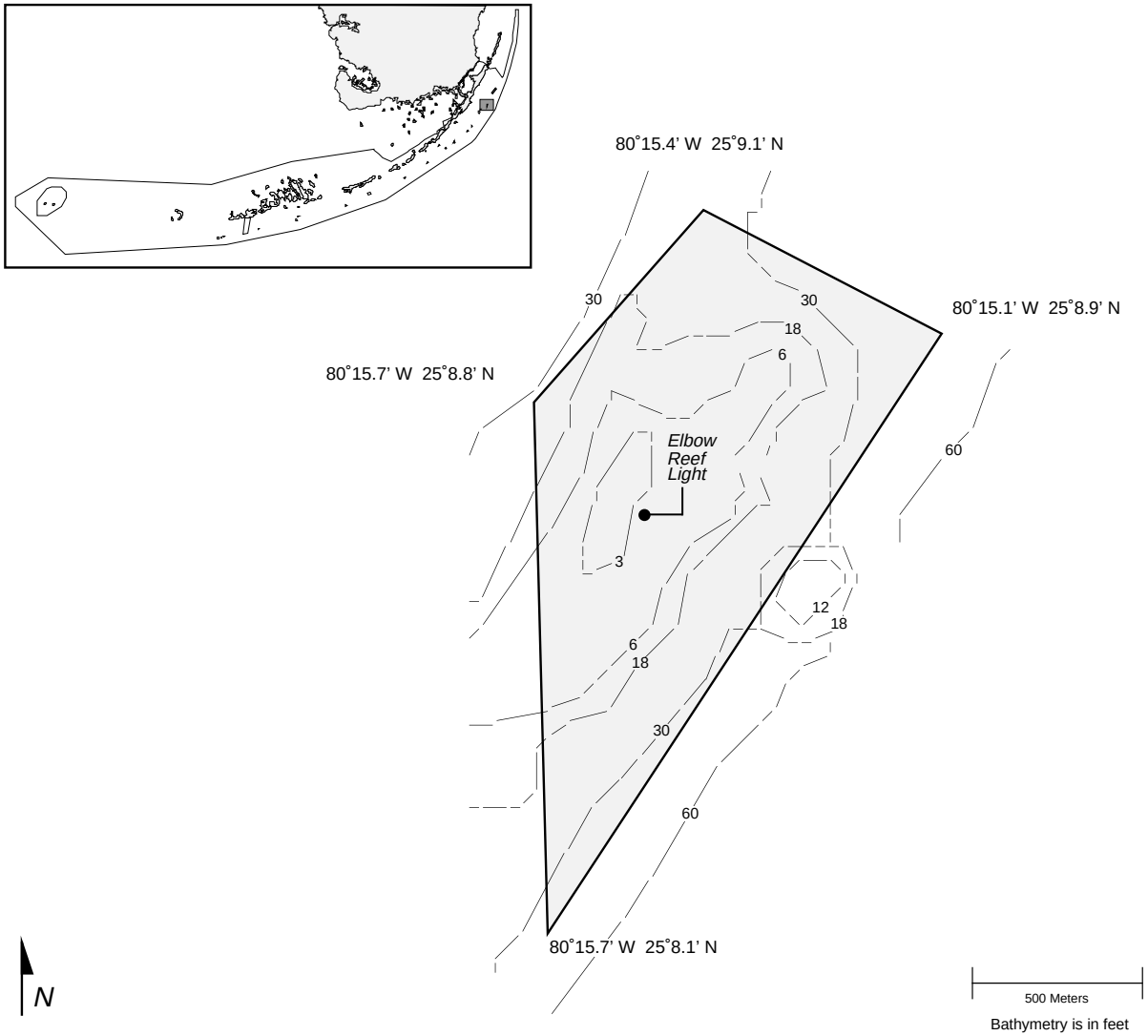
Description

Sombrero Key has a spur-and-groove reef formation with stands of elkhorn coral. The Sanctuary Preservation Area (SPA) is located approximately 3.5nm (6km) seaward of Boot Key. The historic Sombrero Key Light is in the northern corner of this triangular SPA.

The SPA covers an area of approximately 0.2nm^2, or about 73ha. It captures the reef crest, spur-and-groove system, and some of the rubble field.

Diving and snorkeling currently occurs in and around this high-use area. Most commercial fishing occurs seaward on the reef, while most recreational fishing occurs to the back and at the sides of this site. Catch and release fishing by trolling will be allowed in this SPA. Current conflicts between divers and recreational fishermen will be addressed by the proposed boundaries. Existing users will not be dramatically displaced, and conflicts between user groups will be reduced.

Sanctuary Preservation Area: The Elbow



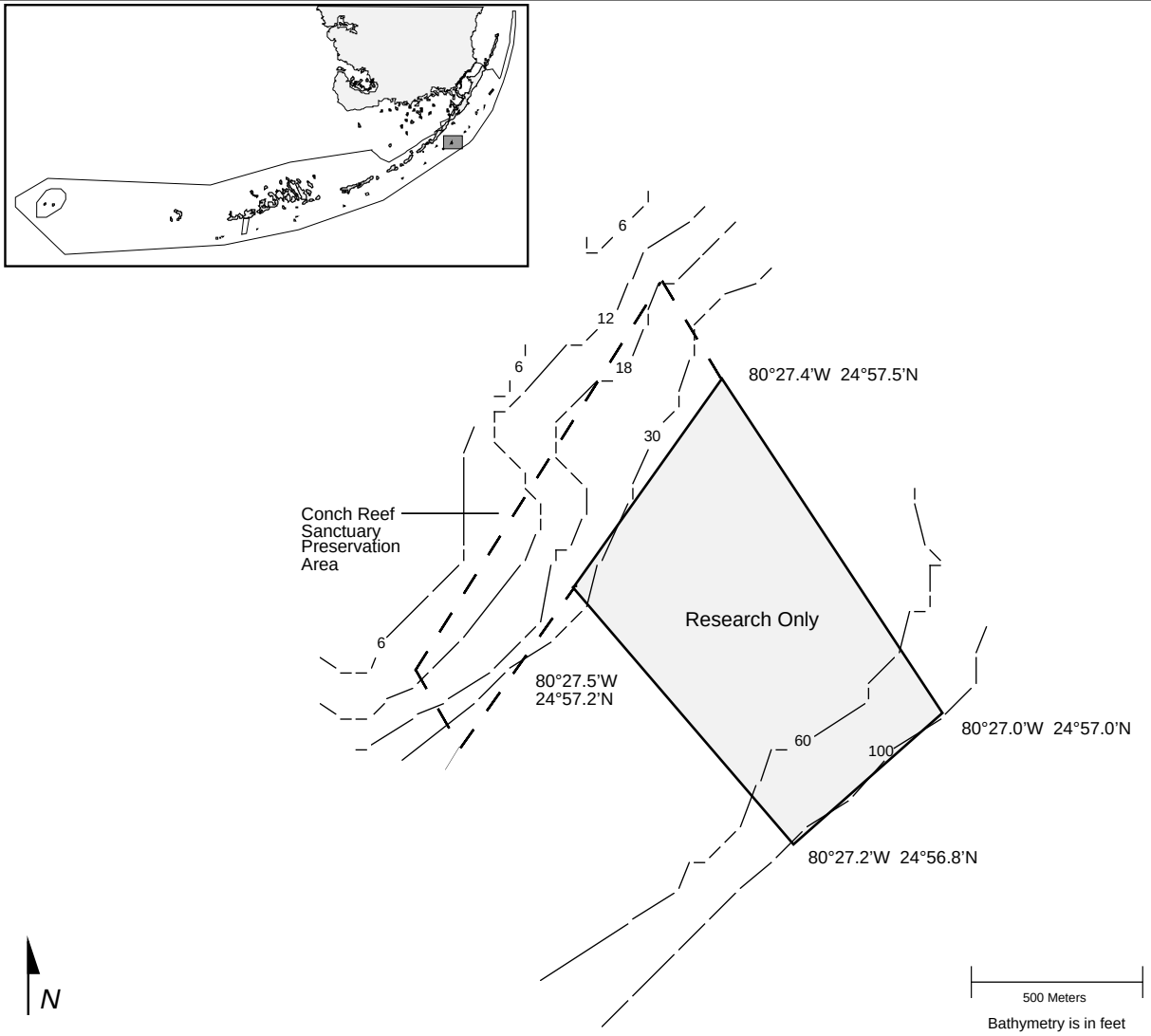
Description

The Elbow is a bank reef with a well-defined spur-and-groove system and healthy deepwater corals. The Sanctuary Preservation Area (SPA) is located approximately 5.5nm (10km) southeast of Key Largo.

The SPA is irregularly shaped and covers approximately 0.3nm^2, or about 90ha. It includes the reef crest, rubble horns, and deepwater corals. Its seaward boundary extends to the 30-foot depth contour.

Lobster fishermen and ballyhoo fishermen use the reef and the surrounding area. There is significant recreational fishing adjacent to, and seaward of, the reef. The level of conflict between users is currently minimal because the area is not heavily used.

Special-use Area: Conch Reef (Research Only)

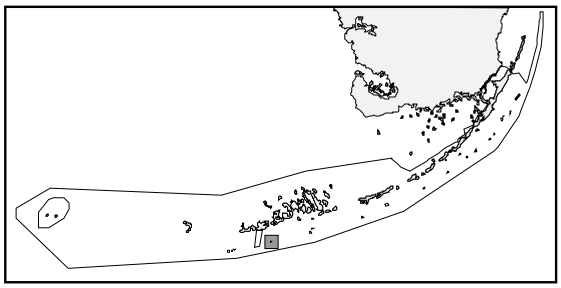


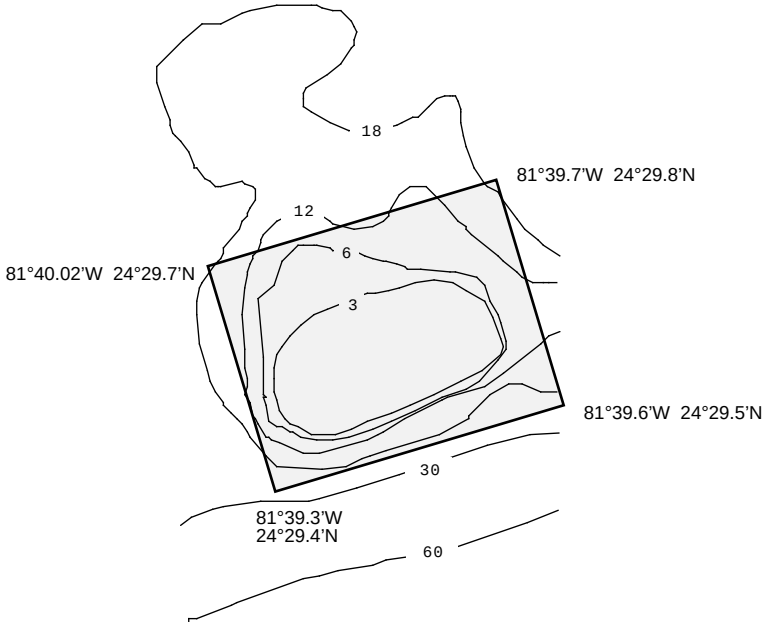
Description

Conch Reef contains stands of rare pillar coral and provides excellent habitat for conch. The seaward side has one of the best developed reef wall systems in the keys. Octocorals and basket sponges are also present at this site. This Special-use Area is located approximately 5nm (9km) southeast of Tavernier and is adjacent to the Conch Reef Sanctuary Preservation Area (SPA).

The Special-use Area is designated as “Research Only,” and will provide an area for the Aquarius underwater laboratory to conduct research. The boundary of the Research Only area approximates the current designated “no anchor” zone for the Aquarius underwater laboratory. There is heavy diving activity landward in the adjacent SPA, and recreational fishermen troll the reef wall in 160 to 180 feet of water.

Special-use Area: Eastern Sambos (Research Only)





N

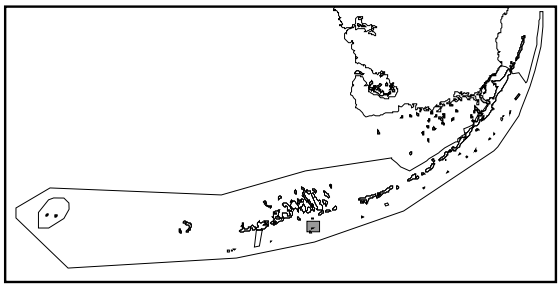
500 Meters

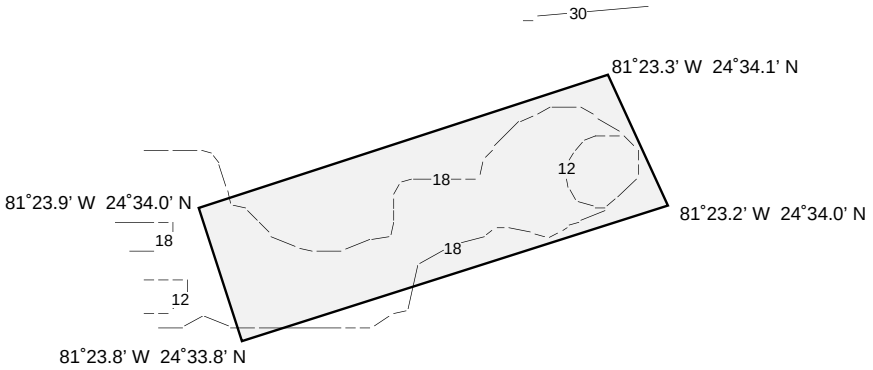
Bathymetry is in feet

Description

Eastern Sambos is a spur-and-groove bank reef with excellent coral formations. It is located in a region of the Keys that currently has some of the best remaining water quality along the reef tract. It is not heavily used by divers and will serve as an excellent shallow reef community to compare with Tennessee Reef that in contrast is located in an area of poor water quality, opposite of Florida Bay. By scientifically comparing these sites, researchers will be able to separate impacts from overuse with those from poor water quality.

Special-use Area: Looe Key (Research Only)



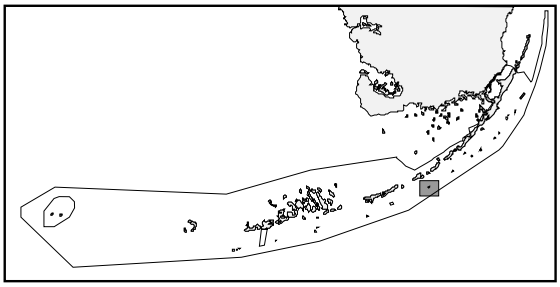


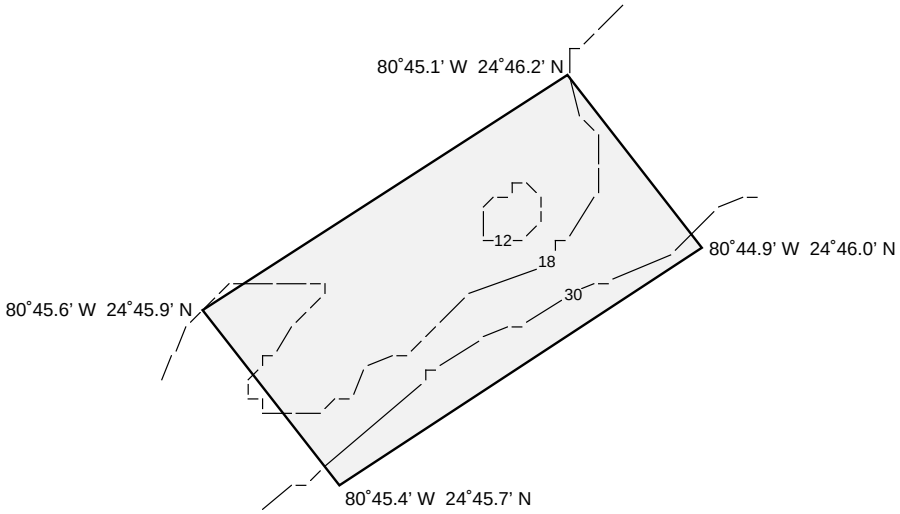
Description

The Looe Key Special-use Area lies inshore of the core area of the current Looe Key National Marine Sanctuary, approximately 5.5nm (10km) south of Ramrod Key and about 8nm (15km) southwest of Bahia Honda State Park. The zone is rectangular and is centered on the mid-channel patch reefs in the northeast corner of the Sanctuary. It covers an area of approximately 0.1nm^2, or about 34ha.

The zone is designated as “Research Only,” and is the only offshore patch reef complex protected in the Lower Keys. Because the area is already protected as a national marine sanctuary, the Special-use Area will have very little impact on current users and is a good choice for continued research activities.

Special-use Area: Tennessee Reef (Research Only)





N

500 Meters

Bathymetry is in feet

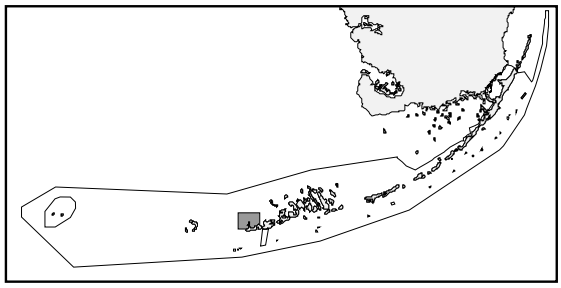
Description

Tennessee Reef is a coral reef habitat containing a deep spur-and-groove system. It contains unique deepwater, slow-growth corals and sponges, and is located approximately 4nm (7km) south of Long Key. This Special-use Area is designated as "Research Only."

The area is rectangular and covers 0.2nm^2, or about 53ha. It extends seaward to the 30-foot depth contour and contains the drowned spur-and-groove system and the unique deepwater corals.

Tennessee reef is a low-use area since it is relatively inaccessible and contains no mooring buoys. While divers occasionally visit the area, it is not a prime dive spot. Fishing and lobster trapping occurs inshore from the reef. The area has good potential as a research site because of its relative inaccessibility and low level of use. Its location in the path of waters from the Florida Bay will give scientists an excellent site to compare with a "Research Only" site that has low use, but is located in an area with good water quality.

Wildlife Management Area: Bay Keys



Boundaries shown are approximate.

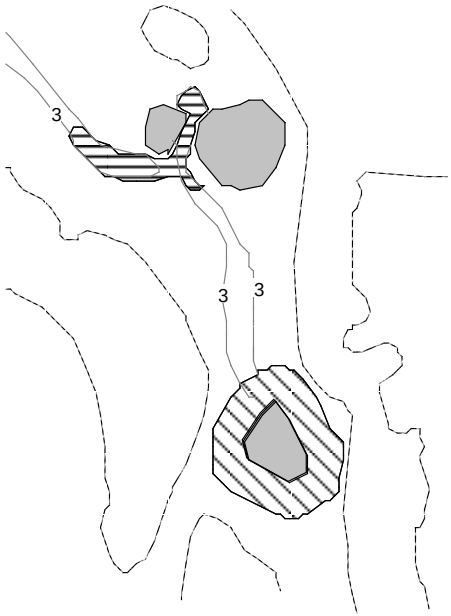
Type of Restriction

No-motor Zone

Idle-speed Only/No Wake Zone

Low-water Line

Bathymetry is in feet.



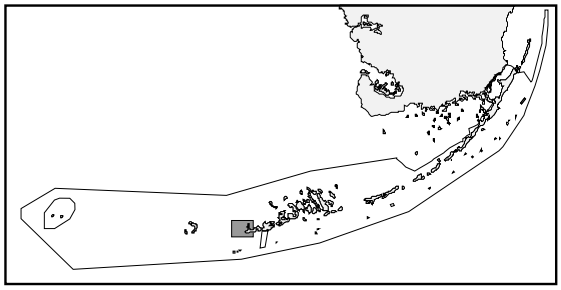
N

500 Meters

Description

The Bay Keys are a series of islands approximately seven kilometers north of Key West. Aside from the Northwest Bay Key, the islands are unspoiled and largely composed of red mangroves. The largest key harbors great white herons and a considerable number of tricolored and little blue herons. ***Restriction: A 300-foot (91m) no-motor zone is created around one island and idle-speed only/no wake zones are established in tidal creeks.*** Disturbance to nesting and roosting birds is decreased by the no-motor and idle-speed zones without impact to boaters.

Wildlife Management Areas: Boca Grande Key, Woman Key



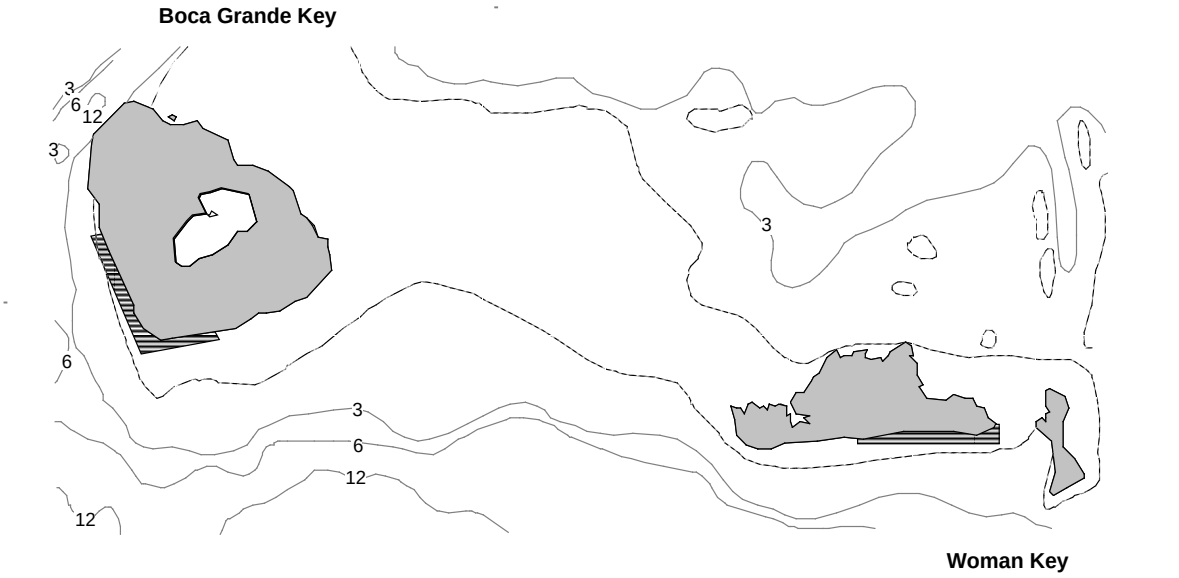
Type of Restriction

Beach Closed

Low Water Line

Bathymetry is in feet.

Boundaries shown are approximate.



N

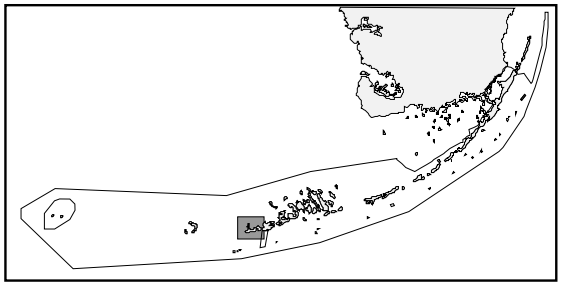
500 Meters

Description

Boca Grande Key is located about 22 kilometers west of Key West. It has an extensive, narrow, low-energy beach on the west and southwest side, which extends almost to the northern tip of the island. There is a relatively large interior pond on the shallow wash flats behind the dunes on the southwest side. Many species of birds use this area, including some that are listed as federally endangered and threatened. ***Restriction: Half of the beach is closed. (Beach above mean high tide is closed by the U.S. Department of the Interior).*** The most heavily used public-use area is still open.

Woman Key is located about 21 kilometers west of Key West. The island contains an extensive south-facing, low-energy beach and associated dunes. Shallow-water flats (hardbottom) border most of the beach. Loggerhead turtles nest on the beach and dunes. Several species of wading birds also nest in the area and a large number of shorebirds use the sand spits on the southeast side of the island. ***Restriction: Half of the beach and sand spit on the southeast side is closed. (Beach above mean high tide is closed by the U.S. Department of the Interior).*** The remainder of the beach remains open to the public.

Wildlife Management Area: Cayo Agua Keys



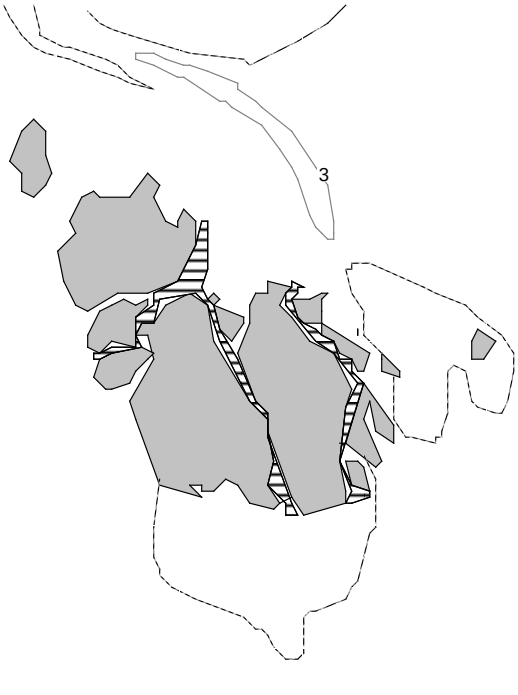
Boundaries shown are approximate.

Type of Restriction

Idle Speed Only/No Wake Zone

Low Water Line

Bathymetry is in feet.



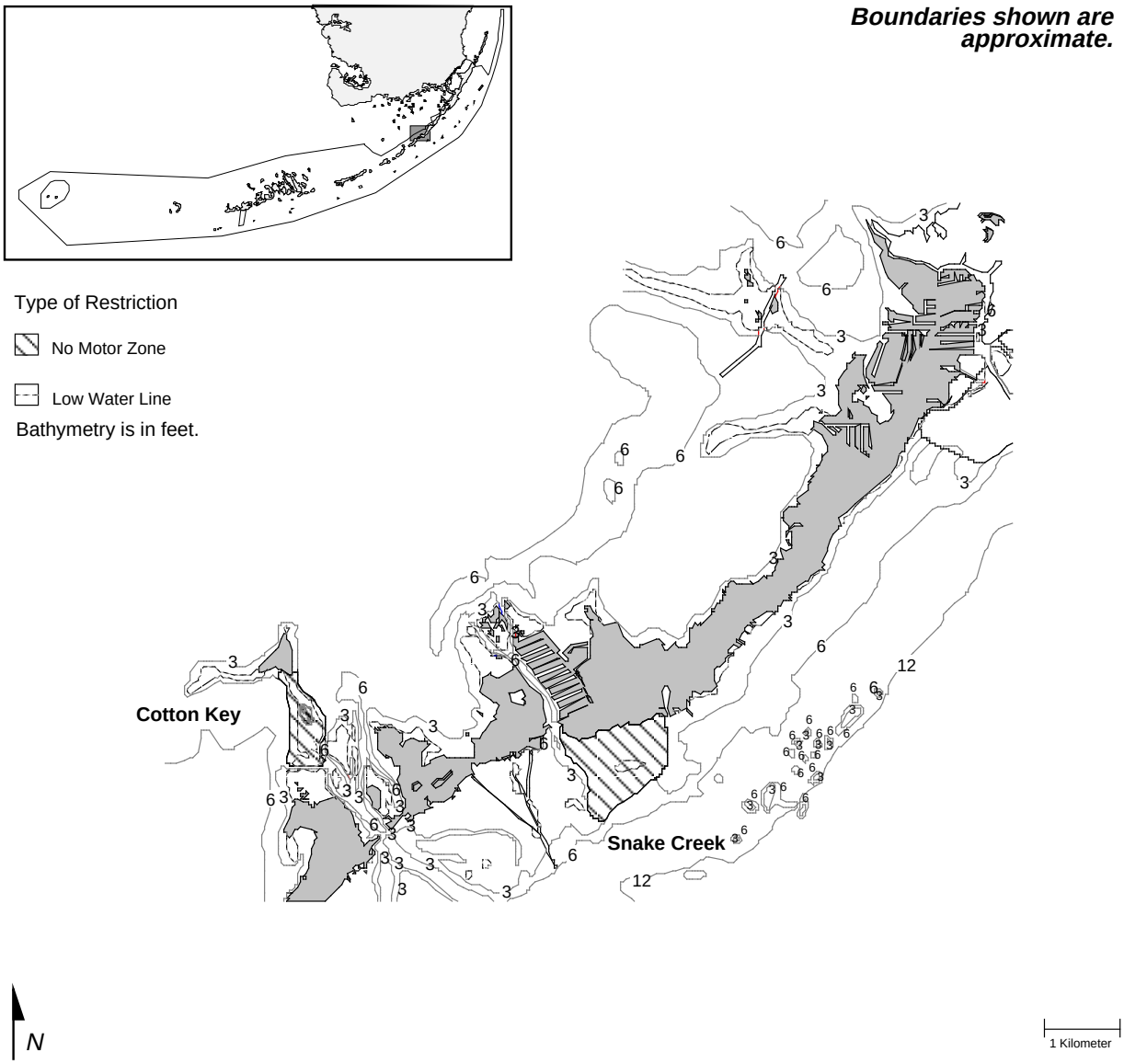
N

250 Meters

Description

This series of islands located approximately 10 kilometers northeast of Key West, is dissected by tidal creeks. All of the Cayo Agua islands consist largely of red mangroves and are used by great white herons and ospreys. ***Restriction: Idle-speed only/no wake zones are created in each of the navigable tidal creeks.*** No major impacts on users are expected.

Wildlife Management Areas: Cotton Key, Snake Creek

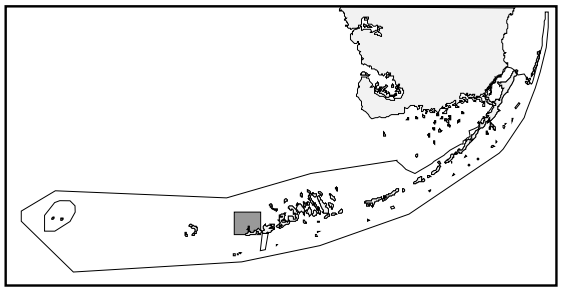


Description

Cotton Key is located in the Upper Keys, off the northeastern tip of Upper Matecumbe Key. It is and area of very shallow flats that are heavily used by a variety of birds as well as bonefish and other desirable fish species. There are also several small mangrove islands that serve as nesting sites for a variety of birds, including pelicans, cormorants, and at least four species of herons. Cotton Key is also a preferred roost for magnificent frigatebirds. ***Restriction: There is a no-motor zone on the tidal flat.*** Shallow-water boats and PWC have modified access to the area.

Snake Creek is located in the Upper Keys, east of Windley Key. It is an area of very shallow flats that are heavily used by a variety of birds, as well as bonefish and other desirable fish species. ***Restriction: There is a no-motor zone on the tidal flat.*** Shallow water boats and PWC have modified access to the area.

Wildlife Management Areas: Cottrell Key, Little Mullet Key, Big Mullet Key



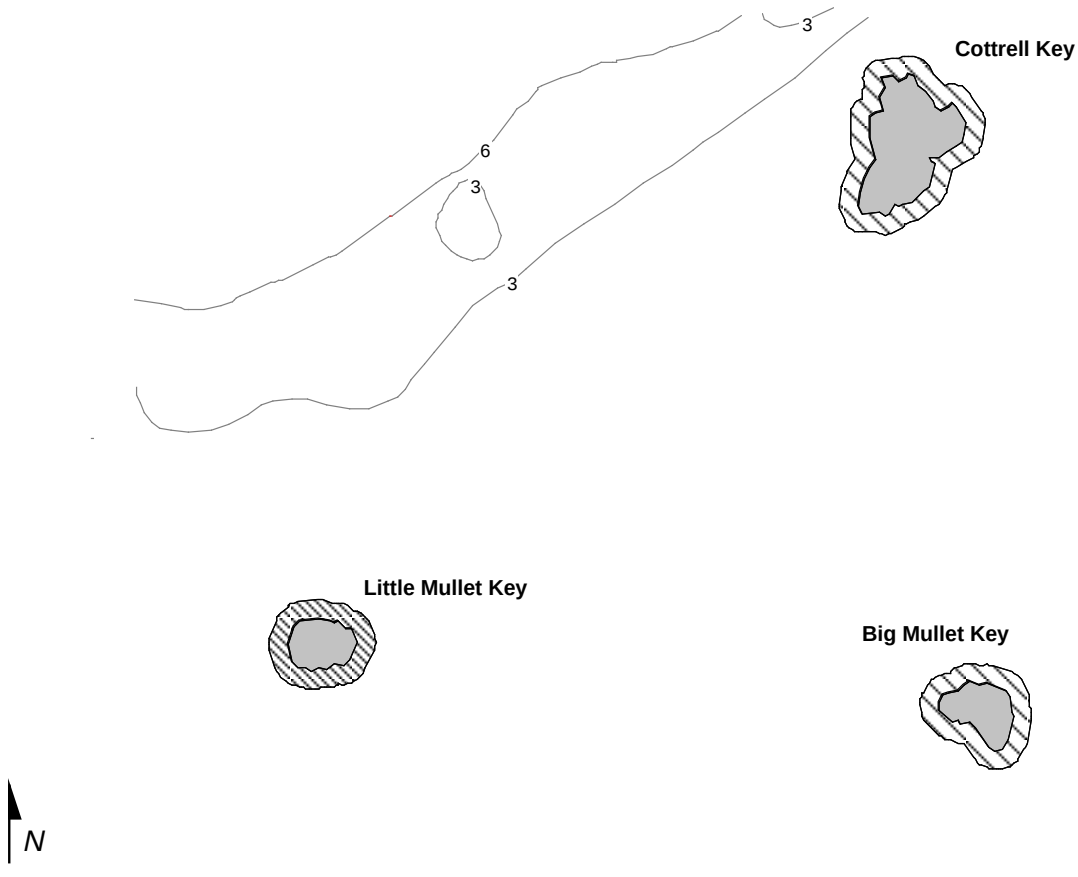
Type of Restriction

No Access Buffer

No Motor Zone

Bathymetry is in feet.

Boundaries shown are approximate.



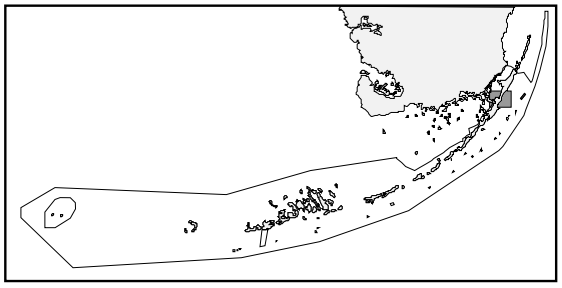
Description

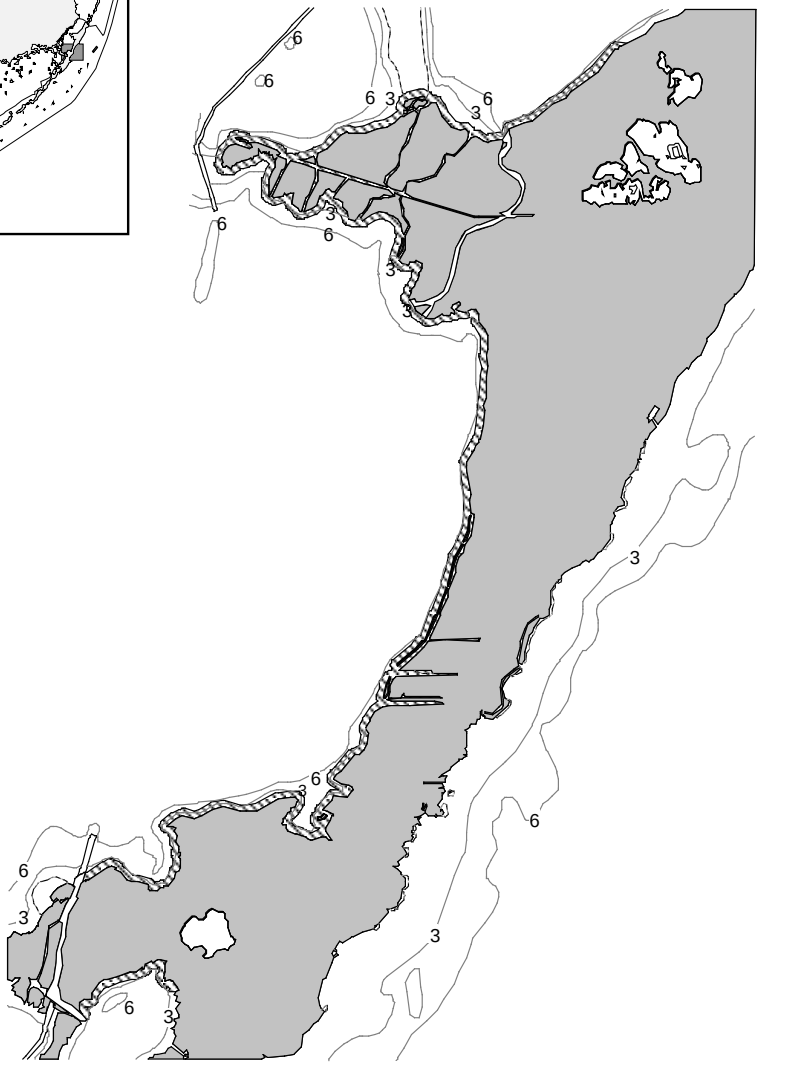
Little Mullet Key is a small mangrove located about 15 kilometers northwest of Key West. ***Restriction: A 300-foot (91m) no-access buffer zone is created around the island.*** Vessel traffic is prevented from approaching the island.

Big Mullet Key is located about 15 kilometers northwest of Key West. The island harbors nesting great white herons and a variety of other wading birds. Mangrove terrapins are also present. ***Restriction: A 300-foot (91m) no-motor zone is created around the island.***

Cottrell Key is located about 15 kilometers northwest of Key West. It contains a variety of wading birds, and mangrove terrapins. ***Restriction: A 300-foot (91m) no-motor zone is created around the island.*** Boat traffic has modified access to the island.

Wildlife Management Area: Crocodile Lake





Type of Restriction

No Access Buffer

Low Water Line

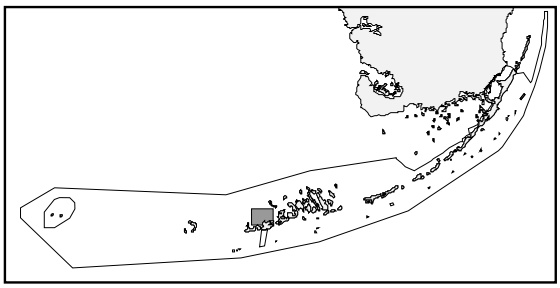
Bathymetry is in feet.

Boundaries shown are approximate.

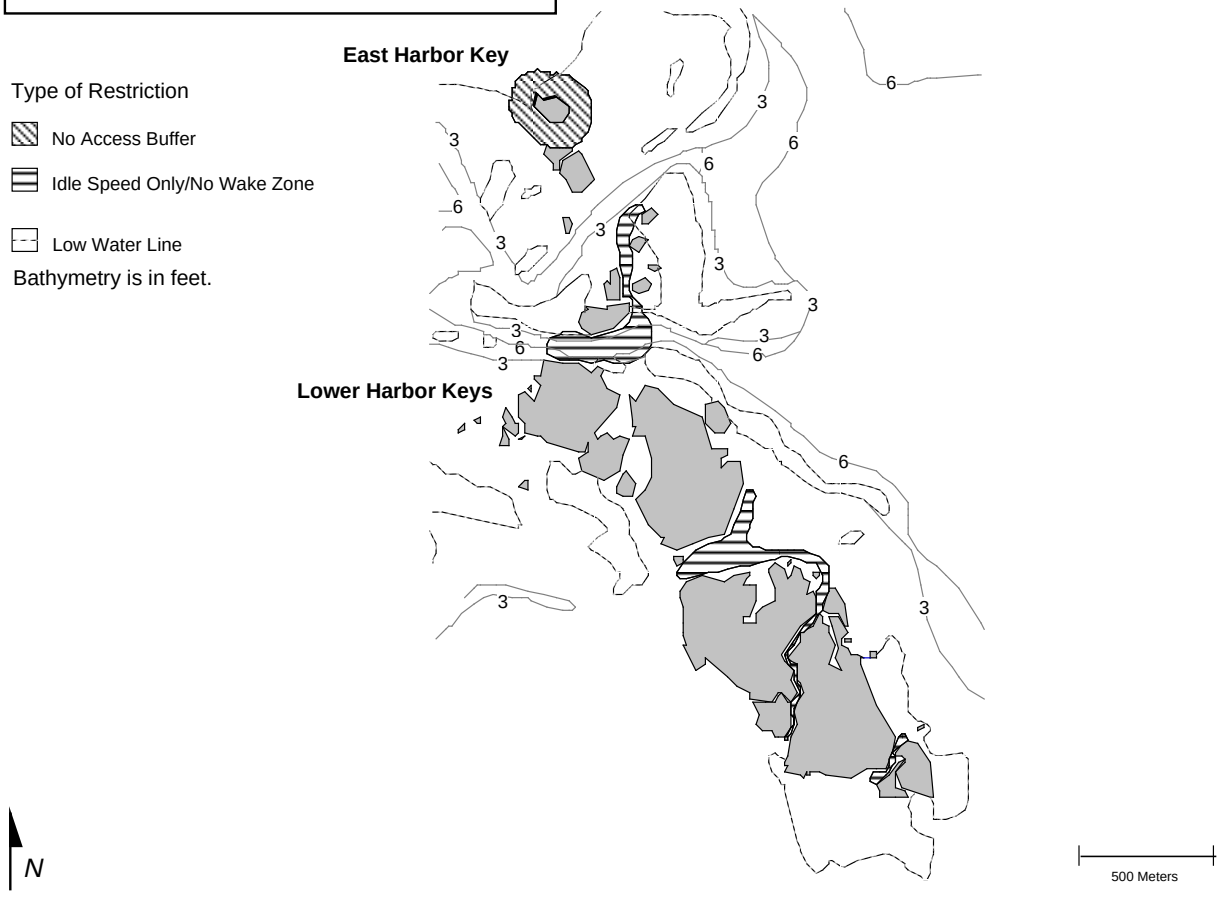
Description

Crocodile Lake is located in the Upper Keys, along the eastern shore of Card Sound. This area has the most extensive stands of tropical hardwood hammocks in the United States. It harbors a number of endangered and threatened species, including the American crocodile and the West Indian manatee. ***Restriction: There is a 100-foot (30m) no-access buffer zone along the shoreline between March 1 and October 1.*** Motorized vessels are prevented from approaching the shoreline. Jewfish and Steamboat Creeks remain open to motorized vessel traffic.

Wildlife Management Areas: East Harbor Key, Lower Harbor Keys



Boundaries shown are approximate.

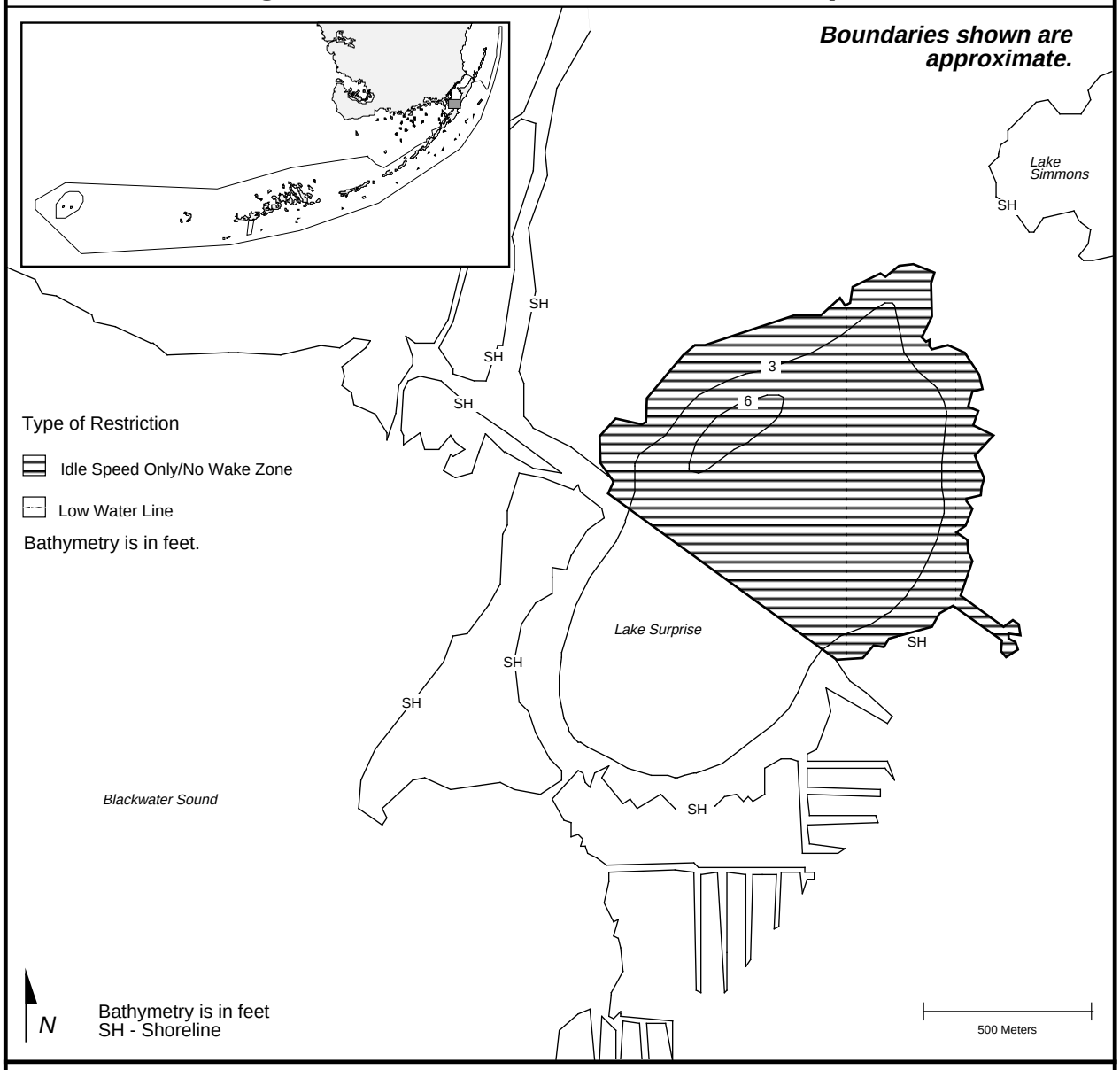


Description

The East Harbor Keys are located approximately 15 kilometers northeast of Key West. All but one of the keys are mangrove islands. The islands are heavily used by boaters, especially on weekends. ***Restriction: A 300-foot (91m) no-access buffer zone is established around the northern most island.*** Boaters are displaced from the no-access zone.

The Lower Harbor Keys lie approximately 12 kilometers northeast of Key West, are dissected by tidal creeks, lack dry land, and are composed primarily of red mangroves. Most of the islands are accessible by navigable channels. The islands contain nesting great white herons, double-crested cormorants, and osprey. A variety of other wading birds use the islands as well. Boat traffic is sometimes heavy on weekends. ***Restriction: Idle-speed only/no wake zones are created in selected tidal creeks.*** This restriction will reduce the impact of boat traffic.

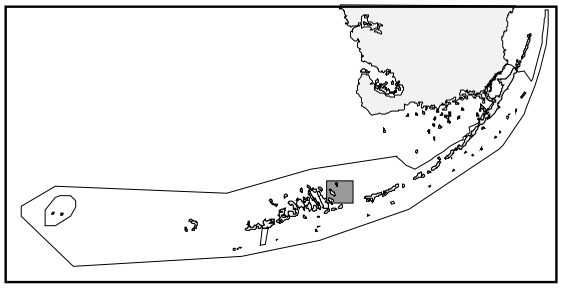
Wildlife Management Area: Eastern Lake Surprise



Description

Lake Surprise is located in the north Key Largo area. Currently, a man-made causeway composed of fill that serves as the base for Highway 1 (US) spans Lake Surprise and cuts it roughly in half. The western side is heavily used by recreational vessels and has remained isolated to the eastern side by the causeway. Future improvements to US 1 call for a bridge to span Lake Surprise. The causeway will be removed, thus improving water circulation in the area. In order to protect the endangered American crocodile and West Indian manatee that inhabit the area from vessel traffic. ***Restriction: Idle speed only/no wake zone east of US 1***.

Wildlife Management Area: Horseshoe Key



Type of Restriction

No Access Buffer

Low Water Line

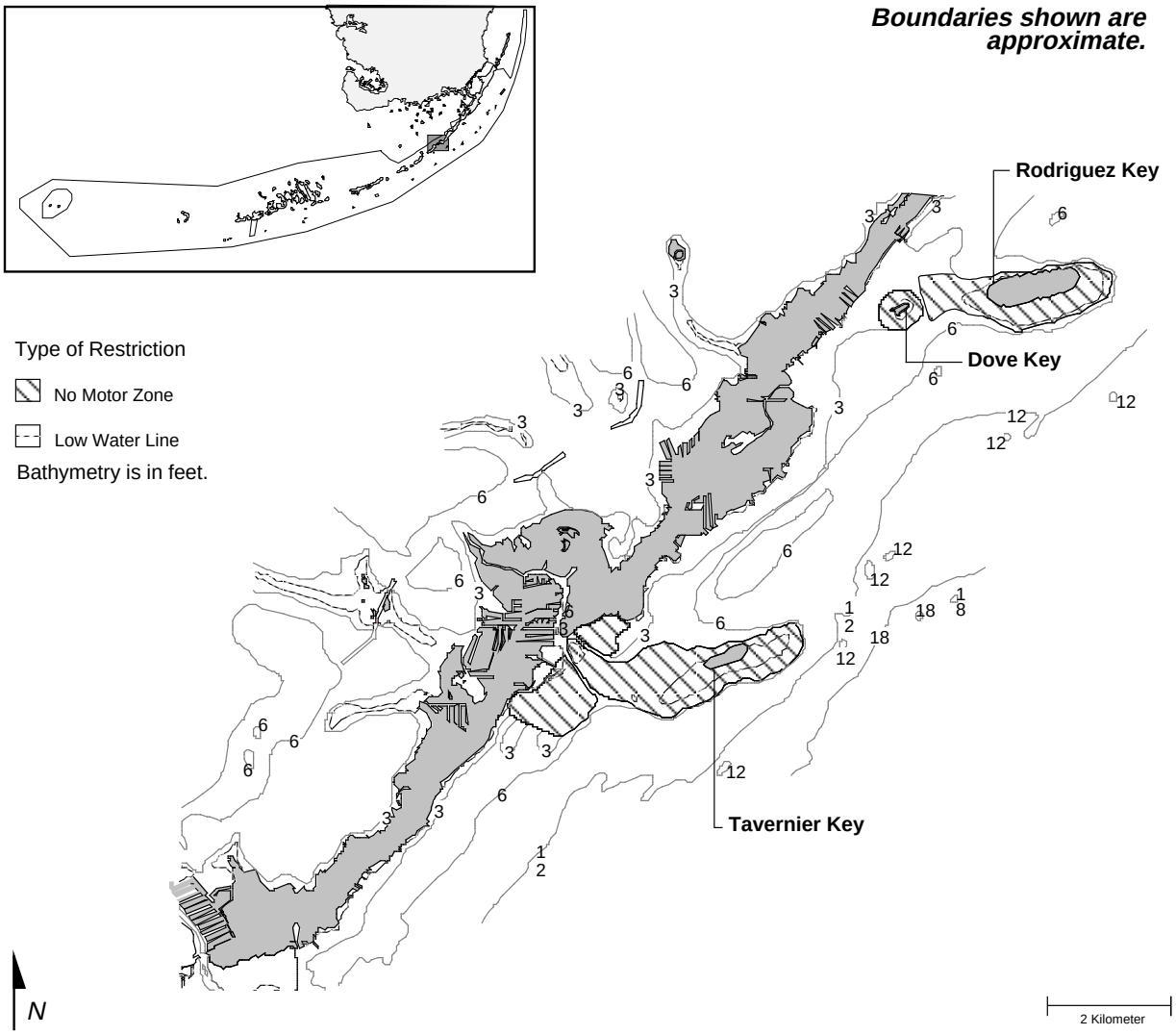
Bathymetry is in feet.

Boundaries shown are approximate.

Description

Horseshoe Key is a relatively large island bordered entirely by red mangroves, and is located approximately 20 kilometers northwest of Marathon. Two large openings on the island's interior contain salt prairies. Heron, willet, and osprey nesting sites have been documented. The island is closed to public access. ***Restriction: There is a 300-foot (91m) no-access buffer zone around the main island. (The main island is closed by the U.S. Department of the Interior).*** There has been minimal public use in the past, therefore, little impact on users is expected.

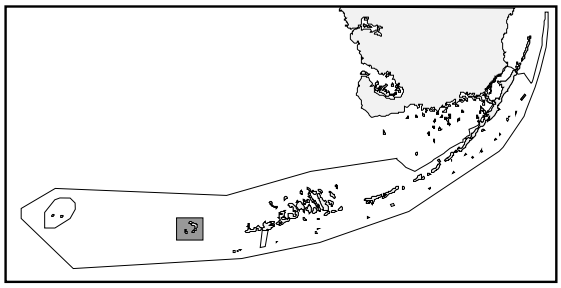
Wildlife Management Areas: Rodriguez Key, Dove Key, Tavernier Key



Description

These three sites are in the Upper Keys. Rodriguez Key is located east of Key Largo. Dove Key is located between Key Largo and Rodriguez Key. Tavernier Key is located east of Key Largo and Plantation Key. They are each areas of very shallow flats that are heavily used by a variety of birds as well as bonefish and other desirable fish species. ***Restriction: There is a no-motor zone on the tidal flats around each key. Additionally, the area around the two small islands of Dove Key is closed.***

Wildlife Management Area: Marquesas Keys



Boundaries shown are approximate.

Type of Restriction

- No Motor Zone
- No Access Buffer
- Idle Speed Only/No Wake Zone
- Low Water Line

Bathymetry is in feet.

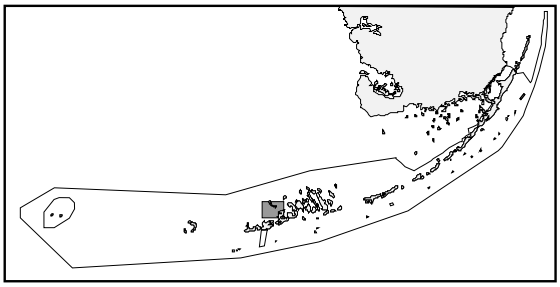
N

1 Kilometer

Description

The Marquesas Keys are a chain of islands located approximately 40 kilometers west of Key West. They are characterized by an extensive network of low-energy beaches and dunes. Deepwater channels cut through the interior of the islands. The islands are used by sea turtles and birds for nesting, feeding, and roosting. ***Restriction: A 300-foot (91m) no-motor zone is established around the three smallest islands, a 300-foot (91m) no-access buffer zone is established around one mangrove island, and an idle speed only/ no wake zone is established in the southwest tidal creek.*** Historically, public use of the area has been low, and minimal impacts on users are expected.

Wildlife Management Area: Mud Keys



Boundaries shown are approximate.

Type of Restriction

Closed

Idle Speed Only/No Wake Zone

Low Water Line

Bathymetry is in feet.

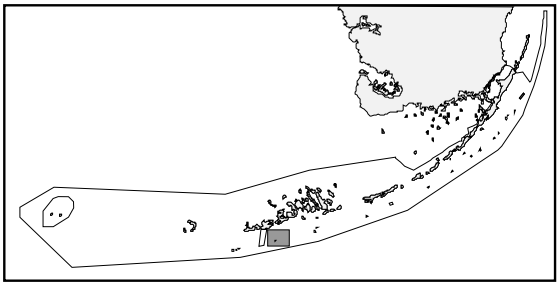
N

500 Meters

Description

Mud Keys are a series of islands approximately 25 kilometers northeast of Key West that are highly dissected by navigable creeks. The islands consist almost entirely of red mangroves, although the northernmost island has considerable upland vegetation. The islands contain nesting ospreys and a small great white heron rookery. Frigatebirds sometimes roost on the islands. ***Restriction: Idle-speed only/no wake zones are created in the two main tidal creeks. The two smaller creeks on the west side are closed to provide a sanctuary for birds.*** Boaters will have modified access to this area.

Wildlife Management Area: Pelican Shoal

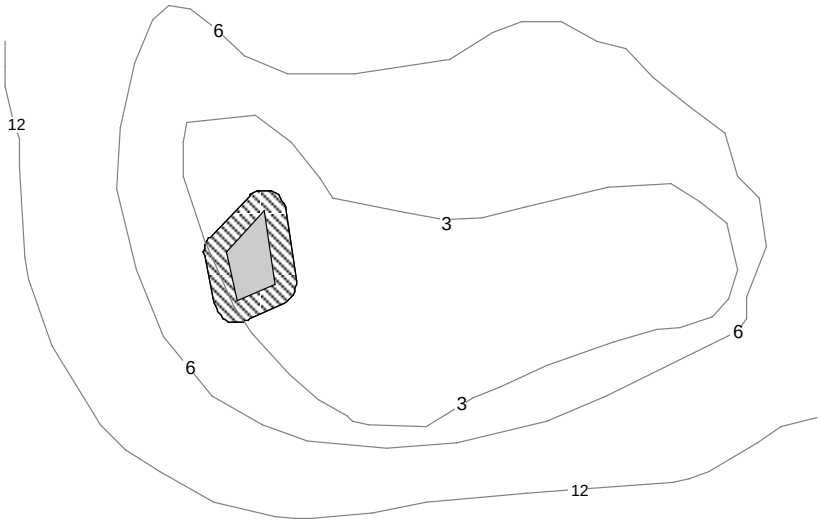


Boundaries shown are approximate.

Type of Restriction

No Access Buffer

Bathymetry is in feet.



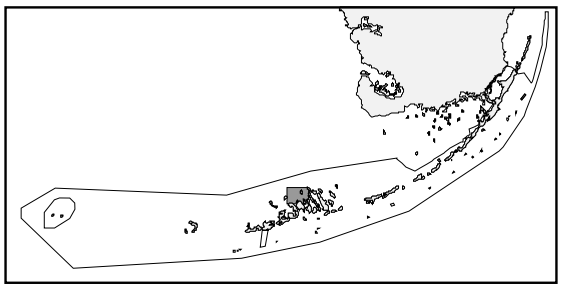
N

50 Meters

Description

Pelican Shoal is located approximately 9 kilometers southeast of Boca Chica. It is primarily a small rubble island that provides an important nesting site for birds. Visitor use is low in this area. ***Restriction: No-access buffer zone is created out to 50 meters from shore between April 1 and August 31. (The shoal is closed by the Florida Game and Freshwater Fish Commission).*** No major displacements of user groups will occur as a result of this new designation.

Wildlife Management Area: Sawyer Keys



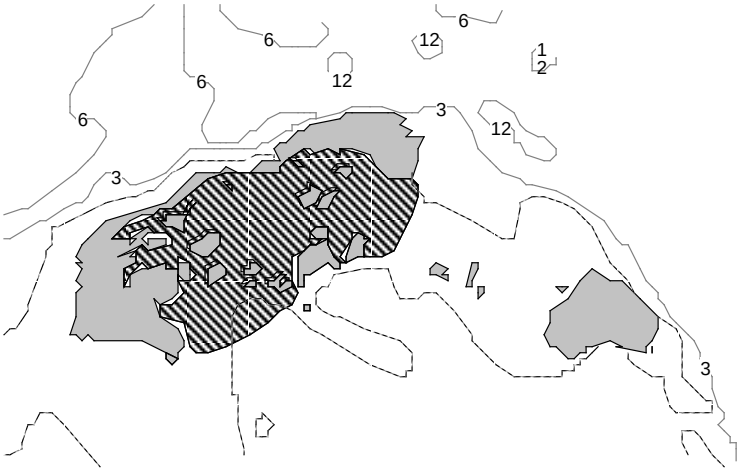
Boundaries shown are approximate.

Type of Restriction

Closed

Low Water Line

Bathymetry is in feet.



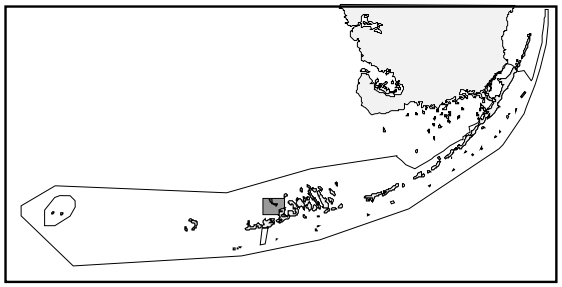
N

500 Meters

Description

Sawyer Keys consist of a series of islands east of Johnston Key Channel, approximately 35 kilometers northeast of Key West. These islands are dissected by shallow, tidal creeks. The northwest side of the largest island is privately owned. Sawyer Keys harbor nesting ospreys. The area is also used by 11 species of wading birds. The area south of the two largest islands is an important staging area for migrant shorebirds in autumn. ***Restriction: Tidal creeks on the south side of the islands are closed.*** Vessel traffic will be prevented from using much of the site.

Wildlife Management Area: Snipe Keys



Boundaries shown are approximate.

Type of Restriction

No Motor Zone

Idle Speed Only/ No Wake Zone

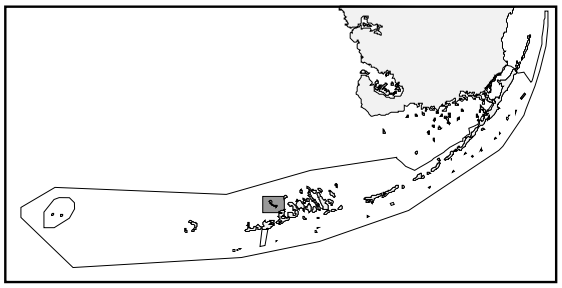
Low Water Line

Bathymetry is in feet.

Description

Snipe Keys are a group of small islands dissected by a maze of tidal creeks between Snipe Point and the Outer Narrows. Snipe Keys lie east of Mud Keys and approximately 25 kilometers northeast of Key West. Groups of little blue herons are present on the tidal creeks. Snipe Point is used by terns and various shorebirds. ***Restriction: An idle-speed only/no wake zone is created for the main tidal creek. A no-motor zone will be established for the remaining creeks.*** Boat traffic will have modified access to this area.

Wildlife Management Area: Tidal Flat South of Marvin Key



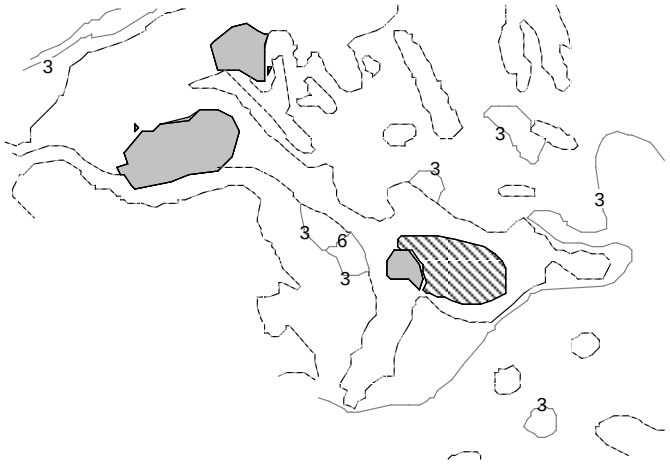
Boundaries shown are approximate.

Type of Restriction

No Access Buffer

Low Water Line

Bathymetry is in feet.



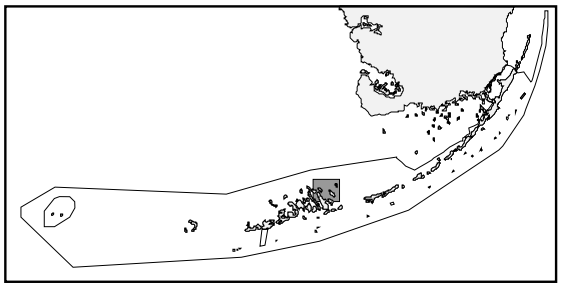
N

500 Meters

Description

The tidal flats south of Marvin Key cover one to two acres and are inundated at high tide. Marvin Key is located east of Mud Keys, approximately 25 kilometers northeast of Key West. Large numbers of resting shorebirds use the flats. ***Restriction: A no-access buffer zone is created to protect birds resting on the flats.*** Vessels and people will be prevented from entering the flats.

Wildlife Management Areas: Upper Harbor Key, East Content Keys



Boundaries shown are approximate.

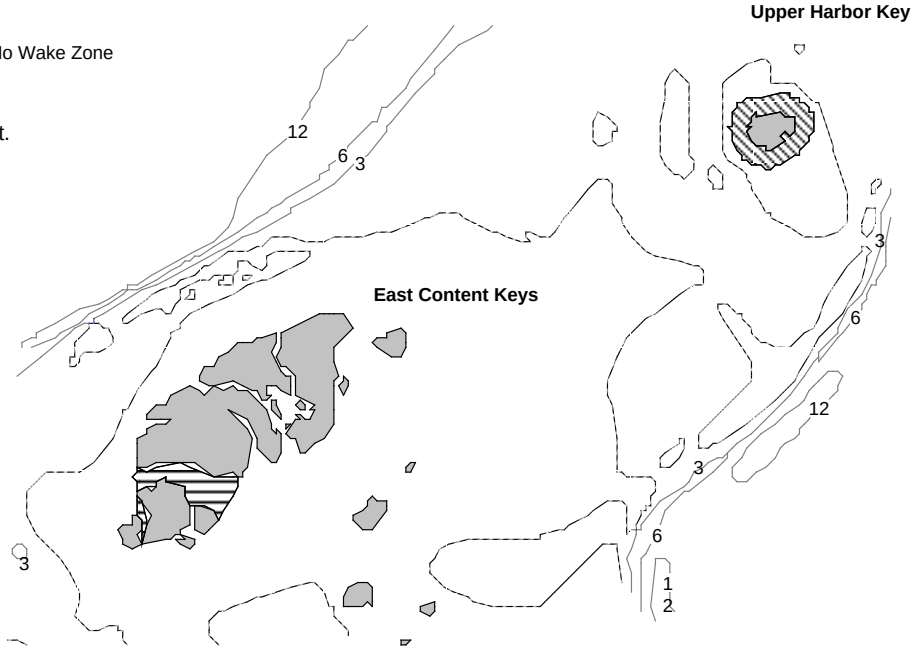
Type of Restriction

No Access Buffer

Idle Speed Only/No Wake Zone

Low Water Line

Bathymetry is in feet.



N

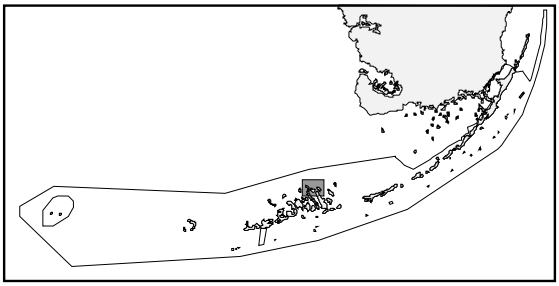
500 Meters

Description

Upper Harbor Key is a mangrove island approximately 35 kilometers northwest of Marathon that is surrounded by flats but is accessible at high tide. It is a premier area for wading birds. The island is used by various bird species including ospreys, frigatebirds, double-crested cormorants, and wading birds. ***Restriction: A 300-foot (91m) no-access buffer zone is created around the island.*** Vessel traffic will be prevented from approaching the island.

The East Content Keys are approximately 40 kilometers northwest of Marathon. These islands, which are located east of Content Passage, are dissected by several shallow tidal creeks and are inaccessible to most vessels at low tide. Herons and white ibises use the interior tidal creeks. ***Restriction: Idle-speed only/no wake zones are created in the tidal creeks.*** Impacts from shallow-draft boats will be decreased.

Wildlife Management Areas: West Content Keys, Little Crane Key



Boundaries shown are approximate.

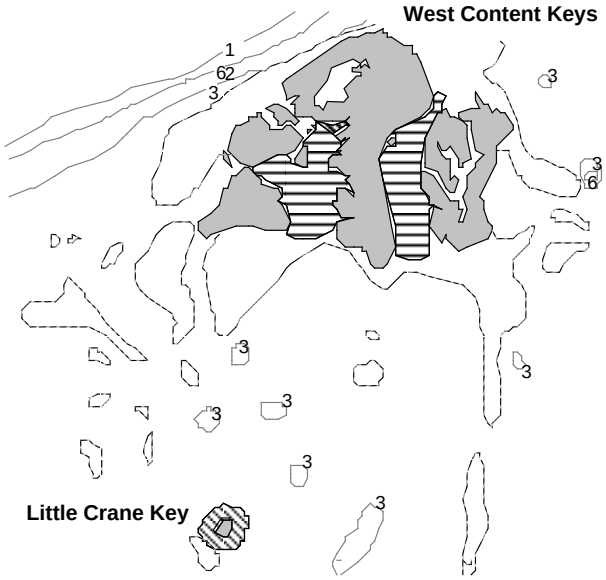
Type of Restriction

No Access Buffer

Idle Speed Only/No Wake Zone

Low Water Line

Bathymetry is in feet.



N

500 Meters

Description

The West Content Keys lie approximately 40 kilometers northwest of Marathon, north of Little Crane Key. These islands, west of Content Passage, are accessible at high tides. Broad, shallow tidal creeks dissect the area, and nesting ospreys and wading birds inhabit the islands. ***Restriction: Idle-speed only/no wake zones are established in selected tidal creeks, and a no-access buffer zone in one cove.*** There will be decreased impacts from vessels using the tidal creeks.

Little Crane Key is a very small island between the Content Keys and Raccoon Key, approximately 40 kilometers northwest of Marathon. One side of the island has been eroded by storms. The island contains a large frigatebird roost and nesting areas for great egrets and double-crested cormorants. ***Restriction: A 300-foot (91m) no-access buffer zone is placed around the island.*** The buffer zone will displace vessel traffic and divers.

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Mooring Buoy Action Plan

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Acronyms

Acronym	Meaning
ACSC	Areas of Critical State Concern
AICUZ	Air Installation Compatible Use Zones
APPS	Act to Prevent Pollution from Ships
ARPA	Archaeological Resources Protection Act
ASA	Abandoned Shipwreck Act
ATBAs	Areas to be Avoided
ATCA	Atlantic Tuna Convention Act
AWT	Advanced Wastewater Treatment
BMES	Bureau of Marketing and Extension Services
BMRRD	Bureau of Marine Resource Regulation and Development
BP	Before Present
BRD	Bycatch Reduction Devices
LP	Bureau of Submerged Lands and Preserves
BSRR	Bureau of Sanctuaries and Research Reserves
CAA	Clean Air Act
CARL	Conservation and Recreation Lands
CBRA	Coastal Barrier Resources Act of 1972
CBRS	Coastal Barrier Resources System
CCC	Coastal Coordinating Council (Florida)
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CDP	Census Designated Place
CFR	Code of Federal Regulations
CMWG	Channel Marking Working Group
CSA	Continental Shelf Associates
CWA	Clean Water Act
CZM	Coastal Zone Management
CZMA	Coastal Zone Management Act of 1972
DARRF	Damage Assessment and Restoration Revolving Fund
DBS	Division of Beaches and Shores
DCA	Department of Community Affairs
DEIS/MP	Draft Environmental Impact Statement/Management Plan
DEMA	Dive Equipment Manufacturers Association
DMR	Department of Marine Resources (Monroe County)
DO	Dissolved Oxygen
DRI	Development of Regional Impact
EIS	Environmental Impact Statement
EMAP	Environment Monitoring and Assessment Program
ENP	Everglades National Park
EPA	Environmental Protection Agency
ESA	Endangered Species Act
F.S.	Florida Statutes
FAA	Federal Aviation Act of 1958
FAC	Florida Administrative Code
FAP	Federal Archaeological Program
FCD	Flood Control District
FCMP	Florida Coastal Management Program
FCREPA	Florida Committee on Rare and Endangered Plants and Animals
FCRES	Florida Committee on Rare and Endangered Species
FDA	Florida Department of Agriculture
FDACS	Florida Department of Agriculture and Consumer Services

Acronym	Meaning
FDBS	Florida Division of Beaches and Shores
FDCA	Florida Department of Community Affairs
FDEP	Florida Department of Environmental Protection
FDHR	Florida Division of Historical Resources
FDHRS	Florida Department of Health and Rehabilitative Services
FDMR	Florida Division of Marine Resources
FDEP	Florida Department of Environmental Protection
FDER	Florida Department of Environmental Regulation
FDNR	Florida Department of Natural Resources
FDOC	Florida Department of Commerce
FDOI	Florida Department of the Interior
FDOS	Florida Department of State
FDOT	Florida Department of Transportation
FDRP	Florida Division of Recreation and Parks
FDSL	Florida Division of State Lands
FEIS	Final Environmental Impact Statement
FGFWFC	Florida Game and Fresh Water Fish Commission
FDHRS	Florida Department of Health and Rehabilatative Services
FDMR	Florida Division of Marine Resources
FIO	Florida Institute of Oceanography
FIRE	Finance, Insurance, and Real Estate Trades
FKAA	Florida Keys Aqueduct Authority
FKARA	Florida Keys Artificial Reef Association
FKNMS	Florida Keys National Marine Sanctuary
FKNMSPA	Florida Keys National Marine Sanctuary and Protection Act
FMFC	Florida Marine Fisheries Commission
FMP	Florida Marine Patrol
FMP	Fishery Management Plan
FMRI	Florida Marine Research Institute
FNAI	Florida Natural Areas Inventory
FPS	Florida Park Service
FWIA	Fish and Wildlife Improvement Act
FWS	Fish and Wildlife Service (U.S. Dept. of Interior)
GDM	General Design Memorandum
GIS	Geographic Information System
GPS	Global Positioning System
HAPC	Habitat Area of Particular Concern
HAZMAT	Hazardous Materials
IMC	Interagency Management Committee
ITQ	Individual Transferrable Quota
JPCRSP	John Pennekamp Coral Reef State Park
LA	Lacey Act
LATF	Land Acquisition Trust Fund
LEO	Law Enforcement Officer
LKNMS	Looe Key National Marine Sanctuary
MBTA	Migratory Bird Treaty Act
MCMCD	Monroe County Mosquito Control District
MFCMA	Magnuson Fishery Conservation and Management Act
MMPA	Marine Mammal Protection Act
MMS	Minerals Management Service
MOA	Memoranda of Agreement
MOU	Memoranda of Understanding
MPPRCA	Marine Plastic Pollution Research and Control Act of 1987
MPRSA	Marine Protection, Research, and Sanctuaries Act

Acronym	Meaning
NCP	National Contingency Plan
NDP	Natural Disaster Planning
NEPA	National Environmental Policy Act
NERR	National Estuarine Research Reserve
NFWF	National Fish and Wildlife Foundation
NGOs	Nongovernmental Organizations
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NMS	National Marine Sanctuary
NMSA	National Marine Sanctuaries Act
NOAA	National Oceanic and Atmospheric Administration
NOS	National Ocean Service (NOAA)
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NPS	Nonpoint Source
NURC	National Underwater Research Center
OCRM	Office of Ocean and Coastal Resource Management
OCS	Outer Continental Shelf
OCSLA	Outer Continental Shelf Lands Act
ODA	Ocean Dumping Act of 1972
OFMAS	Office of Fisheries Management and Assistance Services
OFW	Outstanding Florida Water
ONRW	Outstanding Natural Resource Waters
OPA	Oil Pollution Act of 1990
OPS	Office of Protected Species
ORCA	Office of Ocean Resources Conservation and Assessment (NOAA)
OSDS	On-site Disposal System
OSP	Optimum Sustainable Population
PADI	Professional Association of Dive Instructors
PAED	Planning Analysis Area/Enumeration District
PL	Public Law
PRP	Potentially Responsible Parties
PSA	Public Service Announcement
PSD	Prevention of Significant Deterioration Provisions
PWSA	Port and Waterways Safety Act
RHA	Rivers and Harbors Act
SAV	Submerged Aquatic Vegetation
SCR	Submerged Cultural Resources
SEA	Strategic Environmental Assessments Division (ORCA, NOAA)
SEFSC	Southeast Fisheries Science Center
SFRC	South Florida Research Center
SFWMD	South Florida Water Management District
SHPO	State Historic Preservation Officer
SLA	Submerged Land Act of 1953
SOC	Save Our Coasts
SOR	Save Our Rivers
SPAs	Sanctuary Preservation Areas
SPF	Standard Project Flood
SPL	Saltwater Products License
SRD	Sanctuaries and Reserves Division (OCRM, NOAA)
SRS	Shark River Slough
SWD	Solid Waste Disposal

Acronym	Meaning
SWIM	Surface Water Improvement and Management Act
SWM	Stormwater Management
TDC	Tourism Development Council
TNC	The Nature Conservancy
TSRP	Taylor Slough Rainfall Plan
UIC	Underground Injection Control
ULV	Ultra Low Volume
UNCW	University of North Carolina, Wilmington
USACE	United States Army Corps of Engineers
USCG	United States Coast Guard
USDOC	United States Department of Commerce
USDOI	United States Department of the Interior
USDOS	United States Department of State
USDOT	United States Department of Transportation
USGS	United States Geological Survey
VTSS	Vessel Traffic Separation Schemes
WCAs	Water Conservation Areas
WQBELs	Water Quality Based Effluent Limitations
WWTP	Wastewater Treatment Plant

Glossary of Technical Terms

accretion- growth or increase in size by gradual external addition

ad valorem- according to value; imposed at a rate percent of the value as stated in an invoice

ahermatypic- non reef-building corals

anaerobic- capable of living or growing in an environment lacking free oxygen

annelids- any of various worms with cylindrical segmented bodies

aquaculture- the cultivation of marine life for harvest and utilization by humans

arboreal- relating to, or like, a tree; in referring to species, those that inhabit or frequent trees

ascidians- “sack-like” tunicates; animals in which the larval stage resembles a tadpole but the adult is sedentary and sack-like (e.g. sea squirts)

backcountry- primarily referring to the Florida Bay area of the Keys' islands and waterways

bathymetry- water depth measurement information used to produce depth-contoured charts

benthic communities- bottom-dwelling flora and fauna

Bermuda/Azores high- the subtropical anticyclone positioned over the southern Atlantic Ocean in the Northern Hemisphere; it is most pronounced in spring and summer

bioherm- a mound, dome, or reef-like structure built up by, and composed almost exclusively of, the remains of sedentary organisms, such as corals, algae, or molluscs

biota- animal or plant life of a region considered as a total ecological entity

block-faulted- a type of normal faulting in which the Earth's crust is divided into structural or fault blocks of different elevations and orientations

calcareous- containing characteristics of calcium carbonate, calcium, or limestone

capital facilities- those buildings and structures required for the provision of public services

Carolinian- refers to organisms and physical characteristics of the southeastern U.S. coastline

Census Designated Place- closely settled communities without corporate limits or status

common property resources- resources that are not exclusively controlled by a single agent or source. Access to such resources is not restricted, and therefore the resources can be exploited on a first-come, first-served basis

convective storm- storm characterized by vertically rising air

corallimorphs- false corals

coralline- any animal related to or resembling corals

crenulated (corals)- corals having tiny notches or scallops

crinoids- “sea lilies”; echinoderms that are suspension feeders with jointed arms and appendages that give a feathery appearance resembling a plant

cyclonic storms/systems- a windstorm with a violent whirling movement; a system of rotating winds over a vast area, spinning inward to a low pressure center (counterclockwise in the northern hemisphere) generally causing stormy weather

defaunated- indigenous animals are removed from a particular area

desiccation- removal of moisture; drying out

detrital- the accumulation of disintegrated material

diurnal- pertaining to or occurring in a day or each day; daily

downzoning- the practice of rezoning a parcel or parcels in a “lower” or more restrictive zoning category (e.g., a rezoning from multifamily residential to single-family residential) is considered downzoning; downzonings are often part of a growth management program employed when communities find that they have overzoned for the population growth which is desired

downwelling- a reverse vertical flow of water, moving from the ocean's surface to great depths; occurs at oceanic convergences

echinoderms- radially symmetrical animals that are exclusively marine and possess a spiny skin and a system of water filled canals that aids in feeding and locomotion. (e.g., sea urchins, sand dollars, and sea cucumbers)

endangered species- a species in danger of becoming extinct that is protected by the Endangered Species Act

endemic- restricted to or native to a particular area or region

epibenthic- organisms that live on the surface of a substrate, including motile organisms such as gastropods, sea urchins, sea stars, sea cucumbers, sea biscuits, and a wide variety of crustacea

epifauna- animals that live on the ocean bottom, either attached or moving freely over it

epiphytic- any organisms that grow on the blades of seagrasses, including algae, diatoms, and other encrusting organisms

eutrophication- the process by which nutrient-rich waters bring about a high level of biological productivity that may ultimately lead to reduced dissolved oxygen levels

fauna- animal life of a particular region

flora- plant life of a particular region

Florida Current- the segment of current between the Gulf of Mexico Loop Current and the Gulf Stream from the Dry Tortugas to the Southeastern tip of Florida, and confined by the 250-meter and 500-meter isobaths

Florida reef tract- the third largest barrier reef in the world, running from the Miami area southwest to the Dry Tortugas

Floridan Aquifer- the rock mass of South Florida that contains groundwater

foraminifera- an order of planktonic and benthic protozoans having a calcareous shell; perforations through which numerous pseudopodia protrude

gastropods- "Stomach footed" class of molluscs that have only one shell and usually move about on a muscular "foot" (e.g., snail, slug, cowry, limpet)

gorgonian- a type of octocoral (soft coral) commonly found in southeast Florida reefs at depths less than 30 meters; they include sea fans, sea plumes, sea whips, and sea rods

Gulf of Mexico Loop Current- major surface current in the Gulf of Mexico; enters through Yucatan Straits, flows clockwise into the east central portion of the Gulf, and exits through the Straits of Florida becoming the Florida current and eventually the Gulf Stream

gyre- circular spiral form; used mainly in reference to the circular motion of water in major ocean basins centered in the subtropic high-pressure regions

halophytic- type of plant that can survive in saltwater environments

Holocene Era- designating the present epoch of geologic time

hookah- an underwater breathing apparatus that supplies air to one or more divers through hoses attached to a compressor located on the surface

hot spot- an area of actual or potential trouble

hydrography- the study, description, and mapping of oceans, lakes, and rivers with an emphasis on navigation

hydrology- the science dealing with the nature, distribution, and movement of water on and below the Earth's surface

hydroperiod- hydrologic conditions that contribute to seasonally elevated surficial and groundwater flow conditions

incorporated lands- land areas under the jurisdiction of a municipal government; in Monroe County there are three incorporated areas: the cities of Key West, Layton, and Key Colony Beach; all other areas in the Keys fall under Monroe County's jurisdiction

infaunal- organisms that live buried in sediments, including a variety of polychaetes, burrowing crustaceans, and molluscs

infrastructure- basic installations and facilities, such as roads, power plants, transportation, and communication systems

iron-pile lighthouse- a lighthouse built on iron pilings that are threaded like a screw; the piling legs are screwed into the surface; this design allows water to pass through during storms

isobath- line connecting points of equal depth

keystone species- a single species whose activities determine community structure; a species whose presence is critical to that community

lithology- the scientific study of rocks usually with the unaided eye or little magnification

live rock- rock to which living marine organisms are attached

Lower Keys- that part of incorporated Monroe County south and/or west of the Seven Mile Bridge (i.e., Little Duck, Missouri and Ohio Keys, Bahia Honda, West Summerland/Spanish Harbor, and south to Stock Island)

mailboxes- propeller-wash device treasure hunters use to blow sediment away from wrecks buried beneath the seabed

management alternative- a bundle of management strategies that, when employed together, represent the means for achieving a desired level of protection within the Sanctuary

management strategy- an action or physical measure taken to address a specific issue; a management strategy is combined with an implementation incentive or mechanism to induce behavior; an institutional arrangement with authority to act; and a financing scheme to support the costs of implementation

Middle Keys- that part of unincorporated segment of Monroe County between Seven Mile Bridge and Whale Harbor Bridge (i.e., Islamorada, Upper and Lower Matecumbe, Fiesta Key, Long Key, Conch Key, Walkers Island, Duck Key, Fat Deer Key, Marathon, and Pigeon Key)

military exclusion area- a region or tract reserved for military uses, where unauthorized persons may not enter

National Register of Historic Places- a congressionally authorized register of historically significant places, and or objects that receive protection from alteration or demolition under law; alterations are subject to Historic Preservation Council approval and must not significantly change the character or associations of the place or object in question

nektonic- highly motile organisms, such as fishes and squids that live in, or above, the seagrass canopy

nonpoint source pollutant discharges- those pollutant discharges not associated with a specific location (e.g., urban and agricultural pesticide runoff)

nutrients- any number of organic or inorganic compounds used by plants in primary production (typically nitrogen and phosphorous)

octocorals- coral type that includes sea plumes, sea whips, gorgonians, and soft corals

oolitic- made of a limestone composition consisting of many small grains of carbonate of lime cemented together

patch reef- small circular or irregular reefs that arise from the floor of lagoons, behind barrier reefs, or within an atoll

pathogens- any agent, most commonly a microorganism, capable of causing disease

personal watercraft- a shallow-draft, jet drive watercraft on which the operator sits, kneels, or stands; excludes those vehicles piloted from inside the craft

planktonic- organisms dependent on water movement and currents as their means of transportation, including phytoplankton, zooplankton, and ichthyoplankton

Planning Analysis Area/Enumeration District- aggregated subcounty areas used as a framework for compiling and analyzing census data; aggregated into three areas: Lower, Middle, and Upper Keys

Pleistocene epoch- the first epoch of the Quaternary Period of the Cenozoic Era, beginning approximately 10,000 years ago; characterized by major worldwide climatic fluctuations, the spreading and recession of continental ice sheets with concomitant rise and fall of sea levels, and the appearance of modern humans

point source pollutant discharges- the discharge of pollutants from a distinct and identifiable source, such as a sewer or industrial outfall pipe

polychaeta- class of annelid worms that includes bristle and feather duster worms

potable water- water that is safe to drink

puerulus- the transitional swimming stage of the spiny lobster

seasonal population- any group of organisms of the same species that occupy a given space at a particular time of year (defined as winter, spring, summer, fall, wet, or dry)

sessile- immobile organisms that are permanently fixed to the substrate

sheet flow- surface water runoff

slough- swamp bog or marsh; especially one that is part of an inlet or backwater

solution holes- depression in the Earth's surface caused by dissolving of substrate composed primarily of calcium carbonate

southwest continental shelf- the submerged shelf of land that slopes gradually from the exposed edge of the continent for a variable distance to the point where the steep descent to the ocean floor begins

spur and groove- coral formation endemic to fringing or bank reefs; spurs are usually composed of a framework or *Acropora palmata* that form ramparts protruding at right angles to the axis of the reef and projecting into the prevailing wind pattern; the spaces between the spurs are sand channels referred to as grooves

storm surge- water elevation change due especially to tropical or extratropical storms

threatened species- plant or animal species believed likely to move into the endangered category in the near future if causal factors at work continue to persist

tourism units- hotel/motel rooms, sites for camping and recreational vehicles, and vacation rentals

toxicant- a poisonous or toxic substance

turbid- the state of being clouded, opaqued, or obscured by suspended sediment

unincorporated lands- lands not under the jurisdiction of (and not receiving services from) a town or city

Upper Keys- that part of unincorporated portion of Monroe County north of Whale Harbor Bridge; geologically, the segment of the Keys comprised of exposed Miami Limestone substrate; includes the area from Marathon to Soldier Key

vascular- typically describes tubular structures involved in fluid transport

viviparous- bearing or bringing forth live young, as with most mammals

zoanthids- generally small anemone; may be colonial or solitary, and both symbiotic and free-living; the most common on the Florida reef tract is *Palythoa caribbea*, referred to as "golden sea mat"

zone- an area or region considered as separate and distinct from others because of its designated use, plant or animal life, etc.

zoning- the act of partitioning areas of land or water into sections dedicated to specific purposes and activities

Metric Conversion Table

Linear Measurement

1 foot
= 0.3048 meter

1 meter
= 3.28084 feet
= 0.001 kilometer

1 kilometer
= 1,000 meters
= 0.621371 statute mile

1 statute mile
= 5,280 feet
= 1.60934 kilometers
= 0.8689 nautical mile

1 nautical mile
= 6,076.12 feet
= 1.852 kilometers
= 1.15078 statute miles

Area Measurement

1 acre
= 43,560 square feet
= 4,046.86 square meters
= 0.404686 hectare
= 0.0015625 square statute mile

1 hectare
= 2.47105 acres
= 10,000 square meters
= 0.01 square kilometer
= 0.003861 square statute mile

1 square kilometer
= 247.105 acres
= 100 hectares
= 0.386102 square statute mile

1 square statute mile
= 640 acres
= 258.999 hectares
= 2.58999 square kilometers
= 0.755 square nautical mile

1 square nautical mile
= 847.5443 acres
= 3.43 square kilometers
= 1.324288 square statute miles

Mass Measurement

1 pound
= 0.002 ton
= 0.453592 kilogram

1 ton
= 2,000 pounds
= 0.907185 metric ton

1 kilogram
= 2.20462 pounds
= 0.001 metric ton

1 metric ton
= 2,240 pounds
= 1.10231 tons

Unit Abbreviations

foot	(ft)
hectare	(ha)
kilometer	(km)
meter	(m)
nautical mile	(nmi)
pound	(lb)
square kilometer	(km^2)
square meter	(m^2)
square nautical mile	(nmi^2)
square statute mile	(mi^2)
statute mile	(mi)

Federal Register

Thursday
June 12, 1997

Part II

Department of Commerce

National Oceanic and Atmospheric Administration

15 CFR Parts 922, 929, and 937

Florida Keys National Marine Sanctuary Regulations; Final Rule

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

15 CFR Parts 922, 929, and 937

[Docket No. 9607292–6192–03]

RIN 0648–AD85

Florida Keys National Marine Sanctuary Final Regulations

AGENCY: Office of Ocean and Coastal Resource Management (OCRM), National Ocean Service (NOS), National Oceanic and Atmospheric Administration (NOAA), Department of Commerce.

ACTION: Notice of effective date; modifications to final rule.

SUMMARY: Pursuant to the Florida Keys National Marine Sanctuary and Protection Act and the National Marine Sanctuaries Act, NOAA developed the comprehensive final management plan for the Florida Keys National Marine Sanctuary (FKNMS or the Sanctuary). NOAA issued final regulations on January 30, 1997, to implement that plan and govern the conduct of activities within the Sanctuary. Congress and the Governor of the State of Florida (Governor) had forty-five days of continuous session of Congress beginning on the day on which the final regulations were published to review those regulations and management plan. After the forty-five day review period, the regulations would become final and take effect, except that any term or terms of the regulations or management plan the Governor certified to the Secretary of Commerce as unacceptable would not take effect in the area of the Sanctuary lying within the seaward boundary of the State.

During the forty-five day review period the Governor submitted to the Secretary of Commerce a certification that implementation of the management plan and certain regulations were unacceptable unless specific amendments were made to the regulations. In response to the Governor's certification, NOAA amended those regulations certified as unacceptable to incorporate the Governor's changes. Consequently, upon their effective date the regulations, as modified by this notice, and management plan, in their entirety, will apply throughout the Sanctuary, including within State waters of the Sanctuary.

This notice amends the regulations published in the January 30, 1997, **Federal Register**, in response to the Governor's certification, and announces the effective date of the regulations.

EFFECTIVE DATE: The final rule published on January 30, 1997, at 62 FR 4578 and the revision of 15 CFR part 922, subpart P in this document are effective July 1, 1997.

ADDRESSES: Requests for a copy of the FMP/EIS, the Final Regulatory Flexibility Analysis, or the Federalism Assessment should be submitted to the Sanctuary Superintendent, Florida Keys National Marine Sanctuary, P.O. Box 500368, Marathon, Florida 33050.

FOR FURTHER INFORMATION CONTACT: Billy Causey, Sanctuary Superintendent, 305/743–2437 or Edward Lindelof, East Coast Branch Chief, Sanctuaries and Reserves Division, 301/713–3137 Extension 131.

SUPPLEMENTARY INFORMATION:

I. Introduction

The FKNMS was designated by an act of Congress entitled the Florida Keys National Marine Sanctuary and Protection Act (FKNMSPA, Pub.L. 101–605) which was signed into law on November 16, 1990. The FKNMSPA directed the Secretary of Commerce to develop a comprehensive management plan and regulations for the Sanctuary pursuant to sections 303 and 304 of the National Marine Sanctuaries Act (NMSA) (also known as Title III of the Marine Protection, Research, and Sanctuaries Act of 1972), as amended, 16 U.S.C. 1431 *et seq.* The NMSA authorizes the development of management plans and regulations for national marine sanctuaries to protect their conservation, recreational, ecological, historical, research, educational, or aesthetic qualities.

The authority of the Secretary to designate national marine sanctuaries and implement designated sanctuaries was delegated to the Under Secretary of Commerce for Oceans and Atmosphere by the Department of Commerce, Organization Order 10–15, § 3.01(z) (Jan. 11, 1988). The authority to administer the other provisions of the NMSA was delegated to the Assistant Administrator for Ocean Services and Coastal Zone Management of NOAA by NOAA Circular 83–38, Directive 05–50 (Sept. 21, 1983, as amended).

II. Forty-Five Day Review Period Under the National Marine Sanctuaries Act

NOAA published the final Sanctuary regulations on January 30, 1997, (62 FR 4578) to implement the management plan and govern the conduct of activities within the Sanctuary. Under the NMSA, Congress and the Governor had forty-five days of continuous session of Congress beginning on the day on which the final regulations were published to review the terms of designation (i.e., management plan and regulations). After forty-five days, the regulations would become final and take effect, except that any term or terms the Governor certified within the forty-five day period to the Secretary of Commerce as unacceptable would not take effect in the area of the Sanctuary lying within the seaward boundary of the State. Congress could also act on the terms of designation. The following discusses the Governor and Congress' actions during the forty-five day period and corresponding modifications to the final regulations made by NOAA in response to those actions.

Certification by the Governor of Florida

On March 20, 1997, during the forty-five day review period under the NMSA, the Governor of the State of Florida certified by letter to the Secretary of Commerce that implementation of the management plan and certain regulations were unacceptable in State waters. However, the management plan and regulations certified as unacceptable would be acceptable if NOAA amended the regulations and the Co-Trustees Agreement for Cooperative Management (Co-Trustees Agreement), contained in the management plan, as requested in the Governor's certification letter. NOAA has amended the regulations and the Co-Trustees Agreement to incorporate the modifications requested by the Governor in his letter. By doing so, the regulations and management plan, as modified, are accepted by the Governor and, therefore, will apply within State waters of the Sanctuary upon the effective date of these regulations.

The following is the text of the March 20, 1997, letter from the Governor of Florida to the Secretary of Commerce. Per the Governor's request, the letter is followed by the text of the Resolution passed by the Board of Trustees of the Internal Improvement Trust Fund of the State of Florida (Board of Trustees). The Resolution was adopted on January 28, 1997, and provides the basis for many of the items in the Governor's certification.

Lawton Chiles

Governor

State of Florida

Office of the Governor

The Capitol

Tallahassee, Florida 32399–0001

March 20, 1997.

Honorable William M. Daley, Secretary,
United States Department of Commerce,
Herbert C. Hoover Building, 14 Street
and Constitution Avenue Northwest,
Washington, DC 20230.

Dear Mr. Secretary:

On January 28, 1997, the Florida Cabinet and I, sitting as the Board of Trustees of the Internal Improvement Trust Fund, adopted a resolution to include state sovereign submerged lands within the boundary of the Florida Keys National Marine Sanctuary (FKNMS). It is our intention to create a partnership with the National Oceanic and Atmospheric Administration (NOAA) for management under the provisions of the FKNMS Management Plan and the Memoranda of Agreement included in the management plan, with certain conditions to be applied to the portions of the sanctuary within Florida Territorial Waters. A copy of the resolution is enclosed. We request that the resolution be placed in the preamble to the final notice for the FKNMS regulations.

In accordance with subsection 304(b)(1) of the National Marine Sanctuaries Act and that resolution, the following terms are certified as unacceptable in state waters:

1. Sanctuary fees for allowed public uses unless first approved by the Board of Trustees of the Internal Improvement Trust Fund of the State of Florida.

2. Sanctuary emergency regulations unless and until first approved by the Governor. Accordingly, the following sentence shall be added to section 922.165 CFR as published January 30, 1997: ''Emergency regulations shall not take effect in Florida territorial waters until approved by the Governor of the State of Florida.''

3. Requirements for governmental entities within the state, including but not limited to the State of Florida and Monroe County, to provide funding for the implementation of sanctuary regulations or other actions.

4. Sanctuary fisheries regulations unless established by the Florida Marine Fisheries Commission following promulgation under the provisions of section 370.025(2), F.S. (1995), which requires public input and final approval by the Board of Trustees of the Internal Improvement Trust Fund of the State of Florida. Accordingly, the following sentence shall be added to section 922.42 CFR as published January 30, 1997: ''Any fishery regulations in the Florida Keys National Marine Sanctuary shall not take effect in Florida Territorial Waters until established by the Florida Marine Fisheries Commission.''

5. Sanctuary regulation of discharging or depositing, from beyond the boundary of the Sanctuary, any material or other matter that subsequently enters the Sanctuary and injures a Sanctuary resource or quality, if the discharging or depositing is authorized under Monroe County land use permits or under state permits. Accordingly, 15 CFR section 922.163(a)(4)(ii), concerning prohibited activities, shall be amended to read as follows: ''Discharging or depositing, from beyond the boundary of the Sanctuary, any material or other matter that subsequently enters the Sanctuary and injures a Sanctuary resource or quality, except those listed in paragraph (a)(4)(I) (A) through (D) of this section and those authorized under Monroe County land use permits or under state permits.''

6. The implementation of any additional ecological reserves or any other type of zoning or regulation unless first approved by the Board of Trustees. Accordingly, the following provision shall be added to 15 CFR section 922.163 as published January 30, 1997: ''(h) Any amendment to these regulations shall not take effect in Florida Territorial Waters until approved by the Board of Trustees of the Internal Improvement Trust Fund of the State of Florida;'' and the following provision shall be added to 15 CFR section 962.164: ''(f) Additional wildlife management areas, ecological reserves, sanctuary preservation areas, or special use areas, and additional restrictions in such areas, shall not take effect in Florida Territorial Waters unless first approved by the Board of Trustees of the Internal Improvement Trust Fund of the State of Florida.''

7. Implementation of the management plan in its entirety unless the Co-Trustees agreement is amended to provide as follows:

a. The Florida Department of Environmental Protection (FDEP) employee who has been designated by the Secretary of FDEP and confirmed by the Board of Trustees shall represent the Board of Trustees as an equal partner to work in consultation with the Sanctuary superintendent for the oversight of Sanctuary operations.

b. The FDEP and NOAA shall manage the FKNMS through a cooperative partnership and consult on all management activities throughout the Sanctuary. The intent of this partnership is that the final resolution of any management issues resulting in policy conflicts between the state and NOAA shall be decided by the managing partners consistent with state and federal laws.

c. The state reserves the right to initiate proposed changes to the plan, and NOAA, if necessary, shall initiate the federal rule promulgation process required to make revisions to sanctuary regulations requested by the Board of Trustees.

d. Section 304(e) of the National Marine Sanctuary Act requires the Secretary of Commerce to review the management plan and regulations for the Sanctuary every five years, evaluate the substantive progress toward implementing the management plan and goals for the Sanctuary; especially the effectiveness of site-specific management techniques, and revise the management plan and regulations as necessary to fulfill the purposes and policies of the Act. When the management plan and regulations for the FKNMS are re-evaluated, the Secretary of Commerce will re-propose the management plan and regulations in their entirety and the State of Florida will have the opportunity to review the management plan and regulations, in their entirety, and indicate if any or all of the terms are unacceptable, in which case the unacceptable terms shall not take effect in state waters.

Accordingly, the following provisions shall be added to 15 CFR section 922.160: ''Section 304(e) of the NMSA requires the Secretary to review management plans and regulations every five years, and make necessary revisions. Upon completion of the five year review of the Sanctuary management plan and regulations, the Secretary will repropose the regulations in their entirety with any proposed changes thereto, including those regulations in subparts A and E of this part that apply to the Sanctuary. The Governor of the State of Florida will have the opportunity to review the re-proposed regulations before they take effect and if the Governor certifies such regulations as unacceptable, they will not take effect in State waters of the Sanctuary.''

We also call to your attention the now erroneous reference in section 922.166(b)(2)(iii) to the Submerged Cultural Resources Agreement contained in Volume 1 of the management plan. We suggest striking that reference. The final agreement is that considered by the Board of Trustees on January 28, 1997 and executed by the signatory parties.

We believe that implementation of the plan provides balanced, common sense protection of this fragile, unique and endangered marine treasure and advances the state and federal commitment to jointly manage these resources. We look forward to that continuing relationship.

With kind regards, I am

Sincerely,

Lawton Chiles

LC/khw/mlp

Enclosure

cc: Honorable Frank Brogan
Honorable Bob Butterworth
Honorable Bob Crawford
Honorable Debbie Horan
Honorable Bob Milligan
Honorable Sandra Mortham
Honorable Bill Nelson

Resolution

WHEREAS, the United States Congress passed the Florida Keys National Marine Sanctuary and Protection Act (PL 101–605, ''the Act'') to protect the unique and invaluable natural and cultural resources of the Florida Keys; and

WHEREAS, the President of the United States signed this legislation into law on November 16, 1990; and

WHEREAS, the Florida Keys National Marine Sanctuary (FKNMS) boundary encompasses 2800 square nautical miles of the Atlantic Ocean, Gulf of Mexico, and Florida Bay, of which approximately 65% is Florida state territorial waters; and

WHEREAS, the Board of Trustees of the Internal Improvement Trust Fund (''the Board of Trustees'') is vested with the authority and charged with the responsibility for the acquisition, administration, management, control, supervision, conservation, protection, and disposition of

all state lands, including sovereignty submerged lands, as set forth in Chapter 253, Florida Statutes; and

WHEREAS, upon enactment of the Act, the Board of Trustees resolved on December 16, 1990, to include state waters within the sanctuary boundary under certain specified conditions; and

WHEREAS, the Florida Coastal Resources Interagency Management Committee resolved in February of 1991 to include appropriate state representation in the Florida Keys National Marine Sanctuary Management Plan development process; and

WHEREAS, an ''Interim Memorandum of Agreement'' was executed on September 15, 1992, between the National Oceanic and Atmospheric Administration (NOAA) and Board of Trustees specifying the conditions under which state sovereign submerged lands were to be included in the Sanctuary and managed during the management plan development process; and

WHEREAS, the management plan development period was extended to six years to provide the maximum opportunity for participation by all segments of government, industry, and the citizens of Florida and the United States; and

WHEREAS, Memoranda of Agreement to manage the marine ecosystem of the Florida Keys through a cooperative partnership have been developed and included in the management plan, including the:

(1) Interagency Compact Agreement

(2) Co-Trustees Agreement for Cooperative Management

(3) Submerged Cultural Resources Agreement

(4) Cooperative Enforcement Agreement

(5) Agreement for Coordination of Civil Claims

(6) Protocol for Cooperative Fisheries Management

(7) Protocol for Emergency Response Notification

(8) Certification/Authorization of Permits Agreement

(9) Water Quality Program Steering Committee By-laws; and

WHEREAS, the citizens and government of the State of Florida have expressed continuing interest in issues not specifically addressed or resolved in the management plan or memoranda of agreement relating to the:

(1) Imposition of fees for public use of the marine resources;

(2) Disposition of funds recovered from natural resource damage claims;

(3) Imposition of emergency regulations on state sovereign submerged lands;

(4) Obligation of governmental entities, including the State of Florida, to implement the regulations of the management plan without having been allocated additional funding for that specific purpose;

(5) Promulgation of federal fisheries regulations that are more restrictive than those established by the Florida Marine Fisheries Commission under Florida statutory authority;

(6) Imposition of restrictions on the use of adjacent uplands exceeding those established by the State of Florida;

(7) Purpose, goals and measures of success associated with the Western Sambos Ecological Reserve;

(8) Parity of state and federal management authority for the implementation and ongoing operations of the FKNMS;

(9) Prospects of designating additional ecological reserves in the future as proposed in the draft management plan;

(10) Periodic evaluation of the effectiveness of the sanctuary management plan in the protection and preservation of the marine resources of the Florida Keys;

(11) Resolution of differences between the respective government agencies with Sanctuary management authority for the State of Florida and the United States of America;

(12) Right of the State to initiate changes to the plan;

(13) Article V of the Designation Document; and

(14) Right of the State to revisit the plan and regulations in their entirety.

NOW, THEREFORE, BE IT RESOLVED that the sovereign submerged lands of the State of Florida located within the boundaries of the Florida Keys National Marine Sanctuary, as specified by the United States Congress in PL 101–605, are hereby included in the Sanctuary for management in partnership between the Board of Trustees and NOAA under the provisions of: the Florida Keys National Marine Sanctuary Management Plan; the Memoranda of Agreement included in the management plan; and, the following conditions to be applied to the portions of the Sanctuary within Florida territorial waters:

(1) Federal sanctuary fees for allowed public uses of the marine resources shall not be imposed without having first been approved by the Board of Trustees;

(2) The Memorandum of Agreement for the Coordination of Civil Claims shall be amended to provide that, with regard to proceedings to recover compensation for injury to state resources within the Sanctuary, Board of Trustees' approval on the use of funds recovered by NOAA under section 312 is required;

(3) The imposition of federal sanctuary emergency regulations shall not be authorized without the Governor's approval;

(4) No provision of the management plan will require governmental entities within the state, including but not limited to the State of Florida and Monroe County, to provide funding for the implementation of regulations or other actions;

(5) The implementation of fisheries regulations is unacceptable unless established by the Florida Marine Fisheries Commission following promulgation under the provisions of section 370.025(2), F.S. (1995), which requires public input and final Board of Trustees' approval;

(6) The Certification/Authorization of Permits Agreement shall be amended to provide that NOAA will have only a review and comment role on state permits for activities beyond the boundary of the Sanctuary. To the maximum extent possible the state will consider NOAA's comments as specified in the agreement. However, NOAA shall not require an additional permit. In addition, 15 CFR section 922.163(a)(4)(ii), concerning prohibited activities, shall be amended to read as follows: ''Discharging or depositing, from beyond the boundary of the Sanctuary, any material or other matter that subsequently enters the Sanctuary and injures a Sanctuary resource or quality, except those listed in paragraph (a)(4)(i) (A) through (D) above and those authorized under Monroe County land use permits *or under state permits*.'';

(7) The purpose of the Ecological Reserve in the Western Sambos is to maintain a natural assemblage of living marine resources by setting aside an area that assures minimal human disturbance and is not designed to perform any fishery enhancement or fishery management functions. Monitoring of ecological parameters will be performed to provide information on the status of fish, coral and other benthic components of the Reserve. At the end of five years the success of the Ecological Reserve in the Western Sambos will be assessed. If the state or NOAA finds the area is not fulfilling the purpose for which the reserve was established, the Board of Trustees may take action to initiate the removal of the site;

(8) The Secretary of the FDEP shall designate, with subsequent confirmation by the Board of Trustees, a DEP employee as its representative as an equal partner to work in consultation with the Sanctuary superintendent for the oversight of Sanctuary operations;

(9) The implementation of any additional ecological reserves, or any other type of zoning or regulation, which is applicable to state waters shall require advance Board of Trustees' approval;

(10) The FDEP, in cooperation with NOAA, shall submit to the Board of Trustees an annual status report of the Sanctuary, and a five-year evaluation of the overall effectiveness of the implementation of the Sanctuary management plan toward the goal of protecting the marine resources of the Florida Keys including recommendations for change;

(11) The FDEP and NOAA shall manage the FKNMS through a cooperative partnership and consult on all management activities throughout the Sanctuary. The intent of this partnership is that the final resolution of any management issues resulting in policy conflicts between the state and NOAA shall be decided by the managing partners consistent with state and federal laws. The Board of Trustees has not conveyed title to or relinquished authority over any state-owned lands or other state-owned resources by agreeing to include state-owned land and resources within the Sanctuary boundary. If necessary, NOAA shall initiate the federal rule promulgation process required to make Board of Trustees' requested revisions to the regulations of the FKNMS management plan;

(12) The state reserves the right to initiate proposed changes to the plan. The FDEP will monitor public opinion and provide a process for consideration of grievances and petitions for change;

(13) Article V of the Designation Document shall be amended to strike the first paragraph which states: ''If any valid regulation issued

by any Federal, State or local authority of competent jurisdiction, regardless of when issued, conflicts with a Sanctuary regulation the regulation deemed by the Director, Office of Ocean and Coastal Resource Management, National Oceanic and Atmospheric Administration, or his or her designee to be more protective of Sanctuary resources and qualities shall govern.'' Further, it shall be amended to strike the last sentence of the second paragraph which states: ''However, the Secretary of Commerce or designee may regulate the exercise (including, but not limited to, the imposition of terms and conditions) of such authorization or right consistent with the purposes for which the Sanctuary is designated.''; and

(14) The Co-Trustees Agreement for Cooperative Management shall be amended to add: Section 304(e) of the National Marine Sanctuary Act requires the Secretary of Commerce to review the management plan and regulations for the Sanctuary every five years, evaluate the substantive progress toward implementing the management plan and goals for the Sanctuary, especially the effectiveness of site-specific management techniques, and revise the management plan and regulations as necessary to fulfill the purposes and policies of the Act. When the management plan and regulations for the Florida Keys National Marine Sanctuary are re-evaluated, the Secretary will re-propose the management plan and regulations in their entirety. The State of Florida will have the opportunity to review the management plan and regulations, in their entirety, and indicate if any or all of its terms are unacceptable in which case the unacceptable terms shall not take effect in state waters.

IN TESTIMONY WHEREOF, the Governor and Cabinet sitting as the Board of Trustees of the Internal Improvement Trust Fund of the State of Florida have hereunto subscribed their names and have caused the Official Seal of the State of Florida to be hereunto affixed in the City of Tallahassee on the 28th day of January, 1997.

Lawton Chiles,

Governor.

Sandra B. Mortham,

Secretary of State.

Bob Butterworth,

Attorney General.

Robert F. Milligan,

Comptroller.

Bill Nelson,

Treasurer.

Bob Crawford,

Commissioner of Agriculture.

Frank T. Brogan,

Commissioner of Education.

NOAA's Response to Governor's Certification

In response to the Governor's certification of March 20, 1997, NOAA has amended those regulations certified by the Governor as being unacceptable in State waters. With the modifications, the entire regulations and management plan are accepted by the Governor and will apply throughout the Sanctuary, including within State waters of the Sanctuary, upon their effective date. The basis and purpose of the changes to the regulations are as follows.

(1) Per item number 2 of the Governor's letter which certified as unacceptable in State waters emergency regulations unless approved by the Governor, § 922.165 of subpart P is amended by adding ''Emergency regulations shall not take effect in Florida State waters until approved by the Governor of the State of Florida.'' This is consistent with the management plan which provides that any new regulation or substantive modification to existing Sanctuary regulations will require the Governor's approval in order to take effect in State waters of the Sanctuary.

(2) Per item number 4 of the Governor's letter which certified as unacceptable in State waters Sanctuary fishing regulations unless established by the Florida Marine Fisheries Commission pursuant to section 370.025(2), F.S. (1995), § 922.163 of subpart P is amended by adding a new paragraph (h) to read in pertinent part ''Any fishery regulations in the Sanctuary shall not take effect in Florida State waters until established by the Florida Marine Fisheries Commission.'' The Governor's certification proposed including this language in § 922.42 of part 922, which is a programmatic sanctuary regulation applicable to all sanctuaries. NOAA determined that a more appropriate place for the language is in the Sanctuary specific regulations at a new § 922.163(h) of subpart P, which has been added in response to item number 6 of the Governor's certification.

Item number 4 of the Governor's certification reflects actions already initiated by NOAA. In the January 30 **Federal Register** notice publishing the final regulations and triggering the forty-five day review period under the NMSA, NOAA stated that § 922.164(d), which pertains to Ecological Reserves (Reserves) and Sanctuary Preservation Areas (SPAs), will not take effect in State waters before July 1, 1997, to allow the State of Florida Marine Fisheries Commission (Commission) time to complete its rulemaking process related to the Western Sambos Ecological Reserve and those Sanctuary Preservation Areas located in State waters. The Commission's rule was adopted on May 13, 1997, and is substantively similar to NOAA's except in two instances. First, the Commission's Rule 46–6.003(1)(B), pertaining to the issue of possession of fishing gear, which essentially mirrors 15 CFR § 922.164(d)(1)(iii) of NOAA's regulations, does not contain the phrase ''no presumption of fishing activity shall be drawn'' from possession of gear, because, according to the State, the Commission has no authority to address the issue of presumptions. Further, the Commission's Rule 46–6.003(1)(a), pertaining to possession of marine organisms within a Reserve or SPA, which mirrors 15 CFR § 922.164(d)(1)(ii) of NOAA's regulations, adds the element that to fall within the exception allowing possession of marine organisms in such areas, a vessel must be in ''continuous transit'' through the Reserve or SPA. NOAA's regulation did not require continuous transit.

In the January 30 **Federal Register** notice, NOAA stated that if the Commission's rule is not substantively the same as NOAA's, then NOAA would modify its regulations to conform with the State's, or would consult on whether the non-conforming portions of the Sanctuary regulations should be withdrawn from applying in State waters. NOAA consulted with the State and agreed that no changes are necessary to 15 CFR § 922.164(d)(1)(iii). As regards § 922.164(d)(1)(ii), the Governor requested that NOAA revise it to conform to the Commission's Rule 46–6.003(1)(a). In response to the Governor's request, and consistent with NOAA's January 30 **Federal Register** notice, therefore, NOAA has amended § 922.164(d)(1)(ii) to read as follows:

(ii) Possessing, moving, harvesting, removing, taking, damaging, disturbing, breaking, cutting, spearing, or otherwise injuring any coral, marine invertebrate, fish, bottom formation, algae, seagrass or other living or dead organism, including shells, or attempting any of these activities. However, fish, invertebrates, and marine plants may be possessed aboard a vessel in an Ecological Reserve or Sanctuary Preservation Area, provided such resources can be shown not to have been harvested within, removed from, or taken within, the Ecological Reserve or Sanctuary Preservation Area, as applicable, by being stowed in a cabin, locker, or similar storage area prior to entering and during transit through such reserves or areas, provided further that in an Ecological Reserve or Sanctuary Preservation Area located in Florida State waters, such vessel is in continuous transit through the Ecological Reserve or Sanctuary Preservation Area.

Therefore, § 922.164(d)(1)(ii), consistent with the Commission's rule, now requires vessels possessing fish, invertebrates, or marine plants that are transiting through a Reserve or SPA located in State waters to be in continuous transit through the Reserve or SPA. These areas are the Western

Sambos Ecological Reserve, and the Cheeca Rocks, Eastern Dry Rocks, Hens and Chickens, Newfound Harbor Key, Rock Key, and Sand Key Sanctuary Preservation Areas.

The conforming change to § 922.164(d)(1)(ii) is made to the regulation only as it applies to Reserves and SPAs located in State waters because under the National Marine Sanctuaries Act, the Governor's actions during the forty-five day review period apply to the management plan and regulations as they pertain to the area of the Sanctuary lying within the seaward boundary of the State. Further, under the sanctuary program regulations as 15 CFR § 922.42, all activities may be conducted unless specifically prohibited by a sanctuary's regulations, ''subject to all prohibitions, regulations, restrictions, and conditions validly imposed by any Federal, State, or local authority of competent jurisdiction, including Federal and State fishery management authorities.'' Consequently, as regards State waters of the Sanctuary, regardless of whether NOAA amends § 922.164(d)(1)(ii), users would be subject to the State prohibition requiring continuous transit through a Reserve or SPA in State waters if such vessel possesses fish, invertebrates or marine plants. Finally, under the amended Sanctuary regulation, vessels possessing such marine organisms are not precluded from transiting the Reserve or SPA, which addresses the primary concern raised in the public comments NOAA received on the proposed regulation. In addition, during the State's rulemaking proceeding, it received no comments regarding the provision requiring continuous transit, supporting that there appear to be no significant concerns over the provision.

For consistency throughout the Sanctuary, NOAA will propose to amend the regulation as it pertains to the Ecological Reserves and Sanctuary Preservation Areas in federal waters in a separate rulemaking.

(3) Per item number 5 of the Governor's letter which certified as unacceptable in State waters the prohibition of discharging or depositing from beyond the Sanctuary boundary any material or other matter that subsequently enters the Sanctuary and injures a Sanctuary resource or quality, § 922.163(a)(4)(ii) of subpart P is amended by adding ''or under state permits'' after ''Monroe County land use permits.'' This modification broadens the subject exception to include discharge or deposit activities authorized under State permits. Many upland projects that could result in discharges or deposits outside the Sanctuary that end up in the Sanctuary require Monroe County land use permits, which were already excepted from the Sanctuary prohibition.

(4) Per item number 6 of the Governor's letter which certifies as unacceptable in State waters the implementation of any additional Ecological Reserves or any other type of zoning or regulation unless first approved by the Board of Trustees, § 922.163 of subpart P is amended by adding new paragraph (h) to read ''Any amendment to these regulations shall not take effect in Florida State waters until approved by the Board of Trustees of the Internal Improvement Trust Fund of the State of Florida.'' Further, § 922.164 is amended by adding a new paragraph (f) to read: ''Additional Wildlife Management Areas, Ecological Reserves, Sanctuary Preservation Areas, or Special-use Areas, and additional restrictions in such areas, shall not take effect in Florida State waters unless first approved by the Board of Trustees of the Internal Improvement Trust Fund of the State of Florida.'' As discussed above, this modification merely codifies in the regulations what is contained in the management plan.

(5) Per item number 7 of the Governor's letter which certifies as unacceptable in State waters the implementation of the management plan unless the Co-Trustee Agreement and § 922.160 is amended to add a provision regarding the five year review of the management plan and regulations, § 922.160 of subpart P is amended by adding:

> Section 304(e) of the NMSA requires the Secretary to review management plans and regulations every five years, and make necessary revisions. Upon completion of the five year review of the Sanctuary management plan and regulations, the Secretary will repropose the regulations in their entirety with any proposed changes thereto, including those regulations in subparts A and E of this part that apply to the Sanctuary. The Governor of the State of Florida will have the opportunity to review the re-proposed regulations before they take effect and if the Governor certifies such regulations as unacceptable, they will not take effect in State waters of the Sanctuary.

A corresponding amendment, as well as other amendments, have also been made to the Co-Trustees Agreement per item 7 of the Governor's letter. The modification to the regulation essentially codifies the requirement under the NMSA to conduct reviews of sanctuary management plans and regulations every five years. In the FKNMS context, NOAA has determined that at the conclusion of the five year review of the Sanctuary, it will repropose the regulations for the Governor's review, similar to the forty-five day review period under the NMSA that preceded this notice.

(6) The erroneous reference to the Submerged Cultural Resources Agreement has been corrected by eliminating the reference to Volume I of the management plan.

For clarity, this notice publishes the revised Sanctuary specific regulations at 15 CFR part 922, subpart P in their entirety, which will replace subpart P as published in the January 30, 1997 **Federal Register** notice. Consequently, subpart P as published in this notice and all remaining regulations in the January 30, 1997, notice shall become effective on July 1, 1997.

Congressional Action on the Final Regulations

During the comment period on the draft management plan/environmental impact statement (DMP/EIS), the Sanctuary Advisory Council (SAC) and other public commentors singled out the operation of personal watercraft (PWC) in the Sanctuary as a matter of concern. In response to comments received on the DMP/EIS, NOAA stated the following in the FMP/EIS, and January 30 **Federal Register** notice regarding the operation of personal watercraft (PWC) in the Sanctuary:

> NOAA has developed a multi-pronged approach to address the public's concern about the use of personal watercraft. NOAA has accepted the SAC's recommendation to add a new section to the final regulations (§ 922.163(a)(v)) which prohibits reckless operation of all watercraft. Additionally, proposed § 922.163(a)(5)(iii) has been modified to prohibit operating a vessel at greater than idle speed only/no wake (except in marked channels) in designated areas within 100 yards from residential shorelines, stationary vessels and navigational aids marking emerging or shallow reefs. NOAA has also incorporated into its regulations the authority to enforce all idle-speed only/no wake areas throughout the Sanctuary. NOAA will use the existing county and State process for designating these areas. NOAA accepts that the industry is seriously committed to self regulation and will develop successful educational efforts geared toward changing user behavior. The final component of NOAA's approach is a modification of the SAC's recommendation. NOAA will begin establishing broad zones with restrictions on the use of personal watercraft (consistent with the SAC recommendation) in one year only if these initial efforts are not successful at significantly reducing or eliminating the nuisance and safety problems, as well as the threats to the natural resources.
>
> FMP/EIS Vol. III, page L–10; 62 FR 4578, 4591.

During the forty-five day review period under the NMSA, no

Congressional hearings were held. However, NOAA received inquiries from Representative Don Young, Chair of the House of Representatives Committee on Resources, and Representative Walter B. Jones, Jr. regarding how NOAA was going to measure ''success'' of the PWC industry's educational efforts at significantly reducing or eliminating threats to natural resources and the nuisance and safety problems posed by the operation of personal watercraft, and how evaluation criteria will be developed. There was also one meeting with Congressional aides where concern was expressed about the Sanctuary regulating the safety of vessel operations in general and PWC (e.g., jet skis) in particular.

As indicated above, the FMP/EIS carefully considered the SAC recommendations and public comments, including those from the PWC industry in setting forth its multi-pronged approach to the PWC issue. In general, the success of any Sanctuary action plan or management strategy is measured primarily against whether the Sanctuary resource protection goals are being met, and whether the multiple uses of the Sanctuary are being facilitated consistent with the primary objective of resource protection. The FMP/EIS is the result of a long and laborious public process to identify the threats to Sanctuary resources and qualities, and then to develop management strategies and action plans to address these resource management issues, including resource protection and multiple use management, which includes addressing user conflicts.

The FMP/EIS sets forth an action plan and strategies to address the concerns arising from the use of PWCs in regards to protecting Sanctuary resources, and facilitating compatible multiple use of the Sanctuary. The FMP/EIS therefore provides additional criteria for the measurement of success. The *STRATEGY FOR STEWARDSHIP* (Overview or Executive Summary of the FKNMS MP/EIS—pages 9, 11–12, 19–20, 23) discusses these concerns, and a plan to address problems arising from PWCs, as well as other vessels. NOAA's decision to modify the SAC's recommendations on PWC regulation was in part based on PWC industry statements on how it should be given an opportunity to ''self-regulate'' PWCs, work with NOAA on education geared toward changing user behavior, and establish criteria for the management of commercial PWC rental operations.

The problems regarding operation of PWCs and the planned solutions are identified and discussed throughout the FMP/EIS and therefore provide criteria against which success can be measured. *See* Volume I pp. 16–17 (noise and operation harass wildlife as well as other users), pp. 108–109 (PWC strategy B–17 discussed under NOAA Regulatory Actions); Vol. II Environmental Impact Analysis, p. 124 (user conflicts and habitat impacts), p. 141 (alternative strategies); p. 151 (strategy Z–5 Special Use Zones to address PWC problems), pp. 182, 203 (PWC strategy B–17); Vol. III H–3, K–3, L–9, L–10, L–17, M–1, M–2, M–3, M–6, M–11, M–12, M–22, M–26, M–27, M–28. The public comments on this issue also provide important input for developing criteria to measure the success for both the PWC industry and NOAA.

NOAA is already working with the PWC industry to develop broad measurable milestones by which the industry will increase public awareness and educate the public about the use of PWCs in the Sanctuary. When these are achieved by the PWC industry, NOAA is confident that the proposed education and self-regulation activities should address concerns that surfaced during the development of the final management plan. Such measures include the industry conducting training workshops and school programs, information distribution, and community awareness. In addition, the PWC industry, NOAA and Florida Department of Environmental Protection will also develop a two to five year work plan for the industry based on strategies included in the Education and Outreach Action Plan contained in the management plan for the Sanctuary. Further, the PWC industry will conduct research on the effects of PWC operation on shallow-water seagrass and hardbottom communities in the Florida Keys. If the PWC industry adequately implements these measures within the first year after the effective date of these regulations, NOAA would view this as a significant effort to address the concerns raised during the development of the final management plan. In the event zones are subsequently determined to be necessary, NOAA would seek to discuss such measures with the PWC industry early in the process. Further, at a minimum under the Administrative Procedure Act, there would have to be a public notice of a proposed rule as well as a public comment period. This would likely involve public hearings before any rule would become final. Moreover, the rule would also have to be approved by the Governor through the Board of Trustees in order to become effective in State waters.

Other Modifications to the Final Regulations

In the **Federal Register** notice of January 30, 1997, appendices II, IV and V of subpart P, which delineate the boundary coordinates of Existing Management Areas, Ecological Reserves, and Sanctuary Preservation Areas, respectively, stated that ''When differential Global Positioning Systems [GPS] data becomes available, these coordinates may be revised by **Federal Register** notice to reflect the increased accuracy of such data.'' Since publication of the final regulations on January 30, NOAA has ground-truthed, using differential GPS, the Western Sambos Ecological Reserve, the Sanctuary Preservation Areas, and the four Special-use Areas (listed in appendix VI to subpart P). Consequently, NOAA has modified the regulations to incorporate the more accurate coordinates for those areas it has ground-truthed using differential GPS. When differential GPS data become available for the Existing Management Areas, their coordinates may be revised by **Federal Register** notice to reflect the increased accuracy of such data.

III. Summary of the Changes to the Final Regulations at Subpart P

The following summarizes the Sanctuary regulations at 15 CFR part 922, subpart P, modified by this notice. Except as noted below, this section remains the same as in the January 30, 1997, **Federal Register** notice. With the changes, the final rule published on January 30, 1997, at 62 FR 4578, and the revision of 15 CFR part 922, subpart P, in this document shall apply throughout the Sanctuary, including within State waters of the Sanctuary, on July 1, 1997.

Section 922.160 sets forth the purpose of the regulations—to implement the comprehensive final management plan for the Sanctuary by regulating activities affecting the Sanctuary in order to protect, preserve, and manage the conservation, ecological, recreational, research, educational, historical and aesthetic resources and qualities of the area. Section 922.160 also describes the five-year review of the management plan and regulations for the Sanctuary.

Section 922.163 prohibits a variety of activities within the Sanctuary and in limited instances, outside the Sanctuary, thus making it unlawful for any person to conduct them or cause them to be conducted.

The fourth activity prohibited, § 922.163(a)(4), is the discharge or

deposit of materials or other matter. Exceptions are made for such things as fish baits in connection with and during traditional fishing, biodegradable vessel effluents, graywater, and vessel exhaust and cooling water. Under § 922.163(a)(4)(ii), upland discharge or deposit activities conducted pursuant to Monroe County and State permits are also excepted from the prohibition against discharging or depositing outside the Sanctuary any material or other matter that subsequently enters the Sanctuary and injures any Sanctuary resource.

Section 922.163(h) provides that any substantive (non-technical, non-editorial) amendment to the regulations will not take effect in State waters until approved by the Florida Board of Trustees. Fishing regulations will not take effect in State waters until established by the Florida Marine Fisheries Commission.

Section 922.164 sets forth by Sanctuary zone, restrictions and prohibitions above and beyond those applicable on a Sanctuary-wide basis (most of the Sanctuary is not zoned and, therefore, only the Sanctuary-wide prohibitions of § 922.163 apply). The six types of Sanctuary zones are: (1) Areas to be Avoided (ATBAs); (2) Existing Management Areas; (3) Wildlife Management Areas; (4) Ecological Reserves; (5) Sanctuary Preservation Areas; and (6) Special-use Areas. Details on the location of these zones are specified in Appendices II, III, IV, V and VI to subpart P, respectively. The intent of the zoning regulations is to protect Sanctuary resources, ecosystem and biodiversity, and provide for effective management and facilitation of multiple, compatible uses, consistent with the purposes of the Sanctuary. Activities located within two or more overlapping Sanctuary zones are concurrently subject to the regulations applicable to each overlapping area.

Section 922.164(d)(1)(ii) prohibits possessing, moving, harvesting, removing, taking, damaging, disturbing, breaking, cutting, spearing, or otherwise injuring any coral, marine invertebrate, fish, bottom formation, algae, seagrass or other living or dead organism, including shells, or attempting any of these activities. However, fish, invertebrates, and marine plants may be possessed aboard a vessel in an Ecological Reserve or Sanctuary Preservation Area, provided such resources can be shown not to have been harvested within, removed from, or taken within, the Ecological Reserve or Sanctuary Preservation Area, as applicable, by being stowed in a cabin, locker, or similar storage area prior to entering and during transit through such reserves or areas, provided further that in an Ecological Reserve or Sanctuary Preservation Area located in Florida State waters, such vessel is in continuous transit through the Ecological Reserve or Sanctuary Preservation Area.

Section 922.164(f) provides that any additional Wildlife Management Areas, Ecological Reserves, Sanctuary Preservation Areas, or Special-Use Areas, and additional restrictions in such areas will not take effect in State waters unless first approved by the Florida Board of Trustees.

Section 922.165 provides that where necessary to prevent or minimize the destruction of, loss of, or injury to a Sanctuary resource, or imminent risk of such destruction of, loss of, or injury, any and all activities are subject to immediate temporary regulation, including prohibition. Any such temporary regulation may be in effect for up to 60 days with one 60-day extension. Additional or extended action is subject to the provisions of the Administrative Procedure Act. No emergency regulation will take effect in State waters of the Sanctuary until approved by the Governor of Florida.

IV. Miscellaneous Rulemaking Requirements

Except as noted below, this section remains the same as in the January 30, 1997 **Federal Register** notice.

National Marine Sanctuaries Act

Section 304 of the National Marine Sanctuaries Act provides that Congress and the Governor have forty-five days of continuous session of Congress beginning on the day on which the final regulations were published to review the terms of designation (i.e., regulations and management plan). After forty-five days, the regulations would become final and take effect, except that any term or terms of designation the Governor certified to the Secretary of Commerce as unacceptable would not take effect in the State waters portion of the Sanctuary. The forty-five day review period began on January 30, 1997, the date the final regulations were published in the **Federal Register**, and concluded on April 16, 1997. During that period the Governor submitted to the Secretary a certification that the management plan and certain regulations were unacceptable unless specific amendments were made to such regulations. NOAA amended those regulations certified as unacceptable by incorporating the Governor's changes. Consequently, upon their effective date the regulations, as revised by this **Federal Register** notice, and management plan, in their entirety, will apply throughout the Sanctuary, including within State waters of the Sanctuary.

Administrative Procedure Act

The final Sanctuary regulations at 15 CFR part 922, subpart P, which were promulgated on January 30, 1997, through notice and comment rulemaking, have been amended pursuant to and consistent with the procedures required under the National Marine Sanctuaries Act. The NMSA provides that during the review period of forty-five day continuous session of Congress, the Governor may certify to the Secretary of Commerce any regulation as unacceptable and, if the Governor so certifies, the regulation shall not take effect in the State waters portion of the Sanctuary. As the changes requested by the Governor and herein made by NOAA are within the scope of the proposed rule, additional prior notice and opportunity for public comment are not required by the Administrative Procedure Act (APA), 5 U.S.C. 553. The basis and purpose of the changes to the final regulations requested by the Governor have been set forth above.

The Assistant Administrator for Ocean Services and Coastal Zone Management has determined that, pursuant to 5 U.S.C. 553(d)(3), there is good cause for making the modifications to the final regulations published in this document effective without a thirty day delay in effective date. The primary purpose of the delayed effective date is to provide the public a reasonable time to prepare to comply with the regulations. The modifications to the final regulations pertaining to the Governor's approval of new and emergency regulations, and the five year review of the management plan and regulations do not require compliance by the general public and, therefore, a delayed effective date is unnecessary. Further, the requirement that vessels possessing fish, invertebrates or marine plants must be in continuous transit through SPAs and Reserves located in State waters is currently a requirement under State regulations and, therefore, a delayed effective date is also unnecessary as the general public must already comply with that corresponding restriction. Finally, the modification to the exception to the prohibition against discharging and depositing outside the Sanctuary any material or other matter that subsequently enters and injures a Sanctuary resource broadens the exception to include activities authorized by State permit and,

therefore, relieves a restriction, specifically excepted from a delay in effective date under 5 U.S.C. 553(d)(1). Consequently, the final rule published on January 30, 1997, at 62 FR 4578 and the revision of 15 CFR part 922, subpart P in this document are effective July 1, 1997.

Regulatory Flexibility Act

The January 30, 1997 **Federal Register** notice stated:

Because the Assistant General Counsel for Legislation and Regulation of the Department of Commerce certified to the Chief Counsel for Advocacy of the Small Business Administration that the proposed regulations, if adopted, would not have a significant economic impact on a substantial number of small entities, an Initial Regulatory Flexibility Analysis (IRFA) was not prepared. Nevertheless, because the final regulations will affect a substantial number of small entities, although not in an economically significant way, and particularly because some representatives of the small entity fishing industry criticized the DEIS socioeconomic assessment of the zoning scheme, a Final Regulatory Flexibility Analysis (FRFA) was prepared that fully complies with the requirements of Regulatory Flexibility Act.

The changes made in response to the Governor's request do not change the basis for that certification. In response to the FRFA, the Office of the Chief Counsel for Advocacy of the Small Business Administration (SBA) received several comments critical of certain portions of the FRFA, specifically as regards the treatment of submerged cultural resources and the impacts to treasure salvors. Comments were also received from the Florida Keys Marine Life Association raising concerns that the impacts to their industry have not been properly qualified in the economic impact analysis. Because of the time provided by the forty-five day review period under the National Marine Sanctuaries Act, NOAA is supplementing the FRFA to address the comments received by the SBA. The final supplemental FRFA will be completed prior to the effective date of these regulations. Upon its completion, NOAA will publish a **Federal Register** notice summarizing the supplemental FRFA and announcing its availability, and, if appropriate, making any changes to the regulations NOAA determines are necessary as a result of the supplemental FRFA.

List of Subjects in 15 CFR Parts 922, 929, and 937

Administrative practice and procedure, Coastal zone, Education, Environmental protection, Marine resources, Natural resources, Penalties, Recreation and recreation areas, Reporting and recordkeeping requirements, Research.

Dated: June 5, 1997.

Nancy Foster,

Assistant Administrator for Ocean Services and Coastal Zone Management.

Accordingly, for the reasons set forth above, 15 CFR part 922 is amended as follows:

PART 922—NATIONAL MARINE SANCTUARY PROGRAM REGULATIONS

1. The authority citation for part 922 continues to read as follows:

Authority: 16 U.S.C. 1431 *et seq.*

2. Part 922 is amended by revising subpart P to read as follows:

Subpart P—Florida Keys National Marine Sanctuary

Sec.

922.160 Purpose.
922.161 Boundary.
922.162 Definitions.
922.163 Prohibited activities—Sanctuary-wide.
922.164 Additional activity regulations by Sanctuary area.
922.165 Emergency regulations.
922.166 Permits—application procedures and issuance criteria.
922.167 Certification of preexisting leases, licenses, permits, approvals, other authorizations, or rights to conduct a prohibited activity.
Appendix I to Subpart P of Part 922—Florida Keys National Marine Sanctuary Boundary Coordinates
Appendix II to Subpart P of Part 922—Existing Management Areas Boundary Coordinates
Appendix III to Subpart P of Part 922—Wildlife Management Areas Access Restrictions
Appendix IV to Subpart P of Part 922—Ecological Reserves Boundary Coordinates
Appendix V to Subpart P of Part 922—Sanctuary Preservation Areas Boundary Coordinates
Appendix VI to Subpart P of Part 922—Special-use Areas Boundary Coordinates and Use Designations
Appendix VII to Subpart P of Part 922—Areas To Be Avoided Boundary Coordinates
Appendix VIII to Subpart P of Part 922—Marine Life Rule [As Excerpted From Chapter 46–42 of the Florida Administrative Code]

Subpart P—Florida Keys National Marine Sanctuary

§ 922.160 Purpose.

(a) The purpose of the regulations in this subpart is to implement the comprehensive management plan for the Florida Keys National Marine Sanctuary by regulating activities affecting the resources of the Sanctuary or any of the qualities, values, or purposes for which the Sanctuary is designated, in order to protect, preserve and manage the conservation, ecological, recreational, research, educational, historical, and aesthetic resources and qualities of the area. In particular, the regulations in this part are intended to protect, restore, and enhance the living resources of the Sanctuary, to contribute to the maintenance of natural assemblages of living resources for future generations, to provide places for species dependent on such living resources to survive and propagate, to facilitate to the extent compatible with the primary objective of resource protection all public and private uses of the resources of the Sanctuary not prohibited pursuant to other authorities, to reduce conflicts between such compatible uses, and to achieve the other policies and purposes of the Florida Keys National Marine Sanctuary and Protection Act and the National Marine Sanctuaries Act.

(b) Section 304(e) of the NMSA requires the Secretary to review management plans and regulations every five years, and make necessary revisions. Upon completion of the five year review of the Sanctuary management plan and regulations, the Secretary will repropose the regulations in their entirety with any proposed changes thereto, including those regulations in subparts A and E of this part that apply to the Sanctuary. The Governor of the State of Florida will have the opportunity to review the re-proposed regulations before they take effect and if the Governor certifies such regulations as unacceptable, they will not take effect in State waters of the Sanctuary.

§ 922.161 Boundary.

The Sanctuary consists of all submerged lands and waters from the mean high water mark to the boundary described in Appendix I to this subpart, with the exception of areas within the Dry Tortugas National Park. Appendix I to this subpart sets forth the precise Sanctuary boundary established by the Florida Keys National Marine Sanctuary and Protection Act. (See FKNMSPA § 5(b)(2)).

§ 922.162 Definitions.

(a) The following definitions apply to the Florida Keys National Marine Sanctuary regulations. To the extent that a definition appears in § 922.3 and this section, the definition in this section governs.

Acts means the Florida Keys National Marine Sanctuary and Protection Act, as amended, (FKNMSPA) (Pub. L. 101–605), and the National Marine Sanctuaries Act (NMSA), also known as Title III of the Marine Protection, Research, and Sanctuaries Act, as amended, (MPRSA) (16 U.S.C. 1431 *et seq.*).

Adverse effect means any factor, force, or action that independently or cumulatively damages, diminishes, degrades, impairs, destroys, or otherwise harms any Sanctuary resource, as defined in section 302(8) of the NMSA (16 U.S.C. 1432(8)) and in this section, or any of the qualities, values, or purposes for which the Sanctuary is designated.

Airboat means a vessel operated by means of a motor driven propeller that pushes air for momentum.

Areas To Be Avoided means the areas in which vessel operations are prohibited pursuant to section 6(a)(1) of the FKNMSPA (see § 922.164(a)). Appendix VII to this subpart sets forth the geographic coordinates of these areas, including any modifications thereto made in accordance with section 6(a)(3) of the FKNMSPA.

Closed means all entry or use is prohibited.

Coral means the corals of the Class Hydrozoa (stinging and hydrocorals); the Class Anthozoa, Subclass Hexacorallia, Order Scleractinia (stony corals) and Antipatharia (black corals).

Coral area means marine habitat where coral growth abounds including patch reefs, outer bank reefs, deepwater banks, and hardbottoms.

Coral reefs means the hard bottoms, deep-water banks, patch reefs, and outer bank reefs.

Ecological Reserve means an area of the Sanctuary consisting of contiguous, diverse habitats, within which uses are subject to conditions, restrictions and prohibitions, including access restrictions, intended to minimize human influences, to provide natural spawning, nursery, and permanent residence areas for the replenishment and genetic protection of marine life, and also to protect and preserve natural assemblages of habitats and species within areas representing a broad diversity of resources and habitats found within the Sanctuary. Appendix IV to this subpart sets forth the geographic coordinates of these areas.

Existing Management Area means an area of the Sanctuary that is within or is a resource management area established by NOAA or by another Federal authority of competent jurisdiction as of the effective date of these regulations where protections above and beyond those provided by Sanctuary-wide prohibitions and restrictions are needed to adequately protect resources. Appendix II to this subpart sets forth the geographic coordinates of these areas.

Exotic species means a species of plant, invertebrate, fish, amphibian, reptile or mammal whose natural zoogeographic range would not have included the waters of the Atlantic Ocean, Caribbean, or Gulf of Mexico without passive or active introduction to such area through anthropogenic means.

Fish means finfish, mollusks, crustaceans, and all forms of marine animal and plant life other than marine mammals and birds.

Fishing means:

(1) The catching, taking, or harvesting of fish; the attempted catching, taking, or harvesting of fish; any other activity which can reasonably be expected to result in the catching, taking, or harvesting of fish; or any operation at sea in support of, or in preparation for, any activity described in this subparagraph (1).

(2) Such term does not include any scientific research activity which is conducted by a scientific research vessel.

Hardbottom means a submerged marine community comprised of organisms attached to exposed solid rock substrate. Hardbottom is the substrate to which corals may attach but does not include the corals themselves.

Idle speed only/no-wake means a speed at which a boat is operated that is no greater than 4 knots or does not produce a wake.

Idle speed only/no-wake zone means a portion of the Sanctuary where the speed at which a boat is operated may be no greater than 4 knots or may not produce a wake.

Live rock means any living marine organism or an assemblage thereof attached to a hard substrate, including dead coral or rock but not individual mollusk shells (e.g., scallops, clams, oysters). Living marine organisms associated with hard bottoms, banks, reefs, and live rock may include, but are not limited to: sea anemones (Phylum Cnidaria: Class Anthozoa: Order Actinaria); sponges (Phylum Porifera); tube worms (Phylum Annelida), including fan worms, feather duster worms, and Christmas tree worms; bryozoans (Phylum Bryzoa); sea squirts (Phylum Chordata); and marine algae, including Mermaid's fan and cups (Udotea spp.), corraline algae, green feather, green grape algae (Caulerpa spp.) and watercress (Halimeda spp.).

Marine life species means any species of fish, invertebrate, or plant included in sections (2), (3), or (4) of Rule 46–42.001, Florida Administrative Code, reprinted in Appendix VIII to this subpart.

Military activity means an activity conducted by the Department of Defense with or without participation by foreign forces, other than civil engineering and other civil works projects conducted by the U.S. Army Corps of Engineers.

No-access buffer zone means a portion of the Sanctuary where vessels are prohibited from entering regardless of the method of propulsion.

No motor zone means an area of the Sanctuary where the use of internal combustion motors is prohibited. A vessel with an internal combustion motor may access a no motor zone only through the use of a push pole, paddle, sail, electric motor or similar means of operation but is prohibited from using it's internal combustion motor.

Not available for immediate use means not readily accessible for immediate use, e.g., by being stowed unbaited in a cabin, locker, rod holder, or similar storage area, or by being securely covered and lashed to a deck or bulkhead.

Officially marked channel means a channel marked by Federal, State of Florida, or Monroe County officials of competent jurisdiction with navigational aids except for channels marked idle speed only/no wake.

Personal watercraft means any jet or air-powered watercraft operated by standing, sitting, or kneeling on or behind the vessel, in contrast to a conventional boat, where the operator stands or sits inside the vessel, and that uses an inboard engine to power a water jet pump for propulsion, instead of a propeller as in a conventional boat.

Prop dredging means the use of a vessel's propulsion wash to dredge or otherwise alter the seabed of the Sanctuary. Prop dredging includes, but is not limited to, the use of propulsion wash deflectors or similar means of dredging or otherwise altering the seabed of the Sanctuary. Prop dredging does not include the disturbance to bottom sediments resulting from normal vessel propulsion.

Prop scarring means the injury to seagrasses or other immobile organisms attached to the seabed of the Sanctuary caused by operation of a vessel in a manner that allows its propeller or other running gear, or any part thereof, to cause such injury (e.g., cutting seagrass rhizomes). Prop scarring does not include minor disturbances to bottom sediments or seagrass blades resulting from normal vessel propulsion.

Residential shoreline means any man-made or natural:

(1) Shoreline,

(2) Canal mouth,

(3) Basin, or

(4) Cove adjacent to any residential land use district, including improved subdivision, suburban residential or suburban residential limited, sparsely settled, urban residential, and urban residential mobile home under the Monroe County land development regulations.

Sanctuary means the Florida Keys National Marine Sanctuary.

Sanctuary Preservation Area means an area of the Sanctuary that encompasses a discrete, biologically important area, within which uses are subject to conditions, restrictions and prohibitions, including access restrictions, to avoid concentrations of uses that could result in significant declines in species populations or habitat, to reduce conflicts between uses, to protect areas that are critical for sustaining important marine species or habitats, or to provide opportunities for scientific research. Appendix V to this subpart sets forth the geographic coordinates of these areas.

Sanctuary wildlife means any species of fauna, including avifauna, that occupy or utilize the submerged resources of the Sanctuary as nursery areas, feeding grounds, nesting sites, shelter, or other habitat during any portion of their life cycles.

Seagrass means any species of marine angiosperms (flowering plants) that inhabit portions of the seabed in the Sanctuary. Those species include, but are not limited to: Thalassia testudinum (turtle grass); Syringodium filiforme (manatee grass); Halodule wrightii (shoal grass); Halophila decipiens, H. engelmannii, H. johnsonii; and Ruppia maritima.

Special-use Area means an area of the Sanctuary set aside for scientific research and educational purposes, recovery or restoration of Sanctuary resources, monitoring, to prevent use or user conflicts, to facilitate access and use, or to promote public use and understanding of Sanctuary resources. Appendix VI to this subpart sets forth the geographic coordinates of these areas.

Tank vessel means any vessel that is constructed or adapted to carry, or that carries, oil or hazardous material in bulk as cargo or cargo residue, and that—

(1) Is a United States flag vessel;

(2) Operates on the navigable waters of the United States; or

(3) Transfers oil or hazardous material in a port or place subject to the jurisdiction of the United States [46 U.S.C. 2101].

Traditional fishing means those commercial or recreational fishing activities that were customarily conducted within the Sanctuary prior to its designation as identified in the Environmental Impact Statement and Management Plan for this Sanctuary.

Tropical fish means any species included in section (2) of Rule 46–42.001, Florida Administrative Code, reproduced in Appendix VIII to this subpart, or any part thereof.

Vessel means a watercraft of any description, including, but not limited to, motorized and non-motorized watercraft, personal watercraft, airboats, and float planes while maneuvering on the water, capable of being used as a means of transportation in/on the waters of the Sanctuary. For purposes of this part, the terms ''vessel,'' ''watercraft,'' and ''boat'' have the same meaning.

Wildlife Management Area means an area of the Sanctuary established for the management, protection, and preservation of Sanctuary wildlife resources, including such an area established for the protection and preservation of endangered or threatened species or their habitats, within which access is restricted to minimize disturbances to Sanctuary wildlife; to ensure protection and preservation consistent with the Sanctuary designation and other applicable law governing the protection and preservation of wildlife resources in the Sanctuary. Appendix III to this subpart lists these areas and their access restrictions.

(b) Other terms appearing in the regulations in this part are defined at 15 CFR 922.3, and/or in the Marine Protection, Research, and Sanctuaries Act (MPRSA), as amended, 33 U.S.C. 1401 *et seq.* and 16 U.S.C. 1431 *et seq.*

§ 922.163 Prohibited activities—Sanctuary-wide.

(a) Except as specified in paragraph (b) through (e) of this section, the following activities are prohibited and thus are unlawful for any person to conduct or to cause to be conducted:

(1) *Mineral and hydrocarbon exploration, development and production.* Exploring for, developing, or producing minerals or hydrocarbons within the Sanctuary.

(2) *Removal of, injury to, or possession of coral or live rock.* (i) Moving, removing, taking, harvesting, damaging, disturbing, breaking, cutting, or otherwise injuring, or possessing (regardless of where taken from) any living or dead coral, or coral formation, or attempting any of these activities, except as permitted under 50 CFR part 638.

(ii) Harvesting, or attempting to harvest, any live rock from the Sanctuary, or possessing (regardless of where taken from) any live rock within the Sanctuary, except as authorized by a permit for the possession or harvest from aquaculture operations in the Exclusive Economic Zone, issued by the National Marine Fisheries Service pursuant to applicable regulations under the appropriate Fishery Management Plan, or as authorized by the applicable State authority of competent jurisdiction within the Sanctuary for live rock cultured on State submerged lands leased from the State of Florida, pursuant to applicable State law. *See* § 370.027, Florida Statutes and implementing regulations.

(3) *Alteration of, or construction on, the seabed.* Drilling into, dredging, or otherwise altering the seabed of the Sanctuary, or engaging in prop-dredging; or constructing, placing or abandoning any structure, material, or other matter on the seabed of the Sanctuary, except as an incidental result of:

(i) Anchoring vessels in a manner not otherwise prohibited by this part (see §§ 922.163(a)(5)(ii) and 922.164(d)(1)(v));

(ii) Traditional fishing activities not otherwise prohibited by this part;

(iii) Installation and maintenance of navigational aids by, or pursuant to valid authorization by, any Federal, State, or local authority of competent jurisdiction;

(iv) Harbor maintenance in areas necessarily associated with Federal water resource development projects in existence on July 1, 1997, including maintenance dredging of entrance channels and repair, replacement, or rehabilitation of breakwaters or jetties;

(v) Construction, repair, replacement, or rehabilitation of docks, seawalls, breakwaters, piers, or marinas with less than ten slips authorized by any valid lease, permit, license, approval, or other authorization issued by any Federal, State, or local authority of competent jurisdiction.

(4) *Discharge or deposit of materials or other matter.* (i) Discharging or depositing, from within the boundary of the Sanctuary, any material or other matter, except:

(A) Fish, fish parts, chumming materials, or bait used or produced incidental to and while conducting a traditional fishing activity in the Sanctuary;

(B) Biodegradable effluent incidental to vessel use and generated by a marine sanitation device approved in

accordance with section 312 of the Federal Water Pollution Control Act, as amended, (FWPCA), 33 U.S.C. 1322 *et seq.*;

(C) Water generated by routine vessel operations (e.g., deck wash down and graywater as defined in section 312 of the FWPCA), excluding oily wastes from bilge pumping; or

(D) Cooling water from vessels or engine exhaust;

(ii) Discharging or depositing, from beyond the boundary of the Sanctuary, any material or other matter that subsequently enters the Sanctuary and injures a Sanctuary resource or quality, except those listed in paragraph (a)(4)(i)(A) through (D) of this section and those authorized under Monroe County land use permits or under State permits.

(5) *Operation of vessels.* (i) Operating a vessel in such a manner as to strike or otherwise injure coral, seagrass, or any other immobile organism attached to the seabed, including, but not limited to, operating a vessel in such a manner as to cause prop-scarring.

(ii) Having a vessel anchored on living coral other than hardbottom in water depths less than 40 feet when visibility is such that the seabed can be seen.

(iii) Except in officially marked channels, operating a vessel at a speed greater than 4 knots or in manner which creates a wake:

(A) Within an area designated idle speed only/no wake;

(B) Within 100 yards of navigational aids indicating emergent or shallow reefs (international diamond warning symbol);

(C) Within 100 feet of the red and white ''divers down'' flag (or the blue and white ''alpha'' flag in Federal waters);

(D) Within 100 yards of residential shorelines; or

(E) Within 100 yards of stationary vessels.

(iv) Operating a vessel in such a manner as to injure or take wading, roosting, or nesting birds or marine mammals.

(v) Operating a vessel in a manner which endangers life, limb, marine resources, or property.

(6) *Conduct of diving/snorkeling without flag.* Diving or snorkeling without flying in a conspicuous manner the red and white ''divers down'' flag (or the blue and white ''alpha'' flag in Federal waters).

(7) *Release of exotic species.* Introducing or releasing an exotic species of plant, invertebrate, fish, amphibian, or mammals into the Sanctuary.

(8) *Damage or removal of markers.* Marking, defacing, or damaging in any way or displacing, removing, or tampering with any official signs, notices, or placards, whether temporary or permanent, or with any navigational aids, monuments, stakes, posts, mooring buoys, boundary buoys, trap buoys, or scientific equipment.

(9) *Movement of, removal of, injury to, or possession of Sanctuary historical resources.* Moving, removing, injuring, or possessing, or attempting to move, remove, injure, or possess, a Sanctuary historical resource.

(10) *Take or possession of protected wildlife.* Taking any marine mammal, sea turtle, or seabird in or above the Sanctuary, *except* as authorized by the Marine Mammal Protection Act, as amended, (MMPA), 16 U.S.C. 1361 *et seq.*, the Endangered Species Act, as amended, (ESA), 16 U.S.C. 1531 *et seq.*, and the Migratory Bird Treaty Act, as amended, (MBTA) 16 U.S.C. 703 *et seq.*

(11) *Possession or use of explosives or electrical charges.* Possessing, or using explosives, except powerheads, or releasing electrical charges within the Sanctuary.

(12) *Harvest or possession of marine life species.* Harvesting, possessing, or landing any marine life species, or part thereof, within the Sanctuary, except in accordance with rules 46–42.001 through 46–42.003, 46–42.0035, and 46–42.004 through 46–42.007, and 46.42.009 of the Florida Administrative Code, reproduced in Appendix VIII to this subpart, and such rules shall apply mutatis mutandis (with necessary editorial changes) to all Federal and State waters within the Sanctuary.

(13) *Interference with law enforcement.* Interfering with, obstructing, delaying or preventing an investigation, search, seizure, or disposition of seized property in connection with enforcement of the Acts or any regulation or permit issued under the Acts.

(b) Notwithstanding the prohibitions in this section and in § 922.164, and any access and use restrictions imposed pursuant thereto, a person may conduct an activity specifically authorized by, and conducted in accordance with the scope, purpose, terms, and conditions of, a National Marine Sanctuary permit issued pursuant to § 922.166.

(c) Notwithstanding the prohibitions in this section and in § 922.164, and any access and use restrictions imposed pursuant thereto, a person may conduct an activity specifically authorized by a valid Federal, State, or local lease, permit, license, approval, or other authorization in existence on the effective date of these regulations, or by any valid right of subsistence use or access in existence on the effective date of these regulations, provided that the holder of such authorization or right complies with § 922.167 and with any terms and conditions on the exercise of such authorization or right imposed by the Director as a condition of certification as he or she deems reasonably necessary to achieve the purposes for which the Sanctuary was designated.

(d) Notwithstanding the prohibitions in this section and in § 922.164, and any access and use restrictions imposed pursuant thereto, a person may conduct an activity specifically authorized by any valid Federal, State, or local lease, permit, license, approval, or other authorization issued after the effective date of these regulations, provided that the applicant complies with § 922.168, the Director notifies the applicant and authorizing agency that he or she does not object to issuance of the authorization, and the applicant complies with any terms and conditions the Director deems reasonably necessary to protect Sanctuary resources and qualities. Amendments, renewals and extensions of authorizations in existence on the effective date of these regulations constitute authorizations issued after the effective date of these regulations.

(e) (1) All military activities shall be carried out in a manner that avoids to the maximum extent practical any adverse impacts on Sanctuary resources and qualities. The prohibitions in paragraph (a) of this section and § 922.164 do not apply to existing classes of military activities which were conducted prior to the effective date of these regulations, as identified in the Environmental Impact Statement and Management Plan for the Sanctuary. New military activities in the Sanctuary are allowed and may be exempted from the prohibitions in paragraph (a) of this section and in § 922.164 by the Director after consultation between the Director and the Department of Defense pursuant to section 304(d) of the NMSA. When a military activity is modified such that it is likely to destroy, cause the loss of, or injure a Sanctuary resource or quality in a manner significantly greater than was considered in a previous consultation under section 304(d) of the NMSA, or it is likely to destroy, cause the loss of, or injure a Sanctuary resource or quality not previously considered in a previous consultation under section 304(d) of the NMSA, the activity is considered a new activity for purposes of this paragraph. If it is determined that an activity may be carried out, such activity shall be carried out in a manner that avoids to the maximum extent practical any

adverse impact on Sanctuary resources and qualities.

(2) In the event of threatened or actual destruction of, loss of, or injury to a Sanctuary resource or quality resulting from an untoward incident, including but not limited to spills and groundings caused by the Department of Defense, the cognizant component shall promptly coordinate with the Director for the purpose of taking appropriate actions to prevent, respond to or mitigate the harm and, if possible, restore or replace the Sanctuary resource or quality.

(f) The prohibitions contained in paragraph (a)(5) of this section do not apply to Federal, State and local officers while performing enforcement duties and/or responding to emergencies that threaten life, property, or the environment in their official capacity.

(g) Notwithstanding paragraph (b) of this section and paragraph (a) of § 922.168, in no event may the Director issue a permit under § 922.166 authorizing, or otherwise approve, the exploration for, leasing, development, or production of minerals or hydrocarbons within the Sanctuary, the disposal of dredged material within the Sanctuary other than in connection with beach renourishment or Sanctuary restoration projects, or the discharge of untreated or primary treated sewage (except by a certification, pursuant to § 922.167, of a valid authorization in existence on the effective date of these regulations), and any purported authorizations issued by other authorities after the effective date of these regulations for any of these activities within the Sanctuary shall be invalid.

(h) Any amendment to these regulations shall not take effect in Florida State waters until approved by the Board of Trustees of the Internal Improvement Trust Fund of the State of Florida. Any fishery regulations in the Sanctuary shall not take effect in Florida State waters until established by the Florida Marine Fisheries Commission.

§ 922.164 Additional activity regulations by Sanctuary area.

In addition to the prohibitions set forth in § 922.163, which apply throughout the Sanctuary, the following regulations apply with respect to activities conducted within the Sanctuary areas described in this section and in Appendix (II) through (VII) to this subpart. Activities located within two or more overlapping Sanctuary areas are concurrently subject to the regulations applicable to each overlapping area.

(a) *Areas To Be Avoided.* Operating a tank vessel or a vessel greater than 50 meters in registered length is prohibited in all areas to be avoided, except if such vessel is a public vessel and its operation is essential for national defense, law enforcement, or responses to emergencies that threaten life, property, or the environment. Appendix VII to this subpart sets forth the geographic coordinates of these areas.

(b) *Existing Management Areas.*—(1) *Key Largo and Looe Key Management Areas.* The following activities are prohibited within the Key Largo and Looe Key Management Areas (also known as the Key Largo and Looe Key National Marine Sanctuaries) described in Appendix II to this subpart:

(i) Removing, taking, damaging, harmfully disturbing, breaking, cutting, spearing or similarly injuring any coral or other marine invertebrate, or any plant, soil, rock, or other material, except commercial taking of spiny lobster and stone crab by trap and recreational taking of spiny lobster by hand or by hand gear which is consistent with these regulations and the applicable regulations implementing the applicable Fishery Management Plan.

(ii) Taking any tropical fish.

(iii) Fishing with wire fish traps, bottom trawls, dredges, fish sleds, or similar vessel-towed or anchored bottom fishing gear or nets.

(iv) Fishing with, carrying or possessing, except while passing through without interruption or for law enforcement purposes: pole spears, air rifles, bows and arrows, slings, Hawaiian slings, rubber powered arbaletes, pneumatic and spring-loaded guns or similar devices known as spearguns.

(2) *Great White Heron and Key West National Wildlife Refuge Management Areas.* Operating a personal watercraft, operating an airboat, or water skiing except within Township 66 South, Range 29 East, Sections 5, 11, 12 and 14; Township 66 South, Range 28 East, Section 2; Township 67 South, Range 26 East, Sections 16 and 20, all Tallahassee Meridian, are prohibited within the marine portions of the Great White Heron and Key West National Wildlife Refuge Management Areas described in Appendix II to this subpart.

(c) *Wildlife Management Areas.* (1) Marine portions of the Wildlife Management Areas listed in Appendix III to this subpart or portions thereof may be designated ''idle speed only/no-wake,'' ''no-motor'' or ''no-access buffer'' zones or ''closed''. The Director, in cooperation with other Federal, State, or local resource management authorities, as appropriate, shall post signs conspicuously, using mounting posts, buoys, or other means according to location and purpose, at appropriate intervals and locations, clearly delineating an area as an ''idle speed only/no wake'', a ''no-motor'', or a ''no-access buffer'' zone or as ''closed'', and allowing instant, long-range recognition by boaters. Such signs shall display the official logo of the Sanctuary.

(2) The following activities are prohibited within the marine portions of the Wildlife Management Areas listed in Appendix III to this subpart:

(i) In those marine portions of any Wildlife Management Area designated an ''idle speed only/no wake'' zone in Appendix III to this subpart, operating a vessel at a speed greater that idle speed only/no wake.

(ii) In those marine portions of any Wildlife Management Area designated a ''no-motor'' zone in Appendix III to this subpart, using internal combustion motors or engines for any purposes. A vessel with an internal combustion motor or engine may access a ''no-motor'' zone only through the use of a push pole, paddle, sail, electric motor or similar means of propulsion.

(iii) In those marine portions of any Wildlife Management Area designated a ''no-access buffer'' zone in Appendix III of this subpart, entering the area by vessel.

(iv) In those marine portions of any Wildlife Management Area designated as closed in Appendix III of this subpart, entering or using the area.

(3) The Director shall coordinate with other Federal, State, or local resource management authorities, as appropriate, in the establishment and enforcement of access restrictions described in paragraph (c)(2) (i)–(iv) of this section in the marine portions of Wildlife Management Areas.

(4) The Director may modify the number and location of access restrictions described in paragraph (c)(2) (i)–(iv) of this section within the marine portions of a Wildlife Management Area if the Director finds that such action is reasonably necessary to minimize disturbances to Sanctuary wildlife, or to ensure protection and preservation of Sanctuary wildlife consistent with the purposes of the Sanctuary designation and other applicable law governing the protection and preservation of wildlife resources in the Sanctuary. The Director will effect such modification by:

(i) Publishing in the **Federal Register**, after notice and an opportunity for public comments in accordance, an amendment to the list of such areas set forth in Appendix III to this subpart, and a notice regarding the time and place where maps depicting the precise locations of such restrictions will be

made available for public inspection, and

(ii) Posting official signs delineating such restrictions in accordance with paragraph (c)(1) of this section.

(d) *Ecological Reserves and Sanctuary Preservation Areas.* (1) The following activities are prohibited within the Ecological Reserves described in Appendix IV to this subpart, and within the Sanctuary Preservation Areas, described in Appendix V to this subpart:

(i) Discharging or depositing any material or other matter except cooling water or engine exhaust.

(ii) Possessing, moving, harvesting, removing, taking, damaging, disturbing, breaking, cutting, spearing, or otherwise injuring any coral, marine invertebrate, fish, bottom formation, algae, seagrass or other living or dead organism, including shells, or attempting any of these activities. However, fish, invertebrates, and marine plants may be possessed aboard a vessel in an Ecological Reserve or Sanctuary Preservation Area, provided such resources can be shown not to have been harvested within, removed from, or taken within, the Ecological Reserve or Sanctuary Preservation Area, as applicable, by being stowed in a cabin, locker, or similar storage area prior to entering and during transit through such reserves or areas, provided further that in an Ecological Reserve or Sanctuary Preservation Area located in Florida State waters, such vessel is in continuous transit through the Ecological Reserve or Sanctuary Preservation Area.

(iii) Except for catch and release fishing by trolling in the Conch Reef, Alligator Reef, Sombrero Reef, and Sand Key SPAs, fishing by any means. However, gear capable of harvesting fish may be aboard a vessel in an Ecological Reserve or Sanctuary Preservation Area, provided such gear is not available for immediate use when entering and during transit through such Ecological Reserve or Sanctuary Preservation Area, and no presumption of fishing activity shall be drawn therefrom.

(iv) Touching living or dead coral, including but not limited to, standing on a living or dead coral formation.

(v) Placing any anchor in a way that allows the anchor or any portion of the anchor apparatus (including the anchor, chain or rope) to touch living or dead coral, or any attached organism. When anchoring dive boats, the first diver down must inspect the anchor to ensure that it is not touching living or dead coral, and will not shift in such a way as to touch such coral or other attached organisms. No further diving shall take place until the anchor is placed in accordance with these requirements.

(vi) Anchoring instead of mooring when a mooring buoy is available or anchoring in other than a designated anchoring area when such areas have been designated and are available.

(vii) Except for passage without interruption through the area, for law enforcement purposes, or for purposes of monitoring pursuant to paragraph (d)(2) of this section, violating a temporary access restriction imposed by the Director pursuant to paragraph (d)(2) of this section.

(2) The Director may temporarily restrict access to any portion of any Sanctuary Preservation Area or Ecological Reserve if the Director, on the basis of the best available data, information and studies, determines that a concentration of use appears to be causing or contributing to significant degradation of the living resources of the area and that such action is reasonably necessary to allow for recovery of the living resources of such area. The Director will provide for continuous monitoring of the area during the pendency of the restriction. The Director will provide public notice of the restriction by publishing a notice in the **Federal Register**, and by such other means as the Director may deem appropriate. The Director may only restrict access to an area for a period of 60 days, with one additional 60 day renewal. The Director may restrict access to an area for a longer period pursuant to a notice and opportunity for public comment rulemaking under the Administrative Procedure Act. Such restriction will be kept to the minimum amount of area necessary to achieve the purposes thereof.

(e) *Special-use Areas.* (1) The Director may set aside discrete areas of the Sanctuary as Special-use Areas, and, by designation pursuant to this paragraph, impose the access and use restrictions specified in paragraph (e)(3) of this section. Special-use Areas are described in Appendix VI to this subpart, in accordance with the following designations and corresponding objectives:

(i) ''Recovery area'' to provide for the recovery of Sanctuary resources from degradation or other injury attributable to human uses;

(ii) ''Restoration area'' to provide for restoration of degraded or otherwise injured Sanctuary resources;

(iii) ''Research-only area'' to provide for scientific research or education relating to protection and management, through the issuance of a Sanctuary General permit for research pursuant to § 922.166 of these regulations; and

(iv) ''Facilitated-use area'' to provide for the prevention of use or user conflicts or the facilitation of access and use, or to promote public use and understanding, of Sanctuary resources through the issuance of special-use permits.

(2) A Special-use Area shall be no larger than the size the Director deems reasonably necessary to accomplish the applicable objective.

(3) Persons conducting activities within any Special-use Area shall comply with the access and use restrictions specified in this paragraph and made applicable to such area by means of its designation as a ''recovery area,'' ''restoration area,'' ''research-only area,'' or ''facilitated-use area.'' Except for passage without interruption through the area or for law enforcement purposes, no person may enter a Special-use Area except to conduct or cause to be conducted the following activities:

(i) in such area designated as a ''recovery area'' or a ''restoration area'', habitat manipulation related to restoration of degraded or otherwise injured Sanctuary resources, or activities reasonably necessary to monitor recovery of degraded or otherwise injured Sanctuary resources;

(ii) in such area designated as a ''research only area'', scientific research or educational use specifically authorized by and conducted in accordance with the scope, purpose, terms and conditions of a valid National Marine Sanctuary General or Historical Resources permit, or

(iii) in such area designated as a ''facilitated-use area'', activities specified by the Director or specifically authorized by and conducted in accordance with the scope, purpose, terms, and conditions of a valid Special-use permit.

(4)(i) The Director may modify the number of, location of, or designations applicable to, Special-use Areas by publishing in the **Federal Register**, after notice and an opportunity for public comment in accordance with the Administrative Procedure Act, an amendment to Appendix VI to this subpart, except that, with respect to such areas designated as a ''recovery area,'' ''restoration area,'' or ''research only area,'' the Director may modify the number of, location of, or designation applicable to, such areas by publishing a notice of such action in the **Federal Register** if the Director determines that immediate action is reasonably necessary to:

(A) Prevent significant injury to Sanctuary resources where

circumstances create an imminent risk to such resources;

(B) Initiate restoration activity where a delay in time would significantly impair the ability of such restoration activity to succeed;

(C) Initiate research activity where an unforeseen natural event produces an opportunity for scientific research that may be lost if research is not initiated immediately.

(ii) If the Director determines that a notice of modification must be promulgated immediately in accordance with paragraph (e)(4)(i) of this section, the Director will, as part of the same notice, invite public comment and specify that comments will be received for 15 days after the effective date of the notice. As soon as practicable after the end of the comment period, the Director will either rescind, modify or allow the modification to remain unchanged through notice in the **Federal Register**.

(f) Additional Wildlife Management Areas, Ecological Reserves, Sanctuary Preservation Areas, or Special-use Areas, and additional restrictions in such areas, shall not take effect in Florida State waters unless first approved by the Board of Trustees of the Internal Improvement Trust Fund of the State of Florida.

§ 922.165 Emergency regulations.

Where necessary to prevent or minimize the destruction of, loss of, or injury to a Sanctuary resource or quality, or minimize the imminent risk of such destruction, loss, or injury, any and all activities are subject to immediate temporary regulation, including prohibition. Emergency regulations shall not take effect in Florida territorial waters until approved by the Governor of the State of Florida. Any temporary regulation may be in effect for up to 60 days, with one 60-day extension. Additional or extended action will require notice and comment rulemaking under the Administrative Procedure Act, notice in local newspapers, notice to Mariners, and press releases.

§ 922.166 Permits—application procedures and issuance criteria.

(a) National Marine Sanctuary General Permit.—(1) A person may conduct an activity prohibited by §§ 922.163 or 922.164, other than an activity involving the survey/inventory, research/recovery, or deaccession/transfer of Sanctuary historical resources, if such activity is specifically authorized by, and provided such activity is conducted in accordance with the scope, purpose, terms and conditions of, a National Marine Sanctuary General permit issued under this paragraph (a).

(2) The Director, at his or her discretion, may issue a General permit under this paragraph (a), subject to such terms and conditions as he or she deems appropriate, if the Director finds that the activity will:

(i) Further research or monitoring related to Sanctuary resources and qualities;

(ii) Further the educational value of the Sanctuary;

(iii) Further the natural or historical resource value of the Sanctuary;

(iv) Further salvage or recovery operations in or near the Sanctuary in connection with a recent air or marine casualty;

(v) Assist in managing the Sanctuary; or

(vi) Otherwise further Sanctuary purposes, including facilitating multiple use of the Sanctuary, to the extent compatible with the primary objective of resource protection.

(3) The Director shall not issue a General permit under this paragraph (a), unless the Director also finds that:

(i) The applicant is professionally qualified to conduct and complete the proposed activity;

(ii) The applicant has adequate financial resources available to conduct and complete the proposed activity;

(iii) The duration of the proposed activity is no longer than necessary to achieve its stated purpose;

(iv) The methods and procedures proposed by the applicant are appropriate to achieve the proposed activity's goals in relation to the activity's impacts on Sanctuary resources and qualities;

(v) The proposed activity will be conducted in a manner compatible with the primary objective of protection of Sanctuary resources and qualities, considering the extent to which the conduct of the activity may diminish or enhance Sanctuary resources and qualities, any indirect, secondary or cumulative effects of the activity, and the duration of such effects;

(vi) It is necessary to conduct the proposed activity within the Sanctuary to achieve its purposes; and

(vii) The reasonably expected end value of the activity to the furtherance of Sanctuary goals and purposes outweighs any potential adverse impacts on Sanctuary resources and qualities from the conduct of the activity.

(4) For activities proposed to be conducted within any of the areas described in § 922.164 (b)–(e), the Director shall not issue a permit unless he or she further finds that such activities will further and are consistent with the purposes for which such area was established, as described in §§ 922.162 and 922.164 and in the management plan for the Sanctuary.

(b) *National Marine Sanctuary Survey/Inventory of Historical Resources Permit.* (1) A person may conduct an activity prohibited by §§ 922.163 or 922.164 involving the survey/inventory of Sanctuary historical resources if such activity is specifically authorized by, and is conducted in accordance with the scope, purpose, terms and conditions of, a Survey/Inventory of Historical Resources permit issued under this paragraph (b). Such permit is not required if such survey/inventory activity does not involve any activity prohibited by §§ 922.163 or 922.164. Thus, survey/inventory activities that are non-intrusive, do not include any excavation, removal, or recovery of historical resources, and do not result in destruction of, loss of, or injury to Sanctuary resources or qualities do not require a permit. However, if a survey/inventory activity will involve test excavations or removal of artifacts or materials for evaluative purposes, a Survey/Inventory of Historical Resources permit is required. Regardless of whether a Survey/Inventory permit is required, a person may request such permit. Persons who have demonstrated their professional abilities under a Survey/Inventory permit will be given preference over other persons in consideration of the issuance of a Research/Recovery permit. While a Survey/Inventory permit does not grant any rights with regards to areas subject to pre-existing rights of access which are still valid, once a permit is issued for an area, other survey/inventory permits will not be issued for the same area during the period for which the permit is valid.

(2) The Director, at his or her discretion, may issue a Survey/Inventory permit under this paragraph (b), subject to such terms and conditions as he or she deems appropriate, if the Director finds that such activity:

(i) Satisfies the requirements for a permit issued under paragraph (a)(3) of this section;

(ii) Either will be non-intrusive, not include any excavation, removal, or recovery of historical resources, and not result in destruction of, loss of, or injury to Sanctuary resources or qualities, or if intrusive, will involve no more than the minimum manual alteration of the seabed and/or the removal of artifacts or other material necessary for evaluative purposes and will cause no significant adverse impacts on Sanctuary resources or qualities; and

(iii) That such activity will be conducted in accordance with all requirements of the Programmatic Agreement for the Management of Submerged Cultural Resources in the Florida Keys National Marine Sanctuary among NOAA, the Advisory Council on Historic Preservation, and the State of Florida (hereinafter SCR Agreement), and that such permit issuance is in accordance with such SCR Agreement. Copies of the SCR Agreement may also be examined at, and obtained from, the Sanctuaries and Reserves Division, Office of Ocean and Coastal Resource Management, National Ocean Service, National Oceanic and Atmospheric Administration, 1305 East-West Highway, 12th floor, Silver Spring, MD 20910; or from the Florida Keys National Marine Sanctuary Office, P.O. Box 500368, Marathon, FL 33050.

(c) *National Marine Sanctuary Research/Recovery of Sanctuary Historical Resources Permit.* (1) A person may conduct any activity prohibited by §§ 922.163 or 922.164 involving the research/recovery of Sanctuary historical resources if such activity is specifically authorized by, and is conducted in accordance with the scope, purpose, terms and conditions of, a Research/Recovery of Historical Resources permit issued under this paragraph (c).

(2) The Director, at his or her discretion, may issue a Research/Recovery of Historical Resources permit, under this paragraph (c), and subject to such terms and conditions as he or she deems appropriate, if the Director finds that:

(i) Such activity satisfies the requirements for a permit issued under paragraph (a)(3) of this section;

(ii) The recovery of the resource is in the public interest as described in the SCR Agreement;

(iii) Recovery of the resource is part of research to preserve historic information for public use; and

(iv) Recovery of the resource is necessary or appropriate to protect the resource, preserve historical information, and/or further the policies and purposes of the NMSA and the FKNMSPA, and that such permit issuance is in accordance with, and that the activity will be conducted in accordance with, all requirements of the SCR Agreement.

(d) *National Marine Sanctuary Special-use Permit.* (1) A person may conduct any commercial or concession-type activity prohibited by §§ 922.163 or 922.164, if such activity is specifically authorized by, and is conducted in accordance with the scope, purpose, terms and conditions of, a Special-use permit issued under this paragraph (d). A Special-use permit is required for the deaccession/transfer of Sanctuary historical resources.

(2) The Director, at his or her discretion, may issue a Special-use permit in accordance with this paragraph (d), and subject to such terms and conditions as he or she deems appropriate and the mandatory terms and conditions of section 310 of the NMSA, if the Director finds that issuance of such permit is reasonably necessary to: establish conditions of access to and use of any Sanctuary resource; or promote public use and understanding of any Sanctuary resources. No permit may be issued unless the activity is compatible with the purposes for which the Sanctuary was designated and can be conducted in a manner that does not destroy, cause the loss of, or injure any Sanctuary resource, and if for the deaccession/transfer of Sanctuary Historical Resources, unless such permit issuance is in accordance with, and that the activity will be conducted in accordance with, all requirements of the SCR Agreement.

(3) The Director may assess and collect fees for the conduct of any activity authorized by a Special-use permit issued pursuant to this paragraph (d). No Special-use permit shall be effective until all assessed fees are paid, unless otherwise provided by the Director by a fee schedule set forth as a permit condition. In assessing a fee, the Director shall include:

(i) All costs incurred, or expected to be incurred, in reviewing and processing the permit application, including, but not limited to, costs for:

(A) Number of personnel;

(B) Personnel hours;

(C) Equipment;

(D) Biological assessments;

(E) Copying; and

(F) Overhead directly related to reviewing and processing the permit application;

(ii) All costs incurred, or expected to be incurred, as a direct result of the conduct of the activity for which the Special-use permit is being issued, including, but not limited to:

(A) The cost of monitoring the conduct both during the activity and after the activity is completed in order to assess the impacts to Sanctuary resources and qualities;

(B) The use of an official NOAA observer, including travel and expenses and personnel hours; and

(C) Overhead costs directly related to the permitted activity; and

(iii) An amount which represents the fair market value of the use of the Sanctuary resource and a reasonable return to the United States Government.

(4) Nothing in this paragraph (d) shall be considered to require a person to obtain a permit under this paragraph for the conduct of any fishing activities within the Sanctuary.

(e) *Applications.* (1) Applications for permits should be addressed to the Director, Office of Ocean and Coastal Resource Management; ATTN: Sanctuary Superintendent, Florida Keys National Marine Sanctuary, P.O. Box 500368, Marathon, FL 33050. All applications must include:

(i) A detailed description of the proposed activity including a timetable for completion of the activity and the equipment, personnel and methodology to be employed;

(ii) The qualifications and experience of all personnel;

(iii) The financial resources available to the applicant to conduct and complete the proposed activity;

(iv) A statement as to why it is necessary to conduct the activity within the Sanctuary;

(v) The potential impacts of the activity, if any, on Sanctuary resources and qualities;

(vi) The benefit to be derived from the activity; and

(vii) Such other information as the Director may request depending on the type of activity. Copies of all other required licenses, permits, approvals, or other authorizations must be attached to the application.

(2) Upon receipt of an application, the Director may request such additional information from the applicant as he or she deems reasonably necessary to act on the application and may seek the views of any persons. The Director may require a site visit as part of the permit evaluation. Unless otherwise specified, the information requested must be received by the Director within 30 days of the postmark date of the request. Failure to provide such additional information on a timely basis may be deemed by the Director to constitute abandonment or withdrawal of the permit application.

(f) A permit may be issued for a period not exceeding five years. All permits will be reviewed annually to determine the permittee's compliance with permit scope, purpose, terms and conditions and progress toward reaching the stated goals and appropriate action taken under paragraph (g) of this section if warranted. A permittee may request permit renewal pursuant to the same procedures for applying for a new permit. Upon the permittee's request for renewal, the Director shall review all

reports submitted by the permittee as required by the permit conditions. In order to renew the permit, the Director must find that the:

(1) Activity will continue to further the purposes for which the Sanctuary was designated in accordance with the criteria applicable to the initial issuance of the permit;

(2) Permittee has at no time violated the permit, or these regulations; and

(3) The activity has not resulted in any unforeseen adverse impacts to Sanctuary resources or qualities.

(g) The Director may amend, suspend, or revoke a permit for good cause. The Director may deny a permit application, in whole or in part, if it is determined that the permittee or applicant has acted in violation of a previous permit, of these regulations, of the NMSA or FKNMSPA, or for other good cause. Any such action shall be communicated in writing to the permittee or applicant by certified mail and shall set forth the reason(s) for the action taken. Procedures governing permit sanctions and denials for enforcement reasons are set forth in Subpart D of 15 CFR part 904.

(h) The applicant for or holder of a National Marine Sanctuary permit may appeal the denial, conditioning, amendment, suspension or revocation of the permit in accordance with the procedures set forth in § 922.50.

(i) A permit issued pursuant to this section other than a Special-use permit is nontransferable. Special-use permits may be transferred, sold, or assigned with the written approval of the Director. The permittee shall provide the Director with written notice of any proposed transfer, sale, or assignment no less than 30 days prior to its proposed consummation. Transfers, sales, or assignments consummated in violation of this requirement shall be considered a material breach of the Special-use permit, and the permit shall be considered void as of the consummation of any such transfer, sale, or assignment.

(j) The permit or a copy thereof shall be maintained in legible condition on board all vessels or aircraft used in the conduct of the permitted activity and be displayed for inspection upon the request of any authorized officer.

(k) Any permit issued pursuant to this section shall be subject to the following terms and conditions:

(1) All permitted activities shall be conducted in a manner that does not destroy, cause the loss of, or injure Sanctuary resources or qualities, except to the extent that such may be specifically authorized.

(2) The permittee agrees to hold the United States harmless against any claims arising out of the conduct of the permitted activities.

(3) All necessary Federal, State, and local permits from all agencies with jurisdiction over the proposed activities shall be secured before commencing field operations.

(l) In addition to the terms and conditions listed in paragraph (k) of this section, any permit authorizing the research/recovery of historical resources shall be subject to the following terms and conditions:

(1) A professional archaeologist shall be in charge of planning, field recovery operations, and research analysis.

(2) An agreement with a conservation laboratory shall be in place before field recovery operations are begun, and an approved nautical conservator shall be in charge of planning, conducting, and supervising the conservation of any artifacts and other materials recovered.

(3) A curation agreement with a museum or facility for curation, public access and periodic public display, and maintenance of the recovered historical resources shall be in place before commencing field operations (such agreement for the curation and display of recovered historical resources may provide for the release of public artifacts for deaccession/transfer if such deaccession/transfer is consistent with preservation, research, education, or other purposes of the designation and management of the Sanctuary. Deaccession/transfer of historical resources requires a Special-use permit issued pursuant to paragraph (d) and such deaccession/transfer shall be executed in accordance with the requirements of the SCR Agreement).

(4) The site's archaeological information is fully documented, including measured drawings, site maps drawn to professional standards, and photographic records.

(m) In addition to the terms and conditions listed in paragraph (k) and (l) of this section, any permit issued pursuant to this section is subject to such other terms and conditions, including conditions governing access to, or use of, Sanctuary resources, as the Director deems reasonably necessary or appropriate and in furtherance of the purposes for which the Sanctuary is designated. Such terms and conditions may include, but are not limited to:

(1) Any data or information obtained under the permit shall be made available to the public.

(2) A NOAA official shall be allowed to observe any activity conducted under the permit.

(3) The permittee shall submit one or more reports on the status, progress, or results of any activity authorized by the permit.

(4) The permittee shall submit an annual report to the Director not later than December 31 of each year on activities conducted pursuant to the permit. The report shall describe all activities conducted under the permit and all revenues derived from such activities during the year and/or term of the permit.

(5) The permittee shall purchase and maintain general liability insurance or other acceptable security against potential claims for destruction, loss of, or injury to Sanctuary resources arising out of the permitted activities. The amount of insurance or security should be commensurate with an estimated value of the Sanctuary resources in the permitted area. A copy of the insurance policy or security instrument shall be submitted to the Director.

§ 922.167 Certification of preexisting leases, licenses, permits, approvals, other authorizations, or rights to conduct a prohibited activity.

(a) A person may conduct an activity prohibited by §§ 922.163 or 922.164 if such activity is specifically authorized by a valid Federal, State, or local lease, permit, license, approval, or other authorization in existence on July 1, 1997, or by any valid right of subsistence use or access in existence on July 1, 1997, provided that:

(1) The holder of such authorization or right notifies the Director, in writing, within 90 days of July 1, 1997, of the existence of such authorization or right and requests certification of such authorization or right;

(2) The holder complies with the other provisions of this § 922.167; and

(3) The holder complies with any terms and conditions on the exercise of such authorization or right imposed as a condition of certification, by the Director, to achieve the purposes for which the Sanctuary was designated.

(b) The holder of an authorization or right described in paragraph (a) of this section authorizing an activity prohibited by §§ 922.163 or 922.164 may conduct the activity without being in violation of applicable provisions of §§ 922.163 or 922.164, pending final agency action on his or her certification request, provided the holder is in compliance with this § 922.167.

(c) Any holder of an authorization or right described in paragraph (a) of this section may request the Director to issue a finding as to whether the activity for which the authorization has been issued, or the right given, is prohibited

by §§ 922.163 or 922.164, thus requiring certification under this section.

(d) Requests for findings or certifications should be addressed to the Director, Office of Ocean and Coastal Resource Management; ATTN: Sanctuary Superintendent, Florida Keys National Marine Sanctuary, P.O. Box 500368, Marathon, FL 33050. A copy of the lease, permit, license, approval, or other authorization must accompany the request.

(e) The Director may request additional information from the certification requester as he or she deems reasonably necessary to condition appropriately the exercise of the certified authorization or right to achieve the purposes for which the Sanctuary was designated. The information requested must be received by the Director within 45 days of the postmark date of the request. The Director may seek the views of any persons on the certification request.

(f) The Director may amend any certification made under this § 922.167 whenever additional information becomes available justifying such an amendment.

(g) Upon completion of review of the authorization or right and information received with respect thereto, the Director shall communicate, in writing, any decision on a certification request or any action taken with respect to any certification made under this § 922.167, in writing, to both the holder of the certified lease, permit, license, approval, other authorization, or right, and the issuing agency, and shall set forth the reason(s) for the decision or action taken.

(h) Any time limit prescribed in or established under this § 922.167 may be extended by the Director for good cause.

(i) The holder may appeal any action conditioning, amending, suspending, or revoking any certification in accordance with the procedures set forth in § 922.50.

(j) Any amendment, renewal, or extension made after July 1, 1997, to a lease, permit, license, approval, other authorization or right is subject to the provisions of § 922.49.

Appendix I to Subpart P of Part 922—Florida Keys National Marine Sanctuary Boundary Coordinates

(Appendix Based on North American Datum of 1983)

The boundary of the Florida Keys National Marine Sanctuary—

(a) Begins at the northeasternmost point of Biscayne National Park located at approximately 25 degrees 39 minutes north latitude, 80 degrees 5 minutes west longitude, then runs eastward to the 300-foot isobath located at approximately 25 degrees 39 minutes north latitude, 80 degrees 4 minutes west longitude;

(b) Then runs southward and connects in succession the points at the following coordinates:

(i) 25 degrees 34 minutes north latitude, 80 degrees 4 minutes west longitude,

(ii) 25 degrees 28 minutes north latitude, 80 degrees 5 minutes west longitude, and

(iii) 25 degrees 21 minutes north latitude, 80 degrees 7 minutes west longitude;

(iv) 25 degrees 16 minutes north latitude, 80 degrees 8 minutes west longitude;

(c) Then runs southwesterly approximating the 300-foot isobath and connects in succession the points at the following coordinates:

(i) 25 degrees 7 minutes north latitude, 80 degrees 13 minutes west longitude,

(ii) 24 degrees 57 minutes north latitude, 80 degrees 21 minutes west longitude,

(iii) 24 degrees 39 minutes north latitude, 80 degrees 52 minutes west longitude,

(iv) 24 degrees 30 minutes north latitude, 81 degrees 23 minutes west longitude,

(v) 24 degrees 25 minutes north latitude, 81 degrees 50 minutes west longitude,

(vi) 24 degrees 22 minutes north latitude, 82 degrees 48 minutes west longitude,

(vii) 24 degrees 37 minutes north latitude, 83 degrees 6 minutes west longitude,

(viii) 24 degrees 40 minutes north latitude, 83 degrees 6 minutes west longitude,

(ix) 24 degrees 46 minutes north latitude, 82 degrees 54 minutes west longitude,

(x) 24 degrees 44 minutes north latitude, 81 degrees 55 minutes west longitude,

(xi) 24 degrees 51 minutes north latitude, 81 degrees 26 minutes west longitude, and

(xii) 24 degrees 55 minutes north latitude, 80 degrees 56 minutes west longitude;

(d) then follows the boundary of Everglades National Park in a southerly then northeasterly direction through Florida Bay, Buttonwood Sound, Tarpon Basin, and Blackwater Sound;

(e) after Division Point, then departs from the boundary of Everglades National Park and follows the western shoreline of Manatee Bay, Barnes Sound, and Card Sound;

(f) then follows the southern boundary of Biscayne National Park to the southeasternmost point of Biscayne National Park; and

(g) then follows the eastern boundary of Biscayne National Park to the beginning point specified in paragraph (a).

Appendix II to Subpart P of Part 922—Existing Management Areas Boundary Coordinates

The Existing Management Areas are located within the following geographic boundary coordinates:

National Oceanic and Atmospheric Administration,

Preexisting National Marine Sanctuaries:

Point	Latitude	Longitude
Key Largo Management Area (Key Largo National Marine Sanctuary)		
1	25°19.45′ N	80°12.00′ W
2	25°16.02′ N	80°08.07′ W
3	25°07.05′ N	80°12.05′ W
4	24°58.03′ N	80°19.08′ W
5	25°02.02′ N	80°25.25′ W
Looe Key Management Area (Looe Key National Marine Sanctuary)		
1	24°31.62′ N	81°26.00′ W
2	24°33.57′ N	81°26.00′ W
3	24°34.15′ N	81°23.00′ W
4	24°32.20′ N	81°23.00′ W
United States Fish and Wildlife Service: Great White Heron National Wildlife Refuge (based on the North American Datum of 1983)		
1	24°43.8′ N	81°48.6′ W
2	24°43.8′ N	81°37.2′ W
3	24°49.2′ N	81°37.2′ W
4	24°49.2′ N	81°19.8′ W
5	24°48.0′ N	81°19.8′ W
6	24°48.0′ N	81°14.4′ W
7	24°49.2′ N	81°14.4′ W
8	24°49.2′ N	81°08.4′ W
9	24°43.8′ N	81°08.4′ W
10	24°43.8′ N	81°14.4′ W
11	24°43.2′ N	81°14.4′ W
12	24°43.2′ N	81°16.2′ W
13	24°42.6′ N	81°16.2′ W
14	24°42.6′ N	81°21.0′ W
15	24°41.4′ N	81°21.0′ W
16	24°41.4′ N	81°22.2′ W
17	24°43.2′ N	81°22.2′ W
18	24°43.2′ N	81°22.8′ W
19	24°43.8′ N	81°22.8′ W
20	24°43.8′ N	81°24.0′ W
21	24°43.2′ N	81°24.0′ W
22	24°43.2′ N	81°26.4′ W
23	24°43.8′ N	81°26.4′ W
24	24°43.8′ N	81°27.0′ W
25	24°43.2′ N	81°27.0′ W
26	24°43.2′ N	81°29.4′ W
27	24°42.6′ N	81°29.4′ W
28	24°42.6′ N	81°30.6′ W
29	24°41.4′ N	81°30.6′ W

Point	Latitude	Longitude
30	24°41.4′ N	81°31.2′ W
31	24°40.8′ N	81°31.2′ W
32	24°40.8′ N	81°32.4′ W
33	24°41.4′ N	81°32.4′ W
34	24°41.4′ N	81°34.2′ W
35	24°40.8′ N	81°34.2′ W
36	24°48.0′ N	81°35.4′ W
37	24°39.6′ N	81°35.4′ W
38	24°39.6′ N	81°36.0′ W
39	24°39.0′ N	81°36.0′ W
40	24°39.0′ N	81°37.2′ W
41	24°37.8′ N	81°37.2′ W
42	24°37.8′ N	81°37.8′ W
43	24°37.2′ N	81°37.8′ W
44	24°37.2′ N	81°40.2′ W
45	24°36.0′ N	81°40.2′ W
46	24°36.0′ N	81°40.8′ W
47	24°35.4′ N	81°40.8′ W
48	24°35.4′ N	81°42.0′ W
49	24°36.0′ N	81°42.0′ W
50	24°36.0′ N	81°48.6′ W

Point	Latitude	Longitude
Key West National Wildlife Refuge		
1	24°40′ N	81°49′ W
2	24°40′ N	82°10′ W
3	24°27′ N	82°10′ W
4	24°27′ N	81°49′ W

When differential Global Positioning Systems data becomes available, these coordinates may be revised by **Federal Register** notice to reflect the increased accuracy of such data.

Appendix III to Subpart P of Part 922—Wildlife Management Areas Access Restrictions

Area	Access restrictions
Bay Keys	No-motor zone (300 feet) around one key; idle speed only/no-wake zones in tidal creeks.
Boca Grande Key	South one-half of beach closed (beach above mean high water closed by Department of the Interior).
Woman Key	One-half of beach and sand spit on southeast side closed (beach and sand spit above mean high water closed by Department of the Interior).
Cayo Agua Keys	Idle speed only/no-wake zones in all navigable tidal creeks.
Cotton Key	No-motor zone on tidal flat.
Snake Creek	No-motor zone on tidal flat.
Cottrell Key	No-motor zone (300 feet) around entire key.
Little Mullet Key	No-access buffer zone (300 feet) around entire key.
Big Mullet Key	No-motor zone (300 feet) around entire key.
Crocodile Lake	No-access buffer zone (100 feet) along shoreline between March 1 and October 1.
East Harbor Key	No-access buffer zone (300 feet) around northernmost island.
Lower Harbor Keys	Idle speed only/no-wake zones in selected tidal creeks.
Eastern Lake Surprise	Idle speed only/no-wake zone east of highway U.S. 1.
Horseshoe Key	No-access buffer zone (300 feet) around main island (main island closed by Department of the Interior).
Marquesas Keys	(i) No-motor zones (300 feet) around three smallest keys on western side of chain; (ii) no-access buffer zone (300 feet) around one island at western side of chain; (iii) idle speed only/no-wake zone in southwest tidal creek.
Tidal flat south of Marvin Key	No-access buffer zone on tidal flat.
Mud Keys	(i) Idle speed only/no-wake zones in the two main tidal creeks; (ii) two smaller creeks on west side closed.
Pelican Shoal	No-access buffer zone out to 50 meters from shore between April 1 and August 31 (shoal closed by the Florida Game and Freshwater Fish Commission).
Rodriguez Key	No-motor zone on tidal flats.
Dove Key	No-motor zone on tidal flats; area around the two small islands closed.
Tavernier Key	No-motor zone on tidal flats.
Sawyer Keys	Tidal creeks on south side closed.
Snipe Keys	(i) Idle speed only/no-wake zone in main tidal creek; (ii) no-motor zone in all other tidal creeks.
Upper Harbor Key	No-access buffer zone (300 feet) around entire key.
East Content Keys	Idle speed only/no-wake zones in tidal creeks between southwesternmost keys.
West Content Keys	Idle speed only/no-wake zones in selected tidal creeks; no-access buffer zone in one cove.
Little Crane Key	No-access buffer zone (300 feet) around entire key.

Appendix IV to Subpart P of Part 922—Ecological Reserves Boundary Coordinates

One Ecological Reserve—the Western Sambos Ecological Reserve—is designated in the area of Western Sambos reef. NOAA has committed to designating a second Ecological Reserve within two years from issuance of this plan in the area of the Dry Tortugas. The establishment of a Dry Tortugas Ecological Reserve will be proposed by a notice of proposed rulemaking with a proposed boundary determined through a joint effort among the Sanctuary, and the National Park Service, pursuant to a public process involving a team consisting of managers, scientists, conservationists, and affected user groups.

The Western Sambos Ecological Reserve (based on differential Global Positioning Systems data) is located within the following geographic boundary coordinates:

*WESTERN SAMBOS

Point	Latitude	Longitude
1	24°33.70′ N	81°40.80′ W
2	24°28.85′ N	81°41.90′ W
3	24°28.50′ N	81°43.70′ W

*WESTERN SAMBOS—Continued

Point	Latitude	Longitude
4	24°33.50′ N	81°43.10′ W

(* Denotes located in State waters)

Appendix V to Subpart P of Part 922—Sanctuary Preservation Areas Boundary Coordinates

The Sanctuary Preservation Areas (SPAs) (based on differential Global Positioning Systems data) are located within the following geographic boundary coordinates:

Point	Latitude	Longitude
Alligator Reef		
1	24°50.98′N	80°36.84′W
2	24°50.51′N	80°37.35′W
3	24°50.81′N	80°37.63′W
4	24°51.23′N	80°37.17′W
Catch and release fishing by trolling only is allowed in this SPA.		
Carysfort/South Carysfort Reef		
1	25°13.78′N	80°12.00′W
2	25°12.03′N	80°12.98′W
3	25°12.24′N	80°13.77′W
4	25°14.13′N	80°12.78′W
***Cheeca Rocks**		
1	24°54.42′N	80°36.91′W
2	24°54.25′N	80°36.77′W
3	24°54.10′N	80°37.00′W
4	24°54.22′N	80°37.15′W
Coffins Patch		
1	24°41.47′N	80°57.68′W
2	24°41.12′N	80°57.53′W
3	24°40.75′N	80°58.33′W
4	24°41.06′N	80°58.48′W
Conch Reef		
1	24°57.48′N	80°27.47′W
2	24°57.34′N	80°27.26′W
3	24°56.78′N	80°27.52′W
4	24°56.96′N	80°27.73′W
Catch and release fishing by trolling only is allowed in this SPA.		
Davis Reef		
1	24°55.61′N	80°30.27′W
2	24°55.41′N	80°30.05′W
3	24°55.11′N	80°30.35′W
4	24°55.34′N	80°30.52′W
Dry Rocks		
1	25°07.59′N	80°17.91′W
2	25°07.41′N	80°17.70′W
3	25°07.25′N	80°17.82′W
4	25°07.41′N	80°18.09′W
Grecian Rocks		
1	25°06.91′N	80°18.20′W
2	25°06.67′N	80°18.06′W
3	25°06.39′N	80°18.32′W
4	25°06.42′N	80°18.48′W
5	25°06.81′N	80°18.44′W
***Eastern Dry Rocks**		
1	24°27.92′N	81°50.55′W
2	24°27.73′N	81°50.33′W
3	24°27.47′N	81°50.80′W
4	24°27.72′N	81°50.86′W
The Elbow		
1	25°08.97′N	80°15.63′W
2	25°08.95′N	80°15.22′W
3	25°08.18′N	80°15.64′W
4	25°08.50′N	80°16.07′W
French Reef		
1	25°02.20′N	80°20.63′W
2	25°01.81′N	80°21.02′W
3	25°02.36′N	80°21.27′W
***Hen and Chickens**		
1	24°56.38′N	80°32.86′W
2	24°56.21′N	80°32.63′W
3	24°55.86′N	80°32.95′W
4	24°56.04′N	80°33.19′W
Looe Key		
1	24°33.24′N	81°24.03′W
2	24°32.70′N	81°23.85′W
3	24°32.52′N	81°24.70′W
4	24°33.12′N	81°24.81′W
Molasses Reef		
1	25°01.00′N	80°22.53′W
2	25°01.06′N	80°21.84′W
3	25°00.29′N	80°22.70′W
4	25°00.72′N	80°22.83′W
***Newfound Harbor Key**		
1	24°37.10′N	81°23.34′W
2	24°36.85′N	81°23.28′W
3	24°36.74′N	81°23.80′W
4	24°37.00′N	81°23.86′W
***Rock Key**		
1	24°27.48′N	81°51.35′W
2	24°27.30′N	81°51.15′W
3	24°27.21′N	81°51.60′W
4	24°27.45′N	81°51.65′W
***Sand Key**		
1	24°27.58′N	81°52.29′W
2	24°27.01′N	81°52.32′W
3	24°27.02′N	81°52.95′W
4	24°27.61′N	81°52.94′W
Catch and release fishing by trolling only is allowed in this SPA.		
Sombrero Key		
1	24°37.91′N	81°06.78′W
2	24°37.50′N	81°06.19′W
3	24°37.25′N	81°06.89′W
Catch and release fishing by trolling only is allowed in this SPA.		
(* denotes located in State waters)		

Appendix VI to Subpart P of Part 922—Special-Use Areas Boundary Coordinates and Use Designations

The Special-use Areas (based on differential Global Positioning Systems data) are located within the following geographic boundary coordinates:

Point	Latitude	Longitude
Conch Reef (Research Only)		
1	24°56.83′N	80°27.26′W
2	24°57.10′N	80°26.93′W
3	24°56.99′N	80°27.42′W
4	24°57.34′N	80°27.26′W
Eastern Sambos (Research Only)		
1	24°29.84′N	81°39.59′W
2	24°29.55′N	81°39.35′W
3	24°29.37′N	81°39.96′W
4	24°29.77′N	81°40.03′W
Looe Key (Research Only)		
1	24°34.17′N	81°23.01′W
2	24°33.98′N	81°22.96′W
3	24°33.84′N	81°23.60′W
4	24°34.23′N	81°23.68′W
Tennessee Reef (Research Only)		
1	24°44.77′N	80°47.12′W
2	24°44.57′N	80°46.98′W
3	24°44.68′N	80°46.59′W
4	24°44.95′N	80°46.74′W

Appendix VII to Subpart P of Part 922—Areas To Be Avoided Boundary Coordinates

Point	Latitude	Longitude
In The Vicinity of the Florida Keys (Reference Charts: United States 11466, 27th Edition—September 1, 1990 and United States 11450, 4th Edition—August 11, 1990)		
1	25°45.00′N	80°06.10′W
2	25°38.70′N	80°02.70′W
3	25°22.00′N	80°03.00′W
4	25°00.20′N	80°13.40′W
5	24°37.90′N	80°47.30′W
6	24°29.20′N	81°17.30′W
7	24°22.30′N	81°43.17′W
8	24°28.00′N	81°43.17′W
9	24°28.70′N	81°43.50′W
10	24°29.80′N	81°43.17′W
11	24°33.10′N	81°35.15′W
12	24°33.60′N	81°26.00′W
13	24°38.20′N	81°07.00′W
14	24°43.20′N	80°53.20′W
15	24°46.10′N	80°46.15′W
16	24°51.10′N	80°37.10′W
17	24°57.50′N	80°27.50′W
18	25°09.90′N	80°16.20′W
19	25°24.00′N	80°09.10′W
20	25°31.50′N	80°07.00′W
21	25°39.70′N	80°06.85′W
22	25°45.00′N	80°06.10′W
In the Vicinity of Key West Harbor (Reference Chart: United States 11434, 21st Edition—August 11, 1990)		
23	24°27.95′N	81°48.65′W
24	24°23.00′N	81°53.50′W
25	24°26.60′N	81°58.50′W
26	24°27.75′N	81°55.70′W
27	24°29.35′N	81°53.40′W
28	24°29.35′N	81°50.00′W

Point	Latitude	Longitude
29	24°27.95′N	81°48.65′W

Area Surrounding the Marquesas Keys
(Reference Chart: United States 11434, 21st Edition—August 11, 1990)

30	24°26.60′N	81°59.55′W
31	24°23.00′N	82°03.50′W
32	24°23.60′N	82°27.80′W
33	24°34.50′N	82°37.50′W
34	24°43.00′N	82°26.50′W
35	24°38.31′N	81°54.06′W
36	24°37.91′N	81°53.40′W
37	24°36.15′N	81°51.78′W
38	24°34.40′N	81°50.60′W
39	24°33.44′N	81°49.73′W
40	24°31.20′N	81°52.10′W
41	24°28.70′N	81°56.80′W
42	24°26.60′N	81°59.55′W

Area Surrounding the Dry Tortugas Islands
(Reference Chart: United States 11434, 21st Edition—August 11, 1990)

43	24°32.00′N	82°53.50′W
44	24°32.00′N	83°00.05′W
45	24°39.70′N	83°00.05′W
46	24°45.60′N	82°54.40′W
47	24°45.60′N	82°47.20′W
48	24°42.80′N	82°43.90′W
49	24°39.50′N	82°43.90′W
50	24°35.60′N	82°46.40′W
51	24°32.00′N	82°53.50′W

Appendix VIII to Subpart P of Part 922—Marine Life Rule [As Excerpted From Chapter 46–42 of the Florida Administrative Code]

46–42.001 Purpose and Intent; Designation of Restricted Species; Definition of ''Marine Life Species.''
46–42.002 Definitions.
46–42.003 Prohibition of Harvest: Longspine Urchin, Bahama Starfish.
46–42.0035 Live Landing and Live Well Requirements.
46–42.0036 Harvest in Biscayne National Park.*
46–42.004 Size Limits.
46–42.005 Bag Limits.
46–42.006 Commercial Season, Harvest Limits.
46–42.007 Gear Specifications and Prohibited Gear.
46–42.008 Live Rock.*
46–42.009 Prohibition on the Taking, Destruction, or Sale of Marine Corals and Sea Fans.

*—Part 42.0036 was not reproduced because it does not apply to the Sanctuary.

*—Part 42.008 was not reproduced because it is regulated pursuant to this Part 922.163(2)(ii).

46–42.001 Purpose and Intent; Designation of Restricted Species; Definition of ''Marine Life Species''.—

(1) (a) The purpose and intent of this chapter are to protect and conserve Florida's tropical marine life resources and assure the continuing health and abundance of these species. The further intent of this chapter is to assure that harvesters in this fishery use nonlethal methods of harvest and that the fish, invertebrates, and plants so harvested be maintained alive for the maximum possible conservation and economic benefits.

(b) It is the express intent of the Marine Fisheries Commission that landing of live rock propagated through aquaculture will be allowed pursuant to the provisions of this chapter.

(2) The following fish species, as they occur in waters of the state and in federal Exclusive Economic Zone (EEZ) waters adjacent to state waters, are hereby designated as restricted species pursuant to Section 370.01(20), Florida Statutes:

(a) Moray eels—Any species of the Family Muraenidae.

(b) Snake eels—Any species of the Genera Myrichthys and Myrophis of the Family Ophichthidae.

(c) Toadfish—Any species of the Family Batrachoididae.

(d) Frogfish—Any species of the Family Antennariidae.

(e) Batfish—Any species of the Family Ogcocephalidae.

(f) Clingfish—Any species of the Family Gobiesocidae.

(g) Trumpetfish—Any species of the Family Aulostomidae.

(h) Cornetfish—Any species of the Family Fistulariidae.

(i) Pipefish/seahorses—Any species of the Family Syngnathidae.

(j) Hamlet/seabass—Any species of the Family Serranidae, except groupers of the genera Epinephalus and Mycteroperca, and seabass of the genus Centropristis.

(k) Basslets—Any species of the Family Grammistidae.

(l) Cardinalfish—Any species of the Family Apogonidae.

(m) High-hat, Jackknife-fish, Spotted drum, Cubbyu—Any species of the genus Equetus of the Family Sciaenidae.

(n) Reef Croakers—Any of the species Odontocion dentex.

(o) Sweepers—Any species of the Family Pempherididdae.

(p) Butterflyfish—Any species of the Family Chaetodontidae.

(q) Angelfish—Any species of the Family Pomacanthidae.

(r) Damselfish—Any species of the Family Pomacentridae.

(s) Hawkfish—Any species of the Family Cirrhitidae.

(t) Wrasse/hogfish/razorfish—Any species of the Family Labridae, except hogfish, Lachnolaimus maximus.

(u) Parrotfish—Any species of the Family Scaridae.

(v) Jawfish—Any species of the Family Opistognathidae.

(w) Blennies—Any species of the Families Clinidae or Blenniidae.

(x) Sleepers—Any species of the Family Eleotrididae.

(y) Gobies—Any species of the Family Gobiidae.

(z) Tangs and surgeonfish—Any species of the Family Acanthuridae.

(aa) Filefish/triggerfish—Any species of the Family Balistes, except gray triggerfish, Balistidae capriscus.

(bb) Trunkfish/cowfish—Any species of the Family Ostraciidae.

(cc) Pufferfish/burrfish/balloonfish—Any of the following species:

1. Balloonfish—Diodon holocanthus.

2. Sharpnose puffer—Canthigaster rostrata.

3. Striped burrfish—Chilomycterus schoepfi.

(3) The following invertebrate species, as they occur in waters of the state and in federal Exclusive Economic Zone (EEZ) waters adjacent to state waters, are hereby designated as restricted species pursuant to Section 370.01(20), Florida Statutes:

(a) Sponges—Any species of the Class Demospongia, except sheepswool, yellow, grass, glove, finger, wire, reef, and velvet sponges, Order Dictyoceratida.

(b) Upside-down jellyfish—Any species of the Genus Cassiopeia.

(c) Siphonophores/hydroids—Any species of the Class Hydrozoa, except fire corals, Order Milleporina.

(d) Soft corals—Any species of the Subclass Octocorallia, except sea fans Gorgonia flabellum and Gorgonia ventalina.

(e) Sea anemones—Any species of the Orders Actinaria, Zoanthidea, Corallimorpharia, and Ceriantharia.

(f) Featherduster worms/calcareous tubeworms—Any species of the Families Sabellidae and Serpulidae.

(g) Star-shells—Any of the species Astraea americana or Astraea phoebia.

(h) Nudibranchs/sea slugs—Any species of the Subclass Opisthobranchia.

(i) Fileclams—Any species of the Genus Lima.

(j) Octopods—Any species of the Order Octopoda, except the common octopus, Octopodus vulgaris.

(k) Shrimp—Any of the following species:

1. Cleaner shrimp and peppermint shrimp—Any species of the Genera Periclimenes or Lysmata.

2. Coral shrimp—Any species of the Genus Stenopus.

3. Snapping shrimp—Any species of the Genus Alpheus.

(l) Crabs—Any of the following species:

1. Yellowline arrow crab—Stenorhynchus seticornis.

2. Furcate spider or decorator crab—Stenocionops furcata.

3. Thinstripe hermit crab—Clibanarius vittatus.

4. Polkadotted hermit crab—Phimochirus operculatus.

5. Spotted porcelain crab—Porcellana sayana.

6. Nimble spray or urchin crab—Percnon gibbesi.

7. False arrow crab—Metoporhaphis calcarata.

(m) Starfish—Any species of the Class Asteroidea, except the Bahama starfish, Oreaster reticulatus.

(n) Brittlestars—Any species of the Class Ophiuroidea.

(o) Sea urchins—Any species of the Class Echinoidea, except longspine urchin, Diadema antillarum, and sand dollars and sea biscuits, Order Clypeasteroida.

(p) Sea cucumbers—Any species of the Class Holothuroidea.

(q) Sea lillies—Any species of the Class Crinoidea.

(4) The following species of plants, as they occur in waters of the state and in federal Exclusive Economic Zone (EEZ) waters adjacent to state waters, are hereby designated as restricted species pursuant to Section 370.01(20), Florida Statutes:

(a) Caulerpa—Any species of the Family Caulerpaceae.

(b) Halimeda/mermaid's fan/mermaid's shaving brush—Any species of the Family Halimedaceae.

(c) Coralline red algae—Any species of the Family Corallinaceae.

(5) For the purposes of Section 370.06(2)(d), Florida Statutes, the term ''marine life species'' is defined to mean those species designated as restricted species in subsections (2), (3), and (4) of this rule.

Specific Authority 370.01(20), 370.027(2), 370.06(2)(d), F.S. Law Implemented 370.01(20), 370.025, 370.027, 370.06(2)(d), F.S. History—New 1–1–91, Amended 7–1–92, 1–1–95.

46–42.002 Definitions.— As used in this rule chapter:

(1) ''Barrier net,'' also known as a ''fence net,'' means a seine used beneath the surface of the water by a diver to enclose and concentrate tropical fish and which may be made of either nylon or monofilament.

(2) ''Drop net'' means a small, usually circular, net with weights attached along the outer edge and a single float in the center, used by a diver to enclose and concentrate tropical fish.

(3) ''Hand held net'' means a landing or dip net as defined in Rule 46–4.002(4), except that a portion of the bag may be constructed of clear plastic material, rather than mesh.

(4) ''Harvest'' means the catching or taking of a marine organism by any means whatsoever, followed by a reduction of such organism to possession. Marine organisms that are caught but immediately returned to the water free, alive, and unharmed are not harvested. In addition, temporary possession of a marine animal for the purpose of measuring it to determine compliance with the minimum or maximum size requirements of this chapter shall not constitute harvesting such animal, provided that it is measured immediately after taking, and immediately returned to the water free, alive, and unharmed if undersize or oversize.

(5) ''Harvest for commercial purposes'' means the taking or harvesting of any tropical ornamental marine life species or tropical ornamental marine plant for purposes of sale or with intent to sell. The harvest of tropical ornamental marine life species or tropical ornamental marine plants in excess of the bag limit shall constitute prima facie evidence of intent to sell.

(6) ''Land,'' when used in connection with the harvest of marine organisms, means the physical act of bringing the harvested organism ashore.

(7) ''Live rock'' means rock with living marine organisms attached to it.

(8) ''Octocoral'' means any erect, nonencrusting species of the Subclass Octocorallia, except the species Gorgonia flabellum and Gorgonia ventalina.

(9) ''Slurp gun'' means a self-contained, handheld device that captures tropical fish by rapidly drawing seawater containing such fish into a closed chamber.

(10) ''Total length'' means the length of a fish as measured from the tip of the snout to the tip of the tail.

(11) ''Trawl'' means a net in the form of an elongated bag with the mouth kept open by various means and fished by being towed or dragged on the bottom. ''Roller frame trawl'' means a trawl with all of the following features and specifications:

(a) A rectangular rigid frame to keep the mouth of the trawl open while being towed.

(b) The lower horizontal beam of the frame has rollers to allow the trawl to roll over the bottom and any obstructions while being towed.

(c) The trawl opening is shielded by a grid of vertical bars spaced no more than 3 inches apart.

(d) The trawl is towed by attaching a line or towing cable to a tongue located above yor at the center of the upper horizontal beam of the frame.

(e) The trawl has no doors attached to keep the mouth of the trawl open.

(12) ''Tropical fish'' means any species included in subsection (2) of Rule 46–42.001, or any part thereof.

(13) ''Tropical ornamental marine life species'' means any species included in subsections (2) or (3) of Rule 46–42.001, or any part thereof.

(14) ''Tropical ornamental marine plant'' means any species included in subsection (4) of Rule 46–42.001.

Specific Authority 370.027(2), F.S. Law Implemented 370.025, 370.027, F.S. History—New 1–1–91, Amended 7–1–92, 1–1–95.

46–42.003 Prohibition of Harvest: Longspine Urchin, Bahama Starfish.—No person shall harvest, possess while in or on the waters of the state, or land any of the following species:

(1) Longspine urchin, Diadema antillarum.

(2) Bahama starfish, Oreaster reticulatus.

Specific Authority 370.027(2), F.S. Law Implemented 370.025, 370.027, F.S. History—New 1–1–91, Amended 7–1–92.

46–42.0035 Live Landing and Live Well Requirements.—

(1) Each person harvesting any tropical ornamental marine life species or any tropical ornamental marine plant shall land such marine organism alive.

(2) Each person harvesting any tropical ornamental marine life species or any tropical ornamental marine plant shall have aboard the vessel being used for such harvest a continuously circulating live well or aeration or oxygenation system of adequate size and capacity to maintain such harvested marine organisms in a healthy condition.

Specific Authority 370.027(2), F.S. Law Implemented 370.025, 370.027, F.S. History—New 7–1–92.

46–42.004 Size Limits.—

(1) Angelfishes.—

(a) No person harvesting for commercial purposes shall harvest, possess while in or on the waters of the state, or land any of the following species of angelfish, of total length less than that set forth below:

1. One-and-one-half (1 1/2) inches for:

a. Gray angelfish (Pomacanthus arcuatus).

b. French angelfish (Pomacanthus paru).

2. One-and-three-quarters (1¾) inches for:

a. Blue angelfish (Holacanthus bermudensis).

b. Queen angelfish (Holacanthus ciliaris).

3. Two (2) inches for rock beauty (Holacanthus tricolor).

(b) No person shall harvest, possess while in or on the waters of the state, or land any angelfish (Family Pomacanthidae), of total length greater than that specified below:

1. Eight (8) inches for angelfish, except rock beauty (Holacanthus tricolor).

2. Five (5) inches for rock beauty.

(c) Except as provided herein, no person shall purchase, sell, or exchange any angelfish smaller than the limits specified in paragraph (a) or larger than the limits specified in paragraph (b). This prohibition shall not apply to angelfish legally harvested outside of state waters or federal Exclusive Economic Zone (EEZ) waters adjacent to state waters, which angelfish are entering Florida in interstate or international commerce. The burden shall be upon any person possessing such angelfish for sale or exchange to establish the chain of possession from the initial transaction after harvest, by appropriate receipt(s), bill(s) of sale, or bill(s) of lading, and any customs receipts, and to show that such angelfish originated from a point outside the waters of the State of Florida or federal Exclusive Economic Zone (EEZ) waters adjacent to Florida waters and entered the state in interstate or international commerce. Failure to maintain such documentation or to promptly produce same at the request of any duly authorized law enforcement officer shall constitute prima facie evidence that such angelfish were harvested from Florida waters or adjacent EEZ waters for purposes of this paragraph.

(2) Butterflyfishes.—

(a) No person harvesting for commercial purposes shall harvest, possess while in or on the waters of the state, or land any butterflyfish (Family Chaetodontidae) of total length less than one (1) inch.

(b) No person shall harvest, possess while in or on the waters of the state, or land any butterflyfish of total length greater than 4 inches.

(3) Gobies—No person shall harvest, possess while in or on the waters of the state, or land any gobie (Family Gobiidae) of total length greater than 2 inches.

(4) Jawfishes—No person shall harvest, possess while in or on the waters of the state, or land any jawfish (Family Opistognathidae) of total length greater than 4 inches.

(5) Spotfin and Spanish hogfish—

(a) No person shall harvest, possess while in or on the waters of this state, or land any Spanish hogfish (Bodianus rufus) of total length less than 2 inches.

(b) No person shall harvest, possess while in or on the waters of this state, or land any Spanish hogfish (Bodianus rufus) or spotfin hogfish (Bodianus pulchellus) of total length greater than 8 inches.

Specific Authority 370.027(2), F.S. Law Implemented 370.025, 370.027, F.S. History—New 1–1–91, Amended 7–1–92, 1–1–95.

46–42.005 Bag limit.—

(1) Except as provided in Rule 46–42.006 or subsections (3) or (4) of this rule, no person shall harvest, possess while in or on the waters of the state, or land more than 20 individuals per day of tropical ornamental marine life species, in any combination.

(2) Except as provided in Rule 46–42.006, no person shall harvest, possess while in or on the waters of the state, or land more than one (1) gallon per day of tropical ornamental marine plants, in any combination of species.

(3) Except as provided in Rule 46–42.006, no person shall harvest, possess while in or on the waters of the state, or land more than 5 angelfishes (Family Pomacanthidae) per day. Each angelfish shall be counted for purposes of the 20 individual bag limit specified in subsection (1) of this rule.

(4)(a) Unless the season is closed pursuant to paragraph (b), no person shall harvest, possess while in or on the waters of the state, or land more than 6 colonies per day of octocorals. Each colony of octocoral or part thereof shall be considered an individual of the species for purposes of subsection (1) of this rule and shall be counted for purposes of the 20 individual bag limit specified therein. Each person harvesting any octocoral as authorized by this rule may also harvest substrate within 1 inch of the perimeter of the holdfast at the base of the octocoral, provided that such substrate remains attached to the octocoral.

(b) If the harvest of octocorals in federal Exclusive Economic Zone (EEZ) waters adjacent to state waters is closed to all harvesters prior to September 30 of any year, the season for harvest of octocorals in state waters shall also close until the following October 1, upon notice given by the Secretary of the Department of Environmental Protection, in the manner provided in s.120.52(16)(d), Florida Statutes.

Specific Authority 370.027(2), F.S. Law Implemented 370.025, 370.027, F.S. History—New 1–1–91, Amended 1–1–95.

46–42.006 Commercial Season, Harvest Limits.—

(1) Except as provided in Rule 46–42.008(7), no person shall harvest, possess while in or on the waters of the state, or land quantities of tropical ornamental marine life species or tropical ornamental marine plants in excess of the bag limits established in Rule 46–42.005 unless such person possesses a valid saltwater products license with both a marine life fishery endorsement and a restricted species endorsement issued by the Department of Environmental Protection.

(2) Persons harvesting tropical ornamental marine life species or tropical ornamental marine plants for commercial purposes shall have a season that begins on October 1 of each year and continues through September 30 of the following year. These persons shall not harvest, possess while in or on the waters of the state, or land tropical ornamental marine life species in excess of the following limits:

(a) A limit of 75 angelfish (Family Pomacanthidae) per person per day or 150 angelfish per vessel per day, whichever is less.

(b) A limit of 75 butterflyfishes (Family Chaetodontidae) per vessel per day.

(c) There shall be no limits on the harvest for commercial purposes of octocorals unless and until the season for all harvest of octocorals in federal Exclusive Economic Zone (EEZ) waters adjacent to state waters is closed. At such time, the season for harvest of octocorals in state waters shall also close until the following October 1, upon notice given by the Secretary of the Department of Environmental Protection, in the manner provided in Section 120.52(16)(d), Florida Statutes. Each person harvesting any octocoral as authorized by this rule may also harvest substrate within 1 inch of the perimeter of the holdfast at the base of the octocoral, provided that such substrate remains attached to the octocoral.

(d) A limit of 400 giant Caribbean or ''pink-tipped'' anemones (Genus Condylactus) per vessel per day.

Specific Authority 370.027(2), F.S. Law Implemented 370.025, 370.027, F.S. History—New 1–1–91, Amended 7–1–92, 1–1–95.

46–42.007 Gear Specifications and Prohibited Gear.—

(1) The following types of gear shall be the only types allowed for the harvest of any tropical fish, whether from state waters or from federal Exclusive Economic Zone (EEZ) waters adjacent to state waters:

(a) Hand held net.

(b) Barrier net, with a mesh size not exceeding ¾ inch stretched mesh.

(c) Drop net, with a mesh size not exceeding ¾ inch stretched mesh.

(d) Slurp gun.

(e) Quinaldine may be used for the harvest of tropical fish if the person using the chemical or possessing the chemical in or on the waters of the state meets each of the following conditions:

1. The person also possesses and maintains aboard any vessel used in the harvest of tropical fish with quinaldine a special activity license authorizing the use of quinaldine, issued by the Division of Marine Resources of the Department of Environmental Protection pursuant to Section 370.08(8), Florida Statutes.

2. The quinaldine possessed or applied while in or on the waters of the state is in a diluted form of no more than 2% concentration in solution with seawater. Prior to dilution in seawater, quinaldine shall only be mixed with isopropyl alcohol or ethanol.

(f) A roller frame trawl operated by a person possessing a valid live bait shrimping license issued by the Department of Environmental Protection pursuant to Section 370.15, Florida Statutes, if such tropical fish are taken as an incidental bycatch of shrimp lawfully harvested with such trawl.

(g) A trawl meeting the following specifications used to collect live specimens of the dwarf seahorse, Hippocampus zosterae, if towed by a vessel no greater than 15 feet in length at no greater than idle speed:

1. The trawl opening shall be no larger than 12 inches by 48 inches.

2. The trawl shall weigh no more than 5 pounds wet when weighed out of the water.

(2) This rule shall not be construed to prohibit the use of any bag or container used solely for storing collected specimens or the use of a single blunt rod in conjunction with any allowable gear, which rod meets each of the following specifications:

(a) The rod shall be made of nonferrous metal, fiberglass, or wood.

(b) The rod shall be no longer than 36 inches and have a diameter no greater than ¾ inch at any point.

(3) No person shall harvest in or from state waters any tropical fish by or with the use of any gear other than those types specified in subsection (1); provided, however, that tropical fish harvested as an incidental bycatch of other species lawfully harvested for commercial purposes with other types of gear shall not be deemed to be harvested in violation of this rule, if the quantity of tropical fish so harvested does not exceed the bag limits established in Rule 46–42.005.

Specific Authority 370.027(2), F.S. Law Implemented 370.025, 370.027, F.S. History—New 1–1–91, Amended 7–1–92, 1–1–95.

46–42.009 Prohibition on the Taking, Destruction, or Sale of Marine Corals and Sea Fans; Exception; Repeal of Section 370.114, Florida Statutes.—

(1) Except as provided in subsection (2), no person shall take, attempt to take, or otherwise destroy, or sell, or attempt to sell, any sea fan of the species Gorgonia flabellum or of the species Gorgonia ventalina, or any hard or stony coral (Order Scleractinia) or any fire coral (Genus Millepora). No person shall possess any such fresh, uncleaned, or uncured sea fan, hard or stony coral, or fire coral.

(2) Subsection (1) shall not apply to:

(a) Any sea fan, hard or stony coral, or fire coral legally harvested outside of state waters or federal Exclusive Economic Zone (EEZ) waters adjacent to state waters and entering Florida in interstate or international commerce. The burden shall be upon any person possessing such species to establish the chain of possession from the initial transaction after harvest, by appropriate receipt(s), bill(s) of sale, or bill(s) of lading, and any customs receipts, and to show that such species originated from a point outside the waters of the State of Florida or federal Exclusive Economic Zone (EEZ) adjacent to state waters and entered the state in interstate or international commerce. Failure to maintain such documentation or to promptly produce same at the request of any duly authorized law enforcement officer shall constitute prima facie evidence that such species were harvested from Florida waters in violation of this rule.

(b) Any sea fan, hard or stony coral, or fire coral harvested and possessed pursuant to permit issued by the Department of Environmental Protection for scientific or educational purposes as authorized in Section 370.10(2), Florida Statutes.

(c) Any sea fan, hard or stony coral, or fire coral harvested and possessed pursuant to the aquacultured live rock provisions of Rule 46–42.008(3)(a) or pursuant to a Live Rock Aquaculture Permit issued by the National Marine Fisheries Service under 50 CFR Part 638 and meeting the following requirements:

1. Persons possessing these species in or on the waters of the state shall also possess a state submerged lands lease for live rock aquaculture and a Department of Environmental Protection permit for live rock culture deposition and removal or a federal Live Rock Aquaculture Permit. If the person possessing these species is not the person named in the documents required herein, then the person in such possession shall also possess written permission from the person so named to transport aquacultured live rock pursuant to this exception.

2. The nearest office of the Florida Marine Patrol shall be notified at least 24 hours in advance of any transport in or on state waters of aquacultured live rock pursuant to this exception.

3. Persons possessing these species off the water shall maintain and produce upon the request of any duly authorized law enforcement officer sufficient documentation to establish the chain of possession from harvest on a state submerged land lease for live rock aquaculture or in adjacent Exclusive Economic Zone (EEZ) waters pursuant to a federal Live Rock Aquaculture Permit.

4. Any sea fan, hard or stony coral, or fire coral harvested pursuant to Rule 46–42.008(3)(a) shall remain attached to the cultured rock.

Specific Authority 370.027(2), F.S.; Section 6, Chapter 83–134, Laws of Florida, as amended by Chapter 84–121, Laws of Florida. Law Implemented 370.025, 370.027, F.S.; Section 6, Chapter 83–134, Laws of Florida, as amended by Chapter 84–121, Laws of Florida. History—New 1–1–95.2222

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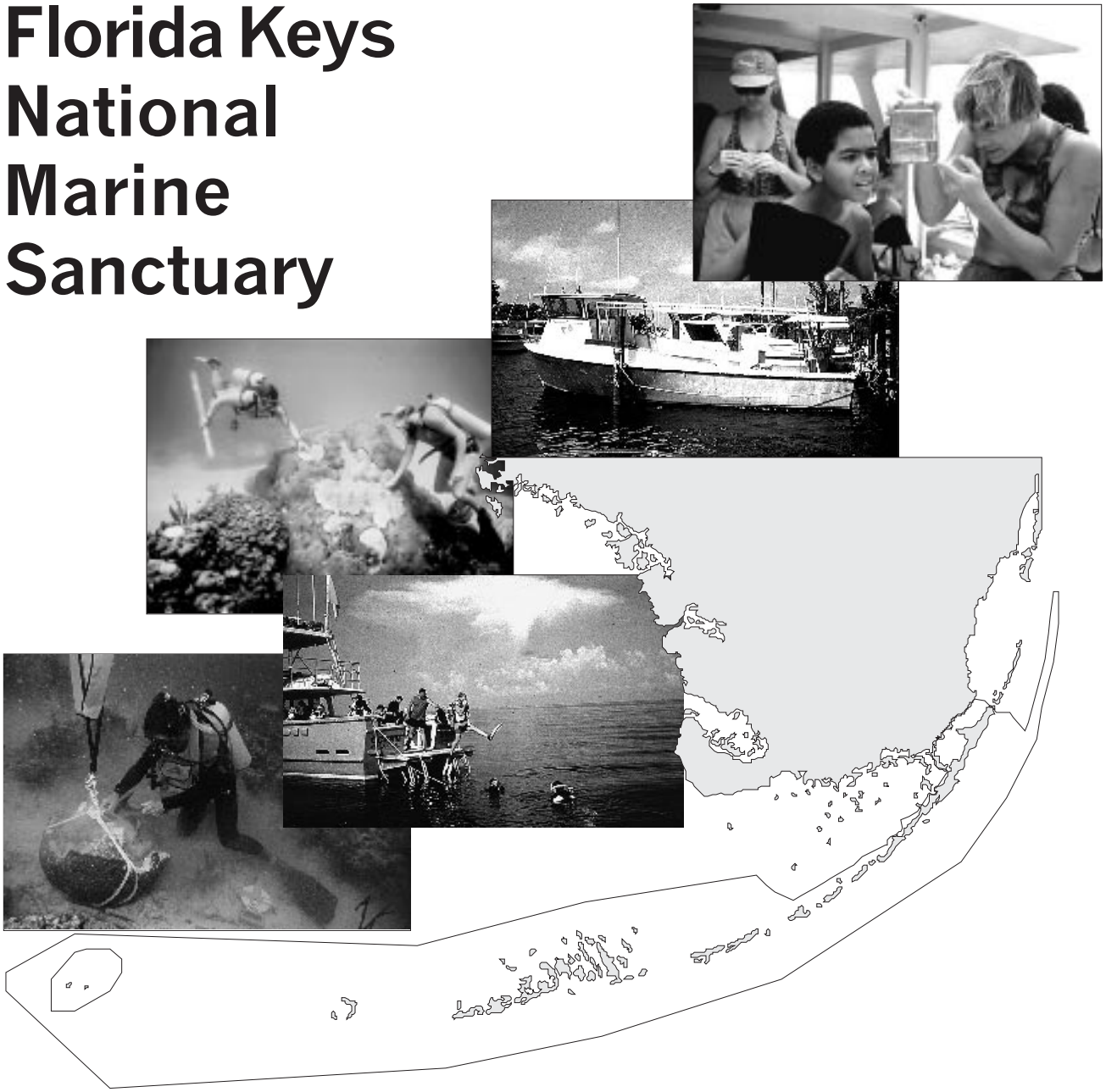
Strategy for Stewardship

Florida Keys National Marine Sanctuary



Final Management Plan/Environmental Impact Statement

Volume II of III

Development of the Management Plan: Environmental Impact Statement

U.S. Department of Commerce

National Oceanic and Atmospheric Administration

National Ocean Service

Office of Ocean and Coastal Resource Management

Sanctuaries and Reserves Division

This final management plan and environmental impact statement is dedicated to the memories of Secretary Ron Brown and George Barley. Their dedicated work furthered the goals of the National Marine Sanctuary Program and specifically the Florida Keys National Marine Sanctuary.

"We must continue to work together - inspired by the delight in a child's eye when a harbor seal or a gray whale is sighted, or the wrinkled grin of a fisherman when the catch is good. We must honor the tradition of this land's earliest caretakers who approached nature's gifts with appreciation and deep respect. And we must keep our promise to protect nature's legacy for future generations."

- Secretary Ron Brown
  Olympic Coast dedication ceremony, July 16, 1994

"The Everglades and Florida Bay will be our legacy to our children and to our Nation."

- George Barley
  Sanctuary Advisory Council Chairperson

Cover Photos: Marine Educator--Heather Dine, Upper Keys Regional Office; Lobster Boats--Billy Causey, Sanctuary Superintendent; Divers--Harold Hudson, Upper Keys Regional Office; Dive Charter--Paige Gill, Upper Keys Regional Office; Coral Restoration--Mike White, NOAA Corps.

Florida Keys National Marine Sanctuary

Final Management Plan/Environmental Impact Statement

Volume II
Development of the Management Plan: Environmental Impact Statement

1996

National Oceanic and Atmospheric Administration

Acknowledgments

In 1955, renowned naturalist and marine biologist Rachel Carson described the Florida Keys this way in her book *The Edge of the Sea:*

> "I doubt that anyone can travel the length of the Florida Keys without having communicated to his mind a sense of the uniqueness of this land of sky and water and scattered mangrove-covered islands. The atmosphere of the Keys is strongly and peculiarly their own. This world of the Keys has no counterpart elsewhere in the United States, and indeed few coasts of the Earth are like it."

This unique environment is the reason for the existence of the Florida Keys National Marine Sanctuary, and the reason why so many people have contributed so much of their time and energy to making the Management Plan as comprehensive and fair as possible.

Since 1989, numerous environmental organizations and individuals have worked long and hard to provide input into the legislation designating the Sanctuary and into developing the Final Management Plan/Environmental Impact Statement (FMP/EIS). They provided useful and objective comments at numerous workshops, Advisory Council meetings, and other public forums held during the planning process. The contributions of each of these individuals, and the organizations they represent, is appreciated.

The National Marine Sanctuary Program staff wish to thank everyone who has participated in the development of this plan, especially members of the public who gave of their time to offer objective and useful input during the many public comment periods offered during the planning process.

Special thanks go to the members of the Sanctuary Advisory Council for their major contribution to the planning process. Their diligent work and sacrifice of time and expenses will be remembered as the key to the success of developing a comprehensive management plan. With the leadership of their chairman and vice-chairman, they navigated waters never before charted for a National Marine Sanctuary or, for that matter, any marine protected area in the United States. Their role was crucial in this planning process, especially the leadership they exhibited in developing the Sanctuary's final plan. Never before has such a comprehensive plan been assembled by such a diverse interest group to solve complex problems in one of the Nation’s most ecologically diverse regions.

In addition, Program staff would like to thank our local, State, and Federal agency planning partners for their assistance during the development of this plan. Those individuals who worked diligently for over four years on the plan sacrificed an enormous amount of time and effort to assist in this project. Dozens of agency scientists, managers, and planners have devoted time to this planning process, especially during the various workshops and strategy assessment planning sessions, extended review sessions, and deliberations on the compact agreement. The National Marine Sanctuary Program staff is grateful to all of you.

Also, special thanks to all of those individuals who reviewed various portions of the document, especially sections of the Description of the Affected Environment. Your thorough review has served to make this section an important reference for future use.

We also extend our appreciation to the Sanctuary Volunteers and staff and students of Indiana University who have helped assess some shipwrecks identified in the management plan.

Particularly, the Program owes special recognition and thanks to the staff of NOAA’s Strategic Environmental Assessments Division for their enormous amount of time and sacrifice in assisting in the planning and development of this plan.

Abstract

This abstract describes the Final Management Plan and Environmental Impact Statement (FMP/EIS) for the Florida Keys National Marine Sanctuary. Congress, recognizing the degradation of this unique ecosystem due to direct physical impacts and indirect impacts, passed the Florida Keys National Marine Sanctuary and Protection Act of 1990 (Public Law 101-605) designating the Florida Keys National Marine Sanctuary. The Act requires the National Oceanic and Atmospheric Administration (NOAA) to develop a comprehensive management plan with implementing regulations to govern the overall management of the Sanctuary and to protect Sanctuary resources and qualities for the enjoyment of present and future generations. The Act also establishes the boundary of the Sanctuary, prohibits any oil drilling and exploration within the Sanctuary, prohibits the operation of tank ships or ships greater than 50 meters in the Area to Be Avoided, and requires the development and implementation of a water quality protection program by the U.S. Environmental Protection Agency and the State of Florida, in conjunction with NOAA.

The Sanctuary consists of approximately 2,800 nm^2 (9,500 km^2) of coastal and oceanic waters, and the submerged lands thereunder, surrounding the Florida Keys, and extending westward to encompass the Dry Tortugas, but excluding the Dry Tortugas National Park. The shoreward boundary of the Sanctuary is the mean high-water mark. Within these waters are spectacular, unique, and nationally significant marine environments, including seagrass meadows, mangrove islands, and extensive living coral reefs. These marine environments support rich biological communities possessing extensive conservation, recreational, commercial, ecological, historical, research, educational, and aesthetic values that give this area special national significance. These environments are the marine equivalent of tropical rain forests in that they support high levels of biological diversity, are fragile and easily susceptible to damage from human activities, and possess high value to human beings if properly conserved.

The economy of the Keys is dependent upon a healthy ecosystem. Approximately four million tourists visit the Keys annually, participating primarily in water-related sports such as fishing, diving, boating, and other ecotourism activities. In 1991, the gross earnings of the Florida Keys and Monroe County totaled $853 million, 36 percent of which came from services provided as part of the tourism industry. Another 18.7 percent of the gross earnings came from the retail trade, which is largely supported by tourists. In 1990, half of the Keys' population held jobs that directly or indirectly supported outdoor recreation. In addition, the commercial fishing industry accounted for $17 million of the Keys' economy, more than 20 percent of Florida's total gross earnings from commercial fishing. All of these activities depend on a healthy marine environment with good water quality.

The purpose of the proposed Management Plan is to ensure the sustainable use of the Keys' marine environment by achieving a balance between comprehensive resource protection and multiple, compatible uses of those resources. Sanctuary resources are threatened by a variety of direct and indirect impacts. Direct impacts include boat groundings, propeller dredging of seagrasses, and diver impacts on coral. For example, over 30,000 acres of seagrasses have been impacted by boat propellers. Indirect impacts include marine discharge of wastes, land-based pollution, and external sources of water quality degradation. These and other management issues are addressed by the comprehensive Management Plan.

Volume I contains the final comprehensive Management Plan and includes the discussion of the Preferred Alternative and socioeconomic analysis as well as 10 action plans composed of management strategies developed with substantial input from the public, local experts, and the Sanctuary Advisory Council to address management issues. The action plans provide an organized process for implementing management strategies, including a description of the activities required, institutions involved, staffing requirements, and an estimate of the implementation cost. A list of the action plans in alphabetical order is as follows: 1) Channel/ Reef Marking; 2) Education and Outreach; 3) Enforcement; 4) Mooring Buoy; 5) Regulatory; 6) Research and Monitoring; 7) Submerged Cultural Resources; 8) Volunteer; 9) Water Quality; and 10) Zoning. These action plans include several critical activities designed to manage and protect the natural and historic resources of the Sanctuary, including:

- Establishing water-use zones providing focused protection for 60 to 70 percent of the well-developed reef formations, prohibiting consumptive activities in a small portion of the Sanctuary, buffering important wildlife habitat from human disturbance, and protecting several large reserves for species diversity replenishment, breeding areas, and genetic protection.

- Establishing Sanctuary regulations to designate nonconsumptive zones, prohibit damage to natural resources, establish special-use permits, and restrict other activities that may negatively impact Sanctuary resources.

- Expanding and coordinating the Enforcement Program to enforce the regulations, particularly in the zoned areas.

- Implementing an Ecological Monitoring Plan to evaluate the effectiveness of the zoned areas and the health of the Sanctuary.

- Expanding the Mooring Buoy Program to include the new zones and protect important coral reef and seagrass habitat.

- Implementing a Channel and Reef Marking Program to protect seagrasses, coral reefs, and mangroves in shallow-water areas.

- Implementing a Submerged Cultural Resources Plan to protect the numerous historically important shipwrecks and other submerged cultural resources.

- Expanding the Education and Volunteer programs to reach more users and the millions of visitors coming to the Keys each year.

Volume II describes the process used to develop the draft management alternatives and includes environmental and socioeconomic impact analyses of the alternatives used in the draft management plan and environmental impact statement.

Volume III consists of the appendices, including the two acts that designate and implement the Sanctuary.

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General Introduction

This is the second of three volumes describing the Final Management Plan/Environmental Impact Statement (EIS) for the Florida Keys National Marine Sanctuary. Volume I contains the selection of the Final Preferred Alternative, which is the Final Management Plan, including 10 detailed action plans. The Final Preferred Alternative explains the modifications to the Draft Preferred Alternative (III) based on public comments, the FKNMSPA, the NMSA and other considerations. Volume II describes the Management Plan/EIS development process, including the process for selecting the Draft Preferred Alternative that underwent a nine-month public review. Volume III contains the appendices referenced in Volumes I and II. The Final Plan is based on the EIS analysis in Volumes I, II, and III.

Authority for Designation

National marine sanctuaries are routinely designated by the Secretary of Commerce through an administrative process established by the National Marine Sanctuaries Act (NMSA) of 1972, 16 U.S.C. 1431 et seq., as amended, including activation of candidate sites selected from the National Marine Sanctuary Program Site Evaluation List. Sanctuaries also have been designated by an Act of Congress. The Florida Keys National Marine Sanctuary was designated when the President signed the Florida Keys National Marine Sanctuary and Protection Act. Appendix A in Volume III contains a copy of this Act.

Terms of Statutory Designation

Section 304(a)(4) of the NMSA requires that the terms of designation set forth the geographic area included within the Sanctuary; the characteristics of the area that give it conservation, recreational, ecological, historical, research, educational, or aesthetic value; and the types of activities that will be subject to regulation by the Secretary of Commerce to protect those characteristics. This section also specifies that the terms of designation may be modified only through the same procedures by which the original designation was made. Thus, the terms of designation serve as a charter for the Sanctuary.

Mission and Goals of the National Marine Sanctuary Program

The purpose of a sanctuary is to protect resources and their conservation, recreational, ecological, historical, research, educational, or aesthetic values through comprehensive long-term management. National marine sanctuaries may be designated in coastal and ocean waters, the Great Lakes and their connecting waters, and submerged lands over which the United States exercises jurisdiction consistent with international law. They are built around distinctive natural and historical resources whose protection and beneficial use require comprehensive planning and management.

The National Oceanic and Atmospheric Administration (NOAA) administers the National Marine Sanctuary Program through the Sanctuaries and Reserves Division (SRD) of the Office of Ocean and Coastal Resource Management (OCRM).

In accordance with the NMSA, the mission of the National Marine Sanctuary Program is to identify, designate, and comprehensively manage marine areas of national significance. National marine sanctuaries are established for the public's long-term benefit, use, and enjoyment. To meet these objectives, the following National Marine Sanctuary Program goals have been established (15 CFR, Part 922.1(b)):

- Enhance resource protection through comprehensive and coordinated conservation and ecosystem management that complements existing regulatory authorities.
- Support, promote, and coordinate scientific research on, and monitoring of, the site-specific marine resources to improve management decisionmaking in national marine sanctuaries.
- Enhance public awareness, understanding, and the wise use of the marine environment through public interpretive, educational, and recreational programs.
- Facilitate, to the extent compatible with the primary objective of resource protection, multiple uses of national marine sanctuaries.

The Florida Keys National Marine Sanctuary is one of a system of national marine sanctuaries that has been established since the Program's inception in 1972. Sanctuaries are not new to the Florida Keys; there is a twenty year history of National Marine Sanctuaries in the Keys.

Background

Historical Perspective. The lure of the Florida Keys has attracted explorers and visitors for centuries. The clear tropical waters, bountiful resources, and appealing natural environment were among the many fine qualities that attracted visitors to the Keys. However, warning signs that the Keys' environment and natural resources were fragile, and not infinite, came early. In 1957, a group of conservationists and scientists held a conference at the Everglades National Park and discussed the demise of the coral reef resources in the Keys at the hands of those attracted there because of their beauty and uniqueness. This conference resulted in action that created the world's first underwater park, the John Pennekamp Coral Reef State Park in 1960. However, in just a little over a decade following the establishment of the park, a public outcry was sounded that cited pollution, overharvest, physical impacts, overuse, and use conflicts as continuing to occur in the Keys. These concerns continued to be voiced by environmentalists and scientists alike throughout the decade of the 1970's and indeed, into the 1990's.

Other management efforts were instituted to protect the coral reefs of the Florida Keys. The Key Largo National Marine Sanctuary was established in 1975 to protect 103 square nautical miles of coral reef habitat stretching along the reef tract from north of Carysfort Lighthouse to south of Molasses Reef, offshore of the Upper Keys. In 1981, the 5.32 square nautical mile Looe Key National Marine Sanctuary was established to protect the very popular Looe Key Reef located off Big Pine Key in the Lower Keys. Throughout the 80's, mounting threats to the health and ecological future of the coral reef ecosystem in the Florida Keys prompted Congress to take action to protect this fragile natural resource. The threat of oil drilling in the mid-to-late 1980's off the Florida Keys, combined with reports of deteriorating water quality throughout the region, occurred at the same time scientists were assessing the adverse affects of coral bleaching, the die-off of the long-spined urchin, loss of living coral cover on reefs, a major seagrass die-off, declines in reef fish populations, and the spread of coral diseases. With the reauthorization of the National Marine Sanctuary Program in 1988, Congress directed the Sanctuary Program to conduct a feasibility study of possible expansion of Sanctuary sites in the Keys. Those study sites were in the vicinity of Alligator Reef, Sombrero Key, and westward from American Shoals. This endorsement for expansion of the Sanctuary program in the Keys was a Congressional signal that the health of the resources of the Florida Keys was of National concern. The feasibility study was overtaken by several natural events and ship groundings that precipitated the designation of the Florida Keys National Marine Sanctuary.

Three large ships ran aground on the coral reef tract within a brief 18 day period in the fall of 1989. Coincidental as it may seem, it was this final physical insult to the reef that prompted Congress to take action to protect the coral reef ecosystem of the Florida Keys. Although most remember the ship groundings as having triggered Congressional action, it was in fact the cumulative events of environmental degradation, in conjunction with the physical impacts that prompted Congressman Dante Fascell to introduce a bill into the House of Representatives in November of 1989. Congressman Fascell had long been an environmental supporter of South Florida and his action was very timely. The bill was sponsored in the Senate by Senator Bob Graham, also known for his support of environmental issues both in Washington, and as a Florida Governor. It was passed by Congress through bi-partisan support and was signed. On November 16, 1990, President George Bush signed into law the Florida Keys National Marine Sanctuary and Protection Act (FKNMSPA) (Appendix A in Volume III).

Florida Keys Environmental Setting. The Florida Keys National Marine Sanctuary extends approximately 220 miles southwest from the southern tip of the Florida peninsula. Located adjacent to the Keys' land mass are spectacular, unique, and nationally significant marine environments, including seagrass meadows, mangrove islands, and extensive living coral reefs. These support rich biological communities possessing extensive conservation, recreational, commercial, ecological, historical, research, educational, and aesthetic values that give this area special national significance. They are the marine equivalent of tropical rain forests, in that they support high levels of biological diversity, are fragile and easily susceptible to damage from human activities, and possess high value to humans if properly conserved.

The marine environment of the Florida Keys supports over 6,000 species of plants, fishes, and invertebrates, including the Nation's only coral reef that lies adjacent to the continent, and one of the largest seagrass communities in this hemisphere. Attracted by this natural diversity and tropical climate, approximately four million tourists visit the Keys annually, where they participate primarily in water-related sports such as fishing, diving, boating, and other activities.

Sanctuary Boundary. The Act designated 2,800 square nautical miles of coastal waters off the Florida Keys as the Florida Keys National Marine Sanctuary. The Sanctuary boundary extends southward on the Atlantic Ocean side of the Keys from the north easternmost point of the Biscayne National Park along the approximate 300-foot isobath for over 200 nautical miles to the Dry Tortugas. From there it turns north and east, encompassing a large portion of the Gulf of Mexico and Florida Bay, where it adjoins the Everglades National Park. The landward boundary is the mean high water mark. The Key Largo and Looe Key National Marine Sanctuaries, the State Parks and Aquatic Preserves, and the Florida Keys Refuges of the U.S. Fish and Wildlife Service are overlapped by the Sanctuary; whereas the Everglades National Park, Biscayne National Park, and Dry Tortugas National Park are excluded from the boundary of the Sanctuary.

Threats to the Environment. The deterioration of the marine environment in the Keys is no longer a matter of debate. There is a decline of healthy corals, an invasion by algae into seagrass beds and reefs, a decline in certain fisheries, an increase of coral diseases and coral bleaching. In Florida Bay, reduced freshwater flow has resulted in an increase in plankton blooms, sponge and seagrass die-offs, and fish kills.

Over four million people visit the Keys annually, 70% of whom visit the Sanctuary. Over 80,000 people reside in the Keys full time. Since 1965, the number of registered private recreational vessels has increased over six times. There are significant direct and indirect effects from the high levels of use of Sanctuary resources resulting from residents and tourists. The damage done by people hinders the ability of marine life to recover from naturally occurring stresses. Human impacts can be separated into direct and indirect impacts.

Direct human impacts. The most visible and familiar physical damage results from the carelessness or, on occasion, the recklessness of ship captains, boaters, divers, fishermen, snorkelers and beachgoers. Over 30,000 acres of seagrasses have been damaged by boat propellers. Direct impacts to resources also result from careless divers and snorkelers standing on coral, improperly placed anchors, and destructive fishing methods. In the period between 1993 and 1994, approximately 500 vessels were reported aground in the Sanctuary. These groundings have a cumulative effect on the resources. Over 19 acres of coral reef habitat has been damaged or destroyed by large ship groundings.

Indirect human impacts. The overnutrification of nearshore waters is a documented problem in the Sanctuary. A major source of excess nutrients is sewage-25,000 septic tanks, 7,000 cesspools, 700 shallow injection wells, and 139 marinas harboring over 15,000 boats. These nutrients are carried through the region by more than 700 canals and channels. Removing nitrogen and phosphorous from wastewater requires a technology that, at present, is lacking from sewage treatment facilities in the Keys.

Management Plan Requirements

The FKNMSPA directs the Secretary of Commerce to develop a comprehensive management plan and implement regulations to protect Sanctuary resources. The Act requires that the plan:

- facilitate all public and private uses of the Sanctuary consistent with the primary objective of resource protection;
- consider temporal and geographic zoning to ensure protection of Sanctuary resources;
- incorporate the regulations necessary to enforce the comprehensive water quality protection program developed under Section 8 of the FKNMSPA;
- identify needs for research, and establish a long-term ecological monitoring program;
- identify alternative sources of funding needed to fully implement the Plan's provisions and supplement appropriations authorized under Section 10 (16 U.S.C., §1444) of the FKNMSPA and Section 313 of the NMSA;
- ensure coordination and cooperation between Sanctuary managers and other Federal, State,

and local authorities with jurisdiction within or adjacent to the Sanctuary;

- promote education among users of the Sanctuary about coral reef conservation and navigational safety; and

- incorporate the existing Looe Key and Key Largo national marine sanctuaries into the Florida Keys National Marine Sanctuary.

All of these requirements have been addressed in the Management Plan.

In addition to the above statutory objectives, the Sanctuary Advisory Council, early on in the planning process in 1992, developed a set of goals and objectives for the Sanctuary that NOAA later adopted. The goal is:

“To preserve and protect the physical and biological components of the South Florida estuarine and marine ecosystem to ensure its viability for the use and enjoyment of present and future generations.”

The objectives include:

- Encouraging all agencies and institutions to adopt an ecosystem and cooperative approach to accomplish the following objectives, including the provision of mechanisms to address impacts affecting Sanctuary resources but originating outside the boundaries of the Sanctuary;

- Providing a management system which is in harmony with an environment whose long-term ecological, economic, and sociological principles are understood, and which will allow appropriate sustainable uses;

- Managing the Florida Keys National Marine Sanctuary for the natural diversity of healthy species, populations, and communities;

- Reaching every single user and visitor to the FKNMS with information appropriate to their activities; and

- Recognizing the importance of cultural and historical resources, and managing these resources for reasonable, appropriate use and enjoyment.

NOAA incorporated the Sanctuary Advisory Council’s objectives into the Final Comprehensive Management Plan, and some progress has already been made toward accomplishing these objectives. For example, steps have been taken to meet the first objective of ecosystem management. Sanctuary Staff have been involved in the efforts of the South Florida Ecosystem Restoration Task Force and the Governor’s Commission for a Sustainable South Florida. These two efforts have focused on the restoration of the South Florida ecosystem, of which the Sanctuary is the downstream component. These combined efforts recognize the importance of protecting and preserving the natural environment for the sustainable use of future generations. The natural and built environments have to be managed in harmony to sustain the healthy environment upon which South Florida economy is dependent.

Overview of the Planning Process

The size of the Sanctuary and the diversity of its users required that NOAA adopt a holistic, ecosystem-based management approach to address the problems facing the Sanctuary. This meant using a problem-driven focus, relying on partnerships, and building consensus around the identification of issues and their short- and long-term solutions.

A Comprehensive Approach. The FKNMSPA requires NOAA to develop a comprehensive management plan. To meet this mandate, NOAA has addressed many problems and issues, such as water quality and land use, that are outside the "traditional" scope of Sanctuary management. The process involved unprecedented participation by the general public, user groups, and Federal, State, and local governments.

Because of the size of the Sanctuary and the variety of resources it contains, many problems never before encountered by Sanctuary management had to be addressed. For example, significant declines in water quality and habitat conditions in Florida Bay are threatening the health of Sanctuary resources. These conditions are thought to be the result of water quality and quantity management in the South Florida region. Such problems must be addressed by management to ensure adequate protection of Sanctuary resources. There is a need, therefore, to explicitly include the agencies with responsibilities in these areas in an ecosystem management approach.

Knowledge-based Consensus Building. A series of workshops followed a set of public scoping meetings, and laid the foundation for building this Plan. At these work sessions, NOAA used a systematic

process for obtaining relevant information from experts with knowledge of Sanctuary problems.

NOAA recognized that a useful management plan could not be developed and implemented without forging working teams to help provide the vision and knowledge necessary to accomplish the goals set forth in the FKNMSPA. Four teams were formed to ensure that input was provided by major Federal, State, and local interests in the Sanctuary, and to see that a plan was produced that met the goals and objectives set forth by the FKNMSPA and NOAA. There was considerable interaction, and some overlap in membership and function, among these teams.

- In July 1991, the Interagency Core Group, composed of Federal, State, and local agencies with direct jurisdictional responsibility in the Sanctuary, was formed to develop policies, and direct and oversee the management plan development process (Appendix B in Volume III lists the members of this Core Group).

- Sanctuary Planners held a series of workshops, from July 1991 through January 1992, which focused on a range of topics. The workshop topics included mooring buoys, education, photobathymetry, research, submerged cultural resources, and zoning.

- A Strategy Identification Work Group, composed of 49 local scientists and management experts, generated the initial set of strategies and details on implementation requirements.

- The Sanctuary Advisory Council (SAC) was established by the FKNMSPA to ensure public input into the Plan, and to advise and assist NOAA in its development and implementation. The SAC first met in February 1992 and conducted over 30 meetings that were open to the public (Appendix B in Volume III contains a list of SAC members). The SAC became an integral part of the Sanctuary planning process by serving as a direct link to the Keys' user communities, such as the dive industry, environmental groups, and commercial and recreational fishermen. In addition, the SAC has been instrumental in helping NOAA to formulate policy, particularly with regard to: 1) the marine zoning plan, 2) activities needing regulation, and 3) recommending a preferred alternative for the Management Plan.

- A NOAA team composed of the Sanctuaries and Reserves Division, the Strategic Environmental Assessments Division, and the Office of the Assistant General Counsel for Ocean Services was responsible for developing and implementing the process to produce the Draft Plan. The Sanctuaries and Reserves Division is responsible for coordinating the review and producing the Final Management Plan and Environmental Impact Statement.

Focus on Management and Action. From the beginning of the Plan development process, it has been recognized that management is a continuous activity that must involve those responsible for implementing actions. The process has made maximum use of existing knowledge and experience to identify, characterize, and assess alternative management actions. Much of the planning process was devoted to identifying short- and long-term management actions or strategies, including their operational requirements. These management actions can be found in the detailed action plans contained in this volume. These plans address management issues ranging from channel marking, to volunteer programs, to regulations. They provide details on institutional needs, personnel, time requirements, and implementation costs. These details are necessary for the decisions that will have to be made upon Plan implementation by the managers in the region.

Toward Integrated, Continuous Management. A central purpose of the Management Plan is to take the disparate threads of protection and regulation that currently apply to the Florida Keys' ecosystem and weave them into a fabric of integrated coastal management (ICM). ICM is not a new idea or concept; what is new is the notion of applying it in a comprehensive and continuous manner. ICM is a process that begins with direct participation of managers, planners, analysts, scientists, and a concerned public. Developing an integrated management approach does not take place quickly; it evolves over time, based on incremental gains that build upon one another.

A major component of the Management Plan is the consideration of water quality issues and problems. The FKNMSPA called upon the U.S. Environmental Protection Agency and the State of Florida to develop a comprehensive water quality protection program for the Sanctuary. NOAA has incorporated this protection program into the Management Plan as the Water Quality Action Plan found in this volume.

Overview of the Public Review Process

The Draft Management Plan and Environmental Impact Statement for the Florida Keys National Marine Sanctuary was released to the public at a Sanctuary Advisory Council meeting on April 4, 1995. This initiated a nine month public review of the draft plan that ended December 31, 1995. During this review period Sanctuary staff facilitated the public's review of the plan in a variety of ways that were designed to maximize the public's full understanding of the components and contents of the draft plan.

The nine month public review process included the following opportunities:

- *Sanctuary Advisory Council Preview*. On April 4, the draft plan was released in a public meeting. At this meeting, each of the authors of the Action Plans contained in the Preferred Alternative (Volume I) gave a verbal summary of the contents of the Action Plans. This day-long, detailed preview, initiated the public's review of the draft plan and served to introduce and familiarize the public with the plan.

- *Info-Expos*. The Sanctuary staff held two series of three-day-long Info-Expos in April and May of 1995 and October 1995. The Info-Expos were held in the Upper, Middle, and Lower Keys. They were set up like a trade show and individual tables served as information booths manned by Sanctuary staff, Sanctuary Advisory Council members, Core Group members, and a Spanish interpreter. The Info-Expo staff passed out materials and answered the public's questions about the draft plan. Each of the booths represented a specific theme such as water quality, fishing, boating, zoning, etc. Additionally, staff distributed copies of the draft plan to the public if they had not received one by mail.

- *Working Groups*. In June 1995, the Sanctuary Advisory Council established 10 Working Groups, one for each action plan, to assist in the public review of the draft plan. The SAC appointed a Chairperson for each of the Working Groups and other SAC members were encouraged to sign up to participate in the Working Groups that they were interested in monitoring.

  In August 1995, the Sanctuary Staff gave the Working Groups a briefing outlining the purpose, objectives, and ground rules for the Working Group's public review of the draft plan. The purpose of the Working Groups was to broaden the public's review of the draft plan in order to get the best and most comprehensive review possible. An objective of the process was to help the SAC formulate their comments on the draft plan. The ground rules were: that membership on the Working Groups was open and the public was encouraged to sign up and participate; no voting (strive for consensus, but record both sides when split); all suggestions were to be recorded; the Working Group meetings were to be held in different parts of the Keys; and Sanctuary staff were to serve in a support role.

  Each of the Working Groups held multiple meetings in various parts of the Keys. The public was given enormous opportunity to provide their input on the draft plan.

- *Public Hearings*. There were six public hearings held on the draft plan. The hearings were held in Miami, Key Largo, Marathon, Key West, St. Petersburg, and Silver Spring, Maryland. The Sanctuary Advisory Council was encouraged to attend as many of the meetings as possible in order to help the SAC further develop their comments on the draft plan. This made it possible for the SAC to take full advantage of the public's comments in their deliberations on the draft plan in November and December.

As a result of the public review process, NOAA received over 6,400 statements of public comment on the draft management plan and environmental impact statement. Clearly, the use of the Sanctuary Advisory Council Working Groups assisted the advisory council in the development of their comments on the draft plan. As a result of their review process, the input at public hearings, and written public comments, NOAA has been able to develop a Final Management Plan that reflects a broad range of public comments.

The Environmental Impact Statement Process

The National Environmental Policy Act of 1969 (NEPA) requires any Federal agency proposing a major action that significantly affects the quality of the human environment to develop an environmental

impact statement that describes both the positive and negative impacts that may result from implementation. Accordingly, an EIS has been drafted to accompany the Management Plan, and both have gone through a public review and comment process prior to adoption in this Final Plan. The Draft EIS evaluated a range of reasonable alternative approaches to Sanctuary management. These alternatives are presented in Volume II to facilitate analysis of their effects. The Preferred Alternative for Sanctuary management is presented based on NOAA's analysis of its impacts and the public comments.

Contents of Volume II

This volume contains the EIS for the Florida Keys National Marine Sanctuary Final Management Plan. The EIS provides the problem analysis and basis for the Final Plan to manage the Sanctuary. Volume II consists of the following chapters: 1) Description of the Affected Environment; 2) Development of Management Alternatives; 3) Environmental Consequences of Management Alternatives; 4) Socioeconomic Assessment of Management Alternatives; and 5) Selection of the draft Preferred Alternative. The selection of the Final Preferred Alternative is in Volume I. Brief descriptions of these chapters follow.

Description of the Affected Environment. This chapter describes the Florida Keys' ecosystem, Sanctuary resources, and their characteristics. Human activities and uses impacting Sanctuary resources, such as population growth, tourism, and fishing, are also described. This chapter also contains an overview of the existing jurisdictional responsibilities and institutional arrangement for managing and protecting Sanctuary resources. Recognizing and understanding the mix of institutions that regulate and manage in the region is critical to making the most efficient use of NOAA's resources. This section was changed pursuant to public comment on the Draft EIS.

Development of Management Alternatives. This section sets forth management alternatives for dealing with the problems identified in the planning process. This chapter describes how those alternatives were developed in the draft MP/EIS. The process involved identifying themes for problem (issue) areas (e.g., boating, fishing, recreation, etc.) and describing those issues in detail; developing management actions (strategies) for dealing with the problems; and building the alternatives from the strategies. The five alternatives described in this document provide a range of environmental protection for the complete restriction of uses (Alternative I) to the status quo (Alternative V). Three mid-range alternatives (II, III, and IV) are considered acceptable because they more adequately address the requirements of the FKNMSPA and the NMSA. Accordingly, the EIS focuses on these mid-range alternatives.

Environmental Consequences of Management Alternatives. This chapter provides information on the potential impacts of the proposed mid-range alternatives on the environment. It contains a summary of each issue (e.g., boating fishing, etc.), a description of each environmental impact theme (i.e., water quality, habitats, and species), and overall description of the environmental impacts of proposed management actions under those themes, and summary tables comparing environmental impacts across the three mid-range alternatives for each theme. The purpose of this assessment is to facilitate a reasoned decision making process for choosing the Preferred Alternative in the Draft and Final Plan, and inform the public of the basis for proposed actions.

Socioeconomic Assessment of Management Alternatives. In additional to assessing the impacts on the natural environment, the draft MP/EIS also assesses the economic and social aspects of the human environment. This chapter includes information on the groups and/or industries likely to be impacted by various management strategies. It discusses the qualitative nature of impacts that might occur given changes in quantity and/or quality of Sanctuary resources and their uses. It is organized around the issues outline in the Development of Management Alternatives chapter. Within each issues, management strategies are evaluated across alternatives. This section has been supplemented by the assessment of costs and benefits conducted pursuant to E.O. 12866 and attached in Volume III.

Selection of the Draft Preferred Alternative. This chapter describes why Alternative III was chosen as the Preferred Alternative, at the Draft MP/EIS stage, including Federal, State, and local perspectives, and provides a comparison of the alternatives by management issue (e.g., boating, fishing, etc.). This section is supplemented by the discussion of the Final Preferred Alternative in Volume I.

To the extent public comments suggested additional alternatives or modifications of II, III, IV, or V, see the discussion of the selection of the Final Preferred Alternative in Volume I.

Description of the Affected Environment

Introduction

The Keys and the Sanctuary Area. The Florida Keys are a limestone island archipelago extending southwest over 320 km from the southern tip of the Florida mainland to the Dry Tortugas, 101 km west of Key West. They are bounded on the north and west by the relatively shallow waters of Biscayne Bay, Barnes and Blackwater sounds, Florida Bay—all areas of extensive mud shoals and seagrass beds, and the Gulf of Mexico. Hawk Channel lies to the south, between the mainland Keys and an extensive reef tract 8 km offshore. The Straits of Florida lie beyond the reef, separating the Keys from Cuba and the Bahamas.

The Keys are made up of over 1,700 islands encompassing approximately 266 km^2. They are broad, with little relief (generally less than one meter), have a shoreline length of 2,989 km, and are inhabited from Soldier Key to Key West. Key Largo (65 km^2) and Big Pine Key (27 km^2) are the largest islands (Monroe County, 1992).

The Keys are frequently divided into three regions: 1) the Upper Keys, north of Upper Matecumbe Key; 2) the Middle Keys, from Upper Matecumbe Key to the Seven Mile Bridge; and 3) the Lower Keys, from Little Duck Key to Key West (Figure 1). The cities of Key West, Layton, and Key Colony Beach are typically discussed separately, as they are the only incorporated areas in the Keys (Monroe County, 1992).

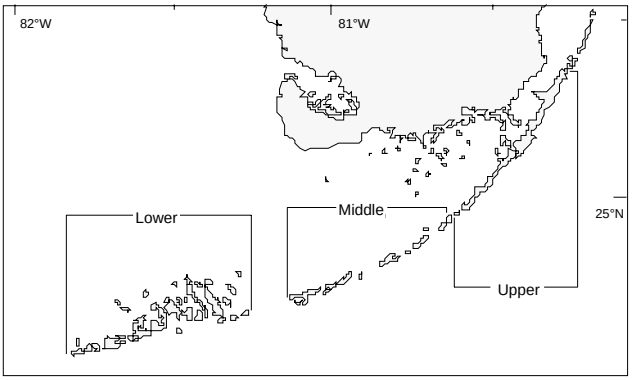
The Sanctuary encompasses approximately 9,500 km^2 of submerged lands and waters between the southern tip of Key Biscayne and the Dry Tortugas Bank (Table 1). North of Key Largo it includes Barnes and Card sounds, and to the east and south the oceanic boundary is the 300-foot isobath. The Sanctuary also contains part of Florida Bay and the entire Florida Reef Tract, the largest reef system in the continental United States.

Table 1. *Summary of Florida Keys Statistics*

Name	km^2	nm^2
Florida Keys National Marine Sanctuary	9,515	2,774
Keys Land Area[a]	266	103[b]
Florida State Waters	5,526	1,611
Florida Keys Incorporated Cities	17	6[b]

a. Outside of the Florida Keys National Marine Sanctuary.
b. Square statute miles.
Source: Monroe County Working Paper 2, 1991.

Figure 1. *The Upper, Middle, and Lower Keys*



Approximately 5,500 km^2 (58%) of Sanctuary waters are under State jurisdiction, and numerous State and Federal parks and reserves are located within the Sanctuary's boundaries. The Key Largo and Looe Key national marine sanctuaries will be incorporated into the Florida Keys National Marine Sanctuary, but the area within Dry Tortugas National Park will be excluded.

The Keys' Population. The Keys have both permanent and seasonal residents. In 1990 the peak population was estimated at 134,600, including 78,000 permanent residents. The remainder were seasonal residents and tourists/visitors. About one-third of the population was located in Key West, Key Colony Beach, and Layton, the three incorporated cities. There were also almost 1,400 live-aboard vessels, accounting for over 2,500 residents.

The population of the Keys varies considerably by season. The annual influx of residents and visitors during the winter months causes the population to increase by over 70 percent. Visitors staying either at tourist facilities or with friends or relatives accounted for approximately 37 percent of the estimated population in 1990.

Accessibility. Visitors to the Keys arrive either by airplane, car, bus, or boat. The number of visitors is restricted primarily by limited access, as only one highway (US 1, the Overseas Highway) runs through the area. This highway replaced the Keys' railroad system, which was destroyed by the Labor Day hurricane of 1935. Forty-two bridges along US 1 connect the area's principal islands; there are no

roads connecting the islands north of Key Largo (i.e., Sands, Elliott, and Old Rhodes keys).

The Upper Keys, particularly Key Largo, receive a large number of weekend visitors. Fewer visitors make short trips further down the Keys, but those travelling to Key West stay for longer periods. Many visitors also travel to the area's large public recreation sites. Approximately 1.3 million visited John Pennekamp Coral Reef State Park in 1990, 339,000 visited Bahia Honda State Park, and 19,400 visited Dry Tortugas National Park (White, 1991).

Existing Management Areas. Federal, State, local, and private organizations currently protect, preserve, and regulate over 120 sites throughout and adjacent to the Sanctuary, covering approximately 9,800 km^2. Some are entirely submerged, some entirely upland, and some have both a land and water component. Some sites serve as protective barriers, preventing damage to sensitive environmental habitats. Others, encompassing ecosystems that are already impacted, are protected from further degradation. Additional protection is provided for archaeological and historical site preservation, environmental conservation, recreation, public access, education, and scientific research. Many needs are served at each site through multi-use management. Table 2 summarizes the Federal, State, and local existing management areas within or near the Keys.

Table 2. *Existing Management Areas*

Jurisdiction	Area km^2	Area nm^2
Federal	**9,436**	**2,751**
Department of Interior	*9,060*	*2,641*
U.S. Fish and Wildlife Service	2,281	665
National Park Service *	6,779	1,976
Department of Commerce	*376*	*110*
National Oceanic and Atmospheric Administration	376	110
State	**356**	**104**
Department of Environmental Protection	*356*	*104*
Division of Recreation and Parks	236	69
Division of State Lands	120	35
Local	**<1**	**<1**
Monroe County Planning/Building Department	<1	<1
City of Key West	<1	<1
Other	**4**	**1**
Total Protected Areas	**9,796**	**2,856**

* National Park Service acreages are outside of FKNMS boundaries

Note: Numbers are rounded. Many areas overlap (see Figure 1), causing the totals to be greater than the actual area managed.

Sources: National Park Service, 1989; U.S. Fish and Wildlife Service, 1990; U.S. Department of Commerce, 1983, 1984; Florida Department of Natural Resources; Monroe County Planning/Building Department. Pers. Comm.: Chuck Olson, Florida Keys Land and Sea Trust; Mark Robertson, Nature Conservancy; Paul R. Wick, Monroe County Land Authority

Federally Protected Areas. The Federal government manages 96 percent of all protected areas in the Keys, including four national wildlife refuges, three national parks, and two national marine sanctuaries. In the Upper Keys region, Everglades National Park, Crocodile Lake National Wildlife Refuge, and the Key Largo National Marine Sanctuary account for almost 7,000 km^2. The Looe Key National Marine Sanctuary, off Big Pine Key, protects about 18 km^2. The Great White Heron and Key West national wildlife refuges protect nearly 1,700 km^2 in the Lower Keys region. The National Key Deer Refuge is dedicated to protecting that species alone, and almost entirely overlaps the Great White Heron National Wildlife Refuge. Dry Tortugas National Park contains about 261 km^2 surrounded by Sanctuary waters.

State Protected Areas. Florida's Division of Recreation and Parks (FDRP) and Division of State Lands (FDSL) maintain almost five percent (approximately 356 km^2) of all protected areas in the Keys. The FDRP protects nine sites: Bahia Honda State Park, Long Key Recreation area, the Indian Key and Fort Zachary Taylor areas, Lignumvitae Key and Key Largo Hammocks state botanical sites, San Pedro Underwater Archaeological Preserve, Windley Key Fossil Reef State Geological Site, and John Pennekamp Coral Reef State Park, the nation's first underwater State park. Each of these sites is in the Upper Keys, except Fort Zachary Taylor and Bahia Honda State Park, which are in the Lower Keys.

The FDSL manages three areas: Biscayne Bay/Card Sound and Lignumvitae aquatic preserves in the Upper Keys, and Coupon Bight Aquatic Preserve in the Lower Keys. Together with John Pennekamp Coral Reef State Park, these four sites account for 96 percent of all areas protected by the State. The State of Florida has also designated the Keys as an "Area of Critical State Concern." Approximately 80 km^2 have been set aside for conservation purposes by the Monroe County Comprehensive Plan (Minerals Management Service, 1990).

Locally Protected Areas. The governments of Monroe County and the City of Key West manage 55 community parks that provide recreation and waterfront access. Thirty-six county parks, most of which are less than 1 km^2, provide picnic tables, ball fields, playing equipment, and restrooms. Boat ramps have

also been built in many waterfront areas. Marathon and Big Pine Key have the most parks in the county, with six and seven sites, respectively (Ferris, pers. comm.). The parks managed by the City of Key West include two bird sanctuaries, a canoe trail, and an 18-hole golf course.

Other Protected Areas. The Nature Conservancy, Florida Keys Land and Sea Trust, National Audubon Society, and Monroe County Land Authority protect and conserve an estimated 4 km^2 in the Keys, with The Nature Conservancy and the Monroe County Land Authority managing 88 percent of the total area (1.5 and 2.0 km^2, respectively). The South Florida Water Management District (SFWMD) manages a "Save Our Rivers" (SOR) property on Big Pine Key. The Florida Keys Land and Sea Trust manages nine areas, with the largest site (0.25 km^2) on Vaca Key. The remaining sites, four in the Lower Keys, one in the Middle Keys, and three in the Upper Keys, are also each smaller than 1 km^2. In addition, the National Audubon Society manages one site in the Middle Keys that is less than 1 km^2.

Physical Environments

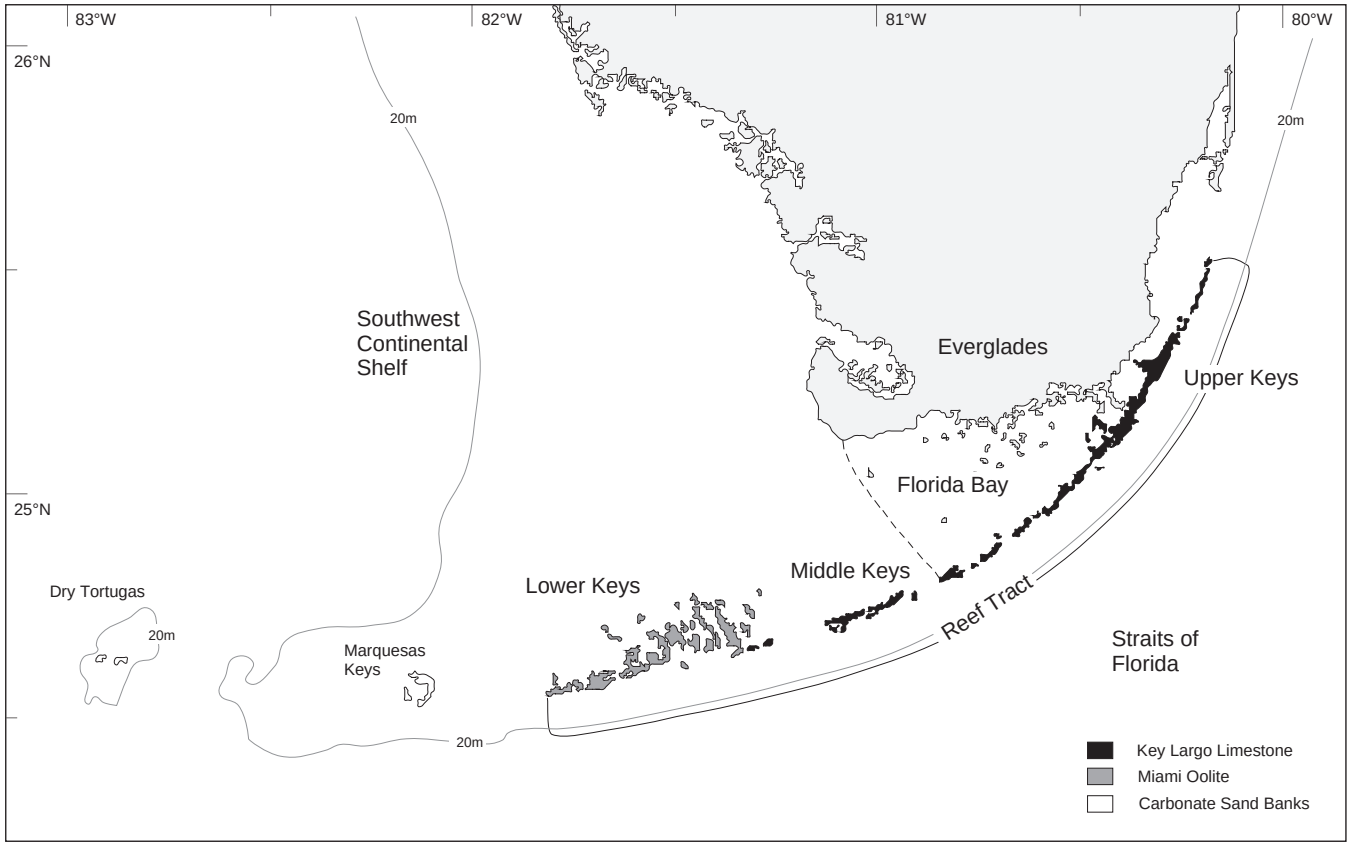
The Florida Keys are located at the southern edge of the Floridan Plateau, a large carbonate platform composed of 7,000 m of marine sediments. The plateau incorporates all of Florida and the adjacent continental shelves of the Gulf of Mexico and Atlantic Ocean (Minerals Management Service, 1990; Mueller, 1991). Sediments have been accumulating in the region for 150 million years and have been structurally modified by subsidence and sea level fluctuation (Mueller, 1991).

The crystalline and sedimentary basement rocks of the South Florida Basin underlie the plateau. The basin is a block-faulted feature associated with the breakup of North America and Africa during the Mesozoic era. Further block-faulting during this era created the Straits of Florida, the water body separating the plateau from the Bahamas and Cuba (Hoffmeister, 1968; Mueller, 1991). Subsequent sea level transgressions flooded the area, initiating episodic reef building and marine deposition. Between 100,000 and 125,000 years ago, sea level was approximately 6 m higher than it is today. Sediments were deposited in a series of bays and lagoons in South Florida, while a large reef complex flourished to the east. To the south, tidal exchange between the Atlantic Ocean and the Gulf of Mexico formed a large series of cross-bedded, carbonate (oolitic) sand bars.

Sea level fluctuations attributed to glaciation are largely responsible for the region's current morphology (Holmes, 1981; Minerals Management Service, 1990). During the Wisconsin Glaciation, sea level dropped between 15 and 30 m, exposing the entire platform to marine and subaerial erosion. Sea level rose again approximately 6,000 years ago, flooding the area and forming the current physiographic regions (Hoffmeister, 1968 and 1974). Lithified remnants of the ancient reef complex formed the Upper Keys, while the Lower Keys were formed from the oolitic sand bars. Florida Bay occupies the southern portion of the old lagoonal structure.

The Sanctuary contains components of five distinct physiographic regions: Florida Bay, the Southwest Continental Shelf, the Florida Reef Tract, the Florida Keys, and the Straits of Florida (Figure 2). The regions are environmentally and lithologically unique, and together they form the framework for the Sanctuary's diverse terrestrial and aquatic habitats.

Figure 2. *Physiographic Regions of the Florida Keys National Marine Sanctuary Area*



Physiographic Regions

Florida Bay. Roughly triangular in shape, Florida Bay is defined by the Everglades to the north and the Keys to the east and south. It has an area of approximately 1,550 km^2 and an average depth of 1.5 to 2 m. Its most distinct feature is a patchwork of interconnected mud banks composed of shelly calcareous silt, which forms a series of oval-shaped basins 4.8 to 6.4 km long, 5.1 to 7.7 km wide, and 1.5 to 1.8 m deep (Multer, 1977; Minerals Management Service, 1990). To the west, these banks gradually mix with the more clastic sediments of the southwest continental shelf.

The bay has been termed an active lime-mud factory (Stockman et al, 1967; Multer 1977), with silts and muds composed of 90 percent calcium carbonate, with aragonite the primary constituent mineral. Biogenic sediments derived from a variety of marine organisms (primarily the green algae *Penicillus*) (Stockman et al, 1967; Multer, 1977; Valleau, 1977; Minerals Management Service, 1990) continually accumulate.

Because of the bay's shallow depth, large seasonal variations in temperature and salinity are common, and abundant sediment contributes to turbidity levels. As winter storms pass through the area, large amounts of sediment-rich cool water are transported through the channels between the Keys to the Florida Reef Tract. During periods of warm, stable weather, tidal currents can transport high-temperature water in the same direction. This influx directly affects reef production by changing water temperature, salinity, and turbidity levels (Ginsburg and Shinn, 1964; Jaap, 1990; Minerals Management Service, 1990).

Southwest Continental Shelf. In the South Florida area, the southwest continental shelf is composed of the southern portion of the west Florida continental shelf and is bordered by Florida Bay to the east, the western extension of the Keys and Florida Reef Tract to the south, and the Florida Canyon to the west. The shelf area is a marine environment that contains a variety of benthic habitats dependent on substrate and the quantity and quality of available light.

Most of the shelf's carbonate-rich surface sediments were formed in the Holocene epoch and are continually developing. As sediment deposition continues, the shelf margin builds seaward (Minerals Management Service, 1990). Continued sediment accumulation can be attributed to both the marine erosion of existing lithologic features and the biogenic production of carbonate sediments from flora and fauna (Multer, 1977; Holmes, 1981).

The shelf can be divided into two main morphologic zones based on water depth and bottom structure. The inner shelf is between 10 and 70 m deep, extending approximately 210 km from Florida Bay. It slopes gradually seaward at a 0.02° angle. Pulley Ridge, a 10-km wide inactive bioherm complex, marks the inner shelf's western edge. Sediment transport is based primarily on tide- and wind-generated currents. Intrusions from the Gulf of Mexico Loop Current are rare (Minerals Management Service, 1990).

The outer shelf is between 90 and 100 m deep and slopes seaward from Pulley Ridge at an angle of 0.07° to 1.0°. A fossilized double-reef complex marks the outer shelf's western edge, and the southern section contains the sediment banks that make up the Marquesas and Dry Tortugas (Holmes, 1981; Minerals Management Service, 1990). The outer shelf contains numerous large sand waves, reflecting the effect of the nearby Gulf of Mexico Loop Current.

The Florida Reef Tract. The Florida Reef Tract is an arcuate band of living coral reefs paralleling the Keys. The reefs are located on a narrow shelf that drops off into the Straits of Florida. The shelf slopes seaward at a 0.06° angle into Hawk Channel, which is several kilometers wide and averages 15 m deep. From Hawk Channel, the shelf slopes upward to a shallower area containing numerous patch reefs. The outer edge is marked by a series of bank reefs and sand banks that are subject to open tidal exchange with the Atlantic. The warm, clear, nutrient-deficient waters in this region are conducive to reef development (Voss, 1988; Jaap, 1990; Minerals Management Service, 1990).

Approximately 130 km of bank reefs stretch from Fowey Rocks to the Marquesas. One of their most noticeable structures are seaward-facing spur-and-groove formations, constructional features formed in part by wave energy (Shinn, 1963). Spurs are composed of elkhorn coral (*Acropora palmata)*, while grooves contain carbonate sands and reef rubble. These features may extend 1 to 2 km off the main reef, from depths of 1 to 10 m. Bank reefs exist in a high-energy environment and absorb the full impact of wave action. Primary corals include *Monastrea annularis* (a stony star coral), *Acropora palmata*; and *Acropora cervincoris* (staghorn coral). The red algae *Goniolithon* adds to the reef structure and exists in a symbiotic relationship with the corals (Hoffmeister, 1974; Enos, 1977; Shinn et al, 1989; Jaap 1990; Minerals Management Service, 1990). *(See the Natural Resources section of this chapter for more detail on the reef environment).*

Approximately 6,000 patch reefs lie along the Florida Reef Tract, with over 80 percent between northern Elliott Key and North Key Largo. They are circular to oval in shape, 30 to 700 m in diameter, and occur in water between 2 and 9 m deep in the low-energy environment on the back side of the outer reefs. They exhibit zonation based on water depth, and many have formed on antecedent Pleistocene topography. Grasses and other flora are not found at the reef's fringe (primarily because of reef-dwelling herbivores), leaving a ring of clean sand. Many are hollow due to solution weathering by seawater.

Corals grow best in warm, clear, nutrient-deficient waters, and their distribution within the Sanctuary reflects the exchange of water between Florida Bay, the southwest continental shelf, and the Atlantic Ocean. Reefs are well-developed seaward of the elongated Upper Keys and off the compact Lower Keys but absent or poorly developed near the wider channels in the Middle Keys, where conditions for optimal growth are adversely affected by water-quality variations (Ginsburg and Shinn, 1964; Voss, 1988; Shinn et al, 1989; Jaap, 1990).

Both patch and outer reefs maintain a balance between physically constructive elements (including corals, algae, and other flora) and destructive elements (e.g., salinity and water temperature changes, turbidity due to weather events, exposure to air, and changes in nutrient levels). By altering the physical characteristics of the reef environment, human activities may further stress an already stressed ecosystem (Jaap, 1990; Voss, 1988).

The Florida Reef Tract is dependent on the warm waters of the Florida Current for its survival, and diverse hyperthermic conditions can occur when the waters are heated during long-lasting summer doldrums. These events have been linked to coral bleaching (Voss, 1988).

The Florida Keys. The Keys extend southwest over 320 km from Biscayne Bay to the Dry Tortugas. They do not contain the wide expanses of sandy beaches characteristic of much of the Atlantic coast, and beaches of any significant size and width are rare. Of the total 50 km of beaches, most are between 4.5 and 7.5 m wide (Monroe County, 1991). The Keys can be divided into four areas based on morphology, lithology, and location: the Upper, Middle, and Lower Keys, and the Marquesas and Dry Tortugas.

The Upper Keys extend from Soldier Key to Lower Matecumbe Key and are composed of the Key Largo Limestone. They are long and narrow, with their main axis paralleling the axis of the chain. They are low-lying, with an average elevation of 1 to 2 m and a maximum elevation of 6 m at Windley Key (Minerals Management Service, 1990). Only a few narrow channels connect Florida Bay with the Atlantic.

The Middle Keys extend from Lower Matecumbe Key to the Seven Mile Bridge. Like the Upper Keys, they are composed of the Key Largo Limestone. Although smaller than the Upper Keys, they are similar in shape to these islands, and have numerous wide channels separating each island.

The Lower Keys extend from Little Duck Key to Key West and (with the exception of Little Duck Key, the Newfound Harbor Keys, and a portion of Big Pine Key) are composed of the Miami Oolite. They are broad and extremely flat, are separated by long, narrow channels, and their long axis is perpendicular to the axis of the chain (Minerals Management Service, 1990). To the west lie the Marquesas and Dry Tortugas, recently formed isolated clusters of carbonate sand shoals on the southern edge of the southwest continental shelf. Their continuing formation is dependent on sediments transported to the area and the growth of surrounding hermatypic coral reefs (Multer, 1977; Minerals Management Service, 1990).

The Key Largo Limestone. The Key Largo Limestone, which composes the Upper and Middle Keys, was formed by the lithification of a coral reef that developed 100,000 to 125,000 years ago. Below the surface, the limestone extends under Miami, Florida Bay, and the Dry Tortugas. At the surface it extends 180 km, from Soldier Key to the Newfound Harbor Channel. The thickness of the formation ranges from 23 to 52 m, with fossilized corals indicating that the Upper and Middle Keys are the remnants of patch reefs (Hoffmeister, 1968; Voss, 1988). It exhibits high porosity and permeability, both factors in the movement and retention of groundwater and pollutant transport throughout the Keys (Schomer and Drew, 1982).

The Miami Oolite. The Miami Oolite, which makes up the Lower Keys, is a lithified series of oolitic sand shoals that developed at the same time as the Key Largo Limestone. The oolitic formation is thin over the southern border of the Lower Keys, reaching a maximum thickness of 10 m on the northern part of Stock Island. The channels between the Lower Keys are the remnants of the original tidal channels that developed in the sand shoals (Hoffmeister, 1968; Voss, 1988; Minerals Management Service, 1990). The Miami Oolite exhibits high porosity but low permeability (EPA, 1992).

Straits of Florida. The Straits of Florida is a large block-faulted basin paralleling the Keys that contains an open-ocean, deepwater environment. Seaward of the Florida Reef Tract, the ocean floor slopes gradually for several kilometers to a depth of 300 m, before dropping off sharply to an average depth of 800 m. One of the Straits' most significant features is the Pourtales Terrace, a well defined plateau (200 km long by 30 km wide; 200-400 m deep) that borders the Lower Keys (Multer, 1977; Minerals Management Service, 1990). Currents associated with the terrace have a significant effect on the reef tract off the Lower Keys. The Straits' morphology is controlled by the Florida Current, which links the Gulf of Mexico Loop Current to the Gulf Stream. Surveys have shown evidence of erosional and depositional structures related to sea level fluctuations. The basin slowly accumulates detrital sediments composed of the skeletons of planktonic foraminifera (Multer, 1977).

Climatology

The Keys have a tropical maritime climate with moderate temperatures, and essentially two seasons: long wet summers and mild dry winters (Schomer and Drew, 1982; Jordan, 1991). Summer lasts from May to October and is characterized by numerous thunderstorms. Winter lasts from November to April and is characterized by dry conditions and infrequent, fast-moving cold fronts (Schomer and Drew, 1982; Winsberg, 1990). The climate is primarily influenced by the warm waters of the Gulf and Atlantic and the circulation patterns of the Florida Current and Gulf Stream.

Weather in the Keys is directly related to the tropical maritime air associated with the Bermuda/Azores high-pressure system. Its movement, seasonal position, and interaction with other pressure systems affect wind direction and speed, temperature, and precipitation (Winsberg, 1990; Jordan, 1991). Winds are from the east-southeast during the summer and the east-northeast during the winter, shifting to the northwest infrequently and for short periods during the passage of cold fronts (Schomer and Drew, 1982). Localized convective storms and intense low-pressure systems (in the form of tropical storms and hurricanes) are also integral climate components.

Temperature and Humidity. The Keys have the most moderate temperatures in Florida. The prevailing easterlies pass over the Gulf Stream and transport warm air across the islands, while cold fronts reaching the area are quickly modified by the warm waters of the Gulf and Florida Bay (Winsberg, 1990; Jordan, 1991). Temperatures are also influenced by the amount of solar radiation the area receives. The Keys are located between the latitudes of 24° 30' and 25° 30' north, and the sun's rays strike the Earth at a greater angle in the Keys than anywhere else in Florida (Winsberg, 1990). Key West receives an average of 3,300 hours of sunshine per year, more than any other area in the state (Schomer and Drew, 1982; Monroe County Board of County Commissioners, 1986).

Average temperatures show little variance over the range of the Keys, and those in Tavernier, in the Upper Keys, are typically within 1° C of those in Key West. At Key West, the average annual maximum temperature is 28° C and the average annual minimum is 23° C. The highest normal daily maximum is 32° C, and typically occurs in July and August. The lowest normal daily minimum is 19° C, and typically occurs in February (White, 1991). The record high (35° C) occurred in July 1951 and August 1957, and the record low (5° C) occurred in January 1981 (Jordan, 1991). Temperatures below freezing have never been recorded.

Air temperature is modified by and reflects surface conditions. Land masses heat more rapidly, reach a higher temperature, and cool more quickly than water, but water retains heat much longer. Compared to the South Florida peninsula, the Keys have very little land mass and are, therefore, constantly influenced by air associated with the surrounding warm waters. The inland areas on the peninsula typically experience a greater range of temperatures than the Keys.

Similarly, humidity levels reflect the maritime environment. The mean average annual relative humidity is 75 percent, and does not vary significantly by month (Schomer and Drew, 1982). Relative humidity also shows only a slight diurnal variation, with the highest humidities occurring in the early morning and the lowest in the late afternoon (Schomer and Drew, 1982; Jordan, 1991).

Precipitation. The Keys are the driest area in Florida, with an average of 124.5 cm of precipitation per year (Schomer and Drew, 1982). The highest monthly mean rainfall, 16.5 cm, occurs in September and the lowest, 3.3 cm, occurs in March (White, 1991). This lack of precipitation can be attributed to minimal well-established land/sea breezes and the limited number of large-scale synoptic systems in the area (Monroe County Board of County Commissioners, 1986; Jordan, 1991). Convection is weak and normally occurs over open water because of the small land area. East winds can push these storms ashore at any time (Jordan, 1991).

Most rainfall occurs during the summer in the form of locally intense convective storms. Only 18 to 33 percent of the area's precipitation occurs during the winter, with large-scale synoptic systems distributing small amounts of rain over a broad area (Schomer and Drew, 1982). Precipitation peaks in June and again in late September/early October as the unstable edges of the Bermuda/Azores High become positioned over the area (Jordan, 1991). Tropical disturbances primarily occur between June and November and contribute a significant amount of precipitation.

Although drought can occur at any time, it is most common in May, June, September, and October. Drought is related to large-scale weather patterns and is initiated by stable, stationary air masses that inhibit convection (Winsberg, 1990). Drought conditions decrease the supply of fresh water (Winsberg, 1990) and stress marine ecosystems by raising water temperatures and salinity levels (Voss, 1988; Jaap, 1990).

Storm Systems

Large-scale Synoptic Systems. During the winter, large-scale, mid-latitude cyclonic systems may be transported over the Keys by fluctuations in the winter polar jet stream (Winsberg, 1990). These systems occur approximately once a week, but are quickly modified by the surrounding warm waters (Schomer and Drew, 1982). Although they do not spread much precipitation, they can have a significant effect on the Keys' marine environment. Shallow areas may experience a decrease in water temperature and an increase in turbidity, and nutrient and salinity levels also may be affected. During the passage of an especially strong cold front, fish and coral kills may occur, with recovery taking several decades (Voss, 1988; Jaap, 1990).

Tropical Depressions and Hurricanes. South Florida experiences more tropical depressions and hurricanes than any other area in the United States (Schomer and Drew, 1982). Storms normally occur between June and November, peaking in late September/early October (Schomer and Drew, 1982; Jordan, 1991). In Monroe County, hurricanes have been reported as early as August and as late as November (White, 1991).

On average, there is a 13 to 16 percent annual probability of a hurricane occurring in the Keys (Winsberg, 1990; Jordan, 1991). There were 20 hurricanes in Monroe County between 1900 and 1990, 11 of which were Class 3 or greater (Nuemann, 1991), and Key West averages one hurricane every eight years (Winsberg, 1990). The Keys are the only area in the nation besides Texas to have experienced a Class 5 hurricane (Herbert, 1975), the Labor Day storm of 1935, which was the most violent ever to make landfall in the United States.

With the exception of Hurricane Andrew in 1992 (which was a Class 4 on landfall), the Keys have only experienced two Class 1 hurricanes since 1966, and approximately 36 percent of Monroe County's population has never experienced a major hurricane (Class 3 or greater). Residents are vulnerable, however, because the Keys are considered more likely than any area in the state to experience a major hurricane within the next 20 years. Public shelters are only available for a small percentage of the current population, and evacuation times have been estimated at between 27 and 30 hours (Monroe County Board of County Commissioners, 1986). Still, many residents remain unconcerned and consider the threat of hurricanes only a minor problem (Cross, 1980).

The topography of the Keys contributes to their vulnerability to such storms. Ninety-six percent of the area's land mass is less than 2 m above sea level (Cross, 1980). The worst-case scenario would involve a fast-moving, powerful hurricane with extremely low pressure reaching the shore at high tide (Winsberg, 1990). In such a case, storm waters would dome up and over the islands in the hurricane's path, completely inundating many areas.

Effects. Tropical depressions are reclassified as hurricanes when maximum sustained winds exceed 120 km/h. Hurricanes are further classified according to wind, storm surge, and pressure (Herbert, 1975). Although winds seldom extend more than 80 km from the eye, speeds can reach 120 to 160 km/h or more and can exert up to 75 pounds of pressure per square foot (Monroe County Board of County Commissioners, 1986). The Keys have experienced hurricane winds in excess of 200 km/h several times in the last century (Schomer and Drew, 1982).

Both tropical storms and hurricanes can cause major damage to the Keys' natural environment, with a single storm causing changes that would normally take years to occur. Storm waves and currents can destroy entire ecosystems, large blocks of coral can be broken from reefs and moved great distances, sediments can abrade corals or bury them completely, and entire islands can be defoliated. In addition, storm surges can flood aquifer recharge areas with saline water and soils can be completely eliminated (Monroe County Board of County Commissioners, 1986; Jaap, 1990). Recovery from such storms may take several decades (Nalvikin, 1969; Jaap, 1990).

The storm surge can be the most devastating element of a hurricane. The height of a surge depends on water depth, the shape of the coast that will be impacted, the speed of the storm, the direction and strength of the winds, and the air pressure in the eye (Winsberg, 1990). Low air pressure can cause the underlying water to dome upward as much as 6 m (Monroe County Board of County Commissioners, 1986). Storm waves of between 6 and 15 m may be superimposed on the storm surge, and often contribute to damages. Record storm surges in the Keys range from 3 to 5.5 m above the mean tide level (Schomer and Drew, 1982).

System Dynamics. Systems affecting the Keys originate in either the western Caribbean, Gulf of Mexico, or Atlantic Ocean. Most approach the islands from the east-southeast and are steered by adjacent pressure systems and the jet stream (Schomer and Drew, 1982; Jordan, 1991).

Precipitation normally associated with tropical depressions and hurricanes ranges from approximately 13 to 26 cm (Schomer and Drew, 1982), but may exceed 50 cm (Winsberg, 1990). Most precipitation is produced by massive thunderstorms that ring the eye of the system outward to 48 km and up to altitudes of over 12,000 m (Monroe County Board of County Commissioners, 1986).

Thunderstorms. Most thunderstorms in the Keys occur during the summer and are caused by convection. The Sanctuary has an average of 64 thunderstorm days per year, with 90 percent occurring between May and October and the greatest number in July (Schomer and Drew, 1982; Winsberg, 1990; Jordan, 1991). Lightning is common during these storms, and it is estimated that any given square mile in South Florida will be hit by 25 bolts per year (Winsberg, 1990).

Waterspouts. Waterspouts are common within the Sanctuary, and the Lower Keys have the nation's greatest point frequency of occurrence (Everling, 1987). Spouts are associated with areas of unstable disturbed airflow, and may form in conjunction with the rising currents of developing cumulus clouds. Fair-weather spouts are often short-lived, have weak winds, and occur most often around noon when solar heating peaks (Golden, 1971; Winsberg, 1990; Jordan, 1991). In general, waterspouts form most frequently between May and October, with most occurring in July (Jordan, 1991). Waterspouts associated with thunderstorms, squall lines, and hurricanes are stronger than average and exhibit characteristics closer to those of a tornado (Winsberg, 1990). True tornadoes are infrequent, however, occurring only when a waterspout moves over land (Winsberg, 1990).

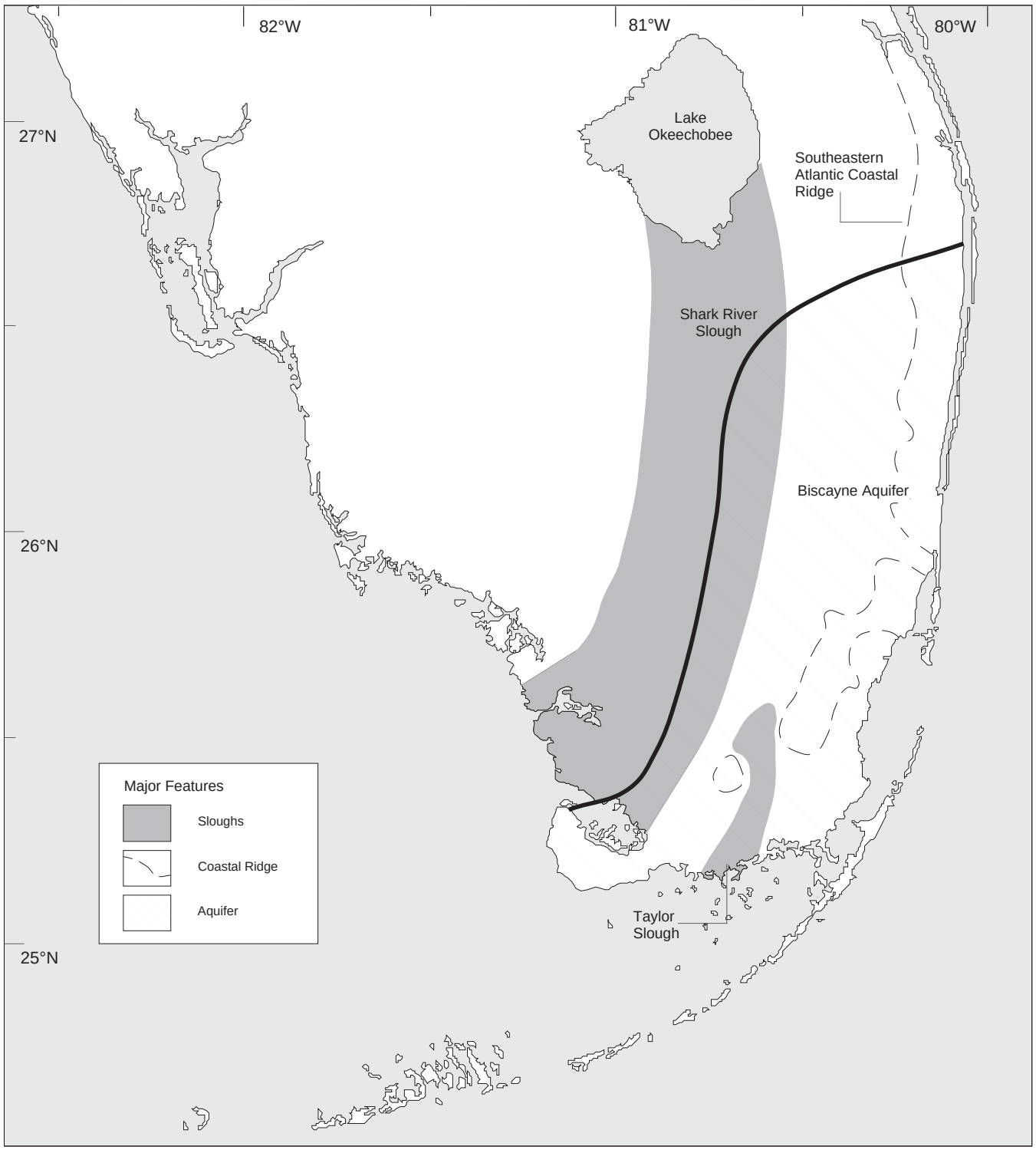
Hydrology

South Florida has serious freshwater problems that threaten the resources of its estuaries (especially Florida Bay) and ultimately the entire Sanctuary. During the past century, the pattern and intensity of freshwater flows to these estuaries have been significantly affected due to intense municipal and agricultural activities and the construction of the Central and Southern Florida Project for Flood Control and Other Purposes (commonly known as the Project). The Project is a surface-water management facility designed by the U.S. ACOE in the 1950s to drain land, provide flood protection, and regulate South Florida's water supply. Through the Project, enormous volumes of freshwater originally intended for the Everglades and its estuaries have been drained, diverted, or stored in "conservation areas." The resulting alteration of the natural freshwater cycle has interrupted the method and timing of freshwater delivery through South Florida. The impacts associated with this alteration have been studied but are still unknown (EPA, 1992).

Historic Hydrologic Patterns (Pre-1880). Historically, freshwater discharge to the Sanctuary was determined by direct precipitation to its restricted basin and runoff from the South Florida peninsula. South Florida's effective watershed once encompassed more than 22,500 km^2, extending inland to the headwaters of the Kissimmee River basin in Central Florida. Peak precipitation and runoff in the basin between June and October filled Lake Okeechobee, causing periodic spill-over at its southern boundary. Shallow groundwater aquifers were quickly saturated during the early summer months, promoting sheet flow (surface runoff) through South Florida. This spill-over, confined to the east by the southeastern Atlantic coastal ridge, was transported south through the Everglades via Taylor Slough and southwest through Big Cypress via the Shark and East River sloughs (Figure 3). By late summer, estuarine salinities were suppressed by the freshwater pulse. As the rainy season abated, the sheet flow of water slowed or ceased, leaving only the sloughs filled with water. As the dry season progressed (November through May), the area of standing water steadily diminished (Duever et al., 1985).

Alteration of Historic Hydrologic Patterns. Beginning in the late 1800s, drainage canals were constructed in South Florida to "open up" the region's interior to agricultural and urban development. Construction continued into the early 1900s, with approximately 708 km (440 miles) of canals completed.

Figure 3. *Natural Hydrology*



While this drainage system allowed an initial burst of growth and development, hurricanes in 1927, 1928, and 1947 caused devastation on a scale that clearly showed that these early drainage works could not adequately protect either Florida's present or future residents from the natural extremes of the region's weather and hydrology.

At the request of the State, the Federal government directed the U.S. ACOE to construct the Central and Southern Florida Flood Control Project, a comprehensive design for a water control system that would provide improved control over water flows, supplies, and levels; protection from floodwaters and saltwater intrusion in coastal wellfields; and the ability to preserve fish and wildlife habitats. This vast project was comprised of a network of over 1,600 km (1,000 miles) of canals and levees, huge water storage areas, and hundreds of pump stations and gated water control structures. The Project was built on top of the Kissimmee-Okeechobee-Everglades system, with the intent of modifying or controlling flows within the natural system that limited or threatened human development. The Project was built over a period of more than 20 years, with most construction completed by 1975.

Table 3 summarizes canal construction and modification through the early 1980s. While the Project was designed and built by the ACOE, the State was responsible for operating and maintaining it. In 1949 the Florida Legislature created the Central and South Florida Flood Control District (FCD), a special taxing district charged with operating and maintaining those portions of the project not retained by the ACOE.

The Florida Water Resource Act, which was adopted in 1973, paved the way for the State's system of regional water management by designating five water management districts whose boundaries were based on natural hydrologic patterns. This legislation broadened the scope of the regional water managers' responsibilities. The FCD was reconfigured as one of the State's five water management districts, and its boundaries were redrawn to encompass all of the Kissimmee-Okeechobee-Everglades system, from the chain of lakes in the Kissimmee River valley south to Florida Bay. Within the almost 47,000 square kilometers (18,000 square miles) included in those boundaries are more than 2,500 square kilometers (1,500 square miles) of canals, many levees, almost 200 primary water control structures, and over 2,000 smaller water control structures.

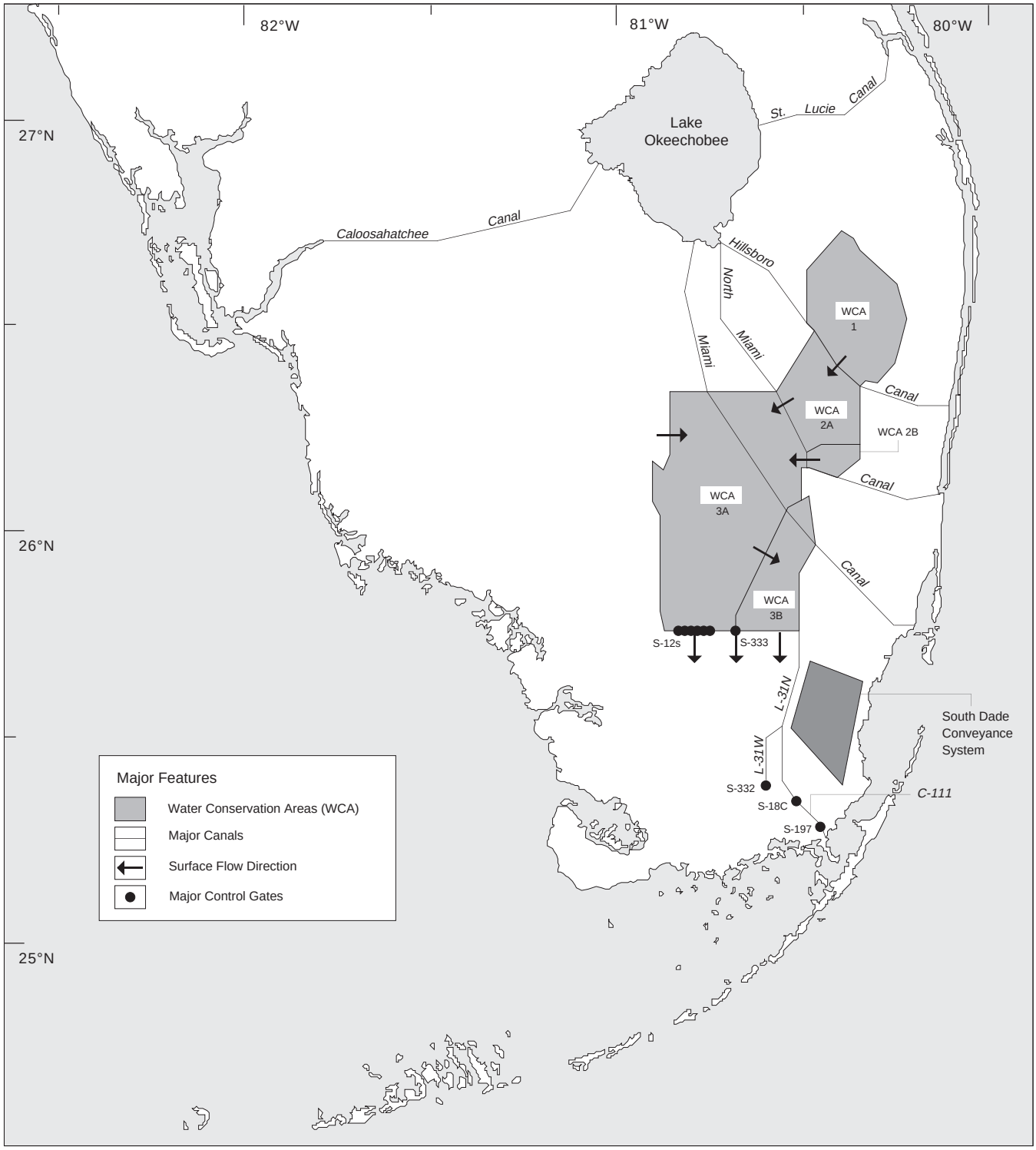
In 1976, the agency's name was changed to the South Florida Water Management District (SFWMD). Since that time, its resource management and protection responsibilities have continued to expand. Today, the SFWMD is responsible for operating and maintaining the Project to provide for urban and agricultural development in coordination with flood and water supply protection.

The Project essentially altered the distribution, flow, and timing of much of the region's surface water. Because of this, the SFWMD is required to maintain predetermined, ACOE-mandated surface water levels in the system's canals, lakes, rivers, and Water Conservation Areas (WCAs). The system is designed to accommodate the Standard Project Flood (SPF), defined as "that rainfall amount that occurs during a 100-year storm event, increased by 25 percent" (Cooper and Roy, 1991). These operation schedules are very complex, but their major pathways have been summarized in Figure 4. At the same time, the agency is also responsible for maintaining and protecting the underlying natural water and land ecosystems that the Project was built to change.

These two divergent responsibilities are often in conflict. For example, required regulatory releases from Lake Okeechobee may have to be channeled east or west, toward the sensitive estuaries fed by the St. Lucie and Caloosahatchee rivers. Today, whenever possible, water managers channel flows south (rather than east or west) into the New North River and Miami canals, so they can be stored in the WCAs and kept within the natural hydrologic system. This affords additional opportunities for water storage and use, and limits the amount of freshwater "lost to tide."

Still, the operation of this vast project has been associated with reduction of freshwater discharge to the Lower Everglades, alterations in timing and volume of inflow, and increases in downstream coastal salinities. In the Everglades basin, the effective watershed has been reduced to 7,800 square kilometers. In 1970, Congress established PL91-282 in an attempt to guarantee minimum water deliverances to Everglades National Park (ENP) and to authorize construction of the necessary conveyance facilities. Delivery schedules were established that required minimum monthly discharges to three areas of ENP: Shark River Slough (SRS), Taylor Slough, and the Park's eastern panhandle. Flows to SRS were made via S-12. The South Dade Conveyance System was also constructed to provide minimum deliveries to Taylor Slough and the panhandle.

Figure 4. *The South Florida Canal System and Water Conservation Areas*



During the 1970s, however, it became apparent that these minimum delivery schedules did not resolve the problems in ENP, because minimum deliveries were based on the calendar, rather than the region's natural rainfall runoff response. The minimum delivery schedule also ignored both the inter- and intra-annual variability of rainfall. In response to these problems, the SFWMD created an alternative water management plan based on historic rainfall distribution. This plan was implemented in the SRS basin in 1985. That "Rainfall Plan" is still being used. However, in the Taylor Slough and eastern panhandle basins, the minimum delivery schedule remained in effect until recently.

Proposed Future Alterations. The Taylor Slough Demonstration Project and C-111 Interim Construction Plan are recent SFWMD plans designed to reestablish the natural hydrology patterns in South Florida. The Demonstration Project addresses the volume and timing of surface-water flow through Taylor Slough. Its objective is to improve water supply deliveries by restoring the rainfall-runoff response that was in place before construction of the Project (SFWMD, 1990). The proposed plan includes added pumping capacity to direct water from the L-31W canal directly to Taylor Slough.

The Interim C-111 Plan, which includes the installation of gates along the length of the canal, is intended to: 1) reduce the duration of large discharge events at S-197 once associated with the removal of the earthen plug at the end of C-111; 2) increase the frequency and distribution of flow to the ENP panhandle by increasing flow through gaps in C-111; 3) control the groundwater stage near L-31N to enhance the hydroperiod of the northeast SRS; and 4) maintain the current level of flood protection (SFWMD, 1990). These activities will be supported by an extensive monitoring program designed to evaluate changes in baseline hydrology resulting from implementation.

Relationship of Hydrology to the Sanctuary. Changes in the volume, timing, and method of freshwater delivery to the South Florida peninsula that occurred after the Project was constructed have been some of the principal features associated with estuarine degradation in the Sanctuary. Normal operation of the canal structures has been associated with reduced discharge to ENP tributaries and a reduction in runoff to its estuarine waters. Operation during major storm events has historically contributed excessive freshwater to Manatee Bay.

Table 3. *Chronology of Modifications to Central and South Florida Hydrology, 1882-1980s*

Date	Canal Construction	Date	Canal Construction
1882	Caloosahatchee Canal	1960	Levees expanded to enclose WCAs 1 and 2 in the northern Everglades
1905-1913	North New River and Miami Canals	1962	Levee parallel to the Tamiami Canal partially enclosed WCA 3
1921	Hillsboro and West Palm Beach Canals	1967	Western boundary of WCA 3 completed
1916-1924	St. Lucie Canal constructed (destroyed 1926 by hurricane)	1967	Canal C-111 constructed as an extension of the Atlantic Ridge to provide flood control, drainage, and navigation benefits for the region between Florida Bay and the Tamiami Canal
1935	St. Lucie Canal reconstructed	1968	Salinity barrier (S-197) constructed
1920s	Tamiami Canal and others near Miami	1971	Kissimmee River flooding controlled; meanders removed and 300 foot wide canal constucted in its place; reduced river length from 100+ miles to 52 miles; Kissimmee River renamed Canal 38.
1920s-late 1930s	Hoover Dike levee around south and east Lake Okeechobee	Late-1970s to Early-1980s	South Dade Conveyance System conveys water south of Tamiami Canal for urban and agricultural supply and for Biscayne Aquifer recharge
Late-1930s	Saltwater intrusion to southeast Florida coast seen as problem; intensified by drought of 1943-45		
1949	Central and Southern Florida Flood Control District (FCD) established to control flood waters and saltwater intrusion		
1953	FCD had constructed levees along the eastern Everglades to retain freshwater runoff during the dry season		

Although current conditions may be attributed to disruption of the natural surface-water patterns, exchanges with the surficial aquifer layer occur easily, complicating the ability to isolate the relative importance of each mechanism. Recent Project modifications have sought to reestablish natural surface and groundwater hydrologic regimes. The monitoring program associated with the C-111 Interim Plan is expected to improve the understanding of issues related to South Florida's water quality and transport.

Groundwater. Because of the slight geographic relief and pervious nature of the Key Largo Limestone and Miami Oolite rock formations, most rainfall in the Keys infiltrates the surficial aquifer and forms shallow freshwater lenses. Groundwater in South Florida and the Keys is restricted to these shallow lenses and the deeper waters of the Floridan Aquifer (Schomer and Drew, 1982). The size of a freshwater lense is controlled by several factors, with the lens generally becoming thicker during the rainy season and thinner during the dry season. Permeability of the subsurface sediments, proximity to seawater and tidal fluctuations, and the rate of freshwater pumpage or seepage from these lenses are also significant (Schomer and Drew, 1982).

The Floridan Aquifer. The 259,000 km^2 Floridan aquifer underlies all of Florida and portions of Georgia, South Carolina, and Alabama (Johnston and Bush, 1988). The aquifer's surface in South Florida is generally 150 to 300 m deep and its average thickness is about 900 m (Meyer, 1989). It is divided into three hydrogeologic units: 1) the upper Floridan aquifer; 2) the middle confining unit; and 3) the lower Floridan aquifer. The upper Floridan aquifer contains brackish groundwater, while the lower Floridan aquifer contains seawater. Groundwater movement in the upper aquifer is generally toward the Keys, from the area of highest head in central Florida, southward to the Straits of Florida, and westward to the Gulf of Mexico. Studies suggest saltwater upwelling occurs from the lower to upper aquifer (Meyer, 1989).

The aquifer system in South Florida is used mainly for subsurface storage of liquid wastes, primarily injected treated municipal wastewater, oil field brine, and industrial wastewater (Meyer, 1989). The impact of groundwater on the habitats and water quality within the Sanctuary is currently unknown.

Hydrography

Hydrography is the study of the physical properties affecting marine water and its movement. It determines the extent to which water quality is affected by changes in salinity, temperature, and circulation both in the ocean and adjacent nearshore environments. The Sanctuary's nearshore waters are affected by regional circulation in the eastern portion of the Gulf of Mexico and adjacent Atlantic Ocean as determined by the Loop and Florida currents, respectively. The variability of these boundary currents, in conjunction with local meteorology and runoff, affects the nature of the water and its transport into and within the Sanctuary.

Regional Currents. Circulation over the outer to middle part of the southwest continental shelf is dominated by the Loop Current (Figure 5), which enters the Gulf of Mexico through the Yucatan Straits and moves in a northerly direction as far landward as the 100-m isobath. Turning in a clockwise direction to the south, it parallels the southwest continental shelf before shifting to the east, just southwest of the Dry Tortugas. It then becomes the Florida Current, meandering through the Straits of Florida confined by the 250-m and 500-m isobaths. It pinches landward south of the Marquesas and is deflected seaward by the Pourtales Terrace. It turns to the northeast near the Middle Keys, again pinching landward near the Upper Keys and continuing on as the Gulf Stream. Periodic changes in the locations of these currents result in the formation of circulation gyres that affect both the transport and entrainment of Sanctuary waters.

These gyres, cold cyclonic features of various sizes moving at speeds ranging from 2 to 20 km per day (Vukovich, 1988), are found along the Loop Current's landward boundary. Off the Dry Tortugas, at the Straits of Florida, they can grow to 100 by 200 km and can become quasi-stationary and elongated to the southwest. They may then move easterly along the northern boundary of the Florida Current (Lee, pers. comm.), decreasing in size to about 50 by 100 km over the Pourtales Terrace, before decaying near the Middle Keys.

A significant gyre has been observed to upwell and trap nutrients along the bank reefs near the Lower Keys. Because of its size and sluggish movement, it may contribute to increased phytoplankton concentrations (Lee et al., 1992). A mean westward countercurrent, located just seaward of the Lower Keys, has been observed (Brooks and Niiler, 1975) and identified (Lee et al., 1992) as part of the Dry Tortugas Gyre. Positioned over the Pourtales Terrace, this gyre may enhance mean westerly transport within Hawk Channel.

Near the Upper Keys, landward deflection of the Florida Current sets up small frontal eddies (10-30 km in diameter) just seaward of the reef tract (Lee, 1975; Lee and Mayer, 1977). These disturbances occur once a week on average and provide cool, nutrient-enriched water to the reef tract through core upwelling. In contrast to the sluggish Dry Tortugas Gyre, these features move quickly, requiring only one to two days to pass a fixed point. Accordingly, the Upper Keys region is relatively well-flushed and has limited nutrient-retention capacities.

Local Transport. Wind dominates the circulation and transport landward of the regional boundary currents. A mean westward current occurs in Hawk Channel (Figure 6) due to the prevailing southeasterly winds caused by the persistence of the Bermuda/Azores High. The current is most pronounced during the spring and summer, conveying waters from the Middle Keys to the Lower Keys and enhancing exchanges between the Gulf and the Atlantic through the Middle Keys tidal passes. In the Lower Keys, surface waters are forced onshore due to shoreline orientation and the rotation of the Earth, causing an offshore movement of water at depth.

Along the southwest continental shelf, transport processes are complex and relatively unstudied, but are important to exchanges throughout the Middle and Lower Keys. Prevailing trade winds dominate most of the region, forcing water in a westerly direction. Other processes, however, control shelf-water movement along the western boundary of Florida Bay and portions of the Middle and Lower Keys backcountry. In both the Middle and Lower Keys, net transport appears to be north-to-south from the Gulf to the Atlantic (Smith, pers. comm.). A weak along-shore current on the lee side of the South Florida peninsula potentially transports the near-coastal waters of southwest Florida toward the Middle and Lower Keys. This effect appears to be

Figure 5. *Regional Circulation*

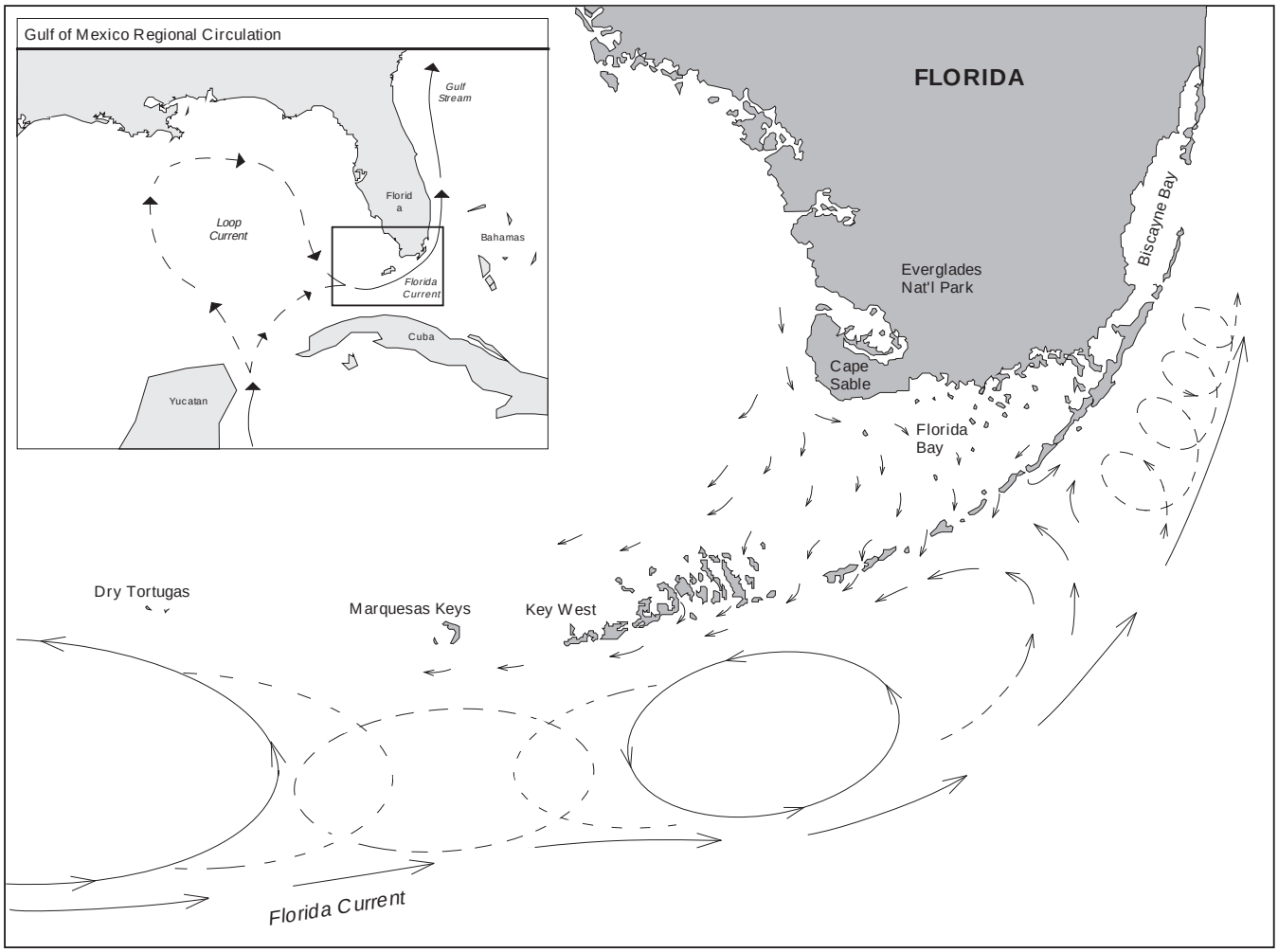
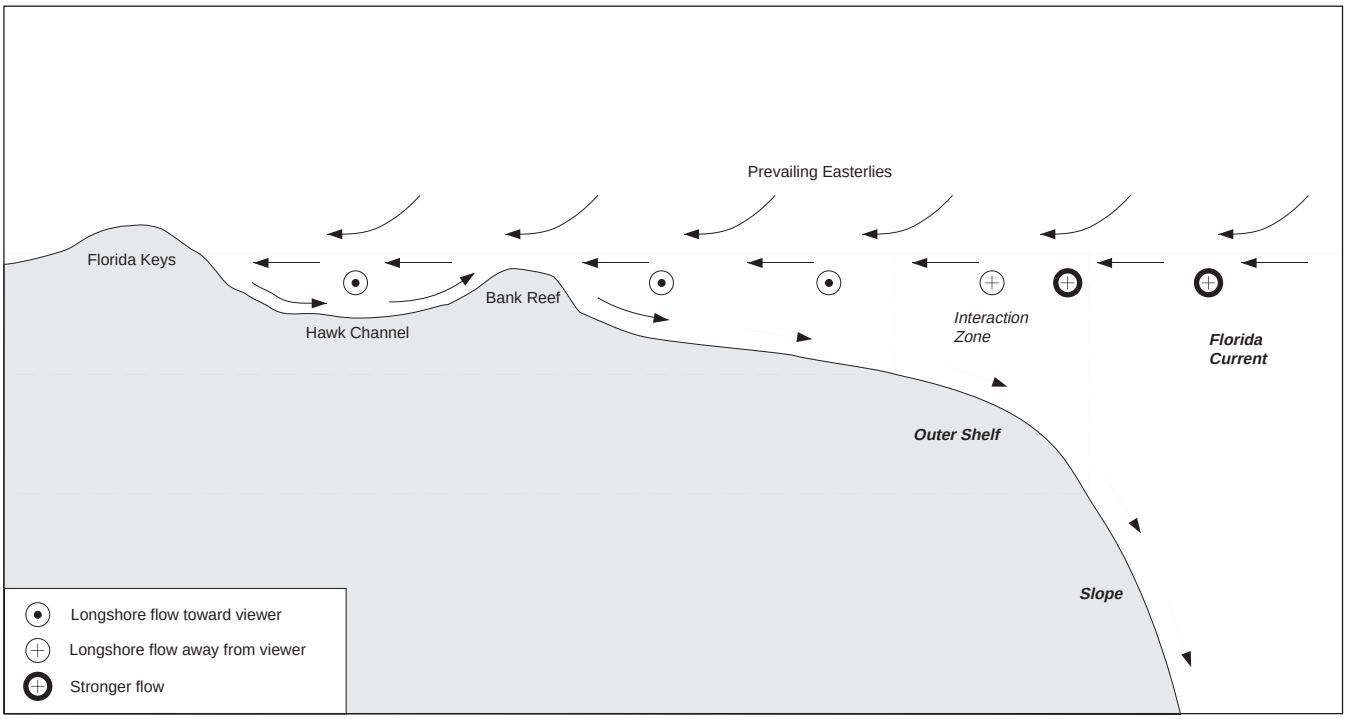


Figure 6. *Nearshore Transport*



enhanced during the fall, when an atmospheric high develops over the southeastern United States, producing southward winds that persist for 5 to 10 days (Lee et al., 1992). In the extreme, frontal passages occurring during the winter and spring can intensify the flow over the entire shelf region, resulting in significant fluxes from the Gulf to the Atlantic.

Water Quality

Preserving the Sanctuary's water quality is essential to maintaining the richness and diversity of its varied environments. Water quality is both a spatial and temporal phenomenon and is affected by both natural and human influences. Recent declines in coral recruitment, increases in the frequency and size of fish kills, and seagrass die-offs are examples of the impacts of declining water quality within the Sanctuary. Under certain conditions, external sources adjacent to the Sanctuary (such as the influences of Florida and Biscayne bays, the Loop and Florida currents, land-based activities, and atmospheric inputs) can dominate water quality impacts.

Types of Pollutant Inputs. Pollutants associated with land-based sources include toxicants and nutrients. Toxicants are mainly hydrocarbons, pesticides, herbicides, and heavy metals. Nutrients are derived primarily from fertilizers and wastewater, and include nitrogen and phosphorus. Other water quality concerns within the Sanctuary include the ocean dumping of glass, wood, aluminum, and paper and the release of various potentially hazardous materials during commercial shipping operations. A separate, but equally significant, concern involves the potential for a major oil spill which could have catastrophic environmental impacts. Although the Keys have not experienced such a spill, since World War II, small spills from refueling activities degrade water quality on a daily basis (EPA, 1992).

Sources of Pollutant Inputs. Pollutant sources affecting the Sanctuary's water quality are considered either point, nonpoint, or external.

Point Sources. Point sources are defined as those facilities that release effluents directly to surface waters. Significant point source dischargers include wastewater treatment facilities, water supply treatment plants, industrial facilities, and power plants. The Clean Water Act requires that a Federal permit be issued whenever pollutants are discharged into navigable waters. There are currently 19 facilities actively discharging to Sanctuary waters, but several are planning to eliminate these surface discharges by connecting to an existing treatment facility. Ten domestic wastewater treatment plants make up the largest component of this group. The major discharger is the Key West Sewage Treatment Plant which discharges into the Atlantic Ocean. Two facilities are industrial dischargers, Key

West Utility and the Ocean Reef Club's desalination unit (EPA, 1993).

Nonpoint Sources. Nonpoint sources involve discharges not made directly to surface waters. They include discharges to the groundwater and contributions from stormwater runoff. The most important nonpoint contributor within the Sanctuary is domestic wastewater. There are 670 injection wells in the area, ranging in depth from 18 to 27 m which are used by schools, hospitals, restaurants, hotels/motels, trailer parks, campgrounds, condominiums, resorts, and shopping centers (EPA, 1992).

The majority of the domestic wastewater contributing to the nonpoint load, however, comes from on-site disposal systems (OSDSs). OSDSs do little to remove nutrients, and there is reason to believe they are responsible for a portion of the Sanctuary's nearshore water quality degradation. In general, package plants, which provide secondary treatment, remove four to seven times more suspended solids and decrease biological oxygen demand more than OSDSs.

There are approximately 30,000 septic tanks and cesspits within the Keys as well (EPA, 1992). Cesspits are not regulated, and discharge directly into local groundwater without waste treatment. Septic tanks with conventional soil absorption can provide effective treatment, but due to the Keys' unique soil conditions and water table elevations additional design criteria are required. The State developed supplemental requirements in 1986 setting allowable densities and setbacks for new development. Septic leachate from OSDS is degrading water quality in confined waters and may be degrading water quality in nearshore waters (EPA, 1993).

Other potential nonpoint sources within the Sanctuary include existing and abandoned landfills, marinas/liveaboards, and stormwater runoff. Preliminary evaluations of the impacts of these sources have been inconclusive, and additional monitoring efforts are needed. However, site-specific examples, such as conditions within confined waters, suggest the importance of understanding these sources in relation to nearshore water quality degradation.

External Sources. External sources can also affect the Sanctuary's water quality. Examples include Florida Bay, Biscayne Bay, the region's boundary currents, and the canal structures operated by the South Florida Water Management District. Florida Bay has periodically experienced poor water quality due to both physical and biotic factors affecting salinity, temperature, suspended particulates, and nutrient concentrations. Seagrass decomposition, and the associated biologic activity, has been observed to create low dissolved oxygen concentrations and high concentrations of suspended particulates. In addition, historical flow modifications in both the Shark River and Taylor sloughs have resulted in both a reduction in total flow and a change in the delivery rate of freshwater inflow to Florida Bay. This has, in turn, affected water temperature, salinity, and retention times (Richards, 1989). The bay's poor water quality may also affect the reef tract, a situation that may be enhanced during periods of wind-induced transport.

Owing to alongshore transport from the north, Biscayne Bay, another external source, may have detrimental effects on the Biscayne National Park reef tract as well as the Sanctuary. The bay is surrounded by numerous potential pollutant inputs. Flows from Miami, other local municipalities, and Metro-Dade County contribute to its water quality conditions. The Miami River consistently has the poorest water and sediment quality in the Biscayne Bay area (EPA, 1992).

In addition to the influences of Florida and Biscayne bays, external sources influence the Sanctuary's water quality via water mass movement. The scale of this problem is related to the region's physical oceanographic and circulation features. The Loop and Florida currents transport most of the water from Florida's west coast, Mississippi River outfall, contributions from Central America and northern South America (Orinoco Flow), and the various islands of the Caribbean. However, due to the large dilutive effects of the ocean environment, only the immediate waters of Florida's west coast and the Mississippi appear to be likely influences.

Other locally important external sources are derived from eddies that form along the boundary currents paralleling the shoreline. These small-scale features can cause the periodic upwelling of cold, nutrient-rich waters (e.g., the Pourtales Gyre that forms off Key West).

Environmental Effects. Because they are generally more soluble than toxicants, nutrient and organic inputs may affect the environment over a greater spatial area. They are deposited and retained more easily within sediments. In addition, while toxicants affect localized environments such as marinas, canals, and areas surrounding industry, nutrients are more susceptible to transport and represent a greater threat to seagrass and coral reef communities.

Seagrass Beds. Seagrass beds and submerged aquatic vegetation within the Sanctuary consist mainly of turtle grass, manatee grass, and shoal grass. In total, the seagrass beds of South Florida, including Florida Bay and the Florida Reef Tract, cover an estimated 5,500 km^2 (EPA, 1992). However, little information exists on the relationship between human uses and recent declines.

In the summer of 1987, a massive seagrass die-off began in Florida Bay that resulted in 40 km^2 of seagrass loss (MMS, 1990) and damage to another 231 km^2 (EPA, 1992). This trend has persisted at a slower pace since 1990. Possible explanations include a reduction in the freshwater inflow that has historically drained to the bay and the fact that relatively few hurricanes have affected the area over the last 20 years. These factors resulted in a condition favorable for the invasion of *Thalassia testudinum* in areas historically too fresh or variable for its colonization. Organic accumulation due to possible nutrient enrichment and a reduction in events such as hurricanes, which tend to cleanse the system and physically crop the seagrasses, have allowed sustained growth and expansion of the *Thalassia* beds (EPA, 1992).

While toxic effects have been blamed for the loss of seagrass beds in nearshore and confined waters, reductions in the quantity and quality of light reaching the seagrasses is often considered the dominant limiting water-quality factor. Nutrient-induced phytoplankton blooms and the enhanced growth of epiphytes that directly shade seagrasses are the primary mechanisms affecting light quantity and quality. In addition, nearshore and confined waters (especially in artificial waterways and canals in developed areas) exhibit increased organic content and reduced dissolved oxygen concentrations, further stressing seagrass communities (EPA, 1992).

Coral Reefs. Various factors, both natural and human-induced, affect coral reefs. Among these factors are biological competition, predation, disease, stress from various pollutants, algal fouling and smothering, sedimentation, temperature extremes, salinity variations, decreases in water clarity, and physical damage. Even minor changes in water temperature or nutrient levels, as affected by the regional water quality surrounding the Sanctuary, can influence coral development. Extensive reefs occur where continuous barriers (e.g., the Upper Keys) limit the intrusion of variable Florida Bay waters that are at times incompatible with reef development and survival (EPA, 1992).

An example of an impacted coral reef community is Algae Reef, an octocoral community off Key Largo that has suffered severe damage over the past two years due to algal fouling. Evidence suggests that this fouling is spreading to nearby Horseshoe Reef and may be related to the leaching of nutrient-enriched groundwater. For the past three years, similar effects have been observed during the summer months off the southeast coast of Broward and Palm Beach counties, where large concentrations of the green alga *Codium isthmocladum* have fouled the reefs from depths of 30 m inshore to nearshore reefs (EPA, 1992).

Natural Resources

The South Florida and Florida Keys region contains one of North America's most diverse assemblages of terrestrial, estuarine, and marine fauna and flora. Formed by significant geological, physical, and biological processes, the area is one of the most complex ecosystems on Earth, and includes mangrove-fringed shorelines, mangrove islands, seagrass meadows, hardbottom habitats, thousands of patch reefs, and one of the world's largest coral reef tracts.

Biogeographic Overview

Peninsular Florida and the archipelago established by the emergent Florida Keys serve as a partial biogeographic barrier between the warm-temperate waters of the Gulf of Mexico and the tropical to subtropical waters of the Atlantic Ocean. This division has resulted in a distribution of marine fauna and flora characterized as having both a warm-temperate and tropical Caribbean component.

Biogeographic Variation. Florida's Gulf coast supports a complex assemblage of biota (Tabb and Manning, 1961 and 1962; Collard and D'Asaro, 1973; Briggs, 1974; Lyons and Camp, 1982), with warm-temperate and tropical species mixing at various points from north to south as they reach the limit of their range. For example, a large number of warm-temperate species, some only common during winter months, have been noted in northern Florida Bay (Tabb et al., 1961). There is also a notable onshore/offshore variation in distribution, with subtropical species found in deeper waters (Gilbert, 1972; Smith, 1976).

While the marine fauna and flora on the northern side of the Keys are characteristic of warm-temperate areas, a distinct tropical biota becomes apparent in the nearshore waters where Gulf of Mexico and Atlantic Ocean mixing occurs. The Keys serve as a partial barrier between the two regions, with numerous major tidal passes separating the islands of the Lower to Middle Keys. Although distinct species assemblages are found on both sides of the Keys, water exchange through these passes allows for a mixing of biota in the area's nearshore transitional habitats.

The biota on the Atlantic side of the Keys is predominantly Caribbean in character. The region is considered part of the Caribbean Province, and tropical waters are supplied by the Florida Current (Briggs, 1974; Jaap, 1984). Often described as an enormous thermostat, the fast-moving current serves as a zoogeographic barrier between the fauna of Florida and other portions of the Caribbean Province (Briggs, 1974) and parts of the West Indian Province (which includes Cuba, the Bahamas, and the West Indies). The current is also responsible for the dispersion of larval fauna and flora to the region, and it plays an important role in providing the physical requirements necessary for coral reef development (Smith, 1948; Jaap, 1984). Because its source is tropical, it also moderates the Keys' winter shelf waters (Jaap, 1984).

While numerous scientists have described the Sanctuary's biological communities (Vaughn, 1914a; Vaughn, 1914b; Vaughn, 1918; Voss and Voss, 1955; Enos, 1977; Marszalek et al., 1977; Marszalek, 1981; Odum et al., 1982; Zieman 1982; Schomer and Drew, 1982; Jaap, 1984; Minerals Management Service, 1989; Jaap and Hallock, 1990; Phillips et al., 1990), most descriptions were regionally focused and did not take a holistic approach in examining the region's varied natural resources. Schomer and Drew (1982) have made an attempt to comprehensively characterize the ecology of the Lower Everglades, Florida Bay, and Keys areas and to describe the complexity and interdependence of the various marine communities.

A Holistic View. Most descriptions of the marine biota of South Florida and the Florida Keys have not emphasized the biogeographical variation and interconnection between the area's Gulf and Atlantic regions. The Keys act as a barrier to cross-shelf water transport from the Gulf's shallow bays and sounds (Ginsburg and Shinn, 1964; Shinn, 1975; Enos, 1977; Jaap, 1984; Shinn et al., 1989). These areas are influenced by seasonal meteorological events that determine temperature, salinity, turbidity, and oxygen concentrations. Changes in these parameters are significant to the dispersal of organisms between the Gulf and the Atlantic, and winter cold fronts, summer doldrums, heavy rainfalls, and droughts can all have a negative impact on the establishment of tropical biota. The natural resources of the two coastal regions are, therefore, tied together and no discussion of the Sanctuary's biota would be complete without examining the region in a holistic manner.

Biogeographic Regions

Note: Within this document, major biogeographic regions are considered to be those comprising the marine components of the Sanctuary. However, as the Keys' terrestrial habitats and species are also significant, a section discussing these environments has been included after the section on the Atlantic Ocean biogeographic region.

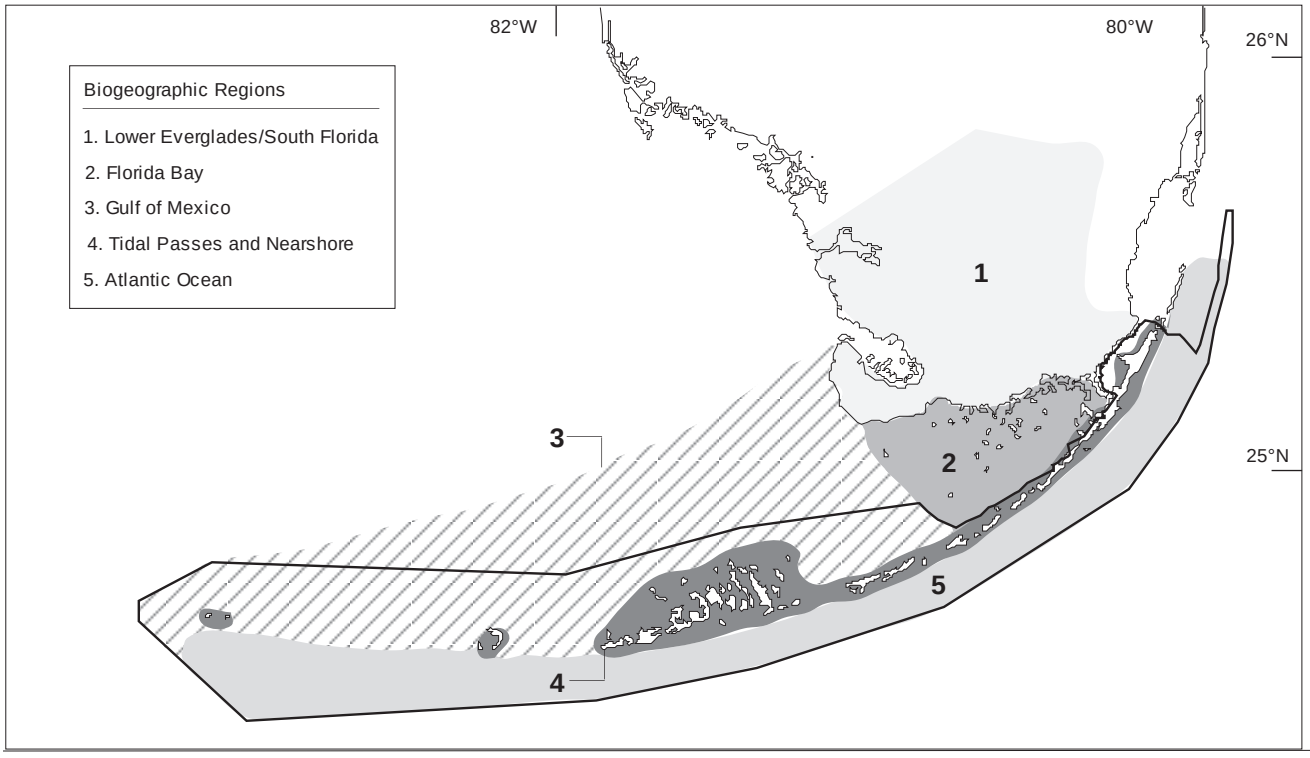
Visitors have traditionally viewed the Keys' marine resources as wholly tropical, and the lack of major coral reef structures and the seasonal appearance of warm-temperate fauna on the Gulf side often escape the casual observer. However, to better understand the complexity and interactions of the natural resources within the Sanctuary, it is important to accurately characterize their distribution by biogeographic region.

In 1989 Continental Shelf Associates, Inc. used aerial imagery and ground survey data to map 9.6 million acres of Florida's southwest continental shelf. The study area included the waters north of the Keys (to a depth of 36 m, west of the Dry Tortugas) to Sanibel Island, and ranged from the west coast of Florida to the Gulf's 36-m depth contour. Four geomorphically distinct subareas were identified: 1) the inner southwest Florida continental shelf (dominated by low-relief hard and soft coral communities and stands of the seagrass *Halophila decipiens*); 2) Florida Bay (dominated by communities of *Thalassia testudinum*, *Syringodium filiforme*, and *Halodule wrightii*); 3) the Lower Florida Keys (dominated by *Thalassia*, *Syringodium*, and *Halodule* stands, hardbottom, and patch reefs); and 4) the Tortugas/ Marquesas Reef Banks (dominated by sand banks and coral reefs).

Four major ecological zones have also been identified in the region as well: 1) terrestrial and freshwater wetlands; 2) estuarine and saltwater wetlands; 3) Florida Bay and mangrove islands; and 4) the Florida Keys (Schomer and Drew, 1982). Although these zones generally characterize the major ecological components within the region, the diversity and complexity of the Sanctuary's natural resources can be better described using more specific biogeographic regions. In this document, five regions (Figure 7) have been identified to more precisely describe the aquatic and marine biota of the Sanctuary:

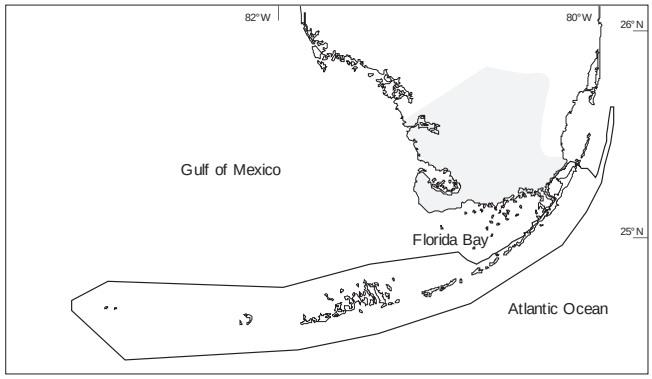
1. Lower Everglades/South Peninsular Florida
2. Florida Bay
3. Gulf of Mexico
4. Nearshore Habitats and Tidal Channels
5. Atlantic Ocean

Figure 7. *Biogeographic Regions of the Florida Keys National Marine Sanctuary and Surrounding Areas*



Although the Lower Everglades/South Peninsular Florida and Florida Bay regions are not within the boundaries of the Sanctuary, their interrelationships with the other regions and their influence on physical, chemical, and ecological processes cannot be ignored. Sanctuary management will require that each of these regions be assessed, and the entire area monitored holistically as a single ecosystem. The geographic extent, biological components, and ecological importance of each region are described below.

Lower Everglades/South Peninsular Florida



Geographic Extent

The Lower Everglades/South Peninsular Florida region may be divided into distinct physiographic subunits based on previously published literature and biological and hydrographic factors (Schomer and Drew, 1982). Shark River Slough (the “river of grass” segment of the Everglades) (Douglas, 1947; Gleason, 1974) and Taylor Slough, the central components of the Florida Bay drainage basin, are the region's major physiographic subunits (Parker et al., 1955). Rocky Glades, a transitional area between these two broad regions, is characterized by surficially exposed limestone, typically referred to as pinnacle rock (Davis, 1943). Northwest of Shark River Slough lies Broad River/ Lostmans River Drainage, a slightly elevated freshwater wetland and upland area. A low salt marsh and mangrove-dominated area of coastal swamps and lagoons lies to the southwest, extending from the furthest inland point of saltwater influence to the Gulf of Mexico (Puri and Vernon, 1964) and receiving the major portion of the runoff from the Everglades (Schomer and Drew, 1982).

A similar coastal swamp and lagoon region, consisting of a series of lagoons, coastal prairies, and mangrove communities (Puri and Vernon, 1964), lies southeast of Taylor Slough. Cape Sable, the southwestern extent of the South Florida mainland, exhibits beaches, salt marshes and prairies, mangroves, and tropical hardwood hammocks (Craighead, 1971; Schmidt, 1991).

Biological Components

Freshwater Wetlands. Seven terrestrial and freshwater wetland habitats (including disturbed habitats) have been identified based on species distributions within the inland physiographic areas of Broad River/ Lostmans River Drainage, Shark River Slough, Taylor Slough, and Rocky Glades (South Florida Research Center, 1980). In order of increasing hydroperiod, these areas include: pinelands, hammocks, wet prairies, cypress, thickets, and marshes. Disturbed habitats occur in all hydroperiods.

Wet prairies, which occur on either side of Shark River Slough and in Taylor Slough, make up the largest portion of the terrestrial/freshwater zone (Olmstead et al., 1980). They are dominated by *Muhlenberghia filipes,* often associated with sawgrass (*Mariscus jamaicense*) and other graminoids (Schomer and Drew, 1982).

Sawgrass-dominated marshes are another extensive and ecologically important habitat found mainly in the sloughs, where the hydroperiod is the longest. Spike rush (*Eleocharis cellulosa*), beak rush (*Rhynchospora tracyi*), maidencane (*Panicum hemitoma*), and pickerelweed (*Pontederia lanceolata*) are the less-dominant species found, along with low-lying pickerelweed communities that provide important habitat for the American alligator (*Alligator mississippiensis*) (Schomer and Drew, 1982).

The remaining terrestrial/freshwater habitat types are less extensive, tend to have patchy distributions, and are found in areas of shorter hydroperiod. Pinelands are fire-arrested climax communities dominated by Caribbean slash pine (*Pinus elliottii var. densa*) (Olmstead et al., 1980). Without periodic low-intensity ground fires, pineland communities will be out-competed by hammock communities. These hammock habitats represent the upland climax communities, are dominated by live oak (*Quercus virginiana*) and strangler fig (*Ficus aurea*), and occur in the areas of shortest hydroperiod.

Cypress communities occur in close association with wet prairie habitats or in dome forests in Taylor Slough and are dominated by bald cypress (*Taxodium*

distichum) (Hilsenbeck et al., 1979). Thickets are associated with marshes and prairies, are dominated by wax myrtle (*Myrica cerifera*) and saltbush (*Baccharis halimifolia*), and provide important habitat for wading birds and other marsh fauna.

Disturbed habitats are found with associated vegetation that is dependent on the type and intensity of disturbance. In the privately owned areas of the east Everglades, they most commonly occur due to intensive agricultural practices, drainage, and fires. The exotic Australian pine (*Casuarina equisetifolia*), cajeput or bottle brush (*Melaleuca quinquenervia*), and Brazilian pepper (*Schinus terebinthifolius*) usually colonize these disturbed lands (Schomer and Drew, 1982).

Freshwater Wetland Inhabitants. The freshwater wetlands of the Lower Everglades/South Peninsular Florida region support the following biota:

Invertebrates. Ecological information on the invertebrates in the region is only available for a few key species including the crawfish (*Procambrus alleni*), freshwater prawn (*Paleomonetes paludosus*), and apple snail (*Pomacea paludosa*) (Schomer and Drew, 1982).

Fishes. Like other aquatic organisms that inhabit the Lower Everglades, fishes have developed adaptive mechanisms to help them survive the widely fluctuating drought and flood conditions. The South Florida Research Center (SFRC) reported 34 species of fish, representing 17 families, in the region (1980), the most prevalent being the Centrarchidae (bluegill) and Cyprinodontidae (topminnow) (Schomer and Drew, 1982).

Amphibians and Reptiles. The SFRC reported 18 species of amphibians, ranging over all habitats, and 47 species of reptiles in the Lower Everglades, including nine turtles, 10 lizards, 25 snakes, and two crocodilians. The American alligator and the Eastern indigo snake (*Drymarchon corais couperi*) are listed as threatened at the State and Federal levels respectively, while the American crocodile (*Crocodylus acutus*) is on both endangered species lists.

Birds. More birds utilize the terrestrial and freshwater habitats of the Lower Everglades than any other wildlife group (Schomer and Drew, 1982). The SFRC listed 221 species in the area, with 27 listed by the Florida Committee on Rare and Endangered Plants and Animals (FCREPA). Four species are on the federally endangered list, including the wood stork (*Mycteria americana*). Eight are considered threatened and nine are species of special concern, including the brown pelican (*Pelecanus occidentalis*) and roseate spoonbill (*Ajaia ajaja*).

Mammals. The SFRC listed 28 mammal species that utilize habitats in the Lower Everglades. Several species ranging into the region have been identified as rare or endangered (Layne, 1977).

Estuarine, Saltwater Wetlands, and Transitional Habitats. Within the low salt marsh and mangrove-dominated coastal areas of the southwesternmost portions of the Florida mainland, four general habitat zonations have been identified: mangrove forests, salt marshes and transitional habitats, open waters, and beach and dune habitat (limited to the shoreline of Cape Sable) (Browder et al., 1973).

Mangrove forests are the most extensive habitat type in the Lower Everglades, and are ecologically unique. (Schomer and Drew, 1982; Minerals Management Service, 1990). Accordingly, these highly productive, tropical ecosystems merit a more detailed discussion than the habitats previously described.

In 1974 Florida's Coastal Coordinating Council (CCC) estimated that there were between 162,000 and 220,000 hectares of mangroves in the state, with 95,000 hectares in Monroe County. Mangrove communities are composed of an association of facultative halophytes, adapted to anaerobic saline soils and periodic inundation. The major factors limiting their distribution and determining the extent of the ecosystem are climate, salinity, tidal fluctuation, and substrate (Odum et al., 1982).

Mangroves are a tropical species and do not require saltwater for survival. However, the presence of saltwater gives them a competitive advantage over less tolerant species. Tidal flow is not critical, but does benefit mangroves through nutrient import/export, the prevention of excessive soil salt loading, and propagule dispersion. In addition, mangroves grow best in low-energy environments that promote propagule establishment, do not stress the root system, and allow for sediment and peat accumulation (Odum et al., 1982).

The red mangrove (*Rhizophora mangle*), black mangrove (*Avicennia germinans*), and white mangrove (*Laguncularia erectus*) are the three “true” species found in South Florida (Tomlinson, 1986). Red mangroves have prop roots and viviparous cigar-shaped seedlings, while black mangroves have a

pneumataphore root system and gray-green leaves, the undersides of which are encrusted with excreted salt. White mangroves have rounded leaves, with a pair of salt glands on each petiole. Buttonwood (*Conocarpus erectus*), an associated species occurring with mangroves, is found in transitional wetland areas between mangrove and upland areas.

A mangrove classification system has been developed that identifies six major forest types based on geological and hydrological processes: riverine, overwash, fringe, basin, dwarf, and hammock (Lugo and Snedaker, 1974). Riverine forests do not occur in southeast Florida due to a lack of freshwater rivers and the associated floodplains (Davis, 1943; Minerals Management Service, 1990). They do occur along creeks and rivers in southwest Florida, however, where red mangroves dominate and productivity due to nutrient import/export from daily tidal flushing is high (Odum et al., 1982).

Overwash and fringe forests are similar in that they both occur along shorelines inundated by high tides, dominated by red mangroves, and exposed to open water. While tidal flow follows the same directional path along the fringe forest, resulting in sediment and litter accumulation, tidal waters pass completely through the overwash community at high tide, producing high nutrient-export rates and low sediment accumulation.

Basin forests mainly occur inland along drainage depressions, where upland runoff is channeled to the coast and inundation occurs at only the highest of high tides (Odum et al., 1982). All three mangrove species are found in basin forests, but red mangroves dominate where the tidal influence is strongest. Dominance shifts to black and then white mangroves as tidal influence decreases. Hammock forests are similar to basin communities, but occur in slightly elevated areas where all species of mangroves may be present (Odum et al., 1982).

Dwarf forests have small mangrove trees that lack the canopy height and high productivity of other forest types due to seasonal inundation and flushing. Dwarfism is a function of shallow soil depth and low nutrient levels (Kruer, pers. comm.).

Salt prairies in the northern part of the region, inland of the mean influence of saline conditions, are transitional areas between mangrove communities and salt or freshwater marshes (Schomer and Drew, 1982). Along northern Florida Bay, these areas are often interspersed with basin-type mangroves and are dominated by saltwort (*Batis maritma*) and glasswort (*Salicornia virginica*).

Salt marshes dominated by *Spartina spp.* or *Juncus spp.* are generally found between estuarine open-water areas upland of salt prairies, in association with black mangroves (Craighead, 1971). In the Lower Everglades, they are found along the interior areas of the Buttonwood levee, Cape Sable, and some larger mangrove islands (Schomer and Drew, 1982). The buttonwood transitional habitats are found between salt marsh areas and the upland hardwood hammocks of lower Taylor Slough (Hilsenbeck et al., 1979).

In addition, various algal forms are present in South Florida's inland bays and lagoons, depending on the salinity levels in these areas. During winter months, when low-salinity conditions (0-10 ppt) are prevalent, *Chara hornemani* and *Bataphora oerstedi* form their greatest areal coverage in Coot and Whitewater bays, with widgeon grass (*Ruppia maritima*) also reaching maximum density (Schomer and Drew, 1982). Other algal species, including *Acetabularia crenulata*, *Caulerpa verticillata*, and *Udotea wilsoni,* dominate the open-water areas during periods of intermediate- to high-saline conditions. The red algae *Dasya pedicellata* and *Gracilaria confervoides* are observed when salinities are greater than 20-25 ppt (Tabb et al., 1962).

Estuarine, Saltwater Wetlands, and Transitional Habitats Inhabitants. Due to the widely fluctuating drought and flood conditions of inland Everglades areas, many organisms have developed adaptive mechanisms, such as burrowing or moving with the water to receding pools, to survive (Schomer and Drew, 1982).

Invertebrates. Large information gaps exist on the invertebrates of the salt marsh, salt prairie, and beach and dune communities (Schomer and Drew, 1982). Invertebrates of the estuarine and saltwater zone have been studied more extensively than those of the freshwater zone. Odum et al. (1982) divided invertebrates into three communities: 1) arboreal arthropod; 2) prop root and associated mud surface; and 3) water column.

The arboreal community is composed of insects, molluscs, and crustaceans, with the mangrove tree crab (*Aratus pisonii*) an important ecological component (Schomer and Drew, 1982). The prop root and associated mud surface community is made up of barnacles, mussels, oysters, coffee snails, and ascidians (Odum et al., 1982). Various species of zooplank-

ton (the most abundant being *Acartia tonsa*), prawns, mysids, mussels, oysters, ostracods, ivory barnacles (*Balanus eburneus*), and the pink shrimp (*Penaeus duorarum duorarum*) are also found in the water column.

Fishes. Mangrove-related fish communities can be organized along various environmental gradients including salinity, mangrove detritus dependence, and substrate (Odum et al., 1982). The sheltered backwater pools of the black mangrove basin forest community are harsh environments inhabited by killifishes (Cyprinodonts) and live bearers (Poeciliids) (McPherson, 1971; Odum et al., 1982).

Riverine forest fish communities oscillate seasonally due to a number of factors. During freshwater flooding, Everglades marsh and slough species such as Florida gar (*Lepisosteus platyrhincus*), sunfish (*Enneacanthus gloriosus*), largemouth bass (*Micropterus salmoides*), and catfish (*Hypostomus spp.*) are present. As the flooding subsides, the freshwater species move upstream and marine species such as stingray (*Dasyatis spp.*), needlefish, and jacks become prevalent (Odum et al., 1982).

There are large numbers of relatively few species in communities fringing estuarine bays, with Clark (1971) reporting silver jenny (*Eucinostomus gula*) and pinfish (*Lagodon rhomboides*) making up over half the total catch in Whitewater Bay. This community can be divided into a benthic habitat dominated by drums (Sciaenidae), mojarras (Gerreidae), and snappers (Lutjanidae) and a mid- to upper-water column habitat dominated by anchovies, herrings, and needlefishes (Odum et al., 1982).

Amphibians and Reptiles. Twenty-four species of amphibians and reptiles have been identified in mangrove and other upland habitats (Odum et al., 1982). Of these, five are considered federally endangered: the Atlantic green turtle (*Chelonia mydas mydas*), Atlantic hawksbill (*Eretmochelys imbricta imbricata*), Atlantic ridley (*Lepidochelys kempii*), Atlantic loggerhead (*Caretta caretta caretta*) and the American crocodile. The Eastern indigo snake is considered threatened.

Birds. Odum et al. (1982) listed 181 birds that utilize the South Florida mangrove zone, and classified them into six categories based on feeding habits: wading birds, probing shorebirds, floating and diving water birds, aerially searching birds, birds of prey, and arboreal birds. Wading, aerially searching, and floating and diving birds are the most prominent. The tricolored heron (Louisiana heron) (*Egretta tricolor*) and snowy egret (*Egretta thula*) are the most abundant wading birds, while the white ibis (*Eudocimus albus*) and wood stork are found less frequently (Kushlan, 1979; Schomer and Drew, 1982). The double-crested cormorant (*Phalacrocorax auritus*) is the most prominent floating and diving bird.

Of the 25 probing shorebird species, only two, the Wilson's plover and willet, are permanent residents of the mangrove zone. Most of the surface and diving birds are present all year (Odum et al., 1982). Nesting colonies of aerially searching birds are restricted to the mangrove islands of Florida Bay, but utilize the inland mangrove zone for foraging.

Eighteen species of birds of prey are found in the mangrove and upland habitats, but only seven extensively utilize the mangrove habitat for feeding. Odum et al. (1982) listed 71 species of arboreal birds that nest and feed within the study area. Kale (1978) listed 40 species of birds considered endangered, threatened, rare, of special concern, or of undetermined status.

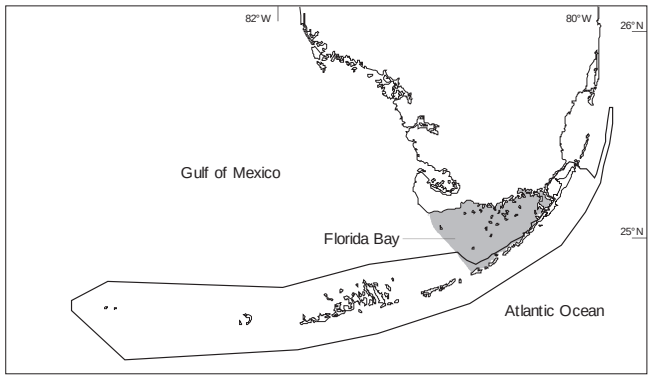
Mammals. Twenty species of mammals have been identified in the mangrove zone (Odum et al., 1982). Of these, the mangrove fox squirrel (*Sciurus niger avicennia*) and the West Indian manatee (*Trichechus manatus*) are endangered.

Ecological Importance

The quality, distribution, quantity and timing of freshwater passing through the Everglades influences the area's capability to support its distinctive fish and wildlife resources (Schomer and Drew, 1982). The freshwater, estuarine, and saltwater wetlands of the Lower Everglades/South Peninsular Florida region provide a variety of habitat features that encourage a complex mixture of invertebrates, fishes, amphibians, reptiles, birds, and mammals. In addition, the area's diverse wetland and successional communities provide food, shelter, and nesting sites for many resident and migratory organisms.

The communities in the region not only affect the local ecosystem, but ecosystems elsewhere through the species they support. For example, Robertson and Kushlan (1974) reported that 60 percent of the birds regularly seen in South Florida are winter or migratory species. In addition, mangrove leaf litter provides the basis for the detrital food web and is utilized by many organisms outside the immediate community (Odum et al., 1982).

Florida Bay



Geographic Extent

Shallow and triangular in shape, Florida Bay is bounded to the north by the freshwater-dominated Everglades (Schomer and Drew, 1982; Fourqurean, 1992). The Keys are the bay's east and southeast boundary, and the broad mud banks extending from Cape Sable toward Lower Matecumbe Key delineate its western extent (Enos, 1989). This western boundary was originally defined arbitrarily as 81°05' west longitude (Scholl, 1966; Fourqurean, 1992).

Florida Bay is a protected low-energy region composed of numerous carbonate-sediment mud banks and 237 low-relief mud islands of greater than 100 m^2. These islands provide the only terrestrial habitat in the region (Enos, 1989), and are dynamic features subject to physical changes due to erosion and accretion (Fourqurean, 1992). They are generally fringed by various mangrove species. Mats of blue-green algae and low, salt-tolerant vegetation occupy the open areas. Approximately 1,800 km^2 of Florida Bay is within Everglades National Park, the majority carpeted by seagrass (Zieman et al., 1989). Seven percent is covered by mangroves (McNulty et al., 1972).

Biological Components

Algae. Mats of blue-green algae (Cyanophytes) are found terrestrially on the area's larger mangrove islands (Enos, 1989). They also occur in ponds and flats in the center of mangrove-fringed mud islands all over Florida Bay (Enos, 1989). Zieman et al. (1989) found four major macroalgal genera in the benthic community: *Batophora*, *Laurencia*, *Penicillus*, and *Acetabularia*. *Bataphora* was the most widely distributed macroalgae, with *Laurencia* the second most prevalent, but most abundant by mass. The algae *Penicillus* produces much of the lime mud that builds the islands (Stockman et al., 1967).

Seagrass. Primary production in Florida Bay's carbonate-sediment environment is dominated by 1,860 km^2 of benthic vascular plants that are probably the most productive photoautotrophic communities in South Florida (Zieman, 1982; Zieman et al., 1989; Zieman, 1990).

Turtle grass (*Thalassia testudinum*) is the dominant submerged macrophyte in both areal extent and biomass. It produces extensive root and rhizome systems and appears to be phosphorus-limited and nitrogen-saturated (Fourqurean et al., 1992). Manatee grass (*Syringodium filiforme*) and shoal grass (*Halodule wrightii*) are found where conditions prevent dense turtle grass growth. Manatee grass is prevalent in deep channels on the outer fringes of Florida Bay, while shoal grass is common in shallow waters on banks or adjacent to mangrove islands. Widgeon grass (*Ruppia maritima*) is less common, and is found in Florida Bay from freshwater to salinities of 60 ppt. In addition, small-grass species *Halophila decipiens*, *H. engelmannii*, and *H. johnsonii* are sparsely distributed throughout the bay (MMS, 1990).

In 1987 a major seagrass die-off, almost exclusively affecting extremely dense areas of turtle grass, began in the bay. By November 1988 approximately 2,000 hectares were eliminated and 5,900 acres were severely impacted (Minerals Management Service, 1989). Hypotheses proposed to account for this phenomenon include pathogens, eutrophication, abnormally high temperatures and salinities, and disease (Minerals Management Service, 1989; Zieman et al., 1989). (*For a further discussion of the seagrass community, see the Gulf of Mexico biogeographic region section.*)

Mangrove Islands. Some islands in Florida Bay are comprised entirely of mangrove communities, and exhibit the characteristics of overwash mangrove forests (Enos, 1989) as classified by Lugo and Snedaker (1974). Most islands are fringed by red mangroves, which form a narrow outer border of taller trees at the periphery and exhibit the characteristics of the fringe mangrove forest. A broader zone of black mangroves generally dominates inside the red mangrove fringe, with larger islands containing areas that are open, free of trees, and covered by mats of blue-green algae. A small proportion of islands is partially covered by beach cord grass (*Spartina spp.*), and palm or hardwood hammocks mixed with buttonwood are found at higher elevations.

Seagrass and Mangrove Island Inhabitants. Many of the organisms in the region utilize both seagrass and mangrove habitats.

Invertebrates. Only molluscs, foraminifera, pink shrimp, and insects have been extensively studied in Florida Bay (Schomer and Drew, 1982). Turney and Perkins (1972) identified 140 molluscan species, and Tabb et al. (1962) reported 32 species of crustaceans including the hermit crab (*Pagurus spp.*), stone crab (*Menippe mercenaria*), and pink shrimp, which use the bay as a primary nursery ground before moving into the Tortugas shrimping grounds (Schomer and Drew, 1982). Simberoff (1976) identified 351 species of insects inhabiting mangrove islands.

Fishes. Despite the bay's latitudinal location, fish communities are dominated by temperate species (Sogard et al., 1989). Those utilizing seagrasses have been divided into three groups: small and inconspicuous permanent residents, seasonal residents that spend their juvenile life stages in the habitat, and occasional residents, such as large carnivores, that rarely visit the grass beds (Zieman, 1982). Noteworthy permanent residents include the emerald clingfish (*Acytrops beryllinus*), pipefishes, and seahorses (Syngnathidae). Seasonal residents include the spotted sea trout (*Cynoscion nebulosus*), spot (*Leiostomus xanthurus*), silver perch (*Bairdiella chrysoura*), and pigfish (*Orthopristis chrysoptera*).

Hudson et al. (1970) reported 64 fish species in a basin in central Florida Bay, many associated with mainland mangroves. In another representative study, Sogard et al. (1989) used throw traps to sample relatively sedentary, epibenthic species inhabiting seagrass beds at six sites. Fifty-nine species, dominated by rainwater killifish (*Lucania parva*), were captured and identified, with the majority found toward the periphery of the bay. More mobile species were sampled in the water column at these same sites using gill nets, with 71 species identified.

In another study, Thayer and Chester (1989) used otter and surface trawls to collect 93 species, mainly juveniles and foraging species, in the western regions of the bay, with rainwater killifish and silver jenny again predominant. In a separate study, 64 species were captured around red mangrove root systems using block nets and rotenone at eight sites, with hardhead silversides (*Atherinomorus stipes*) the most abundant (Thayer et al., 1987). In the adjacent seagrass beds, 53 species were captured using high-speed trawls.

Amphibians and Reptiles. Twenty-four species of turtles, snakes, lizards, and frogs have been identified in South Florida's mangrove communities (Odum et al., 1982). Six of the 10 turtle species present occur in estuarine or marine habitats. The endangered Atlantic hawksbill and Atlantic ridley turtles utilize the area, and the endangered Atlantic green turtle was once a predominant herbivore (Odum et al., 1982). Upper Florida Bay is also critical habitat for the endangered American crocodile (Odum et al., 1982; Schomer and Drew, 1982), and the American alligator is an important reptile in low-salinity mangrove areas (Kushlan, 1980). Other Florida Bay reptiles whose distribution is limited by salinity include the diamondback terrapin (*Malaclemys terrapin*) and mangrove snake (*Nerodia clarkii compressicavda*) (Dunson and Mazzotti, 1989).

Birds. Florida Bay provides significant habitat for many bird species. Most nesting sites of the roseate spoonbill are located in the bay, and the area's smaller mangrove islands shelter most nesting sites of the great blue heron (*Ardea herodias*) and endangered brown pelican (Schomer and Drew, 1982; Powell et al., 1991). Odum et al. (1982) compiled a list of 181 bird species that use mangroves for nesting, feeding, and roosting. Seagrass beds are also utilized as feeding areas by numerous birds (Zieman, 1982). The double-crested cormorant is the most common swimming bird foraging in the seagrass beds, while the osprey (*Pandion haliaetus*) is a common raptor in the bay area.

Mammals. The Atlantic bottlenose dolphin (*Tursiops truncatus*), which preys on mangrove-associated fishes, and the endangered West Indian manatee, which consumes seagrasses, are the most noticeable mammals in the area (Schomer and Drew, 1982).

Ecological Importance

Regional Importance to Fauna. Florida Bay's mangrove islands and seagrass beds are highly productive, faunally rich ecosystems that provide food, protection, and nesting sites for many species of fishes, amphibians, reptiles, birds, and mammals. These areas are critically important to commercial and recreational fish species, as 70 to 90 percent of the harvested species in the Gulf depend on coastal wetlands and seagrass beds during at least part of their life cycle (Lindall and Saloman, 1977). The shallow mud banks are essential for various species of wading birds, as they provide the only feeding access to the bay's fish populations (Holmquist et al., 1989).

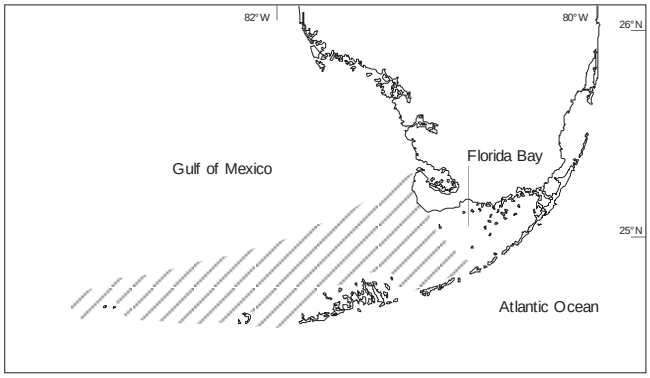
Seagrasses in the bay accelerate and stabilize sediment deposition, maintaining water clarity in adjacent coral reef and open-water communities. They also provide rich nursery grounds for ecologically, commercially, and recreationally important species (Odum et al., 1982; Zieman, 1982; Zieman, 1990).

Mangrove prop roots and dense seagrass stands provide protected habitat for a wide variety of juvenile fishes and invertebrates (Thayer et al., 1987). Decayed, bacterially enriched mangrove leaf litter and seagrass blades are the basic energy source for the detritus-based food web (Odum et al., 1982; Zieman, 1982). Mangroves also provide hard substrate for the attachment of sessile organisms and critical nesting sites for many species of birds that forage in the shallow seagrass beds. Based on their resource value, they are protected within the region (Snedaker, 1989).

The water quality of the bay has a significant effect on the biogeographic distribution and abundance of the region's species. Runoff from Taylor Slough and the coastal wetlands south of Shark River Slough, combined with groundwater seepage from the mainland, account for the freshwater drainage flowing into the bay (Schomer and Drew, 1982). The bay's surface-water chemistry has not been well studied, but salinity, temperature, and turbidity are frequently reported parameters. Turbidity is highly variable due to wind effects in upper Florida Bay, with wind less significant toward the Gulf of Mexico. Water levels can fluctuate up to 53 cm seasonally due to the bay's restricted flushing (Turney and Perkins, 1972).

The bay has been divided into four subenvironments based on benthic mollusc distributions, a convenient means of discussing hydrology. The northern subenvironment is adjacent to the mangroves of the mainland coast and is, therefore, influenced by seasonal freshwater runoff. Salinities in this area range from 13 to 48 ppt and temperatures from 15° C to 38° C. Only the area's western edge is subject to significant tidal flushing (Turney and Perkins, 1972). The northeast half of the bay comprises the interior subenvironment, which exhibits widely fluctuating salinities (22-52 ppt) and restricted circulation. Little flushing occurs, except when wind-induced. The Atlantic subenvironment begins in the Middle Keys and runs southwest along the northern side, where near-normal salinities (34-41 ppt) and moderate water temperatures (17° C-32° C) exist. In this area, water from the bay is exchanged with oceanic water through the tidal channels between the keys. The Gulf subenvironment is located just inside the 1.8 m depth contour, between Cape Sable and Fiesta Key, where water is exchanged between Florida Bay and the Gulf of Mexico (Turney and Perkins, 1972).

Gulf of Mexico



The waters north and west of the Keys are within the eastern Gulf of Mexico. The Gulf is a semi-closed system with oceanic input through the Yucatan Channel by way of the Yucatan and Loop currents. It receives runoff from approximately two-thirds of the United States and over half of Mexico. Combined with the area's temperate waters, this estuarine influence distinctly separates the physical characteristics of the Gulf from the waters supplied by the Florida Current on the south side of the Keys.

A strong current enters the Gulf from the Caribbean and carries water as far north as 26°, before turning to the south as the Loop Current. The principal outflow of Gulf waters is through the Straits of Florida and the major tidal passes of the Dry Tortugas and Lower-to-Middle Keys. Because of higher sea levels on the Gulf side, the net flow of water is from the Gulf to the Atlantic (except for the ebb and flood of the tide) (Smith and Pitts, 1993). This directional water movement, combined with the shallow depths on the north side of the Keys, has a major influence on the biogeographic distribution of organisms in both the Gulf and nearshore regions.

Geographic Extent

The Gulf region's geographic extent is difficult to determine because there is no definite boundary along the Keys' north-side margin, making it impossible to clearly distinguish nearshore habitats and tidal channels from Gulf waters. Although the Gulf supplies water to the Nearshore Habitats and Tidal Channels area, there is a distinct biotic variation between the two regions. Thus, the biogeographic significance of each region is discussed separately in this document, with the understanding that the geographic interface between them remains vague.

The Sanctuary's northern boundary, from Everglades National Park to the Dry Tortugas, is 223 km long and lies entirely in the Gulf of Mexico. This jurisdictional boundary does not separate habitat types or biogeographic regions, and because its location has no bearing on physical or ecological processes, it is unimportant in describing the Sanctuary's natural resources. On average, the Gulf area within the Sanctuary is approximately 16 km wide.

Biological Components

The Sanctuary's Gulf region contains several biological communities that contribute significantly to the diversity of the area's natural resource base. Although each of these communities is also present in the Key's other biogeographic regions, species diversity and density varies. Communities found in the Gulf include mangrove, seagrass, coral, and hardbottom and softbottom habitats.

Mangrove. Mangrove islands and mangrove-fringed shorelines similar to those in the Florida Bay region are present in the Gulf. An estimated 95,000 hectares of mangrove forests have been reported in Monroe County (Odum et al., 1982), and a large percentage of the area covered by mangroves is owned by Federal, State, or local government agencies.

Mangrove Inhabitants. The inhabitants of the mangrove habitat in the Gulf are similar to those described for the Florida Bay region.

Seagrass. Seagrass communities are among the richest, most productive, and most important of all coastal systems (Zieman, 1990). Florida has one of the world's largest seagrass communities, with an estimated 1.4 million acres within Sanctuary boundaries (Zieman, 1982).

The submerged vegetation in the Gulf region consists mainly of turtle grass, manatee grass, and shoal grass. Zieman (1991) estimated that these three seagrass species make up approximately 95 percent of the total submerged vegetative biomass in the Sanctuary. Two other vascular seagrasses, paddle grass (*Halophila decipiens*) and star grass (*H. engelmannii*) are also found, but contribute very little to the overall biomass.

The large section of Florida Bay extending from Arsnicker Keys to Big Pine Key is populated by manatee grass and lesser amounts of turtle grass. The manatee grass grows on thin sediment and the Pleistocene limestone on which the sediment rests is distinctly different from the rest of the area. It has numerous barren spots and solution holes that provide habitat for reef inhabitants.

Seagrass beds are generally found in protected waters between islands, behind barrier islands, and in lagoonal areas. Distribution is controlled by three primary variables: light, sediment depth, and turbulence/exposure in shallow waters (Zieman, 1982). Seagrasses grow in a variety of sediments, from fine muds to coarse sands. These sediments help anchor the plants, protecting them from the effects of water surge and currents and providing a matrix for regeneration and nutrient supply (Zieman, 1982).

Shoal grass, turtle grass, and manatee grass can be found in mixed beds or alone, between 1 and 10 m, where suitable substrate and favorable physical conditions exist. Definite zonation (distribution) patterns can be observed. Shoal grass tolerates exposure better than the other species, and usually grows in shallower water (Zieman, 1982). Although turtle grass, the dominant species in the Sanctuary, often grows in shallow water, there is usually leaf mortality when the beds are exposed during low tides (especially during winter months). Turtle grass forms extensive mature meadows, usually at depths of less than 10 to 12 m, but can be found at greater depths in less density. Between 12 and 15 m, manatee grass replaces turtle grass, and shoal grass is dominant below 15 m, but does not form dense stands. Paddle grass and star grass can occur deeper than the other species, and have been reported at 40 m (Zieman, 1982).

Seagrass Inhabitants. The distribution and density of species utilizing the seagrass habitat are dependent on the physical, chemical, and geological environment (Zieman, 1990). Five principal groups have been identified that comprise the community of organisms associated with seagrass habitats (Zieman, 1990). These groups may vary, depending on the composition of seagrasses and the influence of abiotic factors. Within the groups, organisms are identified as: 1) epiphytic; 2) epibenthic; 3) infaunal; 4) planktonic; and 5) nektonic.

Epiphytes are any organisms that grow on the blades of seagrasses, including algae, diatoms, bryozoans, and other encrusting organisms (Zieman, 1982). Epibenthic organisms live on the surface of the substrate, and include motile organisms such as gastropods, sea urchins, sea stars, sea cucumbers, sea biscuits, and a wide variety of crustacea. Besides motile organisms, epibenthic fauna includes sessile organisms such as sponges, sea anemones, ascidians, and macroalgae. Infaunal organisms live buried in sediments, and include a variety of polychaetes,

burrowing crustaceans, and molluscs. Planktonic organisms, which depend on water movement and currents for transportation, include phytoplankton, zooplankton, and ichthyoplankton. Nektonic organisms include highly mobile species such as fishes and squids that live in or above the seagrass canopy. In combination, these organisms help comprise the tightly coupled pelagic food webs in the subtropical and tropical oligotrophic waters of the Gulf of Mexico and Straits of Florida (Collard and D'Asaro, 1973; Zieman, 1982; Zieman, 1990).

Benthic Algae. Although seagrass beds and areas of soft or sandy substrate are not optimal habitat for most algae, it may still attach to sediments, seagrass blades, and scattered rock outcroppings. The only algae consistently utilizing sediments as substrate are the mat-forming algae and members of the order Siphonales (Chlorophyta), which have creeping rhizoids that help anchor them in sediments (Zieman, 1982). Important genera of these algae include *Halimeda*, *Penicillus*, *Caulerpa*, *Udotea*, *Avrainvillea*, and *Rhipocephalus*.

Aside from their importance as primary producers of organic carbon, some of these genera produce calcium carbonate for their skeleton. When the algae die, the calcium carbonate becomes a source of sediment, significantly contributing to the overall composition of the Keys' carbonate sediments. Off the Upper Keys Ginsburg (1956) found that more than 80% of the sediment was *Halimeda*. Shinn et al. (1990) reported that an average of 48 percent of the sands in an area 50 km west of Key West (the Quicksands) was composed of fragmented plates of the calcareous green algae *Halimeda*. In another study, Lidz et al. (1985) reported that over 13.5 percent of the sediment within the Looe Key National Marine Sanctuary was composed of calcareous algae fragments. Ginsburg (1956) and Ginsburg and Shinn (1964) have reported similar findings off Key Largo.

Besides calcareous algae, there are several groups of detached drift algae that are found in the seagrass habitat. *Laurencia* is one of the most abundant, with other species including *Amphiroa spp.*, *Melobesia spp.*, *Fosliella spp.*, *and Padina spp.*

Invertebrates. The invertebrate fauna of the seagrass beds of the southwest Florida coast is primarily characterized as Caribbean-West Indian, with increasing Carolinian fauna found to the north (Collard and D'Asaro, 1973). Seagrass bed fauna is diverse and complex, with large epibenthic species the most obvious members (Zieman, 1982). Representative species include gastropods such as true tulip *(Fasciolaria tulipa)* and horse conch *(Pleuroploca gigantea)*, and echinoderms such as the cushion sea star (*Oreaster reticulatus*) and comet star *(Echinaster sentus)*. Other common echinoderms include herbivorous sea urchins such as *Eucidaris tribuloides tribuloides* and *Lytechinus variegatus spp.*

Some sponges of the genus *Spongia* are present in seagrass beds, but due to the lack of suitable substrate for attachment, Alcyonarians (soft corals) are rare (Schomer and Drew, 1982). Scleractinians (stony corals) are represented by only a few species including rose coral (*Manicina areolata*), tube coral (*Cladacora arbuscula*), and finger coral (*Porites divaricata*, *P. porites*, and *P. furcata*).

Numerous species of small crustacea (shrimp and crabs), echinoderms (brittlestars, sea cucumbers, sea stars, etc.), anemones, flatworms, and polychaetes utilize the seagrass habitat as well. Several species of gastropod snails, including *Cerithium muscarum*, *C. eburneum*, *Anachis spp.*, *Mitrella lunata*, *Tegula fasciata*, *Modulus modulus*, and *Bittium varium* are also found. In addition, two species of *Astraea* feed on the epiphytic flora of seagrass blades (Schomer and Drew, 1982). Species of infaunal invertebrates found include the tube-dwelling annelids *Americonuphis magna* and *Arenicola cristata.* Other annelids, such as *Terebellides stroemi* and *Eunice longicerrata*; burrowing bivalves including the pen shells *Atrina rigida* and *A. seminuda*; the cross-barred venus *Chione cancellata*; and several other molluscan genera such as *Arca*, *Anadara*, *Barbatia*, *Codakia*, *Lucina*, *Laevicardium*, and *Tellina* are also present.

The Gulf's seagrass beds support several commercially important species as well, and South Florida's commercial shrimp fishery is based on the region's pink shrimp population (Saloman, 1968). Although the brown shrimp *(Penaeus aztecus aztecus*) and the pinkspotted shrimp *(Penaeus brasiliensis*) are also present, they are not as important (Saloman, 1968).

Pink shrimp are historically common in the estuaries and shallow marine waters surrounding southern Florida and in the deep waters (approximately 100 m) southeast of the Keys, and are the dominant species within the Dry Tortugas shrimping grounds and Florida Bay (Saloman, 1968). Adult pink shrimp congregate in deep water (>6 fathoms) off the Dry Tortugas to spawn. Larvae can take two routes to the estuarine nursery areas where they spend most of their life cycle. One route is directly to the shallow-water estuaries of the Ten Thousand Islands, Whitewater Bay, and Florida Bay. On the other route, larvae are swept southwesterly into the Florida Current by way of

the Loop Current, and are carried northeasterly along the outer edge of the Florida Reef Tract or east coast of Florida (Ingle et al., 1959). As the postlarval pink shrimp mature, they enter Florida Bay on incoming tides. Young shrimp spend from two to seven months in the bay's seagrass nursery grounds before moving into the Gulf off the Dry Tortugas (Schomer and Drew, 1982; Bielsa et al., 1983).

The commercially important spiny lobster begin their existence in the Keys as larvae that arrive in oceanic currents. As planktonic larvae they pass through 11 life stages in more than six months. They then metamorphose into a transitional swimming stage (puerulus) (Little and Milano, 1980; Lyons, 1980) that is found along Florida's southeast coast all year long (Hunt et al., 1991). Pueruli travel through channels between the Keys and enter nursery areas in Florida Bay and the Gulf, where they preferentially settle into clumps of the red alga *Laurencia* (Herrnkind and Butler, 1986). In seven to nine days they metamorphose into juveniles and take up solitary residence in the algal clumps for two to three months (Marx and Herrnkind, 1985b; Hunt et al., 1991).

When juvenile spiny lobsters reach a carapace length of 15 to 16 mm they leave the algal clumps and reside individually within rocky holes, crevices, coral, and sponges. They remain solitary until carapace length reaches approximately 25 to 35 mm, when they begin congregating in rocky dens**.** They remain in these nurseries for 15 months to two years (Hunt et al., 1991).

Adult lobsters move to deeper waters and the coral reef environment, where they occupy dens or holes during daylight hours. They are nocturnal feeders and predominantly prey on molluscs and crustacea, including hermit crabs and conch. Adults move to the offshore reef to spawn, and larvae are swept up the East Coast by the Florida Current, where many are lost due to the length of their pelagic pueruli stage (nine months) (Marx and Herrnkind, 1985a; Hunt et al., 1991).

Stone crabs are distributed in various habitats throughout the Sanctuary's Florida Bay and Gulf of Mexico regions. They inhabit warm-temperate, subtropical, and tropical waters, and although found in harvestable quantities along parts of Florida’s west coast from Cedar Key to the Ten Thousand Islands, the greatest concentrations occur in the coastal waters adjacent to Collier County and throughout Florida Bay (Bert et al., 1978). They occur, but are less abundant, in nearshore habitats and tidal passes with suitable substrate. Although stone crab fishermen set traps on the Atlantic side of the Keys, the majority of the fishery is within Gulf waters.

The crabs' planktonic stage is not extensive. They metamorphose from hatchling to true crab in about six weeks. Juveniles do not dig burrows, but utilize readily available hiding places that are near food. They occupy muddy bottoms, turtle grass beds, sponges, gorgonians, empty shells, shell bottom, and sargassum mats (Bert et al., 1978). Adults inhabit burrows 15 to 127 cm deep in turtle grass flats, along the sides of channels, in hardbottom areas, and in reef communities. They can tolerate most environmental extremes within their distributional area and can withstand a broad range of salinities, making them very adaptable to Florida Bay and Gulf waters (Bert et al., 1978).

Fishes. Diverse and abundant fish assemblages are found within the Gulf's seagrass habitats. These areas are important nursery and feeding grounds for many species that will ultimately have commercial or sportfishing value (Zieman, 1982). Fish populations are largely temperate in character, and seagrasses predominately serve as nursery grounds for seasonal residents (i.e., those fishes that spend only part of their life cycle in these areas). Examples include drums (sciaenids), porgies (sparids), grunts (haemulids), snappers (lutjanids), cobia (rachycentrids), and mojarras (gerrids) (Zieman, 1982).

Numerous fish species occur in the Gulf region ecosystem that are not found in the Atlantic waters just a few kilometers away. For example, several species of the family Sciaenidae are seasonal residents of the Gulf seagrass community but are rarely, if ever, observed on the Atlantic side of the Keys. Examples include the spotted seatrout (*Cynoscion nebulosus*), spot (*Leiostomus xanthurus*), silver perch (*Bairdiella chrysoura*), and red drum (*Sciaenops ocellatus*). Other fishes frequently observed in the Gulf's seagrass habitat or within the nearshore tidal passes, but less frequently on the Atlantic side of the Keys, include pigfish (*Orthopristis chrysoptera*), pinfish (*Lagodon rhomboides*), sheepshead (*Archosargus probatocephalus*), hardhead catfish (*Arius felis*), gafftopsail catfish (*Bagre marinus*), and cobia (*Rachycentron canadum*). All are uncommon seaward of Hawk Channel.

The seagrass community is vital habitat for a variety of commercially important fish species. Snapper, a commercially important family of food fish, spends much of its life cycle in the seagrass habitat. Examples include the mangrove (gray) snapper (*Lutjanus*

griseus), lane snapper (*L. synagris*), schoolmaster (*L. apodus*), and mutton snapper (*L. analis*).

Recreationally important species utilizing the seagrass community include spotted seatrout (*Cynoscion nebulosus*), red drum (*Sciaenops ocellatus)*, bonefish (*Albula vulpes*), permit (*Trachinotus falcatus*), tarpon (*Megalops atlanticus*), great barracuda (*Sphyraena barracuda*), and various sharks. These species are sought by professional fishing guides and sportfishermen from all over the world, and form the basis of an important recreational industry. Although these species are found in the Gulf region and throughout the Sanctuary, they are most common in the Keys' nearshore habitats and tidal channels.

Other resident seagrass fishes include mojarras, killifish, silversides, grunts, inshore lizardfish (*Synodus foetens*) and scarids such as *Sparisoma rubripinne*, *S. radians*, *S. chrysopterum*. A number of small, less mobile cryptic species are also found, including the emerald clingfish (*Acyrtops beryllinus*) that lives epiphytically on turtle grass blades; pipefishes *Syngnathus scovelli*, *S. floridae*, *S. louisianae*, and *Micrognatus crinitus;* seahorses *Hippocampus zosterae* and *H. erectus*; and several species of gobies (Gobiidae) and clinids (Clinidae). The code goby (*Gobiosoma robustum)* is the most abundant goby, and the clinids *Paraclinus fasciatus* and *P. marmoratus* are the most abundant representatives of the clinids.

Hardbottom. A diverse benthic habitat commonly called hardbottom is distributed at various depths (<1 m to >40 m) from northwest of Tarpon Springs to the Keys. Although the range of this habitat extends far north of the Sanctuary, it is important to mention here because of its role in replenishing the area's resources. In addition, this area will be important for long-term habitat monitoring to detect change before it reaches the Sanctuary.

Sporadic hardbottom outcroppings parallel the shoreline at approximately the quartz sand/carbonate sand interface in 6.1 to 18.2 m of water (Minerals Management Service, 1989). The exposed calcium carbonate substrate, dating from the Holocene, is thought to be the remnants of previous shorelines that were covered by water as the sea level rose. Although most of the exposed hardbottom has low relief (< 1 m), ledges with over 3 m of relief are found between Tarpon Springs and Sarasota. The density and diversity of sessile, epibenthic organisms in these areas is high for a temperate region. Accordingly, the area has supported the commercial sponge industry in Tarpon Springs since Greek sponge divers first settled there in the early 1900s. It also supports a commercial and recreational grouper and stone crab fishery and provides habitat for recreational scuba divers. Some commercial harvest of decorative rock and fish and invertebrates for the aquarium trade also occurs.

Although the geographic extent of the hardbottom habitat in Sanctuary waters is not fully known, major low-profile hardbottom substrate supports a diverse sessile, epibenthic community in the Gulf. In the Keys, the biotic structure resembles that of the temperate waters off the Tarpon Springs area. Octocorals, which include sea plumes, sea whips and other gorgonians, and soft corals, help characterize the habitat. Genera represented include *Euenicea*, *Muricea*, *Plexaurella*, and *Pseudopterogorgia* (Phillips et al., 1990). Soft corals dominate stony corals (Scleractinia) and fire corals (Hydrozoa) throughout the hardbottom habitat and within other areas of the Gulf region.

Hardbottom Inhabitants. The distribution of the diverse assemblage of invertebrates and fishes making up the majority of the hardbottom biota helps characterize the Gulf biogeographic region as temperate.

Algae. Macroalgae are an important component of the Gulf's hardbottom community. Continental Shelf Associates, Inc. (1987) collected over 160 species of macroalgae during a survey of the hardbottom habitat of the southwest continental shelf. Some of the most common genera were within the main groupings of red algae (*Eucheuma*, *Laurencia*, *Gracilaria*, and *Lithothamnium*), green algae (*Codium*, *Caulerpa*, *Halimeda*, *Penicillus*, and *Udotea*), and brown algae (*Dictyopteris*, *Dictyota*, and *Sargassum*).

Invertebrates. Although the hardbottom community does not support three-dimensional tropical reef development, many stony corals (Scleractinians) are present (Jaap, 1984). The dominant species are ivory tube coral (*Cladocora arbuscula*), ivory bush coral (*Oculina diffusa)*, rough star coral (*Isophyllastrea rigida*), sinuous cactus coral (*Isophyllia sinuosa*), rough starlet coral (*Siderastrea siderea*), lobed star coral (*Solenastrea hyades*) smooth star coral (*Solenastrea bournoni*), and other species of solitary corals (Phillips et al., 1990). Crenelated fire coral (*Millepora alcicornis*), an encrusting and branching species of fire coral, is common but does not form massive colonies.

Sponges (Porifera) make up another major group of colonial, epibenthic organisms that contributes significantly to the diversity of the region's sessile organisms. Representatives include the loggerhead sponge

(*Spheciospongia vesparia*), vase sponge (*Ircinia campana*), stinker sponge (*I. felix*), black-ball sponge (*I. strobilina*), finger sponge (*Axinella polycapella*), and several red and orange branched species of the class Demospongiae. Commercially important sponges include sheepswool sponge (*Hippospongia lachne*), yellow sponge (*Spongia barbara*), grass sponge (*Spongia obscura*), glove sponge (*Spongia graminea*), velvet sponge (*Hippiospongia gossypina*), wire sponge (*Spongia sterea*), reef sponge (*Spongia obliquia*), and finger sponge.

Several sponge species are collected for the marine aquarium industry, including red and orange branched colonies of Demospongiae. One of the most abundant is a red encrusting Demospongiae found in association with the bivalve mollusc turkey wing (*Arca zebra*). This sponge and bivalve combination is so abundant in some hardbottom areas that the bottom appears to move as the bivalves close in reaction to the presence of an intruder. Other colonial epibenthic organisms found attached to the hardbottom substrate include bryozoans, hydroids, and ascidians.

Hardbottoms in shallow Gulf waters (< 40 m) support a diverse motile invertebrate epifauna as well. Over 306 species of molluscs, 283 species of crustaceans, and 120 species of echinoderms have been reported, including species of sea urchins, sea stars, holothurians, numerous shrimps (e.g., anemone shrimp, synalpheid shrimp, etc.), lobsters, portunid and calappid crabs, conchs, bivalves, nudibranchs, and annelids (Minerals Management Service, 1987). Hardbottom habitats with high-relief ledges or solution holes often support commercially important species such as palinurid and scyllarid lobsters including *Panulirus argus*, *P. guttatus*, *Scyllarides spp.*, and *Scyllarus spp.* Stone crabs are often found in burrows or solution holes.

Examples of temperate invertebrates include the purple-spined sea urchin (*Arbacia punctulata*) and pin cushion urchin (*Lytechinus variegatus*). *Arbacia punctulata* is abundant on hard substrate in 7 to 15 m of water (possibly deeper) within the Gulf. However, it is rarely found on the hardbottom of the Keys' Atlantic side. Another common temperate invertebrate is the Greek goddess nudibranch (*Hypselodoris edenticulata*), a sponge-feeder commonly found off Tarpon Springs. Within the Sanctuary it is only abundant in the hardbottom habitats of the Gulf, although isolated sightings have been made on the Atlantic side of the Keys.

Fishes. During their 1987 study of the southwest continental shelf, Continental Shelf Associates, Inc. collected 220 fish species from the Gulf's hardbottom habitats. In these areas, the diversity and density of fish species vary considerably depending on both the physical and structural characteristics of the ecosystem (e.g., relief, ledges, crevices, holes, etc.). Habitats with greater three-dimensional complexity offer more protection to populations and support a richer, more abundant fish fauna.

Like the fish found in other Gulf habitats, populations in the hardbottom community exhibit an obvious temperate influence. Several sea basses (Serranidae) commonly occur on the Gulf side of the Keys but are not found on the Atlantic side. Examples include the belted sandfish (*Serranus subligarius*) and the black sea bass (*Centropristis striata*). The jackknife fish (*Equetus lanceolatus*), a species of drum, is found on both sides of the Keys, but adults are far more abundant on the Gulf side than the Atlantic side. Juveniles are common on the Gulf hardbottom as well, but not on the Atlantic side. Similarly, the sheepshead is common in the Gulf's hardbottom areas, but infrequently observed on the Atlantic side of the Keys. These are but a few of the numerous species commonly found in Gulf waters but not in the Atlantic, further supporting the characterization of the northern side of the Keys as temperate.

Gulf Coral Reef Habitats and Inhabitants. There is no tropical coral reef development off the west coast of Florida, and the only major reef complex in the eastern Gulf is the Florida Middle Ground, a fossil limestone topographic feature 157 km northwest of Tampa Bay. Although it exhibits a high diversity of coral species, the Middle Ground is not a growing coral reef, as are those off the Keys (Jaap, 1984).

Coral patch reefs and hardbottom communities are rare within Florida Bay proper (Minerals Management Service, 1989), but areas of hardbottom and patch reef on the far western end of the bay have been studied (Zieman et al., 1989). Some mixed finger coral, rose coral, and seagrass communities occur in the shallow waters surrounding mangrove islands. However, significant coral communities do not occur on the Gulf side until the Lower Keys. In the Middle Keys, the area southwest of Conch Key and northeast of Big Pine Key is influenced by environmental extremes brought on by large tidal exchanges (Minerals Management Service, 1989). The seasonal and annual extremes that affect coral distribution (and other biotic communities) in Florida Bay and the Gulf side of the Middle and Lower Keys result from hydrographic changes in the Gulf of Mexico (Smith and Pitts, 1993).

On the northern side of the Lower Keys, scattered patch reefs are common, forming a generally continuous band approximately 7 km from shore. The band contains larger, head-forming coral species (e.g., *Montastrea annularis* and species of *Diploria* and *Colpophyllia*) and is surrounded by areas of lower relief that have solitary (e.g., *Siderastrea siderea*, *Solenastrea spp.*, and *Dichocoenia stokesii*) and soft corals. The band runs from Key West northeastward past Big Pine Key, where it becomes less distinct due to changing bottom topography, sediment distribution, and the major tidal influences of the Middle Keys (Minerals Management Service, 1989).

One of the most commonly visited coral reef habitats on the north side of the Keys is the "rock pile" located along the 5.5 m depth contour, north to northwest of the Content Keys. This area of high-relief, boulder-like coral heads supports a diverse mix of temperate and tropical fauna, and has distinct seasonal variations in fish density and diversity. Each year since the early 1970s a bloom of long, filamentous algae (possibly blue-green) has occurred during the summer months, totally covering the coral heads.

Another coral reef community north of the Keys includes New Ground Shoal and the tract extending east to Ellis Rock. At up to 7.6 m of relief, these reefs are higher than some Atlantic formations (Shinn et al., 1989). They are constructed of massive corals including *M. annularis* and *Siderastrea spp*.

Located at the westernmost extent of the Keys are the Dry Tortugas Banks. These banks are separated from the remainder of the Keys by a 24 m-deep channel. Described as an atoll by Vaughan (1914), the banks have a rim of Holocene coral reef development surrounding an inner basin containing several sandy islands including Loggerhead Key, Garden Key, Bush Key, and Hospital Key (Shinn et al., 1989).

Numerous scientists have worked in the Dry Tortugas since the Carnegie Institution Marine Laboratory operated on Loggerhead Key between 1910 and 1939. Jaap (1984) provided an excellent historical record of the research on Florida's coral reefs, including the work accomplished at the Carnegie Laboratory. Davis (1979) used aerial photography to construct a detailed habitat map for the Fort Jefferson National Monument (renamed Dry Tortugas National Park in 1992). Other recent studies of the area's reefs include those by Davis (1982) and Jaap et al. (1989). In addition, Wheaton and Jaap are currently conducting long-term coral monitoring studies.

The reefs off the Dry Tortugas have many characteristics of other South Florida reefs (Jaap and Hallock, 1990). One notable exception, however, is the dense staghorn coral (*Acropora cervicornis*) thickets that occur west and north of Loggerhead Key. Reports from as early as 1878 (Jaap and Hallock, 1990) have described these dense stands and the changes in their density and distribution as a result of environmental perturbations such as cold fronts. Staghorn coral proliferation during favorable periods is characterized by rapid growth and fragmentation.

Softbottom. A large portion of the Sanctuary's Gulf region, especially west of Key West, contains softbottom habitat, where the sediment may be up to 7.6 m thick (Shinn et al., 1989). North of the Sanctuary, an area of silty sand extends from the mouth of Florida Bay westward to the Dry Tortugas, roughly paralleling the 25° N latitude line (Minerals Management Service, 1989). This area effectively divides a northern habitat characterized by low-relief, hardbottom algal stands and the seagrass *Halophila decipiens* from the hardbottom and reef communities just north of the Keys. The area corresponds to the Tortugas shrimping grounds (Zieman, pers. comm.).

Westward of Northwest Channel off Key West, there is a broad shallow bank or series of flats and shoals made up of the Boca Grande Bank, the Marquesas, and the Quicksands. Patch reef development is poor on the north side of these banks, especially in the Quicksands, due to the sand's shifting nature. However, major growths of the carbonate sand-producing alga *Halimeda opuntia* have been reported by several investigators (Shinn et al., 1982; Hudson, 1985). Shinn et al. (1991) described the Quicksands near the Marquesas.

No major reef development occurs inshore between the Quicksands and the Dry Tortugas, except near Rebecca Shoal and New Ground Shoal. On average, the passage between Rebecca Shoal and Pulaski Light is approximately 24 m deep. The bottom consists of current-swept sand, sparsely covered by the seagrass *Halophila decipiens* and the green alga *Caulerpa prolifera* (Shinn et al., 1989).

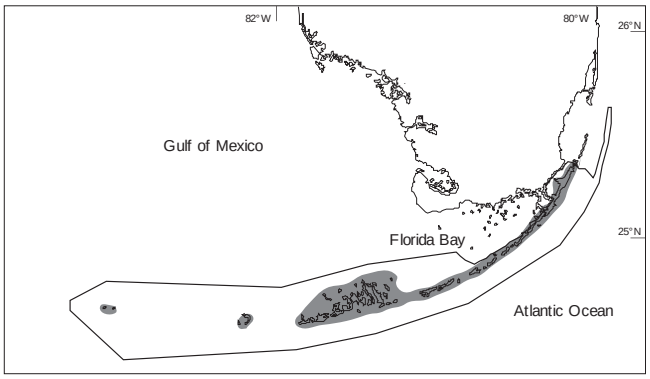
Softbottom Inhabitants. Softbottom communities support a diverse infauna assemblage in continental shelf environments. At least 1,121 species have been identified in the southwest Florida region (Minerals Management Service, 1987), with crustaceans accounting for the largest percentage (40%), followed by polychaetes (37%) and molluscs (21%).

In addition to the diverse infauna, sand and softbottom communities support a motile epifauna. Common inhabitants include several echinoids (*Meoma ventricosa ventricosa, Clypeaster rosaceus*, and *Plagiobrissus grandis*) and *Encope michelini*, *Clypeaster subdepressus*, and *Leodia sexiesperforata* which burrow in clean, grassless sand areas (Schomer and Drew, 1982).

Ecological Importance

The importance of the Sanctuary's Gulf of Mexico region as a fisheries resource cannot be overstated, in that it serves as the nursery grounds for many recreationally and commercially important species of fishes and invertebrates, including groupers, snappers, pink shrimp, spiny lobster, and stone crab. The region's location “upstream” of the Keys is also significant, in that the anthropogenic processes negatively influencing the waters of the Gulf ultimately impact the habitats and natural resources of the Keys. The region, therefore, must be considered as an integral part of the overall Sanctuary ecosystem.

Nearshore Habitats and Tidal Channels



The Holocene geology of the emergent Keys sets the scene for the distribution of marine communities throughout the Sanctuary and adjacent areas. The Upper Keys are composed of the 120,000-year-old Key Largo Limestone, a fossil reef formation that progresses to the west. The Miami oolite (oolitic facies of the Miami Limestone) begins at Big Pine Key and overlies the Key Largo Limestone formation (Hoffmeister and Multer, 1968). This oolitic formation plunges below sea level in the Newfound Harbor Keys/ Eastern Big Pine Key area (Hoffmeister and Multer, 1968; Mueller et al., 1991). The Lower Keys, which are fossilized oolitic sandbars, are oriented in a northwest to southeast direction, allowing for greater water exchange between the Gulf and Atlantic than the Upper Keys.

The Keys' nearshore habitats and tidal channels are transitional areas of species mixing between the Gulf and the Atlantic, and the presence or absence of tidal passes, coupled with their bathymetric features (e.g., depth, width, current velocity, etc.), plays an important role in the distribution of biota and the establishment of marine communities within the Sanctuary (Schomer et al., 1982; Zieman, 1982; Jaap, 1984; Minerals Management Service, 1989). Studies have shown that the net flow of water is from Florida Bay and the Gulf to the Atlantic (Smith and Pitts, 1993). Once in the Atlantic, the principal flow in the Lower to Middle Keys is westward during most of the year. This flow also has a significant influence on the distribution and mixing of the biota in the region.

Geographic Extent

The Nearshore Habitats and Tidal Channels biogeographic region extends from the northernmost portion of the Sanctuary (except for a narrow strip paralleling the offshore boundary of Biscayne National Park) to the south, southwest, and westernmost reaches. The region is narrowest in the Upper Keys and reaches its maximum width in the Big Pine Key area. The habitats discussed below are located in the nearshore waters north of the Keys and surrounding the islands in Florida Bay and the Gulf of Mexico.

Upper Keys. Due to their orientation and elevation, the Upper Keys form an almost continuous land mass, resulting in the absence of wide tidal passes through the Lower Matecumbe area and restricting water flow between the Gulf and the Atlantic. Beyond these natural features, water exchange was further limited, and water-flow resistance increased, by the bridge piles of the Overseas Railroad, built between 1904 and 1907 (Albury, 1991). Twenty-seven kilometers of bridges were built across open water and 32 km of causeways were constructed to connect islands where natural passes had once existed (e.g., Indian Key Fill).

Middle Keys. Several major passes between Lower Matecumbe and Big Pine Key connect Florida Bay and the Gulf to the Atlantic (Table 4). In addition to allowing for the mixing of temperate and tropical biota, these passes allow the exchange of warm, saltier water in the summer and cold, less saline water in the winter.

Heavy rainfall, drought, summer doldrums, and winter cold fronts influence temperature, salinity, nutrient supply, and turbidity in the shallow waters north of the

Table 4. *Middle Keys Tidal Passes*

Name	Width (m)	Depth (m)
Channel Two	580	4
Channel Five	1,375	4
Long Key Pass	3,640	5
Duck Key Area	784	3
Vaca Cut	90	5
Seven Mile Bridge Pass and Moser Channel	10,719	5
Little Duck Key Pass	250	1
Ohio Pass	245	2
Missouri Key Pass	395	2

Middle Keys (Jaap and Hallock, 1990). Extreme variations in these parameters affect the distribution of organisms from the nearshore habitats to the outer bank reefs. In areas exposed to wide seasonal variations in environmental and hydrographic parameters, the sessile, benthic epifauna are hardier and more capable of withstanding a broader range of environmental stresses. This ability is characteristic of the communities in the nearshore habitats and tidal channels of the Middle Keys.

Seven Mile Bridge. In the Lower to Middle Keys, the widest bridged gap is the open body of water spanned by the Seven Mile Bridge. Several deep cuts allow for water exchange in this area, with Moser Channel, close to the center of the gap, the deepest at 5.2 m.

Lower Keys. The area between Big Pine Key and Key West, north of the open Atlantic waters, is a complex system of shallow-water bays and basins surrounded by hundreds of mangrove-fringed keys and developed shorelines. The Lower Keys are oriented predominantly in a northwest to southeast direction, and form the widest land mass in the Sanctuary. Water exchange occurs through several deepwater passes on the north side of the Keys. Although these tidal passes allow for water exchange between the Gulf and the Atlantic, the cluster of islands protects the reef tract from the outflow of seasonally variable Gulf waters.

The Lower Keys' major backcountry passes (Table 5) include Rocky Channel (2,035 m wide/5.8 m deep), Big Spanish Channel (2,340 m wide/ 8.8 m deep), Harbor Channel (700 m wide/7.9 m deep), Cudjoe Channel (1,000 m wide/6.4 m deep), Johnston Key Channel (700 m wide/6.1 m deep), and numerous smaller channels. After flowing through the Keys, the water exits through several major ocean-side passes including Bahia Honda Channel (1,560 m wide/8.2 m deep), Bogie Channel (595 m wide/5.2 m deep), Pine Channel (1,000 m wide/6.4 m deep), Niles Channel (1,250 m wide/2.7 m deep), Kemp Channel (965 m wide/3.1 m deep), and Bow Channel (400 m wide/2.7 m deep).

To the west of Bow Channel is a series of passes in the Sugarloaf and Saddlebunch Keys area. Most of these channels are shallow, ranging from 70 m to 380 m wide and .3 m to .6 m deep. The last wide channel in the Lower Keys (before Key West) is the Boca Chica Channel, which is approximately 790 m wide and 3.1 m deep.

Northwest Channel. The last deep natural pass in the Lower Keys before Boca Grande Channel is Northwest Channel, which lies immediately west of Key West. This pass is 4.44 km wide and 8.5 m deep and is the northern extension of the Key West ship channel. Its eastern margin has been used as deepwater anchorage. To the north, the eastern and western margins of the Northwest Channel have man-made submerged granite jetties that serve as habitat for a variety of species.

The Lakes Passage. Ten keys are found between Key West and Boca Grande, with each separated by a shallow tidal pass. The Lakes refers to the shallow and expansive seagrass habitat primarily north of the islands in this area. The seafloor is predominantly covered with seagrasses, and scattered patches of hardbottom supporting sponges, soft corals, and solitary corals are also found. Solution holes, depressions in the seafloor of varying size, are sometimes found in association with the hardbottom habitat. These holes are formed by various geological pro-

Table 5. *Lower Keys Tidal Passes*

Name	Width (m)	Depth (m)
Back Country Passes		
Rocky Channel	2,035	6
Big Spanish Channel	2,340	9
Harbor Channel	700	8
Cudjoe Channel	1,000	7
Johnston Key Channel	700	6
Ocean-Side Passes		
Bahia Honda Channel	1,560	8
Bogie Channel	595	5
Pine Channel	1,000	6
Niles Channel	1,250	3
Kemp Channel	965	3
Bow Channel	400	3

cesses during subaerial exposure when sea level was lower, and offer protection for both fish and invertebrates. This habitat often provides an oasis of reef life in the middle of dense seagrass communities. The Lakes, which are separated by islands, mud banks, and a rock ridge along the north and south margin, are also an important fishing area for flats guides. The shallow waters support bonefish, tarpon, permit, barracuda, and shark, and are a nursery area for numerous commercially important species.

Boca Grande Channel. Boca Grande Channel is 9.8 km wide and separates Boca Grande Key from the Marquesas. The channel has a maximum depth of 9.1 m and exhibits strong tidal exchange. There are several deep cuts in the channel and the entire pass is generally deeper than 4.6 m. The seafloor is covered by seagrasses, hardbottom, corals, and soft substrates, and in some areas there are numerous stony coral colonies, some of which are over 1 m tall. The channel is an area of major mixing between the Gulf and the Atlantic.

The Quicksands. West of the Marquesas is a vast current-swept sand flat referred to as the Quicksands. Sand waves as high as 2.7 m have been reported in this area of high current velocity (Shinn et al., 1982; Hudson, 1985; Shinn et al., 1990). Shifting sands have prevented the development of extensive reef habitats, but have allowed major growths of the carbonate-sand-producing alga *Halimeda spp.* (Hudson, 1985). At the westernmost tip of the Quicksands is Halfmoon Shoal, which is separated from the Rebecca Shoal reef community by a broad pass 17 to 18 m deep. From Rebecca Shoal west to the Dry Tortugas the depth of the passage is approximately 24.4 m, and the bottom is current-swept sand (Minerals Management Service, 1989).

Biological Components

The Keys' nearshore habitats and tidal channels are exposed to a wide range of environmental conditions. Water depths are generally less than 2.5 m (except in the deeper passes) and radical changes in weather conditions and the velocity of water flow can adversely affect the distribution of biota. The structure of the biological community changes considerably based on the speed at which water is transported through the area, the depth of the water, and the type of substrate. In a representative study, Enos (1977) grouped organisms into habitat communities based on the substrate on which characteristic assemblages lived, and on circulation and bottom morphology.

Intertidal Shoreline Habitats. All major biological communities are present in the nearshore habitats and tidal channels including mangroves, intertidal shorelines, seagrasses, hardbottoms, and soft substrates. The most detailed attempt to describe the various habitats in the region was made by Schomer and Drew (1982). Nine shoreline habitats were identified, including those described below.

Exposed Vertical Rocky Shores and Seawalls. These habitats occur both naturally and as a by-product of human activities. Natural formations occur in areas where steep scarps in the limestone bedrock have been created by erosion due to waves and currents. Man-made formations include seawalls, bridge piles, structural supports, power poles, piers, docks, and other vertical structures entering the water. Bridge piles exposed directly to the open ocean and those located in channels with high-velocity currents exhibit diverse attached biota. Several species of stony corals, hydrozoans, gorgonians, sponges, tunicates, barnacles, and algae make up a rich sessile community that supports an equally diverse epifauna composed of fishes and invertebrates. Bridge piles not exposed to high-velocity currents exhibit lower sessile species diversity and organism density.

Exposed Rocky Platforms. Exposed rocky platforms are one of the most extensively studied intertidal shoreline communities within the Keys, and abundant literature is available describing the biota in this habitat (Schomer and Drew, 1982). Stephenson and Stephenson (1950) described three separate zones. The first is an upper platform that varies greatly in width, angle of slope, and pattern of seaward termination, extending from the edge of dry land vegetation to the seaward edge of the lime rock platform. The second is a lower platform that occurs as discontinuous patches of low rock, running seaward from the foot of the upper platform to a level slightly above the spring tide low-water level. The third zone is a low-lying area (usually submerged) in which rocky patches alternate with sand, mud, and gravel.

Fine-grained Sand Beaches. Sand beaches are composed of fine-grained calcareous fragments of shell, coral, and coralline algae. Most of these "pocket beaches" are limited in size, are in the Middle Keys, and face the Straits of Florida. Their formation is often influenced by wave activity. Examples include Long Key Beach, Bahia Honda Beach, and Sombrero Beach.

Coarse-grained Sand Beaches. These areas are physically similar to fine-grained beaches, but are

composed of coarse-grained carbonate sands and are usually narrower (<10 m) between the dunes and low water. Coarse-grained sand beaches are found in the Dry Tortugas and Marquesas, primarily in high-energy areas.

Mixed Sand/Gravel Beaches and Fill. This habitat type is found in areas exposed to high wave energy, which creates beaches of coarse shell and coral fragments. Man-made beaches of this type are composed of poorly sorted mixtures of sediments in a variety of sizes, sometimes resulting in a hard-packed surface layer.

Gravel Beaches and Riprap. All forms of gravel beaches and riprap in the Keys are man-made. The habitat is usually made of materials ranging from gravel to boulder-sized riprap revetments, most often composed of local limestone. Examples include shorelines bordering causeways.

Exposed Tidal Flats. The most common exposed tidal flats in the Keys are the seagrass flats. Generally located in open bays, lee of offshore islands or near tidal inlets, these flats are exposed during low spring tides, vary in size, and are subject to moderate- to high-energy wave activity and tidal currents. The sediments are dominated by carbonate sands, and some muds are often found accompanying migrating carbonate sand bars on the flats' seaward edge.

Sheltered Rocky Shores and Seawalls. Sheltered rocky shores occur when canals are dug through limestone bedrock. The vertical faces are often irregular, with holes, pockets, and crevices providing microhabitat. Depending on where the canals have been dug, the exposed rock may be Key Largo Limestone, Miami Oolite, or both. Both sheltered rocky shores and seawalls often line shorelines along the interior and sheltered areas of populated regions. Each extends below the low-water mark. Waves and currents usually do not have an influence where canals have been dug. However, boating activities can cause shoreline erosion in canals.

Sheltered Tidal Flats. This habitat is found associated with interior island lagoons and is unaffected by even moderate waves or tidal currents. The carbonate mud sediments of this habitat are less consolidated than those of the exposed tidal flats. The habitat is most common in the Lower Keys.

Intertidal Shoreline Inhabitants. The biota associated with intertidal shoreline habitats is diverse and varies according to the habitat type and physical features. Sessile, epibenthic, and infaunal organisms all help comprise this community type. They are thoroughly described by Schomer and Drew (1982).

Hardbottom Habitats and Inhabitants. Exposed limestone is a common bottom type in the Keys' nearshore waters. This rocky surface, whether of geological or biological origin, provides the substrate necessary for the attachment of sessile organisms. Hardbottom habitats are typically dominated by algae, sponges, gorgonian corals, hydrozoans, bryozoans, stony corals, anemones, molluscs, and tunicates. The actual composition of these species depends on the location of the hardbottom and the physical influences on the community. There are two types of nearshore hardbottom habitats: restricted-circulation and high-velocity.

Nearshore Restricted-circulation Hardbottom Habitats. These habitats are located in restricted embayments, and their distribution is controlled by minimal water movement, low turbidity, and/or suspended sediments. Epilithic and drift algae (previously attached species which have broken loose) that attach directly to limestone usually dominate. Common species include seabottles (*Ventricaria ventricosa*), green bubble algae (*Dictyospaeria cavernosa*), mermaid's wine glass (*Acetabularia crenulata*), star algae (*Anadyomene stellata*), and squirrel tail algae (*Dasycladus vermicularis*). Common species of brown algae include forked tumbleweeds (*Dictyota spp.*) and several species of sargassum. Representative red algae include Laurence's weed (*Laurencia papillosum* and *L. poitei*), spiny seaweed (*Acanthophora spicifera*), and *Eucheuma isiforme*. The coralline red alga *Neogoniolithon strictum* is also abundant (Booker, 1991).

Nearshore Restricted-circulation Hardbottom Inhabitants. This habitat is characterized by slow water movement, and fish species are not abundant. Common groups include the needlefishes (Belonidae), killifishes (Cyprinodontidae), livebearers (Poeciliidae), silversides (Atherinidae), mullets (Mugilidae), and barracudas (Sphyraenidae). These species are all capable of withstanding changes in a broad range of environmental parameters including temperature, salinity, and dissolved oxygen levels. Still, abrupt temperature changes can result in fish kills.

Nearshore High-velocity Hardbottom Habitats. Located in tidal channels between islands and on the open-water side of the Keys facing either the Gulf of Mexico or the Atlantic, these communities are swept by strong currents that prevent sediment accumulation. They

generally exhibit a greater diversity of sessile biota than restricted-circulation hardbottom communities.

High-velocity hardbottom habitats can be subdivided based on their proximity to the Atlantic. The first subcategory is composed of habitats located near major deepwater passes such as Moser Channel, Bahia Honda Channel, Boca Grande Channel. The second includes those in close proximity to the Gulf of Mexico.

High-velocity habitats near major deepwater passes are dominated by stony corals and sponges. Bahia Honda Channel for example, one of the deepest natural passes in the Lower-to-Middle Keys, has a diverse stony coral population dominated by ivory bush coral, brain corals (*Diploria spp.* and *Colpophyllia natans*), smooth and rough starlet coral, club finger coral (*Porites porites*), golf ball coral (*Favia fragum*), and others. Most are relatively small (< 1 m), low-profile colonies.

Passes near the Gulf exhibit a completely different benthic and epibenthic community than those near the ocean. Examples include Rocky Channel, Big Spanish Channel, Harbor Channel, Cudjoe Channel, and Johnston Key Channel. The dominant feature is the topographic relief and structure of the hardbottom. Deep and wide holes in the center of some of these channels indicate long-term erosion; some have steep ledges and undercut overhangs that provide excellent habitat. Some overhangs are extensive (2 to 3 m) and may serve as refuge for a host of marine organisms including turtles, spiny lobsters, stone crabs, and a variety of fishes.

Nearshore High-velocity Hardbottom Inhabitants. Despite the similarities between the two habitat subcategories, variation exists between the species composition of these areas.

Benthic Algae and Seagrasses. The flora of the deepwater passes on the Gulf side of the Keys also differs with that of other areas. Although many of the green (including both calcareous and noncalcareous), brown, and red algae exhibit similar species compositions as those found near the Atlantic, noticeable differences exist. Red algae dominate by mass in some of the deeper channels on the Gulf side. *Eucheuma isiforme* exhibits a very different, massive morphological form throughout much of the year in deeper channels with strong tidal influences and restricted light penetration. *Laurencia spp.* forms massive clumps and contributes significantly to the area's algal biomass.

Seagrass distribution was previously described for the Gulf of Mexico biogeographic region. Although the same species occur in the nearshore passes, distributions differ in some areas. For example, *Halophila spp.* commonly occurs in the deeper portions of the tidal passes on the Gulf side, but is not as common closer to the Atlantic passes. Various factors, including turbidity and light penetration, influence its distribution.

Invertebrates. Sponges of class Demospongiae are the dominant organisms in the deepwater passes. Loggerhead sponge, vase sponge, stinker sponge, candle sponges, green sponge, sprawling sponge, chicken liver sponge, and fire sponge (*Tedania ignis*) are common representatives. Commercially important species found include sheepswool sponge, yellow sponge, grass sponge, glove sponge, velvet sponge, wire sponge, reef sponge, and finger sponge.

In passes closer to the Gulf, sponges of class Demospongiae are also the dominant organisms. Loggerhead sponge, vase sponge, stinker sponge, candle sponges, green sponge, sprawling sponge, chicken liver sponge, and fire sponge are all represented in the backcountry hardbottom community. Several commercial species are also common, including sheepswool sponge, yellow sponge, grass sponge, glove sponge, velvet sponge, wire sponge, reef sponge, and finger sponge. Corals are not as abundant in this subhabitat, however, with only lobed star coral, smooth star coral, smooth and rough starlet coral, rough star coral, sinuous cactus coral, and encrusting fire coral (*Millepora alcicornis*) representative species. All of these species are characteristic of the corals previously described for the Gulf biogeographic region.

Fishes. Nearshore high-velocity tidal passes close to the Atlantic also support a diverse assemblage of fishes, and a large number of species spend the early portion of their life history in these areas. Juveniles of many species popular in the aquarium trade spend the early portion of their life cycle in high- to moderate-velocity tidal passes. Most angelfish (Pomacanthidae), butterflyfish (Chaetodontidae), and surgeonfish (Acanthuridae) are commonly found in nearshore tidal passes that have strong tidal influences. Other families of fish common in this habitat include sea basses, jacks (Carangidae), snappers, grunts (Haemulidae), porgies, drums, damselfish (Pomacentridae), barracudas, wrasses (Labridae), parrotfish (Scaridae), clinids, combtooth blennies (Blenniidae), and gobies.

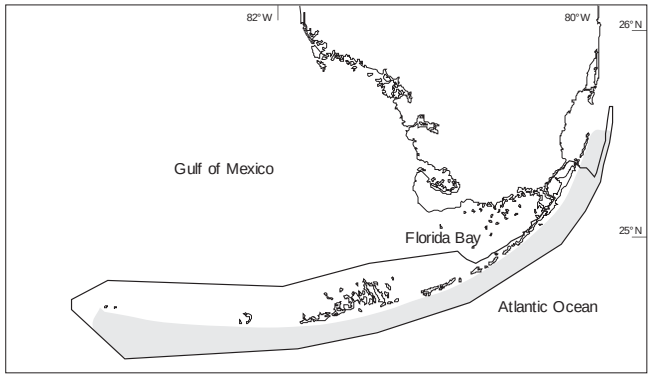
In contrast, the deep backcountry tidal passes close to the Gulf exhibit mixed temperate and tropical fish species. They serve as important migratory routes for

many of the snappers and groupers that move to open water during spawning. Spadefishes, porgies, sheepshead, and drums occur, but are less common near the deep tidal passes closer to the Atlantic.

Ecological Importance

The size and geography of the Sanctuary's Nearshore Habitats and Tidal Channels region help set the Keys' coral reefs apart from the fringing reefs of much of the Caribbean. The biological diversity supported by the area's habitats makes the Keys' ecosystem ecologically and aesthetically unique within the United States. The region is an area of ecological and biological mixing where the temperate waters of the Gulf meet the tropical waters of the Atlantic, producing one of the most complex habitats in the Sanctuary. The majority of the commercially and recreationally important species in the region forage and seek shelter in the nearshore habitat both in their early life stages and as adults. In addition, much of the consumptive recreational and commercial activities in the Keys occur in these areas, and the region has the highest potential for environmental damage as a result of human use. Dredging, development, water quality degradation, and the overuse of resources are but a few of the human-use activities within the region that may result in resource damage.

Atlantic Ocean



Like an enormous thermostat, the Florida Current supplies the Atlantic side of the Keys with a constant flow of tropical waters. Although they become diluted through mingling with nearshore waters, these tropical waters are capable of supporting and sustaining complex coral reef communities. Accordingly, coral reefs and their associated subhabitats are the dominant biological and ecological features of the Sanctuary's Atlantic Ocean biogeographic region.

The region exhibits coral reef communities similar to those found in the Caribbean and other tropical Atlantic areas (Jaap, 1984). However, the Keys' coral reefs occur at an environmental threshold because of their northern distribution, and therefore exist in a delicate ecological balance (Vaughn, 1914a). Because scientists have studied the area's coral reefs since 1852, much literature exists on their biology, ecology, physiology, geology, and community composition (Jaap, 1984). Throughout the development of the management plan, this information has been useful in formulating strategies to reduce potential impacts on these complex areas.

Geographic Extent

The Sanctuary boundaries in the Atlantic Ocean region are established by the seaward shoreline east and south of the Keys approximately to the 91-m depth contour. The region's northern limit is Fowey Rocks at the northern end of Biscayne National Park; the southern limit approximates the westernmost boundary near Dry Tortugas National Park. The region extends along the entire length of the Sanctuary and encompasses all waters on the ocean side of the Keys.

Biological Components

Despite its size, the region is one of the most homogeneous in the Keys. Habitats occur in parallel bands from the extreme north to the southwest, and similar coral reef communities are found when progressing from onshore to offshore environments in the Upper, Middle, and Lower Keys. In addition, reef community distribution by depth correlates with sea-level fluctuations and the changing shoreline (Shinn et al., 1989; Lidz et al., 1991). Although the biota described between Soldier Key and the Dry Tortugas is predominantly Caribbean in character, Kruer and Causey (1992) found numerous fish species common to Gulf waters surrounding artificial reefs in Hawk Channel between Big Pine Key and Upper Sugarloaf Key.

Most of the regional habitat types and biological communities described previously are also found in the Sanctuary's Atlantic Ocean region. However, the biological and ecological composition of the communities within these regions varies greatly. Specifically, the variety of habitat types is greater in the Atlantic region, and the area's more tropical habitats support a significantly greater biodiversity of organisms. Major Atlantic Ocean habitats include: 1) the mangrove fringe and nearshore hardbottom; 2) inshore patch reef; 3) Hawk Channel (mid-channel) reef; 4) Hawk Channel (mid-channel) seagrass and softbottom; and 5) reef tract habitats. The complex reef tract commu-

nity is composed of habitats including offshore patch reef, seagrass, back reef/reef flat, bank reef/transitional reef, intermediate reef, deep reef, outlier reef (Lidz et al., 1991), and sand and softbottom environments.

Mangrove Fringe and Nearshore Hardbottom. The species composition of mangrove communities in the Atlantic's fringe and nearshore hardbottom habitat is similar to that of Florida Bay's fringing mangrove habitat. Nearshore hardbottom is the dominant ecological community, extending seaward to a depth of approximately 5.5 m. This depth varies between the Upper and Middle Keys, but remains relatively constant from the Middle to Lower Keys. Immediately seaward of some Upper Keys is a broad seagrass community that extends to the nearshore hardbottom. In general, the substrate is composed of exposed fossil corals or limestone formed by biological and geological processes.

Although seagrasses are not a major habitat component, turtle grass and manatee grass are often found in sediment-filled depressions. Rhizophytic algal species are dominant, and attach to sediments by forming rhizoidal "root balls," or by affixing themselves directly to the substrate with holdfasts (Croley and Dawes, 1970; Booker, 1991). The most common species are members of the green algae family Codiaceae, including shaving brush (*Penicillus spp.*), halimeda (*Halimeda spp.*), ripweed (*Rhipocephalus phoenix*), mermaid's fan (*Udotea spp.*), and feather algae (*Caulerpa spp.*). Several brown algae (including *Sargassum*, *Padina*, and *Dictyota*) and some species of calcareous red algae (including *Gonolithion*) are also found.

Mangrove Fringe and Nearshore Hardbottom Inhabitants. The habitat does not actively accrete or build massive reef structures, but does support a diverse sessile and motile biota and provides important nursery and foraging habitat for a variety of recreationally and commercially important species including spiny lobster, snapper, and grouper (Jaap, 1984).

Invertebrates. Colonial gorgonian corals are the dominant sessile organism. Gorgonians (octocorals) are typically found in areas exhibiting considerable water exchange, and are therefore able to survive in waters with high levels of sediment loading (Booker, 1991). Octocoral species include the reticulate seafan (*Gorgonia ventalina*), knobby candelabra (*Eunicea mammosa* and *E. calyculata*), double-forked sea rod (*Plexaurella dichotoma*), gray sea rod (*P. grisea*), dry sea plume (*Pseudopterogorgia acerosa*), slimy sea plume (*P. americana*), and spiny candelabra (*Muricea muricata*). Solitary or non-reef-building ahermatypic, stony corals are also found, with common species including club finger coral (*Porites divaricata*), mustard hill coral (*P. astreoides*), smooth and rough starlet corals, golf ball coral, rose coral, elliptical star coral (*Dichocoenia stokesii*), knobby brain coral (*Diploria clivosa*), and smooth brain coral (*D. strigosa*). Encrusting fire coral is also found.

Sponges of class Demospongiae are also prevalent, and loggerhead sponge, vase sponge, stinker sponge, candle sponges, green sponge, sprawling sponge, chicken liver sponge, and fire sponge are common in areas of strong water movement. Commercially important sponges include sheepswool sponge, yellow sponge, grass sponge, glove sponge, velvet sponge, wire sponge, reef sponge, and finger sponge.

This habitat also supports a diverse assemblage of anemones, polychaete worms, shrimps, crabs, molluscs, echinoderms, and other invertebrates. Coral rubble, limestone rock, and solution holes and ledges provide habitat for a host of organisms seeking refuge from predators.

Fishes. Many fish species, including juveniles popular in the aquarium trade, spend the early portion of their life history in the nearshore hardbottom habitat. Juveniles of most angelfish, butterflyfish, surgeonfish, and drums are common. Other juveniles found include sea bass, snappers, grunts, porgies, damselfish, barracuda, wrasses, and parrotfish. Several other families, including clinids, combtooth blennies, and gobies are present as adults.

Inshore Patch Reef. A diverse inshore patch reef community overlaps the nearshore hardbottom between the depths of 3.7 and 5.5 m. The corals of this habitat attach to the hardbottom substrate, forming a discontinuous line of reefs that varies in topographic relief but is found seaward of nearly every island bordering the open ocean. The line approximately parallels (and is restricted to) the chain of emergent Keys, and the age and size of the corals vary tremendously. Many colonies are small, with a low profile, but some rival the offshore bank reefs in size.

Inshore Patch Reef Inhabitants.

Invertebrates. Stony corals dominate the inshore patch reef's sessile biota, and all species in the nearshore hardbottom habitat (except rose coral) also occur here. Some massive corals such as mountain star coral (*Montastrea annularis*), cavernous star coral, and giant brain coral (*Colpophyllia natans*) form colonies that

may be up to 2 m across. Small colonies of lettuce coral (*Agaricia agaricites*) and scattered colonies of staghorn coral occasionally occur.

The habitat's wide diversity of invertebrates is also similar to that of the nearshore hardbottom area. However, inshore patch reefs are primarily occupied by adults of various species, as opposed to juveniles (except for cryptic invertebrates that hide under rubble). Prior to a massive die-off in 1983, the long-spined urchin (*Diadema antillarum*) was a common inhabitant of these reefs. The species grazed effectively and kept algae away from the reefs, producing a halo around certain patch reefs.

Fishes. All families of fishes in the Atlantic's nearshore hardbottom habitat are also found in the inshore patch reef environment. However, like invertebrates, adults are more common than juveniles, especially where adequate relief and shelter afford protection from predators. Herbivorous and omnivorous fish and invertebrate species keep the plants grazed back around the reefs.

Hawk Channel (Mid-channel) Reef. The mid-channel reef habitat is a third coral reef community paralleling the Keys, lying approximately in the center of Hawk Channel. The reefs vary in topographic relief: some have a low profile (1 m or less), while others have relief of over 7 m. This variation is related, in part, to water depth and proximity to the major passes opening to the Gulf. Depths in Hawk Channel vary from 8.5 m off Key Largo to 13.7 m off Big Pine Key and 9.1 m off Key West.

Hawk Channel (Mid-channel) Reef Inhabitants.

Invertebrates. The mid-channel reef habitat is composed of massive corals including mountain star coral, cavernous star coral, smooth starlet coral, and giant brain coral. Many other coral species are present, with diversity and density exceeding that of the inshore patch reef habitat.

Cnidarians dominate the benthic biota, with colonial corallimorphs such as false coral (*Ricordea florida*), zoanthids (*Palythoa spp.*), and a variety of anemones contributing to the array of organisms. Octocorals are both large and numerous, with species composition similar to that of the nearshore hardbottom habitat. Encrusting sponges are diverse and abundant and cover much of the reef. Polychaete worms, including sabellids and serpulids, are also common. Numerous species of molluscs and echinoderms add to the reefs' diversity, and encrusting tunicates cover large surface areas.

Fishes. Mid-channel reefs are a significant habitat for many commercially and recreationally important fish, and species diversity and density is greater than that of inshore areas. Many species are the same as those found near inshore patch reefs, but representative species of some families begin to replace their inshore counterparts. For example, species of damselfish not commonly found inshore begin to occur in abundance. Mid-channel reefs also serve as an important habitat for species migrating offshore to spawn, and due to the turbidity of Hawk Channel throughout most of the year, they are natural biological "recharge" areas for many species targeted by fishing activities.

Hawk Channel (Mid-channel) Seagrass and Softbottom. Starting approximately 5.5 m seaward of the inshore patch reefs, turtle grass, manatee grass, and sparse *Halophila spp.* become the dominant seagrasses on portions of the seafloor in Hawk Channel. A number of algae are also found, and *Caulerpa prolifera* is common. In the Lower Keys, the seagrass and softbottom habitat extends to the seaward edge of Hawk Channel, marking the landward side of the reef tract habitat. It is interrupted by scattered rock outcroppings that support sparse hardbottom communities. For example, in the Upper Keys the seaward edge is White Bank.

Hawk Channel (Mid-Channel) Seagrass and Softbottom Inhabitants. Portions of the seafloor not covered by seagrasses and algae have soft sediments that serve as habitat for a variety of invertebrates including polychaete worms, gastropods, and echinoderms. However, the fauna and flora of this area are not well-known.

Florida Reef Tract

Florida’s coral reef tract comprises one of the largest communities of its type in the world, extending from Fowey Rocks near Miami to the Dry Tortugas. The reef tract parallels the emergent Keys for 356 km, arcing in a southwesterly direction before terminating west of the Dry Tortugas. The coral reef community is almost continuous except for the area between Rebecca Shoal and the Dry Tortugas. An outer reef tract lies east and south of the Keys at a distance of 4.8 to 11.3 km. Because the Upper and Lower Keys are protected from the direct flow of Gulf water, they are considered to have greater reef development than the Middle Keys (Ginsburg and Shinn, 1964; Shinn et al, 1989; Jaap and Hallock, 1990). All but the northernmost extent of the reef tract lies within the boundaries of the Sanctuary.

While there are many references in the popular literature describing the area as a barrier reef, there is a strong belief in the scientific community that it does not fit the definition of such a system (Vaughn, 1914b; Jaap, 1984; Dustan, 1985). To avoid entering into this debate, the reef tract is described in this document as including a “bank reef margin” or as a “bank reef system” (Jaap, 1984). Shinn (personal communication) has suggested it be called a "discontinuous barrier reef." However, it is important to note that within the Sanctuary it is an almost continuous reef community, and that the linear or elongated reef habitats that lie parallel to one another in a discontinuous reef tract often resemble a barrier reef community (Figure 8). In the Keys, such reefs parallel the shoreline and are located between Hawk Channel and the Straits of Florida**.**

Existing Studies. Although the reef ecosystem has historically been one of the Keys' most widely examined marine communities (Smith, 1948; Voss and Voss, 1955), most scientific studies have focused primarily on the shallow bank reef habitat. In many cases, scientists have ignored the deeper and more expansive intermediate-to-deep reef habitats, and only recently have these areas been rigorously investigated (Jameson, 1981; Pomponi and Rützler, 1984; Bohnsack et al., 1987; Miller, 1987; Wheaton and Jaap, 1988; Lidz et al., 1991; Kruer and Causey, 1992; Lapointe et al., 1992).

Numerous scientists have identified and described the organisms comprising the Keys' coral reef ecosystem. Jaap (1984) and Jaap and Hallock (1990) thoroughly described the ecology of South Florida's coral reef ecosystems and provided a historical overview of coral reef research and the resulting published literature. Other scientists who have studied the ecosystem include Starck (1968), who published the most comprehensive list of fishes (517) in the Keys, and Longley and Hildebrand (1941), who listed 442 fish species in the Dry Tortugas.

Numerous studies have also been completed that specifically describe the inhabitants of the Looe Key National Marine Sanctuary. Because Looe Key Reef and its surrounding habitats generally are inhabited by species found along the entire reef tract, these studies may be used as a basis for characterizing species common in these areas.

In a general survey at Looe Key, Littler et al. (1985) reported a diverse tropical flora among the hermatypic corals, gorgonians, and nonarticulated coralline algae that help form Looe Key Reef. Ninety algal taxa representing 28 families were identified, and similar communities are believed to exist along the Keys' reef tract. Wheaton and Jaap (1988) surveyed fire corals, octocorals, stony corals, zoanthids, and corallimorpharians (false corals) and found two species of fire coral, 42 species of octocorals, and 63 taxa of stony corals. Pomponi and Rutzler (1984) reported 38 species of sponges, and Vittor et al. (1984) reported 33 species of polychaete worms. Thomas (1985) described 47 species of amphipods and detailed their distribution and ecology. Miller (1987) identified 82 species of echinoderms, and both Miller and Felder (1984) sampled invertebrates throughout all habitats. Bohnsack et al. (1987) reported 188 fish species within Looe Key National Marine Sanctuary, and Kruer and Causey (1992) surveyed three depths near Big Pine Shoals, reporting 104 species in shallow depths, 114 in mid depths, and 109 on the deep reef.

Reef Tract Habitats. While the Florida Keys reef tract is itself considered a bank reef system, the studies mentioned above (and others) have led to the delineation of several distinct habitats including areas of:

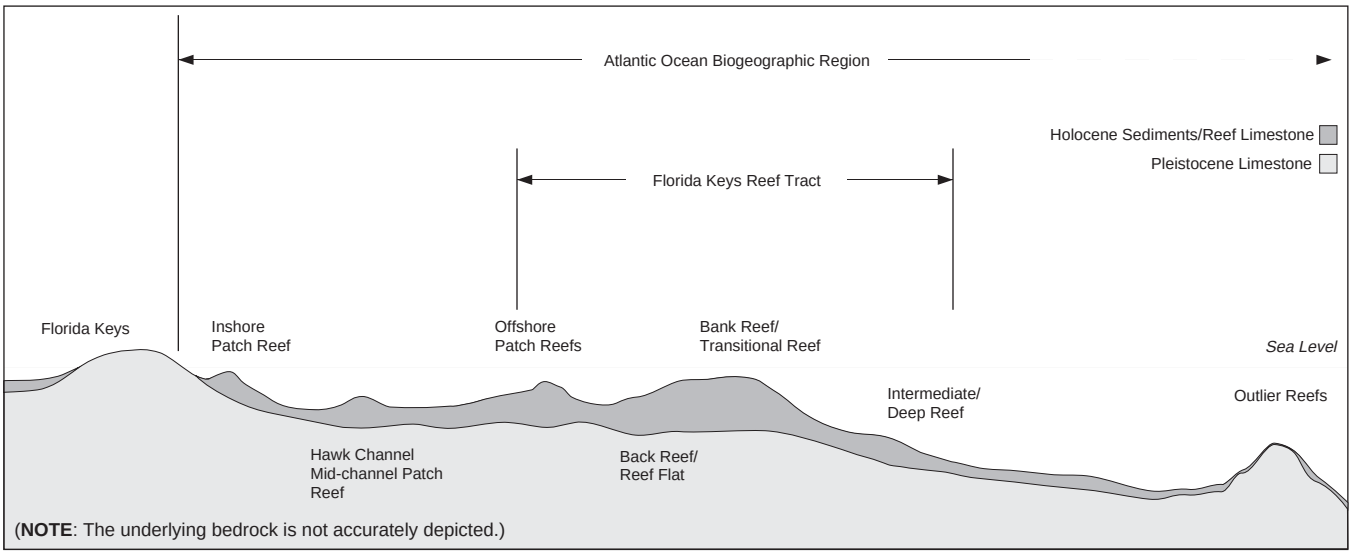
1. Offshore Patch Reef
2. Seagrass
3. Back Reefs/Reef Flat
4. Bank Reef/Transitional Reef
5. Intermediate Reef
6. Deep Reef
7. Outlier Reef
8. Sand and Softbottom

Note: Because many studies have been published on the biota of the Keys' coral reef system, references to species found in reef habitats have been limited to significant species and those unique to a specific area.

Offshore Patch Reef. The Florida Keys reef tract has a distinct profile along most of its length, with depths decreasing seaward of Hawk Channel toward the reef tract. Scattered dead coral outcroppings supporting sparse hardbottom biota are dispersed in seagrass beds, marking the landward edge of the bank reef community. Just seaward is a discontinuous band of offshore patch reefs that parallel the Keys and comprise the first major habitat encountered in a seaward progression toward the reef tract.

The topographic relief of patch reefs varies depending on their proximity to the more seaward back reef and bank reef communities. Sediment accumulation landward and behind some bank reefs is rapid, and may have an effect on the relief of offshore patch reefs. For example, sediments are accumulating in the back reef habitat at Looe Key at a rate of 2 m per

Figure 8. *Profile of the Florida Keys Reef Tract*



1,000 years (Lidz, et al., 1985). The tops of the offshore patch reefs in the area are 6.5 m deep and the surrounding seafloor is 7.5 m deep, giving the reefs 1 m of relief. Along the same line 2.4 km to the east, however, the tops of the reefs are also 6.5 m deep, but the surrounding seafloor is 11.5 m deep. As a result, some of the reefs have over 5 m of relief. Such three-dimensional topography results in both complex and diverse reef assemblages.

Offshore Patch Reef Inhabitants. The offshore patch reef habitat is a transitional zone between the mid-channel and inshore habitats and the outer reef tract community. Accordingly, the area exhibits a subtle mixing of biota.

Invertebrates. Stony corals and octocorals dominate the habitat, with the species of stony corals present very similar to those of the mid-channel reef. Massive corals include mountain star coral, cavernous star coral (*M. cavernosa*), smooth starlet coral, giant brain coral, and pillar coral (*Dendrogyra cylindrus*). Colonies of staghorn coral are often located near patch reefs, but not in the dense colonies found seaward of the bank reefs. Octocorals form large colonies that may grow to over 2 m high. Colonial corallimorphs such as false coral, zoanthids, and a variety of anemones are also abundant. In addition, Hunt et al. (1991) reported that the Caribbean spiny lobster uses the habitat when migrating through Hawk Channel.

Fishes. Due to their proximity to Hawk Channel and the Florida Keys reef tract, offshore patch reefs attract a diverse assemblage of reef fish. Both resident and transient species including wrasses, angelfish, tangs, surgeonfish, porkfish, cardinals, blennies, damselfish, grunts, and hogfish frequent the reefs. Commercially important species such as grouper and snapper are seasonally abundant, and migrate shoreward and seaward between spawning events. In addition, several species uncommon inshore begin to appear, demonstrating the habitat's increasingly tropical influence. Examples include the blue chromis (*Chromis cyanea)*, redspotted hawkfish (*Ambiycirrhitus pinos*), and Spanish hogfish (*Bodianus rufus*).

Reptiles. Loggerhead turtles are frequently observed resting under ledges and overhangs in offshore patch reef areas.

Seagrass Community. An important seagrass community surrounds the offshore patch reefs, extending further seaward toward the outer reef tract. This habitat is composed mainly of turtle grass and manatee grass, although various species of algae (particularly green algae) may be present. Rock outcroppings supporting diverse miniature reef assemblages are scattered throughout the habitat.

Seagrass Community Inhabitants. Like the Sanctuary's Gulf region, the seagrass community exhibits a high density and diversity of organisms. Species composition varies considerably, however, between the Gulf's seagrass environment and that of the Atlantic.

Invertebrates. The Atlantic's seagrass community is an important habitat for a wide variety of invertebrates, most conspicuously those of the class mollusca. The queen conch, for example, spends much of its life

history grazing the beds. A wide variety of echinoderms, such as the cushion sea star and long-spined sea urchin, are often found. In addition, patches of hardbottom with associated reef inhabitants such as sponges, octocorals, small solitary stony corals, tunicates (ascidians), bryozoans, anemones, and algae frequently occur, and a variety of other invertebrates (including polychaetes, mollucsa, and crustacea) help comprise this mini-reef environment. In addition, the Caribbean spiny lobster may seek shelter under ledges created by blowouts (Hunt et al., 1991) and forage in the seagrass beds.

Fishes. A variety of juvenile and adult reef fishes including wrasses, parrotfishes, surgeons, gobies, and others use the seagrass community as both a habitat and food source. Nocturnal species foraging over the beds include snappers, grunts, and porgies.

Amphibians and Reptiles. The endangered Atlantic green turtle is known to graze on turtle grass within the habitat.

Back Reefs/Reef Flat. In back reef areas, where the seagrass community is protected by the shallow bank reef habitat and its associated fossilized coral rubble ridges, a reef flat community often forms. This shallow-water habitat is dominated by turtle grass and manatee grass, with scattered coral heads and small patch reefs providing shelter for community inhabitants.

Back Reefs/Reef Flat Inhabitants. Coral rubble is a prominent feature of the back reef/reef flat habitat, providing shelter and habitat for a wide variety of fishes and invertebrates. Echinoderms, mollusca, polychaetes, and decapod crustacea all seek shelter under the rubble, and it is also important as a nocturnal foraging area for the spiny lobster.

Invertebrates. The back reef/reef flat habitat is important to a variety of invertebrates including the queen conch, which lays eggs in the shallow sand patches between the grass beds (Glazer and Berg, 1993). All species found in the Atlantic's seagrass beds also occur in this habitat.

Fishes. Bohnsack et al. (1987) described back reef/reef flat fishes within the Looe Key National Marine Sanctuary. Their findings included a visual assessment of species comparable to those found along other portions of the reef tract.

Bank Reef/Transitional Reef. The Keys' bank reefs are estimated to be between 6,000 and 7,000 years old and, in the Lower Keys, stopped growing about 800 years ago (Shinn et al., 1977). This may correspond to sea-level rise that results in the mixing of Gulf and Atlantic waters. Bank reefs are considered unique due to the presence of elkhorn coral (*Acropora palmata*), coral zonation by depth, and seawardly oriented spur-and-groove formations (Shinn, 1963; Shinn, 1981; Jaap, 1984; Wheaton and Jaap, 1988). These formations (mainly composed of elkhorn coral) give the reefs three-dimensional relief and contribute to their complexity, making them both biologically and aesthetically appealing. Accordingly, they are popular among scuba divers and snorkelers.

Although the well-known shallow bank reefs (e.g., Carysfort Reef, Molasses Reef, Sombrero Reef) may break the surface at mean low water, less prominent transitional reefs are found from 4.6 to 6 m below the surface. Located on the same continuous reef line as the bank reefs, these transitional reefs stopped developing 1,500 to 2,000 years ago, possibly in relation to rising sea levels. Like the other habitats along the reef tract, the transitional reef community parallels the Keys.

Bank Reef/Transitional Reef Inhabitants. The band of habitat that comprises the bank reef/transitional reef community is almost continuous, except in areas where sediments have smothered the reef.

Plants. Dominant plants of the fore reef include encrusting red algae of the genera Lithothamnium, Goniolithon, and Peyssonellia. Other plants present include *Halimeda opuntia*, *Bryopsis pennata*, and *Dictyota spp.* (Antonius, 1978; Littler et al., 1986).

Invertebrates. The shallow fore reef zone makes up part of the bank reef community. Within this zone at Looe Key Reef, for instance, high-profile spur-and-groove formations descend from the shallow reef crest seaward to the tip of the coral fingers. Shinn (1963) demonstrated that the spurs at the reef are made of fossilized elkhorn coral. Wheaton and Jaap (1988) described reef zonation in the Keys' fore reef habitats and listed the major inhabitants.

Bank reefs and transitional reefs exhibit a high diversity of invertebrate species. The shallow fore reef habitat consists of massive growths of bladed fire corals (*Millepora complanata*) in an area known as the reef crest. Seaward of the reef crest, the reef's shallow surface is covered by yellow sea mat (*Palythoa caribbea*) and colonies of fire coral. Some species of hardy stony coral are also present.

Slightly seaward, the spurs plunge in depth, and colonies of elkhorn coral begin to appear in the Acropora Zone. Although some elkhorn coral is present on most shallow bank reefs, it is uncommon on the deeper transitional reefs as it is less tolerant of environmental changes and succumbs easily to extreme water temperatures, increased turbidity, and deteriorating water quality. The presence or absence of this fragile coral seems related to water depth, exposure to waters derived from the Florida Current, proximity to Hawk Channel, and location relative to major inshore tidal passes. The boulder and head corals previously described for the offshore patch reef habitat occupy the deepest portion of the spurs. These massive coral colonies make up the Buttress Zone of the fore reef. Wheaton and Jaap (1988) reported 23 species of soft coral, 31 species of stony coral, and two species of fire coral in this habitat at Looe Key Reef.

Fishes. Several fish species not found on the offshore patch reefs begin to appear in the bank reef/transitional reef habitat. Juvenile and adult rock beauties (*Holacanthus tricolor*), adult reef butterflyfish (*Chaetodon sedentarius*), creole wrasses (*Clepticus parrae*), and many other species are common, but are rarely found just a few kilometers inshore. Although the significance of this zoogeographic distribution has not been studied, it suggests physical, biological, and environmental requirements that help characterize the distribution of various species. Bohnsack et al. (1987) compiled a comprehensive list of fish species within this habitat. Kruer and Causey (1992) identified fish at a 6 to 8 m deep transitional reef 7.5 km east of Looe Key Reef.

Amphibians and Reptiles. Atlantic hawksbill turtles are frequently observed in the fore reef areas of the bank reefs.

Intermediate Reef. Seaward of the shallow bank reefs and transitional reefs are the deeper intermediate reef communities. This habitat, which forms the majority of available reef substrate along the reef tract, begins at an approximate depth of 10 m and extends out to a depth of approximately 19 to 21 m. The slope is gradual, decreasing only about 11 m over 1 km, making the area a very broad reef habitat. Because it extends almost the entire length of the Keys, the intermediate reef occupies a significant geographical portion of the bank reef community. The reef is composed of a drowned spur-and-groove system exhibiting low-profile coral spurs. This habitat is older than bank and transitional reefs, and may have been left behind during the rapid sea level rise during the early Holocene. The rock is Pleistocene limestone with a veneer of corals and gorgonians. This zone extends down to about 115' when the toe of the limestone is buried in sediment.

Intermediate Reef Inhabitants.

Plants. Eiseman (1981) reported 10 species of algae at depths of 20 to 30 m off Molasses Reef, with the most characteristic being *Halimeda opuntia* (*f.minor)* and *Dictyota dichotoma*. Two other species, *Udotea conglutiata* and *Galaxura obtusat,* were common but not as abundant.

Invertebrates. The benthic biota of the intermediate reef is extremely diverse and may rival that of the sessile organisms found in the bank reef environment. Soft corals, enormous sponges, and a large variety of stony corals are present. Boulder corals are most prominent, but some staghorn coral colonies and finger corals are also found. Colonies of porites are often massive in size (sometimes measuring over 1 m in diameter) and brain corals may get quite large. Before 1977, acres of staghorn coral colonies were common.

Fishes. Most of the species found in the bank reef's fore reef environment also occur in the intermediate reef habitat, but the numbers and sizes of some species are noticeably different. For example, juvenile rock beauties, angelfish, and adult reef butterflyfish are common. In addition, several species of hamlets that are uncommon in shallower waters also occur, including black hamlet (*Hypoplectrus nigricans*), butter hamlet (*H. guttavarius*), and blue hamlet (*H. gemma*). Other common species include the blue chromis, which occurs in all size classes but is more common as a juvenile than in other habitats, and various seabass and grouper species such as the tobaccofish (*Serranus tabacarius*) and the coney (*Epinephelus fulvus*). Much of the seasonal commercial and recreational fishing for yellowtail snapper (*Ocyurus chrysurus*), mangrove (gray) snapper (*Lutjanus griseus*), and king mackerel (*Scomberomorus cavalla*) occurs in this often overlooked reef environment. Due to diving limitations, Bohnsack et al. (1987) were unable to count and identify fish in this habitat. No observations were made deeper than 15 m, and accordingly, the study may not be representative of the diversity and abundance of species found below this depth.

Deep Reef. At approximately 20 to 21 m, the intermediate reef begins to slope at a greater angle, and the deep reef habitat is formed as it descends to a depth of 29 to 33.5 m. The angle of the slope varies along

the reef tract, but is more gradual off Key Largo and steeper off the Lower Keys. At several locations between Sombrero Reef and American Shoals, the slope is almost vertical. Deepwater lace coral (*Acaricia spp.)*, an octocoral occurring along the upper edge of the deep reef, consistently marks the transition from the intermediate reef environment. The deepwater resources of the Key Largo National Marine Sanctuary (stony corals, octocorals, fishes, algae, echinoderms, molluscs, decapod crustaceans, sponges, geology, and archaeology) were described by several scientists in a report based on a survey conducted with a submersible (Jameson, 1981).

Deep Reef Inhabitants. Although the deep reef habitat contains much barren fossilized coral covered with fine sediment, the area is extremely diverse in both invertebrate and fish species (Jameson, 1981).

Plants. The algae within the deep reef habitat are very similar to those in the intermediate reef environment (Eiseman, 1981).

Invertebrates. The most conspicuous invertebrates in the deep reef environment are the giant basket sponges (*Xestospongia muta*), Atlantic thorny oyster (*Spondylus americanus*), and several species of crinoids (*Davidaster spp.*). However, the presence of crinoids has decreased since the early-to-mid 1980s. Common coral species include platelike growth forms of lettuce coral, mountain star coral, cavernous star coral, and yellow pencil coral. Deepwater octocorals such as *Ellisella barbadensis* and *Iciligorgia schrammi* are also found.

Fishes. The number and abundance of chromis species increases at this depth. Purple reef fish (*Chromis scotti*) and sunshinefish (*C. insolata*) are extremely abundant in large schools along the deep reef drop-off. The cherubfish (*Centropyge argi*) is another frequently observed species, and the spotfin hogfish (*Bodianus pulchellus*), which rarely occurs in waters shallower than 15.2 m, is common in all size classes. During the 1970s and early 1980s, it was not uncommon to observe up to six longsnout butterflyfish (*Chaetodon aculeatus*) per dive, although Kruer and Causey sighted none during a two-year study conducted from 1991 to 1992.

Outlier Reef. At the deepest margin of the deep reef habitat, the reef terminates into soft sand/mud substrate. This softbottom extends seaward, gradually sloping until it reaches a deeper reef community approximately 1 km from the base of the deep reef (Antonius, 1974; Jameson, 1981). This habitat has been called the deep reef ridge by Antonius (1974). More recently, however, Lidz et al. (1991) referred to a similar habitat as outlier reefs, reporting 57 km of formations parallel to the outer reef tract from American Shoals to west of Sand Key off Key West. The structures were located .5 to 1.5 km seaward of the bank reef margin, at an approximate depth of 30 to 40 m, and had 21 to 28 m of relief (Lidz et al., 1991). Fishermen have used this habitat for years along portions of the entire reef tract. In another study, Jameson (1981) used side-scan sonar and visual observations from a submersible to survey deep reefs off South Carysfort Reef, The Elbow, and French Reef. The habitat consisted of mounds, generally 1 to 2 m in relief, interspersed with sand channels.

Outlier Reef Inhabitants.

Plants. Eiseman (1981) reported a *Lithothamnion* cobble zone in the Keys' deepest reef habitats. While there was no dominant species, virtually all had ligulate, foliose, or filamentous growth forms.

Invertebrates. Characteristic outlier reef invertebrates include platelike growth forms of lettuce coral, mountain star coral, cavernous star coral, yellow pencil coral (*Madracis mirabilis*), and the barrel sponge (*Xestospongia muta*). Deepwater octocorals such as *Ellisella barbadensis* and *Iciligorgia schrammi* are also present. (Antonius, 1974).

Fishes. The fish species in this habitat are very similar to those found in the deep reef environment.

Sand and Softbottom. Unconsolidated soft sediments comprise the final habitat in the bank reef community. Several scientists (Enos, 1977; Lidz et al., 1985; Shinn et al., 1989) have described the origin of sediments found along the reef tract. Recent work by Lidz et al. (1985) has shown that the majority of sand-sized sediments in the Lower Keys are composed primarily of coral fragments, and not *Halimeda* fragments as previously thought. West of Key West, however, *Halimeda* fragments are the main sediment source (Shinn et al., 1989).

Sand and Softbottom Inhabitants. The habitat occurs throughout the reef tract, and it is much larger than the reefs themselves. Still, its importance is often understated, and it is an area of high polychaete, mollusc, and echinoderm diversity.

Invertebrates. The most conspicuous epifauna are echinoderms including the sea stars (*Luidia spp.*; *Astropecten spp.*), sand dollars, and sea cucumbers. Many molluscs occur on sand, including the Florida

fighting conch (*Strombus alatus*), hawkwing conch (*S. raninus*), and queen helmet shell (*Cassis madagascarensis*).

Fishes. Many fish species are found in the habitat that are not as common in reef areas. Examples include the yellowhead jawfish (*Opistognathus aurifrons*), dusky jawfish (*Opistognathus whitehursti*), sailfin blenny (*Emblemaria pandionis*), sand tilefish (*Malacanthus plumieri*), and lantern bass (*Serranus baldwini*). Several seabass species also occur.

Ecological Importance

The enormous size of the Sanctuary's Atlantic Ocean biogeographic region sets the Florida Keys' coral reef community apart from the fringing reefs of much of the Caribbean. The biological diversity that the region supports makes the Keys' ecosystem ecologically, economically, aesthetically, and biogeographically unique within the United States.

The region's reefs are highly complex and diverse communities whose success is limited by the presence of suitable substrate and a narrow range of environmental and hydrographical parameters. Corals are the principal builders of the reef community and form the main source of spatial complexity and shelter. Biogeographic and environmental factors determine the density and diversity of the species on coral reefs (Jaap and Hallock, 1990).

The ecosystem is not composed solely of coral reefs, however. It also includes the seagrass community, mangroves, and other biotic communities that, in combination, help make the system ecologically unique. Few places have the environmental and geological setting that has made it possible for such an ecosystem to form, and when combined with the other biogeographic regions of the Sanctuary, the entire ecosystem is unique to much of the Caribbean.

Threatened and Endangered Species

A variety of plants, invertebrates, fishes, reptiles, birds, and mammals in the Keys are protected at the Federal and/or State level. Each of these species is a valuable natural resource that contributes to the ecological balance of the Sanctuary. This section provides a short description of the species within the Sanctuary that are endangered, threatened, or of special concern (as defined by the State). Each description defines the species' distribution, range, and use of habitats, as well as the degree of risk posed by certain human-use activities.

Because Federal and State classifications do not always match, the protected status of each species has been summarized in Table 6. A species is defined as endangered if it is at risk of extinction throughout all, or a significant part, of its range. A threatened species is one that is likely to become endangered in the near future, and a species of special concern has received this classification based on either unfavorable regional factors or a decline in population (Owre, 1990). The Federal designation of both plants and animals is classified by the U.S. Fish and Wildlife Service (FWS) and State designation is classified by the Florida Game and Fresh Water Fish Commission (FGFWFC). A list of threatened and endangered plants is also developed by the Florida Department of Agriculture and Consumer Services (FDA) and the Florida Natural Areas Inventory (FNAI).

Plants

Although some of Florida's 3,500 vascular plant species have been introduced through horticultural or agricultural practices, the majority are native to the state. Many of these native plants are unable to withstand human impacts or the competition of invading exotic species, and the number of individuals and populations is declining. The primary causes of declines include the selective horticultural collection/removal of species and habitat destruction or clearing for development (FGFWFC, 1978 [rev. 1988]). Due to these human-induced pressures, as well as natural threats from fires and hurricanes, 71 species of plants in the Keys are listed as threatened or endangered by the FDA, two species are listed as federally endangered, and one as federally threatened.

Both the Key tree cactus (*Cereus robinii*) and Small's milkpea (*Galactia smallii*) are listed as federally endangered by the FWS. The tree cactus ranges from Cuba to the Keys, where five small populations remain. The cactus's endangered status is a result of the destruction of hardwood hammocks for commercial and residential development. Small's milkpea is an endemic plant restricted to seven pine rockland areas in South Florida. It has been classified as endangered based on the destruction of pine rockland and the exclusion of fire in these habitats.

Garber's spurge (*Euphorbia garberi*) is an endemic plant listed as federally threatened by the FWS. It occurs in only four areas of Everglades National Park and one area of the Keys. Like the tree cactus and Small's milkpea, it is classified as threatened due to habitat destruction.

Table 7 summarizes the status, habitat type, range (when available), and cause of decline for plant species in the Keys listed as endangered or threatened by the FDA.

Animals

Animal species in the Keys are dependent on the area's diverse habitats, including beaches, coral reefs, pine rockland, transitional wetlands, freshwater wetlands, mangroves, and hardwood hammocks. As these habitats are altered, a species' chance of survival diminishes. The species described below are threatened primarily by direct or indirect habitat loss and habitat alteration as a result of human activities. Those that are either threatened or endangered are listed in Table 6, along with the juridiction responsible for protecting them.

Invertebrates

Florida Tree Snail (*Liguus fasciatus*). Florida tree snails have historically been found from Grassy Key to Key West, and museum specimens exist from Lower Matecumbe Key (Deisler, 1982). They are found on a variety of native hammock trees and a few introduced ornamentals (Deisler, 1982). Primary threats include the loss of habitat through development and recreational uses, as well as relocation by collectors (Deisler, 1982; Sprunt, pers. comm.).

Stock Island Tree Snail (*Orthalicus reses reses*). Until recently, the Stock Island tree snail subspecies occurred in a small area on Stock Island and was confined to a patch of natural hardwood hammocks (FWS, 1982). However, only a captive population remains (Wilmers, pers. comm.) Major threats include habitat alteration and loss, human recreational use of snail habitat, pesticide application, overcollection for shells (Antonius, 1982), fire ants (Wilmers, pers. comm.), and relocation by collectors (Sprunt, pers. comm.).

Pillar Coral (*Dendrogyra cylindrus*). Pillar coral is found scattered throughout the Florida Reef Tract in shallow, protected areas of the outer reefs and on shallow patch reefs. Because of its ornamental shape, it has been overcollected by marine life collectors (Antonius, 1982).

Schaus's Swallowtail Butterfly (*Heraclides aristodemus ponceanus*). The range of Schaus's swallowtail butterfly is known only from the southeastern tip of the Florida peninsula and in the Keys (FWS, 1982). Adults occur most frequently along overgrown trails in relatively undisturbed hardwood hammocks. Although reports from Lower Matecumbe and Upper Matecumbe keys exist, the species is most often found in northern Key Largo and Biscayne National Park (FWS, 1982; Monroe County, 1992; Kruer, 1992). Primary threats include the widespread aerial application of insecticides, overcollection, hurricanes, and primary habitat destruction (FWS, 1982; Wilmers, pers. comm.).

Fishes

Common Snook *(Centropomus undecimalis).* A subtropical estuarine species, common snook generally inhabits brackish estuaries, particularly mangrove-fringed bays and tidal streams (Seaman and Collins, 1983). The species is also found in salt marsh and coral reef environments and in man-made ditches and canals (Thue et al., 1982; Patillo et al., in prep.). The species occurs from Everglades National Park to the Dry Tortugas (Burgess, 1980) and is prized by recreational fishermen as a sport and food fish (Thue et al., 1982). Primary threats include loss of habitat, low water temperatures, and overfishing (Seaman and Collins, 1983; Patillo et al., in prep.).

Key Blenny (*Starksia starcki*). Key blenny are known only within the Looe Key National Marine Sanctuary, and although Gilbert (1978) has suggested the species may inhabit other areas within the Keys, sightings are rare. All specimens collected have come from isolated coral formations in depths of less than 5 m. Major threats include the loss of coral habitat (Gilbert, 1978).

Key Silverside (*Menidia conchorum*). Key silversides are found in the Middle and Lower Keys in Long Key, Big Pine Key, Cudjoe Key, and Key West (Gilbert, 1978; Gilbert, 1992). The species is essentially marine, and typically occupies shallow open bays (Gilbert, 1978). Since it has a limited range and its numbers fluctuate dramatically, an undisturbed habitat is crucial (Gilbert, 1978). Accordingly, the species is threatened by habitat alteration.

Mangrove Rivulus (*Rivulus marmoratus*). Mangrove rivulus occurs throughout the Keys and has been collected from Key West to Biscayne Bay. The species primarily inhabits shallow mosquito ditches and bays associated with estuarine mangroves and high-salt marsh shorelines (Snelson, 1978; Taylor, 1992). It is threatened by development near estuarine boundaries (Snelson, 1978; Taylor, 1992).

Amphibians and Reptiles

American Alligator (*Alligator mississippiensis*). The American alligator primarily ranges from Little Pine Key to Sugarloaf Key, inhabiting wetland areas, including the edges of natural basins, freshwater marshes, and mosquito ditches on Little Pine, No Name, and Big Pine keys (Kruer, pers. comm.). The greatest concentrations are on Big Pine Key. Alligator holes and ponds may be important refuges for other animals during periods of drought (Woolfenden, 1983), and the maintenance of such ponds plays a significant role in preserving the health of the area's wetlands. Nests are usually constructed on mounds of vegetation, raised banks, or slightly higher ground so eggs will be above the high-water mark (VanMeter, 1987). The species is threatened by the loss of freshwater and wetland habitats (Fogarty, 1978) and human interaction (e.g., poaching, road kills, and removal) (Kruer, pers. comm.).

American Crocodile (*Crocodylus acutus*). A tropical, typically estuarine species that reaches its northern limit in southern Florida, American crocodiles have been reported in the Upper Keys from lower Plantation Key to Key Largo and along Cross Key to the mainland of Barnes and Card sounds. They have also been sighted from southern Biscayne Bay north to Turkey and Black points (FWS, 1984; Moler, 1991). Crocodiles may occur in the Lower Keys, mainly within boundaries of the National Key Deer and Great White Heron wildlife refuges (FWS, 1984a), and have also been found in Key West (Wilmers, pers. comm.). However, there is no recent proof to verify continued presence in these areas (FWS, 1984a).

Crocodiles primarily inhabit mangrove-lined creeks, bays, and other swampy areas. Adult females often construct low nest mounds or holes in sand, marl, or peat soils on abandoned canal levees in mangrove swamps, along creek banks, or on small beaches (FWS, 1984). Of the 25 to 30 nests constructed in Florida each year, 80 percent are in Monroe County or on adjacent beaches in Dade County (Moler, 1991). Most known nests occur in the Florida Bay portion of Everglades National Park, in Barnes and Card sounds,

Black Point, North Key Largo, Turkey Point, and Lake Surprise (Moler, 1991; FWS, 1984a; Monroe County, 1992). Threats include habitat loss/alteration and direct disturbance by humans, including camping, boating and fishing near nesting sites, hunting, and road kills (FWS, 1984a).

Atlantic Green Turtle (*Chelonia mydas mydas*). The Atlantic green turtle occurs throughout the marine waters of the Keys and is highly migratory (Lund, 1978b). There are recent reports of nesting on Boca Grande, Sawyer Key, and the Marquesas (Wilmers, pers. comm.). The Keys' nearshore waters are crucial developmental areas (Hoffman, pers. comm.) and manatee grass and turtle grass provide the species' main food source (Zieman, 1982; Zieman, pers. comm.). Primary threats include the loss of seagrass feeding areas; human disturbances; entanglements in active, passive, and lost fishing gear; water quality degradation; the loss or alteration of nesting beaches (FWS, 1984b; NMFS and FWS, 1991a); and cutaneous fibropapilomas found on immatures (Wells, pers. comm.) that increase the chance of entanglement in fishing gear (Hoffman, pers. comm.).

Atlantic Hawksbill Turtle (*Eretmochelys imbricta imbricata).* Atlantic hawksbill turtles occur throughout the waters of the Keys, with nesting sites reported at Boca Grande Key (Wilmers, pers. comm.) and Soldier Key in Biscayne National Park (Hoffman, pers. comm.). The species is most often observed near coral reefs and is considered the most endangered of the Keys' sea turtles. (Lund, 1978c). Primary threats include the degradation of nesting beaches and coral reefs, decreased water quality, hunting and egg collecting, and entanglements in active and passive fishing gear (Lund, 1978c; FWS, 1984b).

Atlantic Loggerhead (*Caretta caretta caretta*). Inhabiting waters throughout the Keys, Atlantic loggerheads are the most common marine turtle in the Sanctuary and the only species regularly utilizing Keys' beaches for nesting (Monroe County, 1992). Nests occur from Upper Matecumbe Key to the Dry Tortugas, and sites have been reported in areas including the Marquesas Keys, Woman Key, Boca Grande Key, Lower Matecumbe Key, Coco Plum Beach, Bahia Honda, Big Munson, Sawyer, Lower Sugarloaf Key, and Everglades National Park (Monroe County Board of County Commissioners, 1986; Wilmers, pers. comm.). Hatchlings are often associated with sargassum rafts (Odell, 1990). Major threats include shrimp trawl drownings, the destruction of nesting beaches by coastal development, artificial lights near nesting beaches that cause hatchlings to move away from their ocean destination, ingestion of marine debris and tar balls, entanglement in active and passive fishing gear, water quality degradation, and collisions with vessels (Lund, 1978e; FWS, 1984b; NMFS and FWS, 1991b).

Atlantic Ridley Turtle (*Lepidochelys kempii*). Although Atlantic ridley turtles have a range that includes the waters of the Keys, they are rarely sighted (Lund, 1978d). Like other sea turtle species, they have a pelagic juvenile stage. Adults and subadults usually inhabit nearshore waters, mangrove creeks, and bays. Although there are no known nesting areas in the Keys, knowledge of nesting, subadult distribution, and recent strandings off Marathon indicate that much, if not all, of the population migrates through the Straits of Florida (Sprunt, pers. comm.). Threats include egg collecting and shrimp trawl drownings, ingestion of or entanglement in marine debris, and water quality degradation (Lund, 1978d; FWS, 1984b).

Leatherback Turtle (*Dermochelys coriacea*). Though somewhat scarce, leatherback turtles occur throughout the waters of the Keys (Lazell, 1989). They are the most pelagic of the area's turtles and can dive to great depths. There are no records of nesting beaches in the Keys (Lund, 1978a; Wilmers, pers. comm.), although one leatherback unsuccessfully attempted to nest in the Marquesas in 1989. Primary threats include egg collecting on beaches outside the Keys; the killing of females for food; entanglement in fishing gear; and the ingestion of plastic bags that are mistaken for jellyfish (Lund, 1978a; Odell, 1990).

Striped Mud Turtle *(Klinosternon bauri).* Striped mud turtles range from Big Pine Key to Stock Island in the Lower Keys (Monroe County Board of County Commissioners, 1986). Optimal habitats include small fresh or slightly brackish ponds, mangrove swamps, and the edge of hardwood hammocks (Weaver, 1978). Primary threats include land development, which alters freshwater/brackish ponds and the surrounding terrestrial environment (Weaver, 1978).

Big Pine Key Ringneck Snake (*Diadophis punctatus*). Big Pine Key ringneck snakes have the most restricted range of any snake in the Lower Keys (Lazell, 1989). They are found from No Name Key to Sugarloaf Key, but may be restricted to Middle Torch, Little Torch, and Big Pine keys (Monroe County Board of County Commissioners, 1986; Kruer, 1992). On the Torch Keys they have only been found on the edges or within the disturbed portions of tropical hardwood hammocks (Lazell, 1989). The principal threat is increasing residential development, which destroys

tropical hardwood hammock and slash pineland habitats. The destruction of freshwater wetlands by development is also detrimental to the species (Lazell, 1989).

Eastern Indigo Snake (*Drymarchon corais couperi*). Eastern indigo snakes have been reported on Little, Middle, and Big Torch keys, and Summerland, Cudjoe, Sugarloaf, No Name, Key Largo, Sugarloaf, Plantation, Boca Chica, and Big Pine keys (Lazell, 1989; Monroe County Board of County Commissioners, 1986). The species is most often found on Big Pine Key (Wilmers, pers. comm.) and utilizes tropical hardwood hammocks, slash pinelands, freshwater wetlands, tidal mangroves, transitional habitats, and disturbed lands recolonized by non-native vegetation. The species is threatened by habitat loss, collection for pets (by both recreational and commercial collectors), and road kills (Monroe County Board of County Commissioners, 1986; Lazell, 1989).

Florida Brown Snake (*Storeria dekayi victa*). Florida brown snakes occur in the Upper Keys (Sprunt, pers. comm.), but primarily range from No Name Key to Sugarloaf Key and are endemic to the Lower Keys (Monroe County Board of County Commissioners, 1986; Lazell, 1989). They inhabit slash pinelands and freshwater wetlands, and are vulnerable to habitat loss resulting from development (Monroe County Board of County Commissioners, 1986).

Florida Ribbon Snake (*Thamnophis sauritas sackeni*). Florida ribbon snakes are found in the Lower Keys from No Name Key to Sugarloaf Key and have also been reported on Cudjoe, Middle Torch, and Big Pine keys (Monroe County Board of County Commissioners, 1986; Lazell, 1989). They also occur on Key Largo and Plantation Key (Sprunt, pers. comm.). Primary habitats include freshwater and tidal (mangrove and transitional) wetlands. A primary threat is the elimination or degradation of habitat through land development (Monroe County Board of County Commissioners, 1986; Lazell, 1989).

Miami Black-headed Snake (*Tantilla oolitica*). Although mostly found from Key Largo to Grassy Key (Monroe County Board of County Commissioners, 1986), Miami black-headed snakes have also been reported in southeastern Dade County (Sprunt, pers. comm.). They mainly inhabit cavities in the Key Largo limestone underlying Upper Keys' hardwood hammocks (Monroe County Board of County Commissioners, 1986). A primary threat is the loss of tropical hardwood hammocks through land development (Monroe County Board of County Commissioners, 1986).

Red Rat Snake (*Elaphe guttata guttata*). Perhaps the most common snake in the Upper Keys uplands (Sprunt, pers. comm.), red rat snakes have also been reported in the Lower Keys on Bahia Honda Key, Big Pine Key, Vaca Key, Key West, Indian Key, Little Pine Key, Stock Island, Sugarloaf Key, and the Marquesas (Weaver, 1978). Pine woods are the preferred habitat and the species is threatened by habitat destruction as a result of land development (Weaver, 1978).

Florida Keys Mole Skink (*Eumeces egregius egregius*). Although rarely seen, the Florida Keys mole skink has been reported on Middle Torch Key, Key Vaca, the Dry Tortugas, Key West, Indian Key, Stock Island, Upper Matecumbe Key, Key Largo, and Plantation Key (Lazell, 1989; Sprunt, pers. comm.). An endemic subspecies, it is confined to the Keys and is found in sandy areas, usually near the shoreline. Human development is the primary threat to the species (Lazell, 1989).

Birds

American Kestrel (*Falco sparverius sparverius*). A migratory species seen in the winter throughout the Keys, American kestrels are found in open habitats, particularly pine forests and clearings with dead trees. There are no known nesting sites in the Keys. They are threatened by habitat destruction resulting from human development (Wilmers, pers. comm.).

American Oystercatcher (*Haematopus palliatus*). Although rare in the Keys (Sprunt, pers. comm.), American oystercatchers are occasionally seen in the Upper Keys on sandy beaches and oyster and mollusc beds at low tide (Woolfenden, 1978; Owre, 1990). Threats include recreational beach use.

Arctic Peregrine Falcon (*Falco peregrinus tundrius*). Migratory birds observed in the waters of the Keys during the fall and winter, Arctic peregrine falcons inhabit sea coasts, estuaries, bays, and tree-rimmed marshes (Owre, 1990). Over half of the total population may pass through the Keys during the fall migration, using Boot Key and other sites as roosting areas (Hoffman, pers. comm.; Sprunt, pers. comm.). Threats include chemical pollution and the loss of roosting areas.

Bachman's Warbler (*Vermivora bachmani*). Although very rare and possibly extinct (Lazell, 1989), Bachman's warblers have been reported in the Lower Keys as far south as Key West (Stevenson, 1978). The species' habitats include mangroves and hardwood hammocks (Stevenson, 1978; Lazell, 1989).

Bald Eagle (*Haliaeetus leucocephalus*). In the Lower Keys, bald eagles range from Little Pine Key to the Marquesas (Monroe County Board of County Commissioners, 1986). Eagles nesting in the Lower Keys are the southernmost breeders in the United States (Wilmers, 1991). In the Upper Keys, they range north and east of Lower Matecumbe to the mainland (including adjacent islands and waters) and throughout Florida Bay (Monroe County Board of County Commissioners, 1986). They are usually observed in wooded areas near the coast and large lakes, and breed in mangroves (Owre, 1990; Wilmers, 1991; Sprunt, pers. comm.). Threats include lead pellet and pesticide poisoning, nest flushing by boats, and habitat loss from coastal development and acid rain (Wilmers, 1991; Sprunt, pers. comm.), especially near lakes and coastal areas, both of which are crucial nesting and roosting habitats.

Brown Pelican (*Pelecanus occidentalis*). Brown pelican populations are scattered throughout the Keys (Sprunt, pers. comm.), and birds nest on coastal islands in mangrove trees (Schreiber, 1978). Threats include human disturbance of nesting areas, decreases in the availability of prey, and pesticide poisoning (e.g., DDT and chlorinated hydrocarbons) that decreases reproductive success (Schreiber, 1978; Lazell, 1989).

Burrowing Owl (*Athene cunicularia*). Although rare within the Sanctuary, burrowing owl populations are concentrated in the Middle Keys. Because they nest several feet below ground, the local water table must remain low or their burrows may be flooded (Woolfenden, 1983). They are generally seen on high shady ground with little growth (particularly prairies, sand hills, and pastures) and on prairie-like expanses of airports, industrial plants, and campuses (Owre, 1990). In Marathon they have been seen around the airport, golf course, and at Sombrero Beach Park (Wilmers, pers. comm.; Hoffman, pers. comm.). Threats include development and the domestic cat population (Hoffman, pers. comm.).

Cape Sable Seaside Sparrow (*Ammodramus maritimus mirabilis*). Cape Sable seaside sparrows are found primarily in Everglades National Park and adjacent areas (Owre, 1990; Hoffman, pers. comm.), in freshwater marshes and sites with fresh to slightly brackish water. Primary threats include the alteration of drainage areas and the loss of wetland habitat (Werner, 1978).

Florida Sandhill Crane (*Grus canadensis pratensis*). Although rare in the Keys, Florida sandhill cranes have been reported in Everglades National Park (Owre, 1990) and the Dry Tortugas (Hoffman, pers. comm.). They prefer wet prairies, grasslands, sparsely vegetated marshes, and open areas that are shallow and flooded (Williams, 1978). They nest in mounds of aquatic vegetation and in sloughs of water about .3 m deep (Woolfenden, 1983). Because of the species' very low reproductive potential and subsequent inability to respond quickly to environmental change (Williams, 1978), threats include drainage area alteration and wetland loss.

Least Tern (*Sterna antillarum*). Least terns are found throughout the Keys, with nesting sites in areas including Lake Edna, Grassy Key, Big Pine Key, Ohio Key, and Everglades National Park (Hovis and Robson, 1989; Spendelow and Patton, 1988). They prefer to nest on open, flat areas with sparse vegetation and coarse substrates such as sand or shell. They are opportunistic, and have begun to nest on a variety of man-made habitats including gravel rooftops, dredge material sites, highway easements, rock pits, roadside shoulders, and parking lots (Spendelow and Patton, 1988; Hovis and Robson, 1989). These sites will ultimately threaten the species, however, as most dredge material sites are not stable for nesting because they are temporary and subject to high levels of human disturbance. Also, although rooftops are permanent structures, they flood and may be hazardous to young that cannot fly (Hovis and Robson, 1989).

Little Blue Heron (*Egretta caerulea*). Little blue heron populations are scattered throughout the Keys and can be found in exposed tidal flats, intertidal seagrass banks, shallows bordering mangrove islands (Wilmers, pers. comm.), and the wet meadows of wetland areas (Rodgers, 1978). Threats include the loss of foraging and nesting habitats (Rodgers, 1978; Hoffman, pers. comm.).

Snowy Egret (*Egretta thula*). Scattered throughout the Keys, snowy egrets are common in fresh and saltwater marshes but prefer salt and brackish habitats (Ogden, 1978d). Nesting occurs in shrubs, small trees, mangroves, and cacti. Although populations are concentrated in South Florida, a few breed in the Keys (Spendelow and Patton, 1988). As with other wading birds, snowy egret survival is dependent upon the amount of productive wetlands available for nesting and feeding (Ogden, 1978d).

Tricolored Heron; Louisiana Heron (*Egretta tricolor*). Although tricolored herons occur in a variety of environments throughout the Keys, they are most common in estuarine and wetland habitats. Like most waders, herons nest on islands or in woody vegetation over

standing water (Owre, 1990). Nests are often located in mangroves, willow, buttonbush, marsh elder, wax myrtle, pond apple, or similar woody plants characteristic of interior wetland or estuarine areas (Ogden, 1978b). Threats include wetland loss (Ogden, 1978b).

Osprey (*Pandion haliaetus*). Ranging from Everglades National Park to the Lower Keys, osprey nests are concentrated between Florida Bay and the Ten Thousand Islands (Ogden, 1978e; Wilmers, 1991). Nesting usually occurs in the tops of large cypress, mangrove, pine, or swamp hardwood trees near sea coasts, interior lakes, large swamps, or large rivers. However, nests may also occur close to the ground (Ogden, 1978e; Wilmers, 1991) or on man-made objects including utility poles, radio towers, channel markers, and high signs (Wilmers, 1991). Although threatened by pesticides that can greatly reduce nesting success, the primary threat to nesting ospreys is habitat destruction (Ogden, 1978e). In addition, severe prolonged disturbances by boaters during sensitive pre-nesting and incubation periods have drastically reduced productivity in several local areas of Great White Heron National Wildlife Refuge (Wilmers, pers. comm.).

Piping Plover (*Charadrius melodus*). Piping plovers are found in Everglades National Park and the Lower Keys, primarily inhabiting beaches, tidal sand flats, mud flats, and sandfills. The wetlands on Ohio, Woman, and Boca Grande keys provide a major wintering ground (Monroe County, 1992; Wilmers, pers. comm.). Threats include habitat loss and human disturbance (Owre, 1990; Wilmers, pers. comm.).

Reddish Egret (*Egretta rufescens*). Reddish egret populations are scattered throughout Florida Bay and the Lower Keys. Nesting sites are most common within Everglades National Park and on Hemp Key (Robertson, 1978; Kruer, pers. comm.). Reddish egrets are generally associated with red mangroves, usually nesting near or over saltwater or hypersaline water and feeding in nearby shallows (Robertson, 1978; Hoffman, pers. comm.). Because much of the population occurs in areas with submarginal food-source productivity (e.g., Florida Bay), the species is threatened by habitat loss (Owre, 1990).

Roseate Spoonbill (*Ajaia ajaja*). Roseate spoonbills breed in Florida Bay, primarily in Everglades National Park (Sprunt, pers. comm.). Although primarily scattered throughout the Upper Keys, some breeders feed in areas of water lagoons and marshes with mangrove zones (Spendelow and Patton, 1988), and most go to the mainland (Sprunt, pers. comm.). Roseate spoonbills usually nest in the red and black mangroves of Florida Bay (Ogden, 1978c), with colonies on Sandy Key and Porjoe Key (Hoffman, pers. comm.). Most recently, they have been sighted near ponds with weedy bottoms in the town of Layton on Long Key, around shallow ponds on Cudjoe Key, and occasionally on Big Pine Key (Lazell, 1989). Nonbreeders occur south of Long Key (Sprunt, pers. comm.). Threats include habitat loss and food resource declines resulting from an inadequate flow of freshwater from the Everglades (Owre, 1990).

Roseate Tern (*Sterna dougallii*). Roseate terns primarily range from the Middle Keys to the Dry Tortugas (Spendelow and Patton, 1988), preferring to nest on shell/sand beaches, broken coral heaps, and eroded limestone in open or sparsely vegetated sites. They have historically been reported in areas including Coco Plum Beach (Marathon), islands off the Seven Mile Bridge, the Spoil Islands in Key West Harbor, and Molasses Reef Dry Rocks (Spendelow and Patton, 1988). Threats include the loss of nesting sites due to development, the disturbance of nest sites by humans, and the predation of nest sites by raccoons and black rats (Monroe County Board of County Commissioners, 1986).

Southeastern Snowy Plover (*Charadrius alexandrinus tenuirostris*). Southeastern snowy plovers require open, dry sandy beaches for breeding and both dry and tidal flats for foraging. No other bird species feeds and breeds on open, dry sand (Woolfenden, 1978). Although rare in the Keys and most common on Gulf coast beaches (Woolfenden, 1978) and Marco Island (Hoffman, pers. comm.), they have been sighted in the Middle Keys and Florida Bay. They are threatened by human beach use and domestic cats and dogs (Woolfenden, 1978).

White-crowned Pigeon (*Columba leucocephala*). White-crowned pigeons nest on small mangrove islands, from Elliott Key south to the Marquesas, and usually fly into large hardwood hammocks to feed (Bancroft et al., 1991). Breeding populations are dependent on hammocks for food, but because these hammocks occupy high ground they have been extensively developed for human habitation. Accordingly, hammock destruction is a major threat to the species (Bancroft et al., 1991).

Wood Stork (*Mycteria americana*). Wood storks are uncommon in the Keys, except in Barnes and Card sounds. Although nesting once occurred in the mangrove islets in Florida Bay (Spendelow and Patton, 1988), these colonies no longer exist (Hoffman, pers. comm.). Wood storks generally inhabit trees over standing water (including freshwater swamps and

marshes) or on islands, and feed on fish in shallow water (Ogden, 1978a). Population declines result from habitat loss and reduced fish productivity (which has reduced reproductive success) in altered freshwater wetlands such as the Everglades (Ogden and Nesbitt, 1979).

Mammals

Note: *Current threats for each of the whales listed below include the ingestion of chemical pollutants (e.g., pesticides, trace metals) passed through the food chain, marine debris (e.g., plastic bags and lost or discarded fishing gear) (Sadove and Morreale, 1989), entanglement in fishing gear, and collisions with boats (Odell, 1990). Threats to food resources include ocean pollution and competition from commercial fisheries (Odell, 1992). Also, because whales have such vast migration patterns, activities occurring outside the Sanctuary can ultimately have harmful impacts on individuals and populations travelling through the area. Threats considered specific to a particular species have been listed for that species.*

Blue Whale (*Balaenoptera musculus*). There are no records of blue whales in the waters of the Keys. However, because at least one has stranded on the Texas coast, it is possible that the species passes through the Sanctuary (Odell, 1990).

Fin Whale (*Balaenoptera physalus*). The incidence of several historical strandings throughout the Keys (Smithsonian Institution, unpublished data; Schmidley, 1981) suggests that fin whales pass through the Straits of Florida (Odell, 1990). Threats include fishing gear entanglements, collisions with vessels, ingestion of pollutants through the food chain, competition with the fisheries industry, and stress caused by whale-watching activities outside the Sanctuary (Odell, 1992c).

Humpback Whale (*Megaptera novaeangliae*). Although there are no historical records of humpback strandings in the Keys (Smithsonian Institution, unpublished data), the species has been sighted on both coasts of Florida (Schmidley, 1981), and may migrate through the region (Odell, 1990). Threats include fishing gear entanglements, collisions with vessels, pollutant ingestion through the food chain, natural biotoxins, stress caused by whale-watching activities outside the Sanctuary, and habitat modification caused by oil exploration and other human activities (Odell, 1992d).

Right Whale (*Eubalaena glacialis*). Because right whales have overwintering and calving grounds off Florida's east coast (Kraus, 1985) and because there have been recent sightings in Dade County and strandings in the Gulf of Mexico, it can be assumed that they pass through the waters of the Keys (Odell, 1990). Threats include entanglement and collisions with vessels, and recent photograph analysis indicated that 57 percent of North Atlantic right whales have scars indicative of such activities (Kraus, 1990). In addition, coastal pollution may affect food distribution and abundance, impeding whale recovery (Odell, 1992a).

Sei Whale (*Balaenoptera borealis*). Although there are no historical records of sei whales in the Keys, there are several stranding records for the Gulf of Mexico, Caribbean, and Florida's east coast (Smithsonian Institution, unpublished data), suggesting that the species passes through Sanctuary waters (Odell, 1990). Primary threats include a reduction of food resources by ocean pollution and competition from commercial fisheries (Odell, 1992b).

Sperm Whale (*Physeter macrocephalus*). Historical records indicate that sperm whales have stranded in areas throughout the Keys (Smithsonian Institution, unpublished data), and because they feed throughout the year (Schmidley, 1981), it is likely that they feed within the Sanctuary. The occasional stranding of calves suggests that Sanctuary waters may also be a calving area (Odell, 1990). Threats include entanglement in fishing gear and underwater cables, habitat modification by offshore oil development, and the ingestion of pollutants accumulated in the food chain (Odell, 1992e).

Florida Manatee (*Trichechus manatus*). A subspecies of the West Indian manatee, Florida manatees range from Upper Key Largo to Key West. They generally inhabit canals, creeks, and surrounding waters throughout the year, but are not exclusive to Monroe County, travelling to various coastal areas and rivers throughout the southeastern United States (FWS, 1989). They are frequently found in the fresh or brackish waters of large, slow-moving rivers, estuaries, coves, and bays, but can survive in other water types, including those that are saline or acidic (FWS, 1989). Because they prefer submergent, natant, rooted, and emergent vegetation, movements and aggregations of manatees can be correlated with the distribution of seagrasses and vascular freshwater aquatic vegetation (FWS, 1989). Human destruction and/or alteration of the species' habitat (i.e., seagrass) is a primary

threat that has already caused population declines. Other human-induced threats include collisions with boats and barges, fishing gear entanglements, crushing in flood gates or canal locks, and intentional killing (FWS, 1989; O'Shea and Ludlow, 1992).

Key Deer (*Odocoileus virginianus clavium*). A smaller subspecies of the Virginia white-tailed deer (*Odocoileus virginianus*), Key deer range from the Johnson Keys/Little Pine Key complex west to Lower Sugarloaf Key (FWS, 1985). Their range is currently restricted to the Lower Keys (Klimstra, 1992), with the greatest concentrations on Big Pine Key and No Name Key (FWS, 1985; Klimstra, 1992). They are known to swim between Keys, particularly when searching for fresh water in times of drought. Like most white-tailed deer, they utilize various habitats depending on availability, activity, and time of day (FWS, 1985). They most frequently occupy mangroves and hardwood hammocks during the day, as these areas provide escape cover, bedding, and loafing sites. They feed on a variety of plants but prefer red mangroves (FWS, 1985). Habitat use is affected by the availability of fresh water. The primary cause of species decline is the destruction or alteration of habitat by human development. Other threats include road kills, water source reductions (e.g., alteration or decreases of freshwater wetlands), harassment, dog attacks, poaching, and drowning (particularly of fawns in mosquito ditches) (FWS, 1985; Klimstra, 1992).

Key Largo Cotton Mouse (*Peromyscus gossypinus allapaticola*). The Key Largo cotton mouse is found only in and around the hardwood hammocks of northern Key Largo (Brown, 1978; Lazell, 1991). As human development has increased, there has been a corresponding decrease in available hammock habitat. The increase in human settlement has also led to an increase in the number of competing European rats and predatory house cats, causing a subsequent decline in the cotton mouse population (Lazell, 1991; Humphrey, 1992).

Key Largo Wood Rat (*Neotoma floridana smallii*). Found only in northern Key Largo, the Key Largo wood rat utilizes the island's hardwood hammocks as its primary habitat. The species is threatened by the loss of habitat resulting from human development (Lazell, 1989). An increase in human settlement has also led to a corresponding increase in competing European rats and predatory house cats, causing a subsequent decline in the wood rat population (Brown, 1978; Lazell, 1989; Humphrey, 1992).

Silver Rice Rat (*Oryzomys argentatus*). Ranging from Little Pine Key to Saddlebunch Keys, silver rice rat populations are concentrated on Cudjoe, Summerland, Big Torch, Middle Torch, Saddlebunch, Little Pine, Raccoon, Water, and Johnson keys (Humphrey, 1992). They feed throughout these areas, nesting in marsh and buttonwood zones. Most populations depend on wetland habitat containing intertidal red mangroves, salt marsh, and buttonwood. Because this species is not found outside the Lower Keys, a primary threat to its long-term survival is habitat loss due to land development (Lazell, 1989; Humphrey, 1992).

Lower Keys Marsh Rabbit (*Sylvilagus palustris hefneri*). Found on only a few islands in the Lower Keys, the Lower Keys marsh rabbit is an endemic species that ranges from Boca Chica Key to Big Pine Key (Lazell, 1989), living in transition lands at the edges of mangrove islands and in hardwood hammocks. Recent declines have resulted from habitat destruction due to human development, road kills, and juvenile mortalities caused by feral and domesticated house cats (Lazell, 1989; Wolfe, 1992).

Table 6. *Threatened and Endangered Animal and Plant Species by Jurisdiction*

Species		Jurisdiction	
Common Name	Scientific Name	Federal	State
Invertebrates			
Florida tree snail	*Liguus fasciatus*		S
Stock Island tree snail	*Orthalicus reses reses*	T	E
Pillar coral	*Dendrogyra cylindrus*		E
Schaus' swallowtail butterfly	*Heraclides aristodemus ponceanus*	E	E
Fish			
Common snook	*Centropomus undecimalis*		S
Key blenny	*Starksia starcki*		S
Key silverside	*Menidia conchorum*		T
Mangrove Rivulus	*Rivulus marmoratus*		S
Amphibians and Reptiles			
American alligator	*Alligator mississippiensis*	T*	S
American crocodile	*Crocodylus acutus*	E	E
Atlantic green turtle	*Chelonia mydas mydas*	E	E
Atlantic hawksbill turtle	*Eretmochelys imbricta imbricata*	E	E
Atlantic loggerhead	*Caretta caretta caretta*	T	T
Atlantic ridley turtle	*Lepidochelys kempii*	E	E
Leatherback turtle	*Dermochelys coriacea*	E	E
Striped mud turtle	*Klinosternon bauri*		E
Big Pine Key ringneck snake	*Diadophis punctatus*		T
Eastern indigo snake	*Drymarchon corais couperi*	T	
Florida brown snake	*Storeria dekayi victa*		E
Florida Keys mole skink	*Eumeces egregius egregius*		S
Florida ribbon snake	*Thamnophis sauritas sackeni*		T
Miami black-headed snake	*Tantilla oolitica*		T
Red rat snake	*Elaphe guttata guttata*		S
Birds			
American kestrel	*Falco sparverius sparverius*		T
American oystercatcher	*Haematopus palliatus*		S
Arctic peregrine falcon	*Falco peregrinus tundrius*	T	E
Bachman's warbler	*Vermivora bachmani*	E	E
Bald eagle	*Haliaeetus leucocephalus*	E	T
Brown pelican	*Pelecanus occidentalis*		S
Burrowing owl	*Athene cunicularia*		S
Cape Sable seaside sparrow	*Ammodramus maritimus mirabilis*	E	E
Florida sandhill crane	*Grus canadensis pratensis*		T
Least tern	*Sterna antillarum*		T
Little blue heron	*Egretta caerulea*		S
Snowy egret	*Egretta thula*		S
Tricolored heron; Louisiana heron	*Egretta tricolor*		S
Osprey	*Pandion haliaetus*		S
Piping plover	*Charadrius melodus*	T	T
Reddish egret	*Egretta rufescens*		S
Roseate spoonbill	*Ajaia ajaja*		S
Roseate tern	*Sterna dougallii*	T	T
Southeastern snowy plover	*Charadrius alexandrinus tenuirostris*		E
White-crowned pigeon	*Columba leucocephala*		T
Wood stork	*Mycteria americana*	E	E
Mammals			
Blue whale	*Balanoptera musculus*	E	
Fin whale	*Balaenoptera physalus*	E	
Humpback whale	*Megaptera novaeangliae*	E	
Right whale	*Eubalaena glacialis*	E	
Sei whale	*Balaenoptera borealis*	E	
Sperm whale	*Physeter macrocephalus*	E	
Florida manatee	*Trichechus manatus*	E	E
Key deer	*Odocoileus virginianus clavium*	E	E
Key Largo cotton mouse	*Peromyscus gossypinus allapaticola*	E	E

Abbreviations: E, Endangered; T, Threatened; S, Species of Special Concern
Federal designation classified by U.S. Fish and Wildlife Service
State designation classified by Florida Game and Fresh Water Fish Commission

*Due to similarity of appearance to American crocodile

Table 6. *Threatened and Endangered Animal and Plant Species by Jurisdiction (cont.)*

Species		Jurisdiction	
Common Name	Scientific Name	Federal	State
Mammals (cont.)			
Key Largo wood rat	*Neotoma floridana smallii*	E	E
Silver rice rat	*Oryzomys argentatus*	E	E
Key Vaca raccoon	*Procyon lotor auspicatus*		S
Lower keys marsh rabbit	*Sylvilagus palustris hefneri*	E	E
Plants			
Aboriginal prickly apple	*Cereus gracilis var. aboriginum*		E
Apalachicola milkweed; green milkweed	*Asclepias viridula*		T
Aspidium fern (unnamed)	*Thelypteris kunthii*		T
Bahama sachsia	*Sachsia bahamensis*		E
Balsam apple (unnamed)	*Clusia rosea*		E
Bay cedar	*Suriana maritima*		E
Beach creeper	*Ernodia littoralis*		T
Big Pine partridge pea; Florida Keys senna	*Casia keyensis*		T
Bird's nest spleenwort; wild bird nest fern	*Asplenium serratum*		E
Blodgett's wild-mercury	*Argythamnia blodgettii*		E
Boston fern (unnamed)	*Nephrolepis biserrata*		T
Buccaneer palm; Sargent's cherry palm	*Psuedophoenix sargentii*		E
Burrowing four-o'clock	*Okenia hypoganea*		E
Butterfly orchid	*Encyclia tampensis*		T
Carter's small-flowered flax; Everglades flax	*Linum carteri var. carteri*		E
Cowhorn orchid; cigar orchid	*Cyrtopodium punctatum*		E
Cupania	*Cupania glabra*		E
Dildoe cactus	*Cereus pentagonus*		T
Dollar orchid; dogtooth orchid	*Encyclia boothiana var. erythronioides*		E
Everglades poinsettia	*Poinsettia pinetorum*		E
Florida Keys noseburn, South Florida tragia	*Tragia saxicola*		E
Florida peperomia	*Peperomia obtusifolia*		E
Florida three-awned grass; Key West three-awn	*Aristida floridana*		E
Garber's spurge	*Euphorbia garberi*	T	E
Geiger tree	*Cordia sebestena*		E
Giant leather fern	*Acrostichum danaeifolium*		T
Golden leather fern	*Acrostichum aureum*		E
Inkberry	*Scaevola plumieri*		T
Inkwood	*Hypelate trifoliata*		T
Joewood	*Jacquinia keyensis*		T
Johnson’s Seagrass	*Halophia Johnsonii*		T
Ladder brake fern	*Pteris longifolia*		T
Lignum-vitae tree	*Guaiacum sanctum*		E
Little strongback	*Bourreria cassinifolia*		E
Mahogony mistletoe	*Phoradendron rubrum*		E
Manchineel	*Hippomane mancinella*		T
Mand adder's tongue fern	*Ophioglossum palmatum*		E
Michaux's orchid; long-horned orchid	*Habenaria quinquesta*		T
Parsley fern	*Sphenomeris clavata*		T
Pepper (unnamed)	*Peperomia humilis*		E
Pine fern	*Anemia adiantifolia*		T
Pine pink	*Bletia purpurea*		T
Polypody fern (unnamed)	*Microgramma heterophylla*		T
Polypody fern (unnamed)	*Polypodium dispersum*		T
Porter's broom spurge	*Chamaesyce porteriana var. scoparia*		E
Porter's hairy-prodded spurge	*Chamaesyce porteriana var. porteriana*		E
Powdery catopsis	*Catopsis berteroniana*		E
Prickly pear cactus (unnamed)	*Opuntia stricta*		T
Pride-of-big-pine	*Strumptia maritima*		E
Red berry ironwood	*Eugenia confusa*		T
Red stopper	*Eugenia rhombea*		E
Sand flax	*Linum arenicola*		E
Satinleaf	*Chrysophyllum olivaeforme*		E
Sea lavendar	*Mallotonia gnaphalodes*		E

Abbreviations: E, Endangered; T, Threatened; S, Species of Special Concern
Federal designation classified by U.S. Fish and Wildlife Service
State designation classified by Florida Game and Fresh Water Fish Commission

Table 6. *Threatened and Endangered Animal and Plant Species by Jurisdiction (cont.)*

Species		Jurisdiction	
Common Name	Scientific Name	Federal	State
Plants (cont.)			
Semaphore cactus	*Opuntia spinossisima*		E
Shell orchid; clamshell orchid	*Encyclia cochleata*		T
Shoestring fern	*Vittaria lineata*		T
Small's milkpea	*Galactia smallii*	E	E
Small-flowered lilly-thorn; dune lilly-thorn	*Catesbaea parviflora*		E
Southern ladies' tresses	*Spiranthes tortilis*		T
Strap fern (unnamed)	*Campyloneurum phyllitidus*		T
Tamarindillo	*Acacia choriophylla*		E
Tree cactus	*Cereus robinii*	E	E
Twisted air plant	*Tillandsia flexuosa*		T
West Indian mahogany	*Swietenia mahogani*		T
Whiskfern; forkfern	*Psilotum nudum*		T
Wild cotton	*Gossypium hirsutum*		E
Wild pine; air plant (unnamed)	*Tillandsia circinata*		T
Wild pine; air plant (unnamed)	*Tillandsia paucifolia*		T
Wild pine; air plant (unnamed)	*Tillandsia setacea*		T
Wild pine; air plant (unnamed)	*Tillandsia valenzuelana*		T
Wild thyme spurge, wedge spurge	*Chamaesyce deltoidea serpyllum*		E
Wild pine; air plant (unnamed)	*Tillandsia balbisiana*		T
Worm vine orchid; link vine	*Vanilla barbellata*		E
Yellowheart	*Zanthoxylum flavum*		E

Abbreviations: E, Endangered; T, Threatened; S, Species of Special Concern
Federal designation classified by U.S. Fish and Wildlife Service
State designation classified by Florida Game and Fresh Water Fish Commission

Table 7. *Status of Florida Keys Protected Plant Species*

	Habitat							Range				Reason for Decline				
Species	Rocky Pinelands	Tropical Hammocks	Coastal Dunes	Mangroves	Brackish Wetlands	Thickets	Not Available	Lower Keys	Upper Keys	Mainland	Not Available	Collection	Development	Nuisance Removal	Natural	Unknown
Aboriginal prickly apple		●			●			●	●	●			●			
Apalachicola milkweed; green milkweed							●				●					●
Aspidium fern (unnamed)		●									●	●	●			
Bahama sachsia	●							●		●			●			
Balsam apple (unnamed)		●						●					●			
Bay cedar			●					●					●			
Beach creeper			●						●	●			●			
Big Pine partridge pea; Florida Keys senna	●							●					●			
Bird's nest spleenwort; wild bird nest fern		●						●	●	●		●				
Blodgett's wild mercury							●				●					●
Boston fern (unnamed)		●									●	●	●			
Buccaneer palm; Sargent's cherry palm			●						●	●		●	●		●	
Burrowing four-o'clock			●						●	●			●			
Butterfly orchid		●			●						●	●				
Carter's small-flowered flax; Everglades flax							●				●					●
Cowhorn orchid; cigar orchid					●					●		●				
Cupania		●						●					●			
Dildoe cactus		●	●					●	●				●			
Dollar orchid; dogtooth orchid		●				●					●	●				
Everglades poinsettia							●				●					●
Florida Keys noseburn, South Florida tragia	●							●					●			
Florida peperomia							●				●					●
Florida three-awned grass; Key West three-awn							●				●					●
Garber's spurge	●	●							●	●			●			
Geiger tree		●			●								●			
Giant leather fern	●	●		●				●	●	●						●
Golden leather fern	●	●		●				●	●	●						●
Inkberry			●						●				●			
Inkwood				●	●						●					●
Joewood		●	●					●					●			
Johnson's seagrass					●						●					●
Ladder brake fern							●	●								●
Lignum-vitae tree		●							●			●	●			
Little strongback	●							●					●			
Mahogony mistletoe		●							●				●		●	

Table 7. *Status of Florida Keys Protected Plant Species (cont.)*

Species	Habitat							Range				Reason for Decline				
	Rocky Pinelands	Tropical Hammocks	Coastal Dunes	Mangroves	Brackish Wetlands	Thickets	Not Available	Lower Keys	Upper Keys	Mainland	Not Available	Collection	Development	Nuisance Removal	Natural	Unknown
Manchineel					●	●		●	●	●			●	●		
Mand adder's tongue fern		●								●		●			●	
Michaux's orchid; long-horned orchid		●									●	●	●			
Parsley fern							●				●					●
Pepper (unnamed)							●				●					●
Pine fern	●							●					●			
Pine pink	●							●					●			
Polypody fern (unnamed)		●									●	●	●			
Polypody fern (unnamed)							●				●					●
Porter's broom spurge	●							●					●			
Porter's hairy-prodded spurge							●				●					●
Powdery catopsis	●	●		●					●	●		●				
Prickly pear cactus (unnamed)		●	●		●				●				●			
Pride-of-Big-Pine					●			●					●			
Red berry ironwood		●									●		●			
Red stopper		●						●					●			
Sand flax	●							●					●			
Satinleaf		●						●	●				●			
Sea lavendar			●					●	●	●			●			
Semaphore cactus		●			●						●		●			
Shell orchid; clamshell orchid		●									●	●				
Shoestring fern		●		●							●		●			
Small's milkpea	●									●			●			
Small-flowered lilly-thorn; dune lilly-thorn	●							●					●		●	
Southern ladies' tresses							●				●					●
Strap fern (unnamed)		●									●		●			
Tamarindillo		●		●					●							●
Tree cactus		●						●					●			
Twisted air plant		●						●	●	●			●			
West Indian mahogany		●						●	●				●			
Whiskfern; forkfern	●										●					●
Wild cotton						●		●	●	●				●		
Wild pine; air plant (unnamed)		●		●	●			●	●				●			
Wild pine; air plant (unnamed)		●						●	●	●			●			

Table 7. *Status of Florida Keys Protected Plant Species (cont.)*

Species	Habitat							Range				Reason for Decline				
	Rocky Pinelands	Tropical Hammocks	Coastal Dunes	Mangroves	Brackish Wetlands	Thickets	Not Available	Lower Keys	Upper Keys	Mainland	Not Available	Collection	Development	Nuisance Removal	Natural	Unknown
Wild pine; air plant (unnamed)		●						●	●	●			●			
Wild pine; air plant (unnamed)	●															
Wild pine; air plant (unnamed)																
Wild thyme spurge, wedge spurge	●							●					●			
Worm vine orchid; link vine		●		●				●	●	●		●				
Yellowheart																

Cultural and Historic Resources

The history of the Keys can be most easily observed through the region's land-based cultural and historic resources. The numerous buildings in “old town” Key West, for example, represent a time when the town was the crossroads of the Caribbean, and the bridges of Henry Flagler suggest the transition from a seafaring to an industrial age. Despite this shift, the sea remains the common thread through the region’s cultural and historic sites. From the prehistoric Indian mounds of the Upper Keys to the Customs House of Key West, ties to the sea are everywhere, indicating a strong regional connection to the Bahamas and the Caribbean.

Because of the Keys’ significant maritime history, submerged cultural and historic resources are as representative of the area's past as those on land. Such sites provide clues to deciphering the area’s historical settlement patterns and may be useful in determining global climate change through the examination of the stratigraphic record. Also, because of Florida's unique position on European and American trade routes, shipwrecks in the Keys contain a record of the 500-year European occupation of the Americas.

Submerged Paleo-Indian Sites

The inaccessibility of underwater sites has ensured that many delicate artifacts remain undisturbed. In addition, the environment of reduced oxygen, temperature, and light permits many artifacts to remain well preserved for thousands of years. The importance of the submerged cultural resources of the Florida Keys is great, and the possibility exists for discovering some of the earliest sites in North America. Such archaeological finds will provide clues to answering such important questions as the peopling of the Americas and global climate change in the past (Mathewson 1991).

Archaeologists have unearthed remarkable finds in Florida using a hypothesis for site formation based upon geologic and climatologic constraints in the last phases of the Wisconsin Glaciation. As discoveries have shown, sinkholes commonly found in limestone areas contain some of the earliest records of man in North America. The possibility of discovering such sinkholes exists in the Keys (Clausen et al, 1975,1979).

A recent discovery by Eugene Shinn of the United States Geological Survey has raised the possibility of Pleistocene archaeological sites in the Florida Keys (Mathewson 1977, 1992). In 1991 aerial surveys revealed a submarine feature that appeared to be a sinkhole in approximately 10 meters of water off of Key Largo. The 600-meter diameter feature was probed with a high pressure jet, and was found to be filled with impermeable lime muds overlain by about four meters of carbonate reef sand (Shinn, pers. comm.). Investigators feel that this feature may be similar to the famous “Blue Holes” or underwater sinkholes found in the Bahamas and elsewhere. Due to its shallow depth, this feature would have been a cenote (sinkhole) on dry land for most of its history. It would have contained fresh water, not unlike Little Salt Spring. The steep banks of this feature make the prospects for human habitation very good. Thus, the Keys have an excellent prospect for human and animal remains that are between 12,000 and 15,000 years old. In addition, because the mud overburden is impermeable, any remains found will likely be well preserved. As research and industry continue to request permission to conduct activities on the outer continental shelf, managers and legislators must be aware of the possible existence of cultural resources in these areas, and must guard against their destruction.

Seafaring Legacy

1500-1700 Exploration and Early Colonial Development

This period begins with the Spanish “discovery” of the Caribbean, Gulf of Mexico, and the peninsula of Florida and ends with the English settlement of the nearby Bahamas just prior to the establishment of colonies in neighboring Georgia and South Carolina. Early explorations in Florida waters by Ponce de Leon and others discovered the shallow depths of the Gulf, the rocky islands of the Keys, and the swift current of the Florida Straits. With the establishment of a routine convoy system between Spain and her new colonies, Havana became a major port for returning fleets. After a Spanish failure to settle at Pensacola due to a devastating loss of ships in a hurricane, and after a decline in French rivalry on the east coast, again accompanied by a loss of ships in a storm, the founding of St. Augustine in 1565 established uncontested Spanish control over the Straits of Florida well into the 18th century. By the mid 1600s, a chain of missions stretched across northern Florida from the Gulf to the Atlantic, and was supplied by a

small but growing maritime trade network based from Cuba.

With the growth of other European colonies at the end of this period, ships of other nations plying the same homeward route past Florida unintentionally ended their voyages along the shores including the English wreck of the "Reformation" along with two of her consorts in 1696 on the east coast.

1701-1820 Early Maritime Development of the United States

During this period the British colonies of North and South Carolina, and Georgia developed a firm economic base and experienced a major increase in population. While the Spanish colony in Florida stagnated, these northern colonies matured into prospering mercantile communities, as did those English possessions in the Caribbean. The period is marked by a tremendous increase in the volume of shipping past Florida over the previous period, as both maritime technology and overseas trade underwent a rapid evolution. The Spanish convoy system experienced a gradual decline, accompanied by two major fleet disasters along the coast of Florida, in 1715 and in 1733. The Spanish presence in West Florida was briefly challenged by the French in the early years of the period; by the Treaty of Paris in 1763 both East and West Florida fell under British control. Despite Spanish sympathy with the American Revolution, Britain managed to retain her strategic naval outposts in Florida until 1781, when Pensacola fell to Spanish naval forces. The most outstanding cultural phenomena of the later years of this period was a rapid development of American maritime dominance in the region, as both political control and an increasing share of maritime commerce passed to the United States. The year in which ownership of Florida passed from Spain to the United States is chosen as the closing date of this period.

1821-1865 Establishment of the United States as a Naval Power

This period is marked by unprecedented economic expansion and national development, but is an era which ultimately led to war. Commercial sailing vessels reached their highest stage of evolution with the appearance of the great clipper ships, and steam began to be widely utilized in maritime commerce and naval power. In Florida, major shipping ports began to flourish on both coasts, bringing the state into the rapid expansion of a global American trade network. Settlements in the interior were serviced by a growing steamboat trade along Florida's river systems, and coastal commerce in lumber, naval stores, and fish accompanied an increase in population at the end of the Seminole wars. Florida's rise in maritime importance was marked not only by her commercial role, but also by her strategic geographical role as the nation's southern boundary, as coastal forts were built to defend this maritime frontier. Near the end of this period, sectional disputes erupted into a civil war, which, in Florida was played out on the water, rather than on land. The end of the Civil War in 1865 is chosen as the concluding date of this period.

1866 - 1912 Reconstruction, the Dominance of Steamship Technology

After the Civil War, Florida, as well as other southern states, underwent a period of reconstruction that lasted for decades. Coastal urbanization continued hand in hand with increased maritime mercantile development. The ports of Jacksonville, Pensacola, Tampa, Cedar Key, Apalachiacola, and Key West came into their prime, as the dominance of steamship technology made sailing vessels obsolescent in oceangoing commerce. On the Florida Reef, as wreckers continued to salvage cargos from grounded ships to be sold at Key West auctions, a system of lighthouses was established to aid in coastal navigation. On Florida's rivers, steamboat commerce entered a twilight period, as improved railroad networks serviced the interior of the peninsula. This period saw the emergence of the American Merchant Marine, and the Modern Navy appeared towards the end of the century as the United States responded to a growing naval buildup in Europe and Asia. Florida became a routine port-of-call for the newest steel fighting ships; Tampa was a major staging area for the Spanish-American War.

1913-1945 World Wars and the Coming of the Modern Era

Beginning with the completion of the Flagler railroad in 1913, this period saw the development of South Florida accompanied by more diversified and modern commerce. The United States became increasingly involved in world politics, as it had with world commerce in the preceding period. This involvement eventually drew the nation into the first World War, when, for the first time its neutral maritime commerce was subjected to attack by German submarines. Following World War I came Prohibition, with its rumrunners and coastal blockade established to thwart them.

During these years steamships underwent further technological improvements as fuel oil began to replace coal as the major energy source. With the outbreak of World War II in 1939, the United States once again started on the path to conflict as it provided needed support to its traditional allies in Europe. Beginning with a formal declaration of war in 1941, a savage naval conflict commenced along the eastern North American seaboard. Staggering losses to American merchant vessels were caused by German submarines, especially off the east coast of Florida. This period ends in 1945 with the end of the war.

Lighthouses

There are currently 16 lighthouses within or just outside the Sanctuary, with three listed in the National Register of Historic Places (Dean, 1992). There are also three land-based lighthouses in the Keys.

Before permanent lighthouses were built to save ships and their cargo from the reef, lightships were used at various sites to warn of danger. The first lightship stationed in the Keys was built in 1824 to warn ships of the Carysfort reef. Early lightships occasionally broke free from their moorings, causing other ships to strike the reef as their captains tried to plot a safe course. A lightship was stationed at the reef, 13 km off Key Largo, until 1852, when an ironpile light was built directly on the coral.

Construction of the lighthouses in Key West and on Garden Key (Fort Jefferson) was begun in 1825. Construction was also begun on a 70-foot tower in the Dry Tortugas, on Loggerhead Key, only a few miles from Fort Jefferson. The following year, a masonry lighthouse was constructed on Sand Key. A hurricane toppled both the 60-foot Sand Key Light and the 85-foot Key West Light in 1846. The Key West Light was rebuilt in 1847, while Sand Key Light was replaced with an ironpile light. The original Garden Key Light was built in the middle of the island, surrounded by Fort Jefferson. A 157-foot light replaced it in 1858, but eventually burned down and was replaced by a new harbor light on the wall of the fort.

Once improved construction materials and techniques were developed, lighthouses could be constructed directly on the reef. Construction of the first of six original reef lighthouses was begun in 1852. These reef lights were located in shallow water several kilometers from the main chain of islands. The most common type was the ironpile, a derivative of the screwpile lighthouses common in northern waters. Ironpiles have an iron framework that is open to wind and waves. The legs are screwed into the coral, and a keeper's quarters is built about one-third of the way up. The open structure allows most of the wind and wave action to pass through without encountering much resistance, while an enclosed circular stairwell protects the keeper up to the light housing. Significant early reef lighthouses include: Fowey Rocks Light (1878), Carysfort Reef Light (1852), Sombrero Key Light (1858), Alligator Reef Light (1873), American Shoal Light (1880), and Sand Key Light (1853).

Shipwrecks

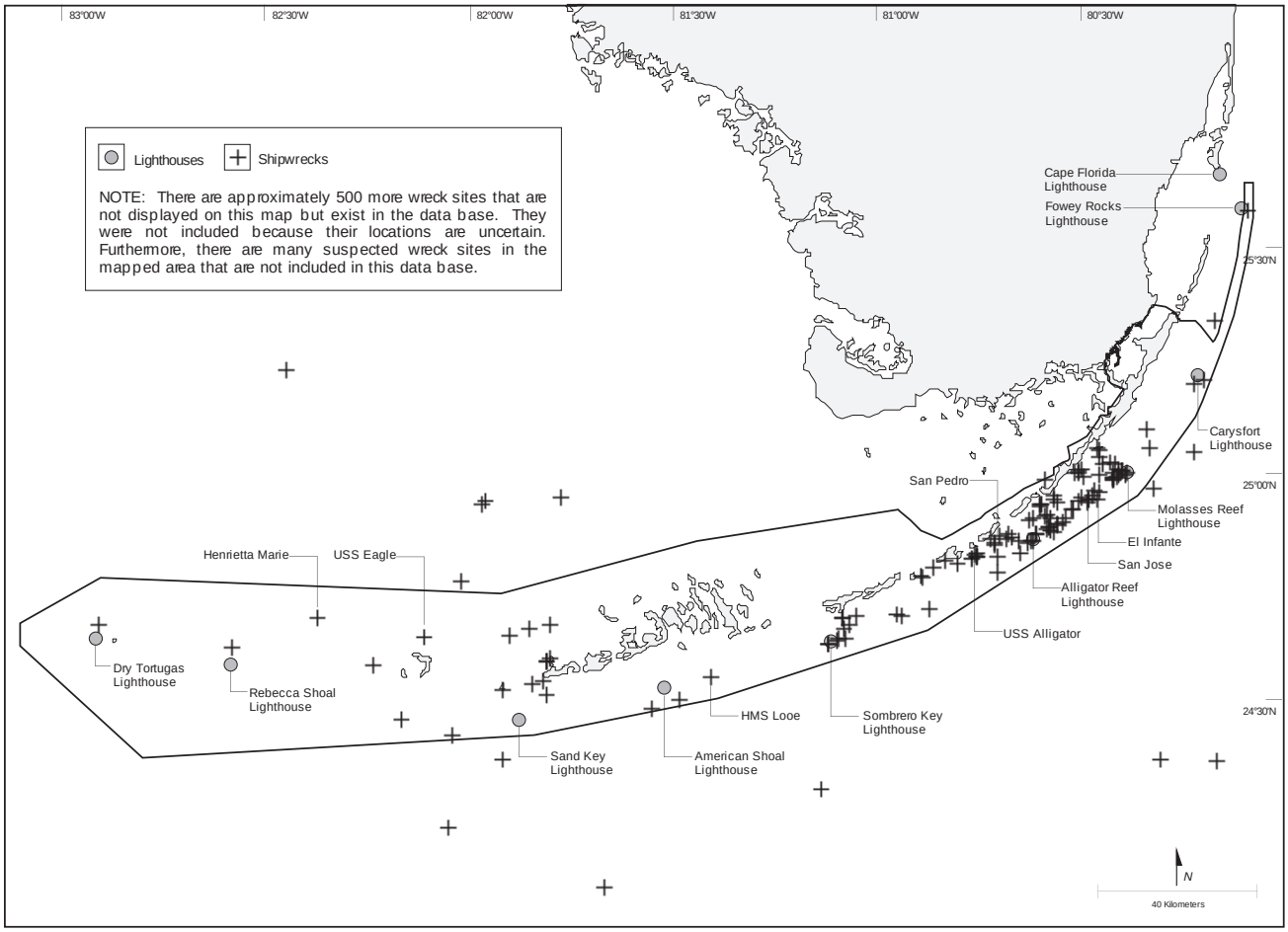
Location and Causes. In attempting to predict the location of shipwrecks in the Keys, several factors must be considered, including where high shipping concentrations have occurred, which areas have been used most consistently over time, the depth of the water navigated, and the existence of natural hazards which may increase the probability of wrecks (Mathewson 1981,1991; Halas 1988).

High concentrations of ships are commonly found along trade routes (Figure 9). Because the Keys are located at the southernmost point of the continental United States and at the end of a peninsula, all ships travelling from one side of the continent to Europe must pass through the area. In addition, the narrowness of the Straits of Florida and the speed of the northward-flowing Gulf Stream mean that ships travelling north will use this route over most others.

The use of trade routes over time also influences the number of shipwrecks in an area. If the shipping route is important for only a short time and is then discontinued, one can expect a lower abundance of wrecks and less historic diversity among those found. Because the Keys have remained on important trade routes for centuries, shipwreck losses occurring in the area represent the full spectrum of maritime history (Table 8).

Water depth is also a factor in determining the number of shipwrecks in an area. For example, it has been proposed that up to 98 percent of all wrecks in the western hemisphere before 1825 occurred in water less than 10 m deep (Marx, 1971). In addition, a 1989 Gulf of Mexico study sponsored by the United States Minerals Management Service (MMS) produced shipwreck distribution plots across the colo-

Figure 9. *Locations of Historic Lighthouses and Selected Shipwrecks*



nial-modern period, showing 75 percent of all losses occurred in nearshore waters (Garrison et al., 1989). Accordingly, with their abundant shallows, the Keys offer an above-average possibility for shipwreck location.

Natural factors are often a direct cause of wrecks. The Florida Reef Tract was unmarked prior to 1825 (Chambers, 1991), and the area's shallow, sporadically occurring corals are difficult to see from a distance. Combined with a low land profile, it is extremely difficult to determine a ship's position relative to the reef. Even with today's modern navigational aids, ship groundings occur (e.g., the M.V. WELLWOOD in 1984 and the ALEC OWEN MAITLAND in 1989), and the constantly curving reef tract presents additional problems for navigators, especially when coasting.

In addition, the prevalence of hurricanes in the Keys has influenced the number of ships wrecked. At least two Spanish flotas were wrecked by hurricanes, and as a result the Keys contain the largest concentration of 18th-century Spanish colonial shipwrecks in the Americas.

Florida is situated along what once was a major trade route between the Empire of Spain and her colonies in the Americas. As the great treasure fleets began their journeys back to Spain laden with coinage from the American mints and other riches from the New World, even the safest route known — the straits between Florida and the Bahamas or the New Bahamas Channel — was fraught with enormous danger and uncertainty. Hurricanes and reefs claimed hundreds of Spanish ships — in some cases, entire fleets such as the 1622, 1715, and the 1733 Fleets. Scores of vessels sank during this period due to errors in navigation, poor ship construction, and storms. (M. Peterson, 1975) (E. Lyon, 1985, 1992)

War and naval battles are also factors in shipwrecks. Naval losses range from vessels chased into shoal waters to those sunk through direct military engagement. Conflicts that may have contributed to wrecks

Table 8. *Prominent Shipwrecks by Era and Integrity*

Era	Integrity* High	Moderate	Low
pre 1700	Seahawk	Atocha	American Shoal Winchester
1701 - 1820	San Jose Henrietta Marie	San Pedro	Sueco de Arizon USS Alligator HMS Looe
1821 - 1865		Issac Allerton USS Alligator	Rigging Wreck**
1866 - 1912	Northern Lights		Granite Wreck**
1913 - 1945		Benwood	
1945 - present	Duane Bibb	Eagle	

* Integrity of a wreck site refers to the degree of disturbance/degradation of the hull structure, ballast, hardware, and small finds. The integrity will depend on cause of sinking, water depth, nature of environment, and adverse impacts of natural and human activities.

**Designates Local Name (vernacular) for wreck not the documented name.

in Sanctuary waters include the Seminole Indian wars, the American Civil War, the Spanish-American War, the prohibition period, and World Wars I and II.

Shipwreck Concentration. There is strong statistical evidence indicating that the Keys contain a high concentration of shipwreck sites. This evidence is derived from both actual ship remains found on the seabed and historical and other documentation. However, documentary evidence may not accurately reflect the true number of ships on the bottom. And although many ships that sank in the Upper Caribbean are undocumented and are likely to be found in Keys' waters, most were salvaged shortly after wrecking. Countries such as Spain, for example, had effective salvage teams and an excellent communications system to report sinkings and recover supplies.

Throughout the history of shipwreck losses in the Keys, there were salvors. From the mid 1500's to the mid 1800's, Calusa Indians, Spaniards, French, Dutch, English, Bahamian and others carried out extensive recovery on vessels lost in the Keys and throughout Florida. Though recovery peaked in the late 1700's through the 1800's, it was always present. The commercial salvage of ships and cargos in distress became profitable for small groups of determined sailors in Key West and the Upper Keys in the early-to mid-1800's. These sailors in the Keys became known as "wreckers" and legend has it that some deliberately lured vessels into hazardous waters. Wreckers were a choice of last resort for masters of ships in distress, however, as they were usually more interested in salvaging cargo than saving ships. The number of vessels used in wrecking increased from 20 in 1835 to 57 licensed vessels in 1858. But as the first formal coastal survey of the reefs and keys began in 1849, and a system of lighthouses was constructed along the reef, the number of shipwrecks began to decline. The business of wrecking, however, continued into the next century; between 1900 and 1910, more than $220,000 was awarded by court decree, and more than $100,000 was paid for claims out of court. In 1921, the wrecking register of the Key West District Court was closed.

During the Keys' American period, there were salvors as well. These "wreckers" were professionals who operated in Key West and the Upper Keys in the early- to mid-1800s. Wreckers were a choice of last resort for shipmasters, however, as they were usually more interested in salvaging cargo than saving ships.

Historical Data Bases. To demonstrate the Keys' potential shipwreck resources, four databases have been selected for analysis. These databases, however, do not reflect actual recorded finds. Instead, they represent a combination of recorded finds and archival references that together provide a representative view of the area's shipwreck resources.

Table 9 illustrates the large number of documented shipwrecks in the Keys, possibly the richest repository in the world. Information is based on data compiled by Judy Halas (Halas, 1988), by Robert Marx (Marx, 1971), and by Duncan Mathewson et al, 1981. Additional analytical information was taken from an outer continental shelf study funded by the MMS (Garrison et al., 1989).

The independent database covers the entire colonial-modern period and integrates State records, treasure salvage records, and independent archival sources. The Halas study is based on archival information, and is the most accurate for American vessel traffic into the 19th and 20th century. It focuses primarily on the greater Key Largo area, but includes information on other keys as well. The Marx data is rich in 16th century vessel reports, many of Spanish origin, as a result of the researcher's interest in treasure hunting operations. Although the vessels cited are not exclusive to the Keys, and precise wreck location is never cited, however, based on the public comments, other records and opinions, it is reasonable to assume that many of these 16th - 18th century wrecks lie within Sanctuary waters. The 1981 MMS study delineates probablity zones for shipwrecks

Table 9. *Database Comparison of Ships Lost or Wrecked in the Keys by Century*

Century	Independent Database	Halas Study	Marx Study
16th	18	N/A	27
17th	28	18	25
18th	98	77	112
19th	267	704	118
20th	131	81	N/A

along the Florida reef tract as far as Key West. The more recent 1989 MMS (Garrison, et al) study deals with the projected shipwreck populations in the Dry Tortugas-Marquesas area west of Key West.

Modern Era Shipwrecks. Recent shipwrecks and ships sunk to form artificial reefs may also be considered cultural resources. The BENWOOD, for example, a World War II-era vessel scuttled off Key Largo, is over 85 years old and may soon qualify for historic status under Federal Historic Preservation law. Divers generally enjoy modern wrecks, such as the Duane and the Bibb, because more of their structure remains intact and identifiable, i.e. high integrity.

Vessels such as the NEPTUNE, an early 20th century wreck located in 60 m of water off Key Largo, may present a dilemma in the future, however. As diving technology improves, historically valuable wrecks that are currently inaccessible to the sportdiving community will become more popular. These deeper wrecks have many artifacts that may be pilfered by the uneducated or unscrupulous diver. Only by protecting these submerged resources can their historic value be preserved.

Human Activities and Uses

Human activities and uses have a major impact on Sanctuary resources. One of the most valuable of these resources is water, and because of its recreational, commercial, and transportation value, its use and conservation are directly linked to the economy of Monroe County.

Water and other Sanctuary resources have been increasingly impacted by the area's growth. As the number of visitors to the Keys has increased over the past several decades, so has the number of residents, homes, jobs, and businesses. The population of Monroe County has grown by 160 percent during the past 40 years, an increase of almost 50,000 people. In recent years, areas such as Key Largo, Marathon, and Big Pine Key have seen dramatic increases in population and development. As population grows and the Keys accommodate ever-increasing resource-use pressures, the quality and quantity of land and water resources are diminished. This section summarizes the major human activities and uses that directly or indirectly affect the waters of the Sanctuary.

Population

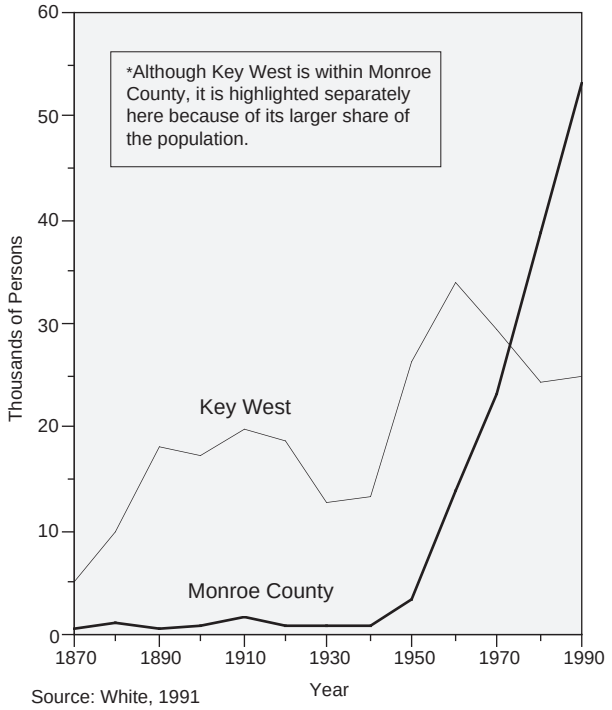
Of the 1,700 islands in the Keys, only 51 are connected to or by US 1, and fewer than 70 are inhabited. In 1990 the total resident population was 78,024, an increase of about 15,000 since 1980. Seasonal visitors, including those living in residential accommodations, in tourist facilities, aboard vessels, or with friends and relatives, accounted for an additional 56,643 people during the peak period of 1990. Dade and Collier counties, which are neighbors of Monroe County, had estimated 1990 populations of 1.94 million and 152,000, respectively.

Because of the region's unique geography, the Keys are divided into discreet population centers. Larger islands, such as Key Largo, have multiple population foci, while other islands have just one. Several inhabited Keys have never been the focus of concentrated growth, however, and remain rural. Certain areas have also become the center of communities, and can be defined by their “sense of community,” rather than their population. The size of an area is often determined by the boundaries of the islands on which it is located. Examples include Ocean Reef Club (North Key Largo), Key Largo, Tavernier (Southern Key Largo), Plantation Key, Islamorada (Upper Matecumbe Key), Layton (Long Key), Marathon (Vaca Key and Key Colony Beach), Big Pine Key, Summerland Key, Big Coppitt Key, Stock Island, and Key West.

Historic Population. The City of Key West has historically been the hub of population and activity in the Keys. Prior to 1940, Key West was home to 90 percent of the population of Monroe County. Growth was sporadic during this time, with the county's rate generally mirroring that of Key West. The Keys' population more than tripled between 1870 and 1890. From 1890 to 1900 and 1910 to 1930 there were significant declines in both populations, and from 1940 to 1960 the population of both areas grew at a similar rate. However, between 1960 and 1990 the population of Key West declined or became stable, while in the remainder of the county the population grew at a rate of 1.0 to 2.4 percent per year on average. The decline in Key West's population may be attributed to a decrease in the area's military population, while the lure of vacant land has allowed the rest of Monroe County to grow independently. Figure 10 shows historical population trends in Key West and Monroe County between 1870 and 1990.

Seasonal Population. Monroe County's economy is essentially based on tourism and tourist-related service industries, and the Keys' population fluctuates seasonally. Peak tourist populations occur in the

Figure 10. *Resident Population of Monroe County and Key West, 1870-1990*



Source: White, 1991

first quarter (January to March) of each year. The tourist season is longer in the Upper Keys than in the Lower Keys, extending from January to August, and is based on weekend tourists from Miami and South Florida.

The sum of the peak seasonal and resident populations is known as the functional population. In 1990 the Keys' functional population was about 134,600, with a population density of 1,300 persons per square mile. This combined population is important because of its impact on infrastructure requirements, resources, and the government's ability to manage these resources. The seasonal population accounts for nearly 42 percent of the functional population during the peak tourist season.

Table 10 gives resident and peak seasonal population estimates for 1990 by Planning Analysis Area/ Enumeration District (PAED) for the unincorporated areas of the county, and Census Designated Place (CDP) for the three incorporated areas. PAEDs are areas where contiguous boundaries exist between aggregated planning area boundaries and census enumeration districts. The estimates in the table represent the 1990 total resident, seasonal, and functional populations for each area. In addition, the population density for each PAED or CDP is given (Figure 11).

Population Characteristics. Monroe County has a large retirement community, with 29 percent of the population 55 years old or older and 16 percent 65 years old or older, both above the national average. Forty-seven percent of the population is between 25 and 54, and the remaining 24 percent is under 25 years old. The large elderly population is reflected in the local economy: about 48 percent of all income is from nonwage sources (e.g., transfer payments, Social Security, and retirement pensions).

The military also makes up a significant segment of the Keys' population. In the 1980s the military population accounted for between seven and nine

Table 10. *Estimated Resident and Seasonal Population, 1990*

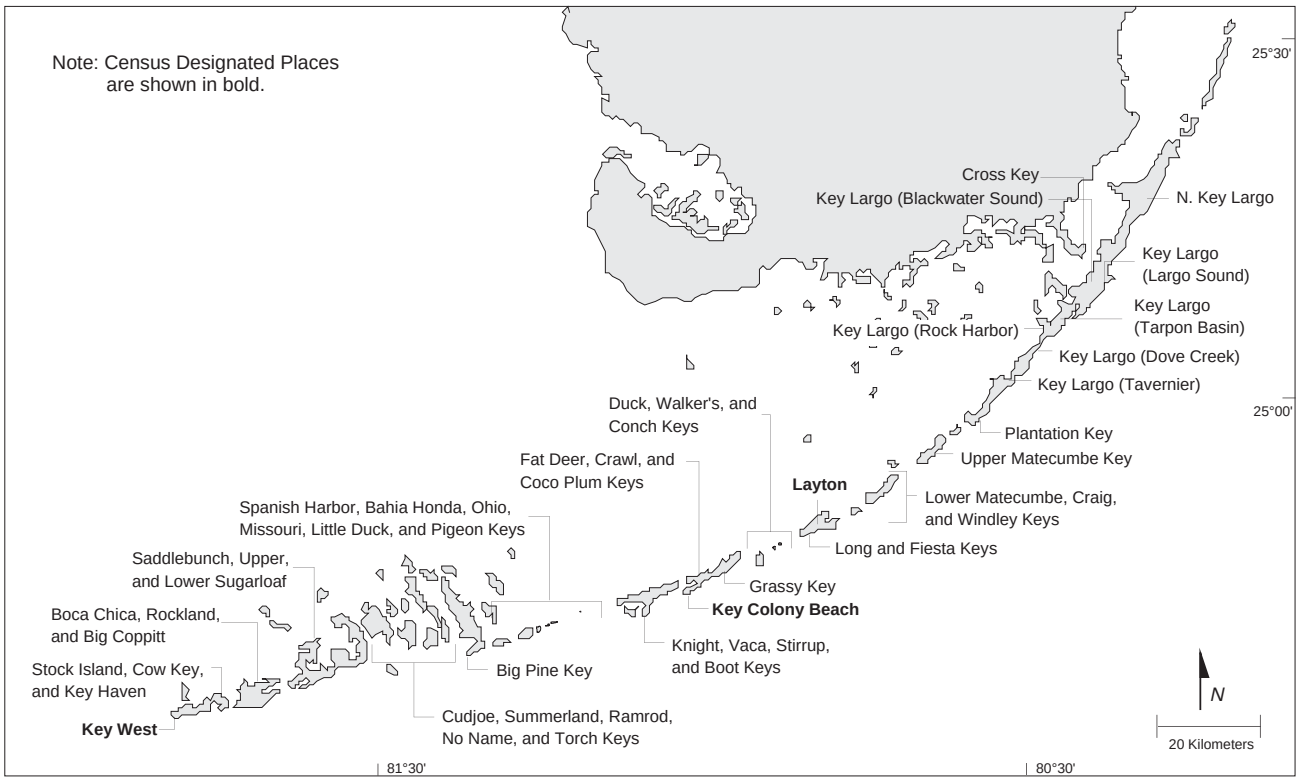
Areas*	Resident Population	Percent Total	Seasonal Population	Percent Total	Population Density
Key West (CDP)	24,832	32	12,887	23	6,472
Stock Island, Cow Key, and Key Haven	4,541	6	1,734	3	5,976
Boca Chica, Rockland, and Big Coppitt Keys	3,106	4	717	1	499
Saddlebunch, Upper and Lower Sugarloaf Keys	1,786	2	944	2	147
Cudjoe, Summerland, Ramrod, No Name, Little Torch, MiddleTorch, and Big Torch Keys	3,983	5	2,117	4	405
Big Pine Key	4,208	5	2,154	4	671
Spanish Harbor, Bahia Honda, Ohio, Missouri, Little Duck, and Pigeon Keys	441	1	981	2	1,637
Knight, Vaca, Stirrup, and Boot Keys	8,861	11	5,099	9	3,328
Key Colony Beach (CDP)	977	1	576	1	3,487
Fat Deer, Crawl, and Coco Plum Keys	697	1	371	1	563
Grassy Key	1,086	1	455	1	1,541
Duck, Walker's, and Conch Keys	629	1	1,917	3	7,147
Long Key and Fiesta Key	356	<1	1,401	2	951
Layton (CDP)	183	<1	70	<1	1,907
Lower Matecumbe, Craig, and Windley Keys	1,096	1	1,650	3	1,426
Upper Matecumbe Key	1,220	2	2,049	4	2,628
Plantation Key	4,405	6	4,745	8	3,967
Key Largo (Tavernier)	2,433	3	1,500	3	NA
Key Largo (Dove Creek)	2,287	3	2,940	5	NA
Key Largo (Rock Harbor)	2,465	3	2,703	5	NA
Key Largo (Tarpon Basin)	4,127	5	2,948	5	NA
Key Largo (Largo Sound)	908	1	418	1	NA
Key Largo (Blackwater Sound)	1,549	2	2,236	4	412
N. Key Largo (Port Bouganville to Angelfish)	1,787	2	3,862	7	328
Cross Key to Dade County Line	61	<1	169	<1	147

*Areas not identified as a Census Designated Place (CDP) are Planning Analysis Area/Enumeration Districts (PAED).

Note: Population density represents persons per square mile. Population density is based on the sum of the resident and seasonal population.

Source: Garrett, pers. com.

Figure 11. *Planning Analysis Areas/Enumeration Districts and Census Designated Places in the Florida Keys*



percent of the Keys' total population (Sorenson, 1990). This was a decline from the early 1970s, however, when the military made up almost one-quarter of the population (Monroe County Board of County Commissioners, 1986; White, 1991). Still, despite defense cutbacks in the early 1970s when the military force in Key West and the Boca Chica Naval Air Station was reduced by almost 4,000, the military remains a major employer in the Key West area and has a major impact on the local economy.

Future Population Trends. The Keys are arriving at a critical point in their history. The population has grown steadily since the 1940s, while the land available for development has dwindled and population densities have increased. In 1975 the Keys were designated as an Area of Critical State Concern because of increasing pressures from population growth and associated development. As a result, issues such as hurricane evacuation and transportation have come to the forefront of local planning efforts. Development is now being severely reduced to allow the public infrastructure to catch up with past growth.

The projection of future growth may be based on a rate of growth ordinance developed for the unincorporated county and adopted in July 1992. Under this ordinance, development is limited to 256 residential units per year (including hotel, motel, and condominium units). To date, these projections are not available, but a single projection based on average household size (2.05 persons per household) and permission of all allocated units, provides 2,560 units over the next 10 years and a population increase of slightly over 26,000 individuals.

Based on past growth rates, Key Largo, the incorporated areas of Monroe County, Plantation Key, Marathon (Boot, Knight, Stirrup, and Vaca keys), Big Pine Key, and Cudjoe, Summerland and Torch keys are projected to have the largest increases in absolute population over the next 20 years (Table 11). This corresponds to relatively high rates of increase in the populations of Plantation Key (44%), Key Largo (39%), Big Pine Key (36%), Cudjoe, Summerland, and Torch keys area (34%), and Marathon (28%). The unincorporated area is projected to have a small rate of increase because it already has a large population (almost 35% of the county's residential total). Relatively high population density increases are projected in many areas, including Duck, Walker's, and Conch keys; Plantation Key; Marathon; and the incorporated areas of the county. Relatively low density increases are projected from Boca Chica to Big Pine Key because of

Table 11. *Functional Population by Planning Analysis Area/Enumeration District, 1990-2010*

Planning Analysis Area/ Enumeration District	1990 Population	Projected Population 2010	% Change in Population 1990-2010	Absolute Change in Population Density*
Stock Island, Cow Key, and Key Haven	6,275	7,132	14	816
Boca Chica, Rockland, and Big Coppitt Keys	3,823	4,323	13	65
Saddlebunch, Upper and Lower Sugarloaf Keys	2,730	3,475	27	40
Cudjoe, Summerland, Ramrod, No Name, Little Torch, MiddleTorch, and Big Torch Keys	6,100	9,212	51	206
Big Pine Key	6,362	9,884	55	372
Spanish Harbor, Bahia Honda, Ohio, Missouri, Little Duck, and Pigeon Keys	1,422	1,829	29	468
Knight, Vaca, Stirrup, and Boot Keys	13,960	17,909	28	941
Fat Deer, Crawl, and Coco Plum Keys	1,068	1,641	54	302
Grassy Key	1,541	2,155	40	614
Duck, Walker's, and Conch Keys	2,546	3,645	43	3,085
Long Key and Fiesta Key	1,757	2,338	33	314
Lower Matecumbe, Craig, and Windley Keys	2,746	4,019	46	661
Upper Matecumbe Key	3,269	4,120	26	684
Plantation Key	9,150	13,192	44	1,753
Key Largo (Tavernier)	3,933	5,404	37	NA
Key Largo (Dove Creek)	5,227	7,228	38	NA
Key Largo (Rock Harbor)	5,168	7,230	40	NA
Key Largo (Tarpon Basin)	7,075	10,300	46	NA
Key Largo (Largo Sound)	1,326	1,859	40	NA
Key Largo (Blackwater Sound)	3,785	4,712	24	101
N. Key Largo (Port Bouganville to Angelfish)	5,649	8,580	52	111
Cross Key to Dade County Line	230	387	68	100
Incorporated Monroe County	39,525	45,226	14	890

*Persons per square mile. NA-not available.
Source: Garrett, pers. com.

the large amount of wetland, unserviced, or refuge acreage on these islands.

Economic Characteristics

The Keys' economy is unique because of the area's location and geography. Monroe County's economy is dominated by the tourism industry, and the Keys attract both seasonal residents and short-term visitors because of their abundant recreational resources. The military and the commercial fishing industry are also important sectors of the region's economy. The Monroe County economic base expanded during the 1980s, with income and employment increasing at a faster rate than those of Florida or the nation.

Personal Income. Personal income includes revenue received by county residents from all sources, including wages, salaries and other income, dividends, interest, rent, and transfer payments. Transfer payments include private pensions, transfers from government funds (such as Social Security, military retirement pensions, Medicare, and Medicaid), and direct government payments, such as unemployment, food stamps, and aid to families with dependent children.

Between 1970 and 1989, total earnings by place of work in Monroe County increased by 450 percent. The largest increases in earned income were in the service, public utility, and fishing industry sectors. However, the aggregate wage figures reflect trends similar to those of employment, and together the retail trade and service industries accounted for the majority of all earnings in Monroe County. The second-largest wage generator was the government, with most wages going to military and State/local employees.

In 1989 Monroe County wage earnings accounted for 52 percent of total personal income, while dividends and transfer payments accounted for 36 percent and 12 percent, respectively (White, 1991). Across the nation, however, wages accounted for over 68 percent of total personal income, while dividends accounted for just 18 percent and transfers 15 percent. Almost half of all personal income in Monroe County is derived from nonwage sources, compared

to 33 percent nationally, indicating the retirement sector's strong role in the local economy (Bureau of the Census, 1991). The county's high percentage of dividend, interest, and rent income reinforces the importance of retirees and indicates that a significant segment of the population is affluent.

Per capita income provides another view of the Monroe County economy. From 1980 to 1989, growth in per capita income exceeded both State and national increases. During this time, per capita income increased at an average annual rate of eight percent. In 1980, per capita income in Monroe County was $8,917, nearly nine percent below that of Florida and 10 percent below that of the nation for that year. By 1989, however, per capita income had increased to $17,896, higher than that of both the state and the nation.

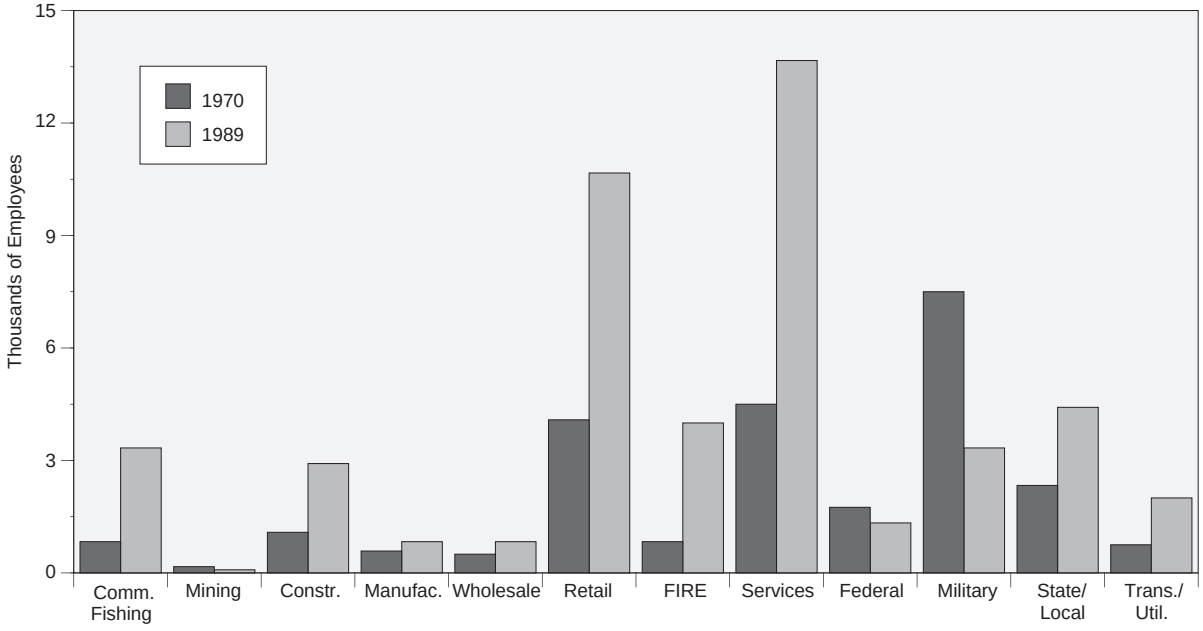
Employment—Private Sector. The service and retail trade industries are by far the largest private-sector employers in Monroe County (Figure 12). The service sector includes the hotel and restaurant trades, while retail trade establishments include gift shops, apparel stores, and businesses that provide specific products such as hardware, boating equipment, and photography supplies. These two industries make up 52 percent of the total employment in the county and 66 percent of total private-sector employment. The strength of these industries indicates the importance of tourism to the Keys' economy. Growth in these industries has been significant over the past decade as well, with nearly 75 percent of the new jobs created in Monroe County during this period in either the service or retail trade sectors.

The finance, insurance, and real estate (FIRE) trades form a secondary, but similarly important, employment sector. Although not necessarily tied to the service and retail trade industries, real estate businesses make up the largest part of the FIRE sector, and it is fair to assume that the resources that bring tourists to the Keys also bring those interested in buying real estate. In 1989 the FIRE trades accounted for 11 percent of all private-sector employment. Tied to the large expansion of residential construction, this industry grew by almost 60 percent during the 1980s.

The commercial fishing industry represents the fourth-largest employment sector in the county, comprising nine percent of the work force. Growth in this industry has been sporadic, exhibiting both large increases and declines during the past decade. The turbulent employment levels are a result of several factors, including the cyclic nature of harvestable resources, changes in catch quotas, and the rising cost of living and doing business in the Keys.

The construction industry ranks fifth among the county's private-sector employers. Reflecting trends in the FIRE trades, it showed significant growth between 1980 and 1989. The industry represented

Figure 12. *Number of Workers by Employment Sector in Monroe County*



Abbreviations: Comm. Fishing, Commercial Fishing; Constr., Construction; Manufac., Manufacture; FIRE, Finance, Insurance, and Real Estate; Trans./Util., Transportation/Utilities

Source: White, 1991

eight percent of the private-sector work force in 1989, growing by more than 57 percent during the decade.

The remaining private-sector employment is in the mining and manufacturing industries and wholesale trade businesses. Mining represents a small, but significant, portion of the Keys' economy. Although the work force is small (less than 1% of the total), the industry contributes greatly to the construction of new homes, businesses, and roads. It was slightly larger in the 1970s because of canal construction and subdivision development. The manufacturing and wholesale trade businesses are represented primarily by “cottage industries.” The lack of large land areas for manufacturing facilities has limited the development of these industries as major employers.

Employment—Public Sector. Public-sector employment makes up approximately 23 percent of the total work force in the Keys. About nine percent of these workers are State and county employees, seven percent are employed by the military, and seven percent are Federal employees. The number of State and local government employees increased substantially during the 1970s, but grew at a slower rate during the 1980s. The public-sector component of the work force has increased at a significant rate in recent years, but has yet to reach its previous level. There was a large decline in the number of military personnel employed in the Keys during the 1970s, but it appears that the military's strategy has been to hire additional civilian employees when possible.

Land Use

In 1975 Florida designated Monroe County an Area of Critical State Concern under the authority of Chapter 380, F.S. This legislation was designed to preserve and protect the county’s unique natural resources, which were being degraded by large development projects. It gave the State Department of Community Affairs (DCA) the responsibility of overseeing all development activities within the designated area. The legislation required both the drafting of a comprehensive plan and development regulations designed to set the county's growth-management standards, over which the State has final review and approval.

Significant features of the plan include the “down-zoning” of large natural areas (excluding Key West, Key Colony Beach, and Layton), and the establishment of the Monroe County Land Authority, which is responsible for purchasing these down-zoned areas. The plan was also designed to preserve the contiguous areas of habitat as biologically functional units, specifying that required open-space areas may not be altered. It also contained the rudiments of the concept of “concurrency,” which requires that a project cannot be completed without the public infrastructure necessary to support it.

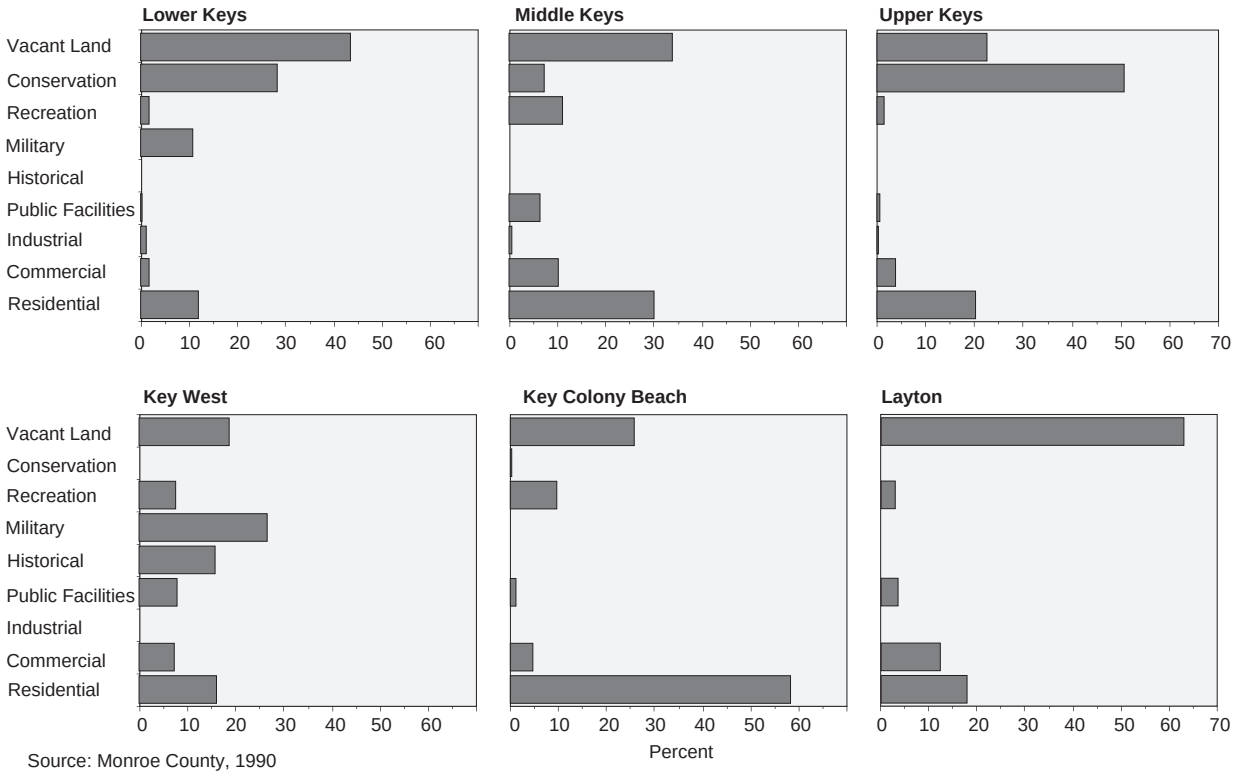
Monroe County and its sister municipalities are currently revising their comprehensive plans under Chapter 163, F.S. In general, Chapter 163 legislates more specific standards, significantly expands the concept of concurrency, and allows the local government to set a "level of service" for hurricane evacuation that cannot be exceeded as a result of new development. However, because the county is an Area of Critical State Concern, the County must still meet the standards of Chapter 380, F.S.

Existing Land Use. The inhabited Keys make up only five percent of Monroe County's total land area (65,500 of 1.2 million acres). The county also contains over 99,000 acres of the Everglades, but this area is almost entirely within Everglades National Park and Big Cypress National Preserve. The majority of the county, consequently, is classified as "conservation land."

Within the county, the unincorporated area is distinguished from the three incorporated areas of Key West, Key Colony Beach, and Layton. The zoning and land development regulations and proportions of land uses are quite different in each. Within the unincorporated area, land use is also apportioned differently between the Upper, Middle, and Lower Keys. However, the types of land use can be categorized similarly. In general, they are defined as residential, commercial, industrial, or public facilities and buildings; historical buildings and districts; military facilities; and recreation, conservation, and vacant land (Figure 13).

Residential Land. The proportion of land used for residential purposes ranges from 12 percent in the Lower Keys to 58 percent in Key Colony Beach. The small percentage of residential use in the Lower Keys is due to the high proportion of conservation land, primarily in the National Key Deer Refuge. The relatively high proportion of residential development in Key Colony Beach reflects the city's reliance on Marathon for commercial and other use categories. Within the unincorporated area, the majority of residential development (78%) consists of single-family units. The unincorporated area also has the majority of the county's mobile homes, although the

Figure 13. *Land Use by Geographic Area*



Source: Monroe County, 1990

total area is relatively small. The cities of Key West and Key Colony Beach have substantial duplex development. In the City of Key West, the single-family/duplex zoning category accounts for 62 percent of all residential area. Key Colony Beach has similar percentages.

Commercial Land. The proportion of commercial land in each area is similar, although there are significant differences between the Upper, Middle, and Lower Keys. In general, commercially zoned land accounts for about four percent of land-use acreage within the Keys. The Middle Keys contain significantly higher proportions because of the large amount of commercial land in Marathon. The lower levels in the Lower Keys reflect the large amount of refuge conservation land.

Industrial Land. The cities of Key West, Key Colony Beach, and Layton contain no significant industrial development, and rely on the adjacent unincorporated areas for their industrial needs. Two industries, rock mining and marine repair and salvage, define industrial use in the Keys. The majority of rock mining operations are in Stock Island and Marathon. Other small-scale industrial businesses are located in Stock Island, Big Pine Key, Marathon, and Key Largo.

Public Facilities and Buildings. As much as eight percent of Key West is allocated to public buildings and facilities (excluding recreational uses), while the unincorporated area, Key Colony Beach, and Layton provide one percent or less.

Historic Buildings and Districts. Within the cities of Key Colony Beach and Layton, and in the unincorporated areas of the Keys, virtually no acreage is allocated for historical lands. There are, however, historic structures and buildings outside Key West, including those on Pigeon Key and the Carysfort Light off North Key Largo, both of which are listed in the National Register of Historic Places. The City of Key West also considers large areas of "old town" historic and, as a result, requires additional permits before allowing development. In addition, the City has established an Historic Architectural Review Commission to ensure that the traditional character and appearance of the area is maintained.

Military Facilities. Military facilities are located exclusively in Key West and the Lower Keys. About 25 percent of Key West's land is used for military purposes. In the Lower Keys there are three military facilities that make up five percent of all land in the unincorporated area.

Recreational Facilities. The proportion of land dedicated to active and passive recreation varies considerably throughout the Keys. The City of Key West provides about seven percent of its land area for recreational purposes, while the Lower and Upper Keys provide less than two percent each. The Middle Keys provide 11 percent, Key Colony Beach nine percent, and Layton none. These numbers may be somewhat misleading, however, as they are derived primarily from a list of publicly and privately owned lands that provide recreational activities. Many private owners of resort areas provide recreational facilities geared toward water activities, but may include swimming pools and/or tennis courts. In addition, recreational needs are generally assessed based on standard estimates of the acreage required per unit of the functional population for a given recreational activity type.

Conservation Land. Conservation land makes up about 34 percent of all unincorporated land use within the Keys. The largest proportion is in the Lower Keys, and is associated with the National Key Deer and Great White Heron refuges (28%). In the Upper Keys (51%), conservation land is located primarily in North Key Largo. The cities of Layton and Key Colony Beach have no conservation land. Within the City of Key West, conservation land is undeveloped and categorized as open water, freshwater islands, tidal wetlands, mangrove, and hammock. Some of the land is in private ownership and, therefore, could be subject to future development. However, substantial areas around the “Salt Ponds” area of Key West have been (and are currently being) acquired by the Monroe County Land Authority. A total of 550 acres remains undeveloped in Key West.

Vacant Land. About 210,000 acres of land are potentially available for development--just over 34 percent of the Keys' total land area. In the unincorporated area of the county, vacant land is the largest land-use category. Ten percent of the county's vacant land is divided into nearly 15,000 vacant lots. These lots represent the only reasonably buildable property remaining in the Keys, and make up a substantial proportion of the total potential single-family development area.

Capital Facilities

Public infrastructure is extremely important in shaping current and future growth in the Keys. A large part of the Keys’ power and virtually all of its potable water originate in South Florida. The availability of land also limits Monroe County’s capability to manage solid waste, and the interisland transportation network has reached its limits in some areas. Because the Keys are so dependent on the mainland, the difficulty and cost of providing services to the public have become increasingly apparent.

Potable Water. South Florida's Biscayne Aquifer provides the Keys with its primary source of public potable water. Through this aquifer, the county extracts water from well fields in the Homestead area south of Miami. Ocean Reef Club, in North Key Largo, is the only area in the Keys that uses an alternative source of water (the Floridan Aquifer and a reverse-osmosis plant).

The Florida Keys Aqueduct Authority (FKAA) manages the distribution of potable water within the Keys. It is permitted by the SFWMD to withdraw up to 19.77 million gallons per day (mgd). About 15 mgd are currently being used. The total permitted yearly withdrawal is 5.56 billion gallons. The FKAA is currently operating at approximately 90 percent of capacity.

Sewage Treatment. Three basic methods of sewage treatment are utilized in the Keys: 1) centralized facilities; 2) individual aeration units that utilize either drainfield or borehole discharge; and 3) septic tanks with drainfields. Florida's Department of Environmental Protection and Department of Health and Rehabilitative Services are responsible for permitting these facilities.

The cities of Key West and Key Colony Beach operate centralized sewage treatment facilities. After secondary treatment, effluent is discharged to surface waters. The remainder of the county (approximately 32,000 residential units and the associated commercial development) uses septic tanks, individual aeration units, or small-scale, centralized package treatment plants.

Stormwater. The City of Key West is the only area in the county with a centralized system for stormwater conveyance. However, this system provides little retention and generally leads to nearshore outfalls. Estimates of total discharge volume are currently unavailable. The county's unincorporated area and the cities of Key Colony Beach and Layton have no centralized drainage facilities. Key Colony Beach does, however, have injection wells. Because of their size, many larger residential and commercial units have on-site retention facilities that are permitted through the SFWMD. In addition, recent improve-

ments to US 1 have required stormwater conveyances and, in some instances where roads have traditionally flooded, storm drainage trenches or wells have been installed.

Solid Waste. Solid waste management currently entails incineration and subsequent landfilling or haul-out. The City of Key West incinerates combustible materials in a “waste-to-energy” plant on Stock Island. Ash is placed in the adjacent landfill. Noncombustible materials are either processed through the city’s recycling program or placed in the landfill. The City of Key West generates almost 60,000 tons of solid waste per year. As the Stock Island site reaches capacity, alternate facilities will be required.

The incorporated area of Monroe County manages its own solid waste and that of Key Colony Beach and Layton. There are three landfills in the unincorporated county, two of which have remaining capacity. However, these sites are currently only used as transfer sites as part of a solid waste haul-out program. Non-recyclable materials are transported to a landfill in Broward County.

Transportation. The highway network in the Keys is unique, with just one major 100-mile roadway (US 1) connecting the chain of islands with 42 bridges. Numerous local roads are connected to the highway and serve the area's many subdivisions. Key West’s roadway network is perhaps the only area in Monroe County that is characteristic of traditional urban settings. There are major traffic constraints on US 1 in four locations: Plantation Key, Upper Matecumbe, Lower Matecumbe, and Big Pine Key. Without further roadway improvements, these constraints will restrict the growth potential of these areas.

Other forms of transportation between islands and from the mainland include airplanes and boats. There are two public airports in the Keys, at Key West and Marathon, and four private airstrips. There are also 163 marinas within the Sanctuary, and Key West accommodates considerable cruiseline activity.

Energy Consumption. The Florida Keys Electric Cooperative and the City Electric System provide electric power to the Keys. The former is a privately owned utility that serves the Upper and Middle Keys. The latter is owned and operated by the City of Key West and is run by a publicly elected board. In combination, the two utilities sold over 1.2 million kilowatt hours of electricity to approximately 48,500 customers in 1990 (Garrett, pers. comm.).

Development

Development in the Keys is constrained by the lack of adequate public infrastructure. A significant limiting factor is highway capacity. US 1 restricts both day-to-day travel and the rate of potential hurricane evacuation transportation. Currently approved development will add to the factors constraining new growth, as insufficient infrastructure support exists.

Since the current development revisions were undertaken, the county has carefully tracked its permitting process because of the ultimate impact approvals will have on existing facilities deficits and future growth capacity. In 1990 there were about 45,000 residential units (both single- and multifamily) in the Keys, with about 72 percent located outside Key West, Key Colony Beach, and Layton. Approximately one-third of all improved, buildable, and residential lots remained vacant. From April 1990 to October 1991, over 1,800 single- and multifamily units, mobile homes, and motel/hotel units were approved in the unincorporated area.

Future Development. Key West, Key Colony Beach, and Layton currently have no capital facilities constraints that would limit growth within their boundaries. However, because residents of the three municipalities must be evacuated on US 1 along with the rest of the area's residents, the county must consider how this influx would affect overall evacuation rates.

Current evacuation times for the Keys have been projected at 27 to 30 hours. Continued population growth would increase traffic during an evacuation, thus increasing evacuation times. State law mandates that no such increases can take place, and the county has suggested that two major stretches of US 1 be improved to offset this problem. Improvements to these road segments would allow for the development of almost 3,700 new residential units throughout the county, without a further increase in projected evacuation times.

The county has agreed to allocate a portion of these units to the three incorporated municipalities, based on the percentage of the total county population in each. This allocation will take place over a 10-year period, with 370 permits allowed annually. This would constitute an approximate 75 percent reduction in the number of residential units permitted each year. The resulting "loan" in residential permit allocation would be paid off within a decade if these improvements are

completed. Whether they are or not, and assuming the current law doesn't change, growth after the 10-year period could be restricted even further due to infrastructure limitations similar to those that currently exist.

Recreation and Tourism

Recreation and tourism are critical to the Keys' economy, and businesses supporting the area's recreational use (e.g., dive shops, charter fishing boats, marinas, hotels, etc.) are vital to its economic livelihood. Retail trade and services, for example, are major employment sectors, accounting for half of Monroe County's work force.

The Keys have an abundance of recreational and open-space resources, and the tropical setting is a major attraction for both seasonal residents and short-term visitors. Because the Keys are a natural chain of islands located between two of the world's great water bodies, the focus of recreation and tourism is on water-related activities (e.g., boating, fishing, scuba diving, and snorkeling).

Recreation/Tourism Infrastructure. The Keys have an extensive public/private recreational infrastructure. There are 257 public and private recreation sites, ranging from single-lane boat ramps along US 1, to private marinas and large public recreational sites such as John Pennekamp Coral Reef State Park.

Beach Facilities. Although participating in beach activities is often a primary objective of tourists travelling to the Keys, the area does not have the wide, sandy beaches characteristic of Florida's east coast. There are 58.4 km of beaches in the Keys' portion of Monroe County (Clark, 1990). These beaches are typically very narrow (8 m wide or less) and many are on unbridged islands, especially west of Key West (e.g., the Marquesas and Dry Tortugas).

Boating Facilities. There are 163 marinas, both public and private, in the Keys, with large numbers in Key Largo (57), Marathon (39), Islamorada (31), and Key West (20). These extensive boating facilities provide 5,127 boat slips and 3,825 locations for dry storage, accounting for almost 9,000 total slips (FDNR, 1990). There are an additional 125 boat ramps scattered throughout the Keys that provide direct access to Sanctuary waters.

Recreation Sites. Public sites are major tourist attractions because they offer a wide range of recreational opportunities. For example, Bahia Honda State Park provides snorkeling, beach activities, fishing, picnicking, swimming, boating, camping, and diving. The Looe Key National Marine Sanctuary contains several shipwrecks, and its easy access makes it an excellent dive site. John Pennekamp Coral Reef State Park and the adjacent Key Largo National Marine Sanctuary together account for over 580 km^2 of coral reefs, seagrass beds, and mangrove swamps, and are both excellent areas for scuba and snorkel trips.

Table 12. *Submerged Area of Public Recreation Sites in the Florida Keys*

Site	Submerged Area (km^2)
Key Largo National Marine Sanctuary	359
Looe Key National Marine Sanctuary	18
Crocodile Lake National Wildlife Refuge	nd
Great White Heron National Wildlife Refuge	842
Key West National Wildlife Refuge	849
National Key Deer Refuge	561
John Pennekamp Coral Reef State Park	222
Bahia Honda State Park	nd
Curry Hammock	nd
Fort Zachary Taylor State Historic Site	nd
Indian Key State Historic Site	<1
Key Largo Hammocks State Botanical Site	nd
Lignumvitae Key State Botanical Site (includes Shell Key State Preserve)	<1
Long Key State Recreation Area	<1
Port Bougainville	<1
San Pedro State Underwater Archaeological Site	<1
Windley Key Fossil Reef State Geological Site	<1
Biscayne Bay and Card Sound Aquatic Preserves	67
Coupon Bight Aquatic Preserve	20
Lignumvitae/Indian Key Aquatic Preserve	33

Abbreviation: nd, no data.

Source: Florida Department of Environmental Protection, 1991

There are 24 Federal and State recreation areas, parks, refuges, historic sites, botanical sites, archaeological sites, geological sites, and aquatic preserves within the Keys, accounting for nearly 10,000 km^2 of land and water resources. Thirty percent of the total area is within the boundaries of the Sanctuary (Table 12). In addition, there are over 35 county recreation sites located on land, with some providing access to Sanctuary waters.

Private recreation sites include marinas, campgrounds, RV trailer parks, and golf courses. There are approximately 200 private recreation sites in the Keys, most in Key Largo, Islamorada, Marathon, and Key West.

Accommodations. There are over 14,600 tourism units in the Keys, representing the sum of all hotel/motel rooms, sites for camping and recreational vehicles, and vacation rentals. A hotel/motel room is defined as a unit in a resort, rooming house, or bed and breakfast. Vacation rental units include apartments, condominiums, and houses (Kearny/Centaur, 1990). Almost half of all hotel/motel and vacation rentals within the Keys are in Key West. Campgrounds are distributed through most of the remainder of the Keys.

In 1990 the hotel/motel occupancy rate in Monroe County ranged from 67 percent in the fourth quarter of the year (Oct.-Dec.) to 85 percent in the first quarter (Jan.-Mar.) (White, 1991). The busiest months are typically February and March, when the City of Key West annually records occupancy rates exceeding 90 percent (White, 1991). In addition, there are over 600 restaurants in the Keys, with almost half in the City of Key West.

Recreation Activities. There are numerous recreation activities available in the Keys. Most are water-related, but archaeological and historical attractions are also popular. The rapid growth of tourism over the past few decades attests to the desirability of the Keys as a destination for outdoor recreation. Popular recreational activities include boating, fishing, scuba diving and snorkeling, beach activities, sight-seeing, walking, jogging, biking, and swimming.

Recreational Boating. Boating is an integral part of life within the Sanctuary. To fish, snorkel, or scuba dive, a boat is usually required. In 1990, 15,595 pleasure boats were registered in Monroe County, about one for every two households (Shermyen, 1991) (Figure 14). From Key Largo to Key West, there are 163 marinas providing 8,952 boat slips. There are also 103 public and 22 private boat ramps (Kearny/Centaur, 1990).

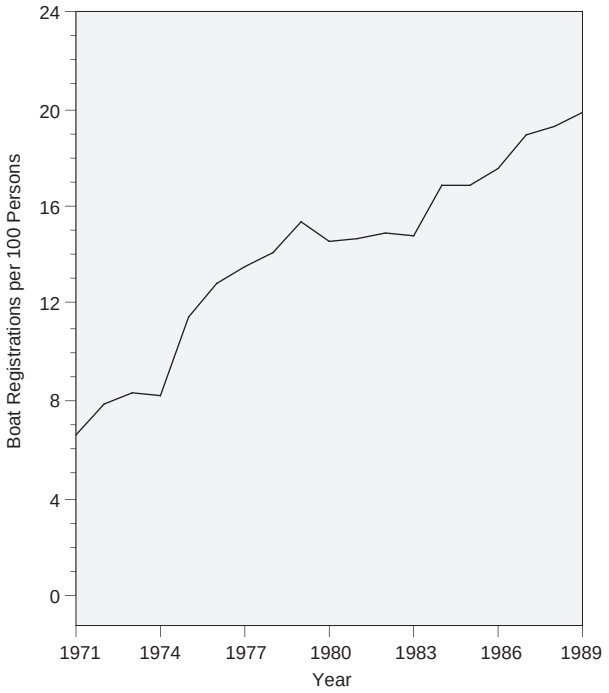
Tourists spend a considerable portion of their time boating in Sanctuary waters, and such activities account for about 13 percent of all visitor days. The primary boating activity involves recreational fishing, and about 55 percent of all visiting boaters participate in fishing activities. Scuba diving and snorkeling trips account for about 29 percent of all tourist boating activities (Kearny/Centaur, 1990).

Because of the mild tropical climate, tourists frequently enjoy recreational boating during the winter months (U.S. Department of the Navy, 1990). Recreational boating peaks between November and February, around Easter, and again in the summer. Residents of neighboring counties in South Florida often trailer boats to the Keys during the summer.

Scuba Diving/Snorkeling. Scuba diving and snorkeling are also popular recreational activities, in part because of the area's many shipwreck sites and extensive coral reefs. Between 20 and 30 percent of all tourists visiting the Keys scuba dive or snorkel during their visit (Kearny/Centaur, 1990). Almost 90 percent of the significant dive spots are located in the Upper Keys, including the protected waters of the Key Largo National Marine Sanctuary and John Pennekamp Coral Reef State Park. These sites, and the Looe Key National Marine Sanctuary in the Lower Keys, are popular because of their accessibility and the number of dive operations available.

Recreational Fishing. The waters surrounding the Keys are world-renowned for sport fishing, and the chance of catching species such as marlin, tarpon, bonefish, and permit make the area a popular fishing destination. The impact on the Keys' economy is enormous. A statewide study has shown that every dollar spent by a fishing tourist gets re-spent 3.23 times before leaving the county. It has been estimated that recreational fishing brings almost $500 million to the local economy each year (Whitney, 1991).

Figure 14. *Recreational Boat Registrations per 100 Persons in Monroe County, 1971-1989*



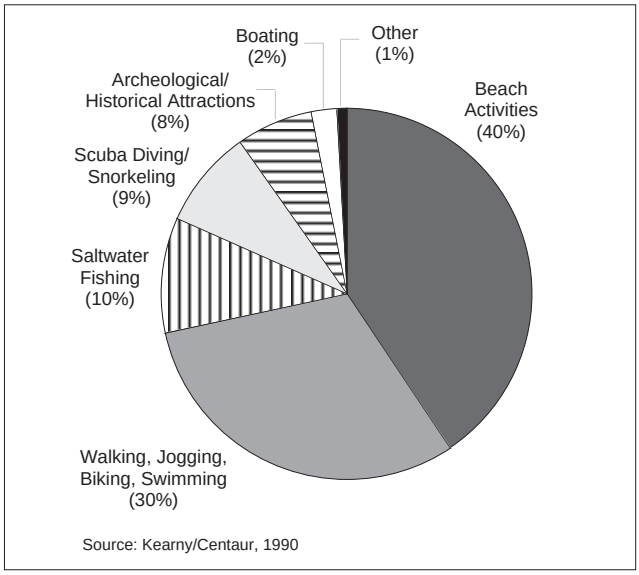
Sources: Monroe County, 1990; White, 1991.

Fishing-for-hire services are an important component of the Keys' tourism industry as well. Several services are available to tourists, including backcountry and reef expeditions. Backcountry guides accommodate one or two fishermen in a 5 to 6 m shallow-draft boat. Much of the backcountry fishing is done by sight for bonefish, permit, and tarpon, with boats typically poled through the clear, shallow waters (Rockland, 1990). Backcountry skiff fishing occurs throughout the Keys, with the greatest concentration in Islamorada (Rockland, 1990).

Reef fishing is done in deeper waters, often near wrecks. Activities are concentrated in the Middle and Lower Keys, with the greatest number of reef fishing boats in Key West (Rockland, 1990). Methods include bottom-fishing, trolling, and casting. Charter boat fishing is almost always done offshore, beyond the reef, in Atlantic waters. Large boats (8.5 to 15 m in length) designed for catching species such as sailfish, mackerel, and dolphin are generally used. Partyboat fishing is done from boats over 12 m long that are licensed to carry more than six people (Rockland, 1990). These boats offer half-day or full-day trips to the reef.

Fishing from one's own boat, without any hired services, however, remains the predominant method in the Keys. Because there are over 106,000 boats registered in Monroe, Dade, and Broward counties, and since many of these boats frequently operate in Sanctuary waters, it is safe to assume that a large number of recreational fishermen are operating in Sanctuary waters during most days of the year. A 1980-81 survey of private-boat fishermen revealed that 31 percent were from the Keys, 43 percent were from Dade and Broward counties, 13 percent were from other Florida counties, and 13 percent were from outside the state (Rockland, 1990).

Figure 15. *Percent of Visitor Days by Outdoor Activity*



Most fishing not done from boats takes place at one of the 42 bridges that connect the islands of the Keys. Bridge fishing is also done on several retired bridges, such as the Old Seven Mile Bridge, and from catwalks beneath bridges. Because of their access to deeper waters, bridges provide a better "shore" location than piers or the shoreline.

Beach Activities. Although the Keys do not have the beaches characteristic of the eastern and Gulf coasts of Florida, beach activities still represent a major tourist interest, accounting for about 41 percent of all visitor-days (Kearny/Centaur, 1990).

Architectural and Historical Tourist Attractions. The Keys have a variety of architectural and historical tourist attractions. For example, Dry Tortugas National Park (accessible only by boat), attracted more

Table 13. *Total Impact of Recreation/Tourism on the Monroe County Economy, 1990*

User Group/ Economic Impact	Direct	Indirect	Induced	Total	Percent of Personal Income by Place of Work
Tourists					
Employment	16,370	1,658	2,482	20,510	50
Income*	287	69	99	455	57
Residents					
Employment	321	32	20	373	1
Income	6	1	1	8	1
Total					
Employment	**16,691**	**1,690**	**2,502**	**20,883**	**51**
Income	**292**	**71**	**100**	**463**	**58**

* Millions of 1990 dollars.

Source: Kearny/Centaur, 1990

than 19,000 visitors in 1990 (Shermyen, 1991). In Key West there are numerous architectural/historical attractions such as Fort Zachary Taylor, the Old Post Office and Customs House, the Ernest Hemingway House, and the Armory. Visits to archaeological and historic attractions account for about seven percent of all visitor days.

Walking, Jogging, Biking, Swimming. These activities are universally popular in warm-weather resort areas, and account for a large proportion of visitor days. Each is much less expensive than renting a boat, going on a dive trip, or hiring a private guide for fishing. Within the Keys, about 31 percent of all visitor days are spent walking, jogging, biking, or swimming (Kearny/Centaur, 1990).

Other. Other recreational activities include windsurfing, which is popular throughout the Keys due to the many available access points, and the use of personal watercraft, especially in the calmer waters of the backcountry.

Economic Impact of Recreation/Tourism. Recreation and tourism activities create economic impacts when the natural resources, historic attractions, or leisure opportunities combine to attract visitors from other areas or to induce local residents to pursue leisure activities. Such activities can also result in a series of purchases that enter the local economy. Visitor expenditures can be viewed as a regional export and, therefore, make up a base sector of the local economy (Kearny/Centaur, 1990).

A direct economic impact occurs in the Keys, for example, when a vacationer books a fishing or scuba trip. Indirect impacts occur when the provider of these services, such as a boat captain, purchases bait and fuel from other local businesses. These suppliers, in turn, need to make purchases from their affiliates. These effects are further compounded when the charter boat captain and the other businesses supplying the operation take their money home. These are induced impacts that have additional indirect and induced effects (Kearny/Centaur, 1990).

The impact of recreation/tourism on the Monroe County economy is shown in Table 13. The direct impact of tourists and residents is measured in terms of employment—in 1990, 16,691 jobs in Monroe County were dependent on the tourism/recreation industry. Recreation activities also had an indirect or induced effect, creating over 2,500 jobs (Kearny/Centaur, 1990). Consequently, outdoor recreation and tourism supported about half of all employment in the county, and half of all personal income by place of work came from these activities.

Commercial Fishing

Commercial fisheries are among the Keys' most valuable natural resources. The area is one of the richest fishing grounds in the Gulf of Mexico (Phillips, 1990) and commercial fishing is the fourth-largest industry in the region, representing nine percent of Monroe County's private-sector employment (White, 1991).

The diversity of the Keys' aquatic habitats and communities (including coral reefs, seagrass beds, and softbottom and hardbottom areas) provides food and shelter for these invertebrates and fishes (Environmental Science and Engineering, Inc. et al., 1987; Comp and Seaman, 1985), and ninety percent of the region's commercially important species use these habitats for shelter, food, or nurseries during at least one stage of their life history (Comp and Seaman, 1985).

Population growth in Monroe County has raised management concerns about demands on the region's fisheries and potential overfishing (Bohnsack, 1991). Commercial harvest is regulated by measures including annual catch quotas, closed seasons, gear restrictions, and guidelines setting minimum catch sizes. These regulations have been developed for most commercially important invertebrates, finfish, and corals through management plans written by the South Atlantic and Gulf of Mexico fishery management councils, the Florida Marine Fisheries Commission, and the Florida Cabinet (Bohnsack, 1991).

Catch Statistics. In southwest Florida (including Monroe County), decapod crustaceans (shrimp, stone crab, and spiny lobster), snappers (e.g., yellowtail), groupers, king mackerels, and Spanish mackerels dominate commercial catches (Williams, 1991). In Monroe County, the total annual commercial landings for these species average almost 15 million pounds (Bohnsack, 1991). In recent years, crustaceans have comprised 81 to 92 percent of the total catch value, while finfish made up the remainder (Rockland, 1988).

The State collects landings information on approximately 400 kinds of fish, invertebrates, and plants harvested in Monroe County. Information is collected

Figure 16a. *Landings of Invertebrates in Monroe County, 1970-1990*

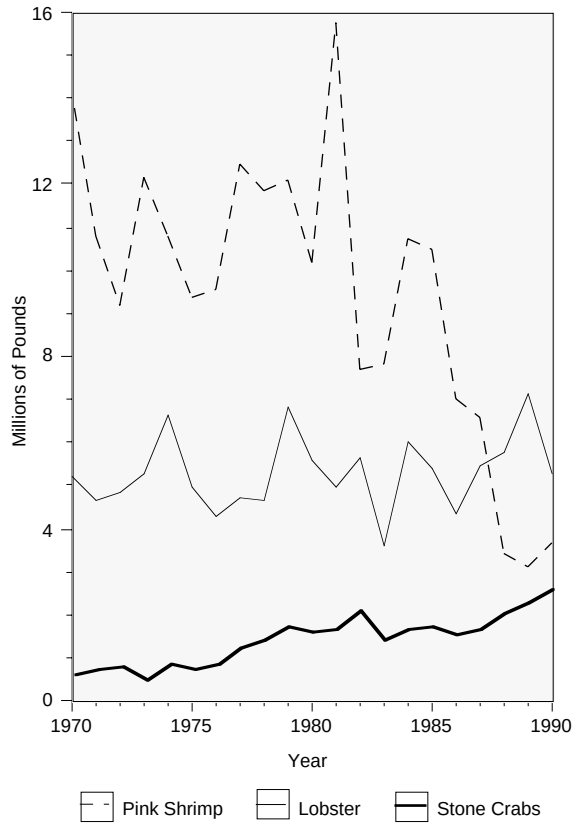
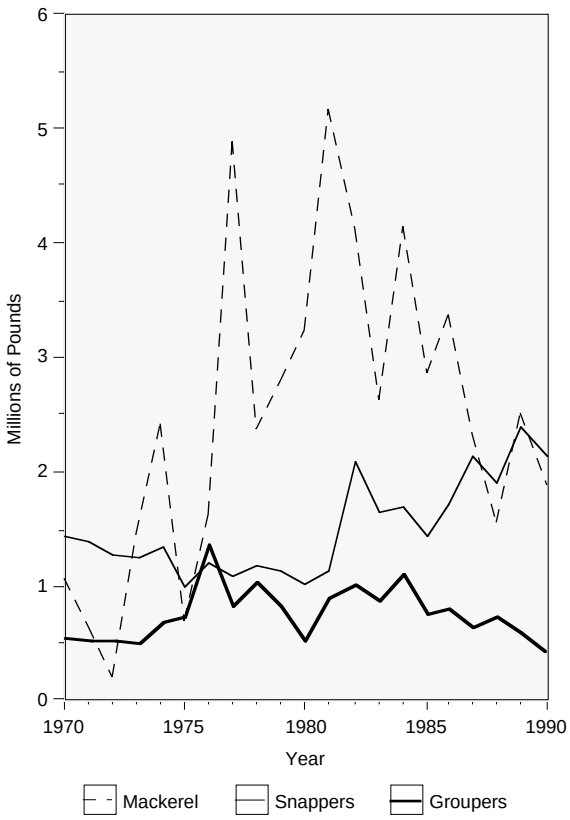


Figure 16b. *Landings of Finfish in Monroe County, 1970-1990*



Source: Muller, pers. com.

from every commercial fishing trip (including those involving marine-life collecting). In 1990 commercial landings of food and bait species were 19.7 million pounds (approximately 10 percent of Florida's total landings) (FDEP, unpublished data). Figures 16a and 16b show annual landings for major crustaceans and finfish between 1970 and 1990. Landings are impacted by the cyclical and migratory patterns of various species and quotas that have been imposed on certain commercial seafood.

Spiny lobster has recently surpassed pink shrimp, and leads the county in both landings and value. In 1990 spiny lobster landings totaled 5.3 million pounds, followed by pink shrimp (3.7 million pounds) and stone crab (2.6 million pounds). Of the finfish, yellowtail snapper accounted for the greatest landings (1.6 million pounds), followed by Spanish mackerel (1.1 million pounds).

Major Species. The major commercial invertebrate species in the Keys are the spiny lobster, Tortugas pink shrimp, and stone crab. All three (particularly spiny lobster) are also caught by recreational fishermen. Queen conch was once an important nearshore fishery, but a harvest moratorium has been in effect in State waters since 1985 and in Federal waters since 1986 (Glazer, pers. comm.) because of severe depletions in local populations due to overfishing (Alevizon and Bannerot, 1990). Snappers, groupers, and mackerels are the most valuable commercial finfish.

Spiny Lobster (Panulirus argus). Commercial fishing for spiny lobster occurs on both sides of the Keys. In the Atlantic, most fishing is done on the back side of the reef, west to just beyond the Dry Tortugas. Fishing activities are evenly distributed from John Pennekamp Coral Reef State Park to Key West, with most done in water less than 9 m deep (Beaver, pers. comm.). In the Gulf of Mexico, fishing ranges from the Everglades National Park (ENP) boundary west to beyond the Dry Tortugas in depths of about 2 to 18 m. The highest trap concentrations occur from ENP to the northern side of Big Pine Key and west of Key West to the Marquesas (Beaver, pers. comm.). Most legal-size adults are harvested during the August-March fishing season, except within ENP, Dry Tortugas National Park, and Biscayne Bay/Card Sound (Gulf of Mexico and South Atlantic Fishery

Management Councils, 1982; Schmahl, pers. comm.).

Over the past 15 years, annual commercial harvests have ranged from about 3.6 to 7.2 million pounds, with a yearly average of approximately five million pounds (Powers and Sutherland, 1989). In 1990 about 5.3 million pounds were landed, valued at $21.2 million (FDEP, unpublished data). Approximately 88 percent of the nation's spiny lobster is harvested in Monroe County (NMFS, 1991), and the fishery is the most important in the Sanctuary in terms of economic value. Recreational harvest is also important, and one recent survey estimated that recreational fishing accounts for 20 percent of the total harvest, much higher than previously believed (Hunt, pers. comm.).

Tortugas Pink Shrimp (Penaeus duorarum). Gulf waters yield 99 percent of the total landings of Tortugas pink shrimp in the Keys, with Atlantic waters yielding the remainder. Other shrimp species, such as rock shrimp and deepwater royal red shrimp, are included in the area's catches, but are of only minor commercial importance (Gulf of Mexico Fishery Management Council, 1981).

Two major pink shrimp fishing areas are the Tortugas and the Sanibel grounds (Gulf of Mexico Fishery Management Council, 1981), which exhibit the highest catch levels in the Tortugas. Both areas are relatively close to estuarine nursery grounds that are essential to the growth and survival of early life stages (Gulf of Mexico Fishery Management Council, 1981). The majority of the Keys' shrimp industry is located on Stock Island, but shrimpers also operate from Key West and Marathon. Shrimping is seasonal, with peak landings occurring between October and March (Little, pers. comm.).

Although Tortugas pink shrimp used to be the most valuable commercial species on the southwest Florida shelf, their importance has declined in recent years due to significant catch declines (Figure 16a). In 1990, 3.7 million pounds were landed, valued at $11.4 million (FDEP, unpublished data).

Stone Crab (Menippe mercenaria). Stone crabs are commercially harvested along Florida's southwest coast from Tampa Bay to the Dry Tortugas, out to the 18-m depth contour (Bert, pers. comm.), with most harvest occurring in the Everglades-Florida Bay area (Gulf of Mexico Fishery Management Council, 1978). The peak stone crab season is between October and May, and all crabs must be returned to the water after claw removal (Gulf of Mexico Fishery Management Council, 1978). The fishery has been stable for the last two decades. In 1990 about 2.6 million pounds (valued at $7.3 million) were landed in the Keys (FDEP, unpublished data).

Snapper-Grouper. The snapper-grouper fishery consists of demersal tropical and subtropical species including snappers (Lutjanidae), sea basses and groupers (Serranidae), porgies (Sparidae), tilefishes (Malacanthidae), grunts (Pomadasyidae), triggerfishes (Balistidae), wrasses (Labridae), and jacks (Carangidae) (Gulf of Mexico and South Atlantic Fishery Management Councils, 1982). Commercial fishing usually occurs outside the reef tract, particularly west of Key West, from the Marquesas to the Dry Tortugas (Little, pers. comm.).

Some snapper and grouper fishing occurs when other fishing seasons are closed or when catches of other species are low (Hunt, pers. comm.). In 1989 combined landings totaled 3.0 million pounds (Beaver, pers. comm.), and in 1990 the total was approximately 2.5 million pounds valued at $4.3 million (FDEP, unpublished data).

Other Fisheries. The gathering, processing, and marketing of natural sponges was a major industry in the Keys for almost a century (Viele, 1991). However, a 1939 blight killed 60 to 90 percent of the region's sponges, leading to a significant decline in the industry. Sponging has recently resumed in the region (Viele, 1991), probably due to an influx of Cubans between the 1960s and 1980s, a prohibition on sponging in Biscayne National Park, and a Mediterranean sponge blight (Schmahl, pers. comm.). Most commercial harvest occurs in Florida Bay (Little, pers. comm.). In 1990 commercial landings totaled 387,000 pounds, valued at $2.8 million (FDEP, unpublished data).

Another significant fishery targets coastal pelagic species, including schooling migratory fish such as Spanish mackerel, king mackerel, and bait fish (e.g., ballyhoo). With the exception of king mackerel, these fish are seasonally available and are usually caught within five nautical miles of shore (Alevizon and Bannerot, 1990). Inshore fisheries target species such as mullet, pompano, and Spanish mackerel (Alevizon and Bannerot, 1990). In 1990 approximately 1.8 million pounds of mackerel were landed, valued at $1.26 million. Spanish mackerel dominated the catch (FDEP, unpublished data). Commercial fishing for pelagic species occurs offshore of the reef tract and within the Straits of Florida and has targeted swordfish, tuna, shark, dolphin, and other bill

fish (Alevizon and Bannerot, 1990; Gregory, pers. comm.).

Commercial Fishing Ports, Fishermen, and Boats. The Keys' major ports are shown in Figure 17. However, because much commercial fishing is conducted through small operations and from individual homes, it is difficult to accurately assess the total number of ports in the region (Hunt and Muller, pers. comm.). It is known, though, that Key West (Stock Island) and Marathon typically lead the Keys in landings and value, with the two areas accounting for 75 percent of the Keys' poundage and 83 percent of the value in 1990. The traditionally high value of Key West's landings made it the 25th most important fishing port in the United States in 1990 (Shermyen, 1991).

Florida requires a saltwater products license (SPL) for the sale of marine resources. In Monroe County during the 1989-90 license year, 4,156 SPLs were issued (Figure 18), the largest number for hook-and-line fishing, followed by traps and spearfishing/diving (FDEP, unpublished data). Because the county attracts fishermen from outside the Keys, landings were reported from 4,914 SPLs during this period (FDEP, unpublished data).

Fishermen typically participate in a variety of fisheries during the year. A cycle may begin in August by fishing for spiny lobsters, adding or switching to stone crabs in mid- to late October, briefly switching to king and Spanish mackerel in January and February, and shifting to snapper, grouper, and dolphin in early summer (Muller, pers. comm.).

In 1989 over 1,700 fishermen regularly operated in association with wholesale fish houses, not including part-time or independent fishermen (White, 1991). In 1989 there were over 1,600 registered commercial fishing vessels in the county (White, 1991). Between 1980 and 1990, however, the number of commercial vessels declined by six percent, contributing to a 22 percent decline in total commercial landings during the period. Factors influencing the declining number of vessels included the high cost of living in the Key West (Stock Island) area, increased dock fees, a reduction in available dock space, the retirement of older fishermen, and a declining shrimp industry (Monroe County, 1992; Bohnsack, pers. comm.).

Commercial Fishing Methods—Finfish. In the early 1900s, the two main gear types used in the Keys were hook-and-line and gill nets. During the 1960s, however, fishing power per unit effort in-

Figure 17. *Major Ports Within the Keys and Distribution of Landings by Port, 1990*

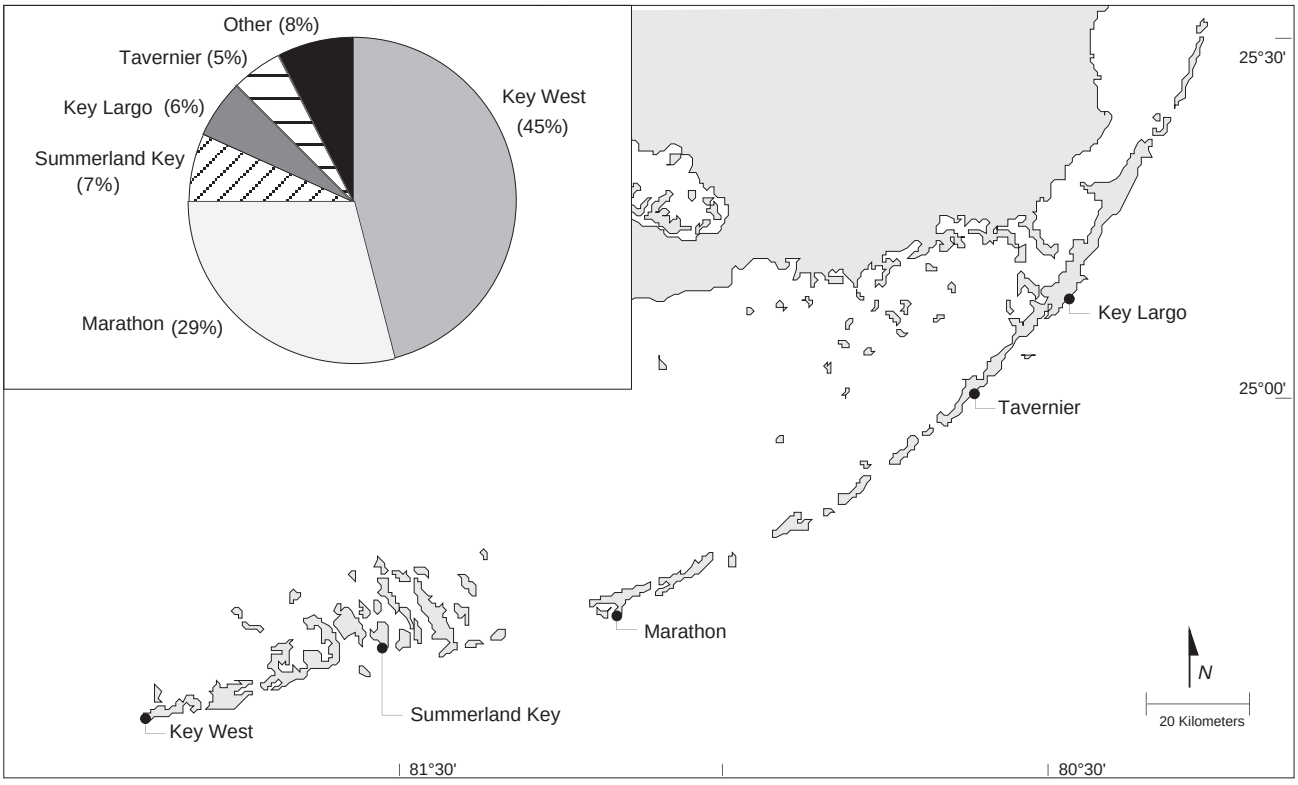
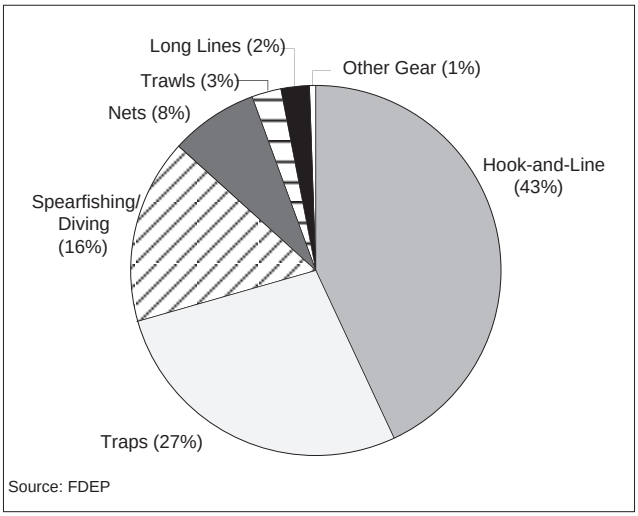


Figure 18. *Distribution of Saltwater Products Licenses by Fishing Method, July 1989 to June 1990*



creased considerably due to larger vessels, power reels, power rollers for hauling gill nets, and the use of electronic navigation devices (e.g., LORAN C) and spotter planes (Alevizon and Bannerot, 1990; Bohnsack, 1991). The main commercial reef-fishing gear currently used includes baited hand lines, electric and hydraulic reels, bottom long lines, and scuba diver spears and powerheads (Alevizon and Bannerot, 1990).

Most reef fish are caught with hook-and-line gear, with the baited hand line the most common type. In deeper water, mechanically operated "bandit" reels may be used (Little, pers. comm.). Both methods are used for snappers, groupers, and mackerels. Bottom long lines, trawls, gill nets, and spears are also used to catch snappers and groupers (Gulf of Mexico Fishery Management Council, 1981). Various nets (e.g., gill and seine) are used to catch Florida pompano, Spanish mackerel, king mackerel, and bait fish (Sweat, pers. comm.). It is currently illegal to use gill nets to catch snappers and groupers (Bertlesen, pers. comm.).

Commercial Fishing Methods—Invertebrates. For shrimp fishing, double-rigged twin trawls, developed in the late 1950s, have replaced single otter trawls as the primary gear. However, some small-scale commercial bait shrimpers still use single trawls (Alevizon and Bannerot, 1990). Most spiny lobsters and stone crabs are taken via wooden slat traps (Gulf of Mexico Fishery Management Council, 1981). A very small percentage of the commercial lobster catch comes from divers who use hand-held nets or their hands (Alevizon and Bannerot, 1990). Fish traps have been illegal in Florida waters since 1980, and in South Atlantic Fishery Management Council waters since 1992. The Gulf of Mexico Fishery Management Council is also currently considering making such traps illegal (Bohnsack, pers. comm.). Sponges are typically caught by hooking from boats, using a four-pronged iron rake attached to the end of a 5 to 7 m pole (Steveley et al., 1978).

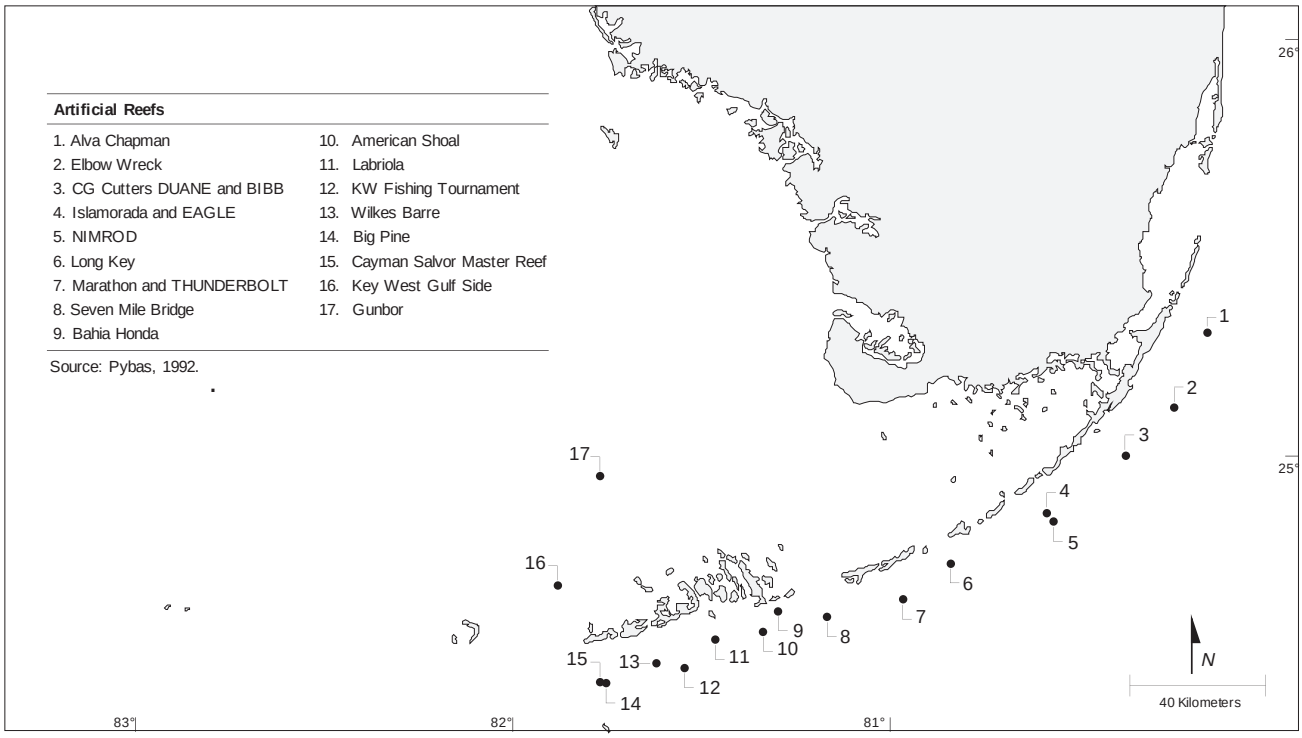
Marine Life Collecting. In addition to the commercial food and bait fish industries, a poorly documented fishery has recently been recognized as economically important. This "marine-life" fishery supplies small fishes, invertebrates, algae, and live rock to wholesalers, retailers, hobbyists, and public aquaria throughout the world (Feddern, pers. comm.).

Although the actual economic value of the marine-life fishery has not been determined due to its recently recognized significance, the wide variety of species involved, and the reluctance of fishermen to release financial data, it is estimated to be $30 million annually. About 260 species are harvested, including the juveniles of a small number of species managed in other fisheries (Feddern, pers. comm.). Overall harvest totals are not applicable because market categories are given as colonies, individuals, and pounds of material (e.g., live rock). Live rock is an important resource in the Sanctuary serving as a refuge and food source to many juvenile and cryptic species and serving as a substrate to filter feeders. However, rock beauty was the most frequently reported species collected in 1990 (on 1,913 trips). Angelfish and butterflyfish are the most frequently collected fish species in the county (Muller, pers. comm.).

Marine life fishermen are considered small business operators (Feddern, pers. comm.), and as such are regulated by Florida permits. Fishermen typically operate from small boats, using scuba, hookah, and snorkel methods, in depths up to 45 m. Hand nets, barrier nets, and anesthetics are used to capture fish, and invertebrates are either detached from the bottom or picked up by hand. Many marine life fishermen also buy live organisms from shrimp trawlers and bycatch from lobster fishermen. Little information is available on the impacts of the marine-life fishery on harvested populations and communities (Hunt, pers. comm.).

Aquaculture. Aquaculture, the rearing or husbandry of aquatic organisms, involves human intervention in the production of marine life. Such operations make

Figure 19. *Artificial Reefs in the Florida Keys*



up a relatively minor portion of the Keys' commercial fisheries, and although various aquaculture attempts have been made, most have failed. There are currently several projects operating in the Keys involving shrimp, finfish, and conch (Little, pers. comm.). One project, a shrimp farm in the Upper Keys, is attempting to rear adult brine shrimp (Hunt and Little, pers. comm.). A second is producing postlarval Pacific white shrimp to stock shrimp farms in Honduras (Little, 1991). The FDEP also recently set up an experimental culture laboratory for the depleted queen conch at the Marine Science and Conservation Center in Layton (Little, 1991) to determine the feasibility of laboratory rearing (Glazer, pers. comm.). In addition, Florida is currently developing a live rock aquaculture policy (Hunt, pers. comm.).

Artificial Reefs

Florida has more active permitted artificial reefs (329) than any other state in the country (Pybas, 1992). In Monroe County there are 17 permitted artificial reef sites (Figure 19), many of which are made of more than one structure or material (Pybas, 1992). Since many objects are deposited without a proper permit (e.g., abandoned shrimp boats, lobster traps), however, this number is probably a rather small percentage of the actual number of artificial habitats in Sanctuary waters (Kruer, pers. comm.; Pybas, pers. comm.).

Most artificial reefs are constructed from discarded materials, although some may be accidentally placed (Bohnsack and Sutherland, 1985). In the past, surplus auto tires; small craft; and household plumbing, cooking, and refrigerating appliances were used as reef structures. However, corrosion, siltation, and storm-related turbulence often caused reefs made of these objects to deteriorate, and more stable, corrosion-resistant materials have recently been used (Pybas, 1992). The two major types of artificial reefs currently used in the Keys are shipwrecks and bridge rubble (Kruer, pers. comm.). Other artificial hard-substrate habitats include engineering structures, piers, wrecked aircraft, pipelines, bridge pilings, culvert materials, large storage tanks, porcelain fixtures, navigational aids, and concrete structures (Jaap and Hallock, 1990; Kruer and Causey, 1992; Pybas, 1992).

In 1980 residents of the Keys formed the nonprofit Florida Keys Artificial Reef Association (FKARA) to determine the best use for the many concrete pieces created during removal of some of the area's original bridges. Between 1981 and 1987, more than 35,000 tons of rubble were placed at six sites throughout the Keys, creating food and shelter for a variety of fish

and invertebrate species (Kruer, 1991). The FKARA has also placed steel vessels, including the Coast Guard cutters BIBB and DUANE (off Key Largo), the EAGLE (near Islamorada), and the THUNDERBOLT (off Marathon), at several permitted sites (Kruer, 1991).

A Fisheries Resource. Artificial reefs are primarily used to create habitat for marine algae, fishes, and invertebrates and/or to enhance fisheries (Seaman et al., 1989; Kruer, 1991). As new habitats are created, species diversity and abundance may increase locally (Bohnsack and Sutherland, 1985; Milon, 1989a; Jaap and Hallock, 1990; Kruer, pers. comm.).

Artificial structures provide a biota similar to nearshore patch reefs and live-bottom communities (Jaap and Hallock, 1990). Marine algae, small invertebrates, and fish inhabit the newly introduced materials almost immediately. Smaller organisms provide food for many fish (e.g., snappers and groupers) and larger invertebrates (e.g., spiny lobster, crabs, and small shrimp) (Bohnsack and Sutherland, 1985; Kruer, 1991). Reefs are eventually colonized by other organisms including corals, tunicates, sponges, molluscs, bryozoans, and hydrozoans (Bohnsack and Sutherland, 1985; Jaap and Hallock, 1990; Kruer, 1991).

The time it takes for an artificial reef to become an effective fishery resource depends on variables including structure type and design, water column location, tidal current patterns, and bottom type (Bohnsack and Sutherland, 1985; Jaap and Hallock, 1990; Kruer, pers. comm.). For example, a structure five meters tall can provide habitats for several different organisms, including bottom and mid-water species (Bohnsack, pers. comm.; Kruer, pers. comm.).

Uses and Users. Fishermen and divers are typically the primary recreational users of artificial reef environments, with sport anglers often selecting the sites based on expectations of higher catch levels (Milon, 1989b). In addition, accessible, well-marked artificial reefs are particularly important to tourists who are unfamiliar with local fishing areas or cannot afford a chartered boat (Bender, 1978). Commercial fishermen and marine-life collectors also use these artificial habitats to catch species including amberjack, cobia, snapper, and spiny lobster (Bohnsack, 1989; Pybas, pers. comm.). Scuba divers often use artificial reefs because they are easily accessible and provide a variety of experiences (Milon, 1989b). They often consider dives near these structures to be unique experiences, rather than substitutes for trips to naturally formed reefs (Blout, 1981).

Artificial reefs can also be used as a resource management tool (Kruer, 1991). For example, as natural reefs become stressed due to fishing or diving, users can be encouraged to move to alternative artificial structures. However, it cannot be assumed that such sites will always increase fish production or be immune to the stress caused by human activities (e.g., overfishing) (Bohnsack, 1989). Although these sites may offer the potential to enhance many marine species, integrated management strategies and research efforts may also be needed to protect fisheries resources (Bohnsack and Sutherland, 1985; Milon, 1989a; Kruer, 1991; Pybas, pers. comm.).

Department of Defense Activities

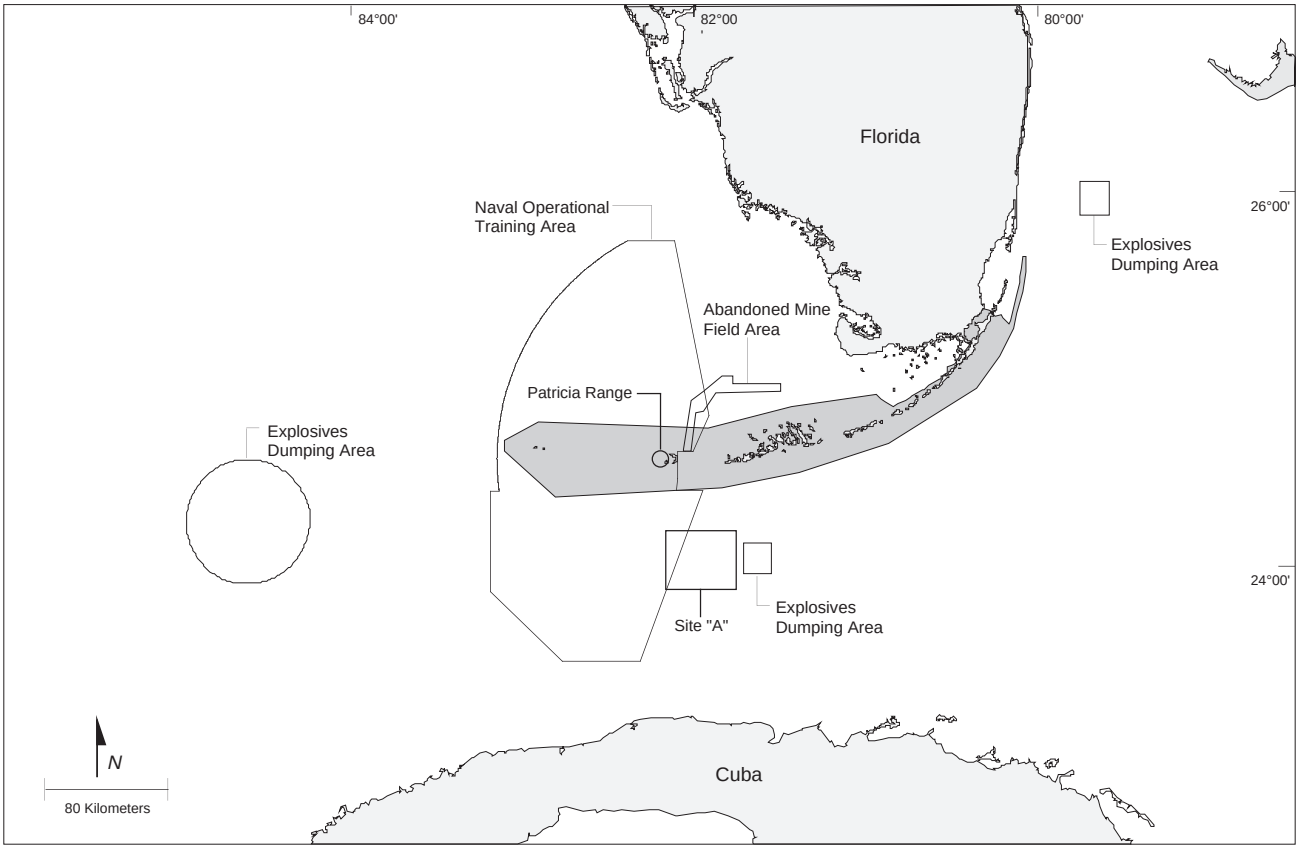
The U.S. Department of Defense has played an important role in Monroe County since the early 1800s, when the Federal government established a small naval operation in Key West to control piracy in nearby waters (1823).

Current Department of Defense Activities. The Department of the Defense (DOD) currently maintains several sites in the Keys, including the largest unencumbered airspace available for training on the East Coast (Figure 20). Although all of the military departments (Navy, Air Force and Army) are represented in the region, the Navy's presence is the most significant.

The Navy's location in the Keys has international significance, as it maintains the closest military installation in the continental United States to Cuba, Central and South America, and the Caribbean. All of the Navy's facilities are in the Lower Keys, with the majority in Key West. The largest is the Naval Air Station on Boca Chica (Monroe County Board of County Commissioners, 1986). Key West harbor, including piers at Trumbo Point and the Truman Annex, is also the site of the only active Navy facility within the Sanctuary, where Navy vessels conducting operations in the Sanctuary area are berthed, and where naval acoustic research vessels conduct operations. Fuel deliveries and other logistical actions are also conducted to support training and operations.

Economic Significance. DOD has historically been, and will continue to be, an important factor in the

Figure 20. *Military Areas Within the Keys*



Keys' economy. Ten percent of all earnings in Monroe County in 1988 were attributed to civilian and uniformed military personnel (White, 1991), and the United State's desire to maintain a strong presence in the Caribbean, combined with a climate ideal for pilot training, makes it likely that the military will continue to use the Keys for operations and training. The implementation of recommendations under the Base Closure and Realignment Act, however, may result in a decrease in the actual number of Naval personnel permanently stationed in the Keys.

Military Activities

Research and Development. DOD conducts research and development activities in the Florida Keys, both on and offshore, including research on radar and missile systems and test missile operations and evaluation. Other R&D activities include the following:

- Underwater Explosives Testing. The Navy formerly conducted small explosives testing in the shallow waters (12 to 120 m) of the Keys, but discontinued these activities in 1992. The Navy now tests explosives in an area Site "A," the upper boundary of which is located 18 miles southwest of Key West and about 10 miles from the Sanctuary boundary. Many of these tests are in connection with weapon systems testing or the shock testing of ship hull designs.

- The Navy prepared two Environmental Assessments (one under NEPA and one under Executive Order 12114) to assess the impacts from these operations at Site "A." Water depths at this site are too great (1,200 - 2,400 feet) to support benthic grasses. Concussive effects of the largest explosives would extend up to one mile from the detonation site. Thus, a two-mile safety zone (or smaller, as appropriate to the charge size) is maintained free of marine mammals and turtles before a charge is detonated. Worst case levels of explosion by-products immediately after detonation are far below levels found toxic to fish, and concentrations drop quickly to ambient levels. Additionally, no testing is conducted close to the northern boundary of Site "A", where the safety zone would extend beyond the site boundary.

- In an emergency, the Navy may dispose of explosives at three deepwater sites in the region (although they are outside the Sanctuary). The

site closest to the Sanctuary is part of Naval Test Area "A" (south of Key West).

- Mine Countermeasure Research. The Office of Naval Research occasionally sponsors research, in which allied forces participate, pertinent to mine operations in the shallow-water carbonate environment of the Sanctuary, using vessels greater than 50 meters in length in the Area To Be Avoided, and uses this environment to test the next generation of environmental monitoring and prediction systems for the next generation of mine countermeasure class ships. According to DOD, Key West is the only location in the continental U.S. where the environmental conditions are similar to those of the Persian Gulf.

- Corrosion and Coatings Tests. The Naval Research Laboratory/Marine Corrosion Facility at Flemming Key conducts a wide variety of corrosion and coatings tests utilizing sea water from the Sanctuary.

- Acoustic Research. Naval acoustic research vessels occasionally operate out of Key West harbor and conduct research activities in the Sanctuary.

Onshore Operations. There are a number of land-based military facilities in the Keys, accounting for about 5,200 acres. The Naval Air Station Key West, located at Boca Chica, and one communications site on Saddlebunch Keys account for 96 percent of all lands. There are also a number of military facilities in Key West, including storage and supply sites, military housing, the Navy commissary, and a medical clinic.

The air station at Boca Chica contains more than 3,000 acres of facilities for airfield operations, aircraft storage and maintenance, administration, supply, housing, recreation, general maintenance, and health care purposes. An Air Installation Compatible-Use Zone (AICUZ) surrounds the air station. The area excludes residential and commercial development because of excessive noise and accident potential.

In addition, the Air Force owns 35 acres on Cudjoe Key known as the blimp site. The blimps are used for aerial surveillance of the waters surrounding the Keys.

Offshore Operations. *Air Operations*. (a) General. The Naval Air Station (NAS) Key West is an operation air station, located at Boca Chica. Various fixed wing and rotary wing aircraft operate from and around the station. For all such aircraft, normal approaches, transits, and holding patterns occur regularly in accordance with applicable Federal Aviation Administration (FAA) guidance. This includes departure and landing patterns that take aircraft over the FKNMS at altitudes below 1000 feet. Normal transit and training flight operations occur year round. Search and Rescue (SAR) operations and any military operations using NAS Key West as a staging base can occur with little or no notice. Much of the airspace over and close to the station is designated as restricted. Air operations at the station are conducted in accordance with a consultation between the Navy and the Fish and Wildlife Service, undertaken pursuant to the Endangered Species Act for the protection of the Lower Keys Marsh Rabbit.

(b) Air Combat Maneuvering (ACM). The reserved airspace areas around NAS Key West are of critical importance to the Atlantic Fleet's aviation training. These areas represent one of the largest areas available for overwater and littoral aviation warfare training. Marine Corps and Navy fighter and attached aircraft squadrons visit the Station and conduct basic and advanced ACM training and carrier qualification training in the designated airspace areas. This training at times entails supersonic flight and low level flight, which can result in short periods of high noise levels. One training fighter squadron, VF-45, operates out of the Station most of the year as an "adversary" squadron to provide an "enemy" for aircrews undergoing training. Air Force fighter squadrons also use this airspace for the same purposes. Live gunnery exercises are conducted from time to time in designated areas with towed sleeves as targets.

(c) Air to Surface Ordnance. Military aircraft periodically use a designated bombing range located just west of Marquesas Key, west of the Station and east of the Dry Tortugas. This range, knows as Patricia Range, consists of a World War II vintage hulk that is aground just west of Marquesas Key. Aircraft make runs on this hulk in order to perfect at-sea delivery of ordnance. Authorized ordnance for training at the Patricia Range is limited to inert ordnance with smoke markers. No live ordnance is dropped. As of the date of issuance of this FEIS, operations at Patricia Range had been temporarily suspended pending an inquiry into the possible presence of endangered turtles at the target site.

Submarine Operations. (a) Exercise Torpedoes. Submarines engage in operations and training, including training in conjunction with Research, Development, Testing and Evaluation (RDT&E) in the

Sanctuary. Occasionally, submarines fire exercise torpedoes. These firings take place outside the Sanctuary. Exercise torpedoes are nonexplosive and are recovered for reuse.

(b) Sonobuoys. The Naval Air Warfare Center tests sonobuoys and conducts diver training operations approximately one or two times per month. Typically, buoys are gravity launched from an aircraft into shallow water and then recovered by divers in scuba equipment.

Special Warfare Operations. NAS Key West supports a Special Warfare Training Center as a tenant command. This center is located on Flemming Key and includes parachute insertions, scuba and rebreather training, and ESAL team training. Such training includes small boat operations, some at high speed, and insertion and recovery of swimmers and divers.

Other Department of Defense Activities.

Search and Rescue. This Search and Rescue (SAR) area is the second busiest in the Navy an extends 150 nautical miles form landing facilities in the Keys and also from Navy ships equipped with landing facilities that are in the area. According to the Navy, the Coast Guard does not maintain a SAR helicopter in the lower Keys, so the Navy picks up most SAR missions. Rotary wing and fixed wing SAR missions and training will fly from NAS Key West whenever necessary. These missions will go wherever they are needed and will entail hovering, insertion of swimmers and small boats into the water, and they even have the potential for helicopters to actually land in the water.

General. NAS Key West maintains piers for contract deliveries and support of small boats and ships at Truman Annex and Trumbo Point. Harbor craft, small military research vessels, surface warships, submarines, and sealift ships call at the Station on a routine basis. Access to these pier facilities is possible for large ships by transiting the Hawk Channel Cut. Transits, anchorings in designated anchorages, moorings, and pierside maintenance area ongoing at the vessels while pierside.

Harbor Management. A variety of small surface craft are used in support of harbor management, including training, waters transportation, pollution control, search and rescue, and other similar management functions. These small craft include oil boom deployment boats, work boats, crew boats, utility boats, and other similar vessels.

Fuel Deliveries. NAS Key West's fuel supplies come by sea by way of the Hawk Channel Cut. One Military Sealift Command (MSC) tanker per month delivers aviation fuel, and between two and three tankers per year deliver diesel fuel. The Key West Pipeline Company owns three tender tanks for receipt and storage of aviation fuel and a pipeline that runs between Trumbo Point Annex and NAS Key West. The pipeline is four inches in diameter and about seven and one-half miles in length. Approximately two miles of it is in the Sanctuary.

U.S. Coast Guard Activities

Because of its responsibilities in U.S. coastal areas, the Coast Guard also maintains a significant presence in the region. It has five primary missions: search and rescue, law enforcement, marine safety, marine environmental protection, and the operation and maintenance of navigational aids (e.g., channel markers, navigational lights, and lighthouses). Because of these responsibilities and the vast expanse of waters along the Keys, the Coast Guard provides an important public function in the Sanctuary. It is responsible for over 900 km of coastline and 88,500 km^2 of ocean area, and typically has several vessels and over 600 personnel located at three stations (Islamorada, Marathon, and Key West) in the area. The largest vessels operate out of Trumbo Annex in Key West.

Commercial Shipping

The Straits of Florida have historically been the access route for all vessels entering the Gulf of Mexico from the north and east and, consequently, the area is one of the most heavily trafficked in the world. It is estimated that 40 percent of the world's commerce passes within 1.5 days' sailing time of Key West (U.S. Department of the Navy, 1990). In addition, oil tankers transit the coast daily, including very large and ultra-large crude carriers.

The Gulf Stream lies offshore, and travels in a west-to-east direction. To take advantage of the additional speed afforded by the current, north- and east-bound vessels have historically followed the axis of the Gulf Stream, which lies about 65 nautical miles south of the Dry Tortugas and 45 nautical miles south of Key West. To avoid the current, south- and west-bound vessels have historically transited close to the reefs. A general guideline for south- or west-bound ships has been roughly to follow the 50-fathom curve.

Figure 21 shows the major commercial shipping routes in the region.

Areas to be Avoided. In 1991, as part of the FKNMSPA, several areas were declared off-limits to tankers and other vessels over 50 meters in length. These "Areas to be Avoided" (ATBAs) were developed in response to the region's many historical groundings, and large vessels have been discouraged from operating in those located along the Florida Reef Tract. Four ATBAs account for 96 nm^2 of waters within and adjacent to the Sanctuary.

Key West Harbor. Key West is a small port with minimal facilities for cargo commerce; its primary commercial activities are fishing and tourism. It is a port-of-call for cruiseships principally from Miami, Port Everglades, and Tampa. Ships with drafts of 8.5 m or less can transit the main ship channel and dock at Mallory Square, which in 1990 served over 127,000 passengers (White, 1991). Because of its favorable location, Key West is an important stop for repair/supply operations and crew changes for ships travelling through the Straits of Florida.

The U.S. military and the local electric plant at Stock Island receive the only commercial cargo entering Key West harbor, with tankers importing jet fuel for the Navy and barges bringing fuel to the electric plant. In addition to their routine operations at the site, the Coast Guard supports cutters and Aerostat vessels involved in radar surveillance.

Cruiseship Industry. The cruiseship industry in the Keys has grown rapidly in recent years, and the annual number of passengers disembarking at Key West grew from 10,600 in 1985 to over 127,000 in 1990. Peak months include February, March, and April. Figure 22 shows the number of passengers arriving monthly at Key West between 1988 and 1990.

Thirteen cruiselines currently use Key West as a destination, and cruiseships made over 300 port calls between October 1991 and September 1992. Key West is typically a stop for cruiselines that originate in Gulf of Mexico or East Coast ports. The majority come from the Port of Miami and include Key West as one stop in trips to various ports in Mexico and the Bahamas. Key West is also an occasional stop for world cruising ships (Hamlin, pers. comm.), ranging from 130 to 200 m long and accommodating up to 1,200 passengers (Hamlin, pers. comm.). Cruiseships typically arrive in early morning and depart in late afternoon, providing an almost daily influx of tourists to downtown Key West.

Figure 21. *Commercial Shipping Routes in the Region*

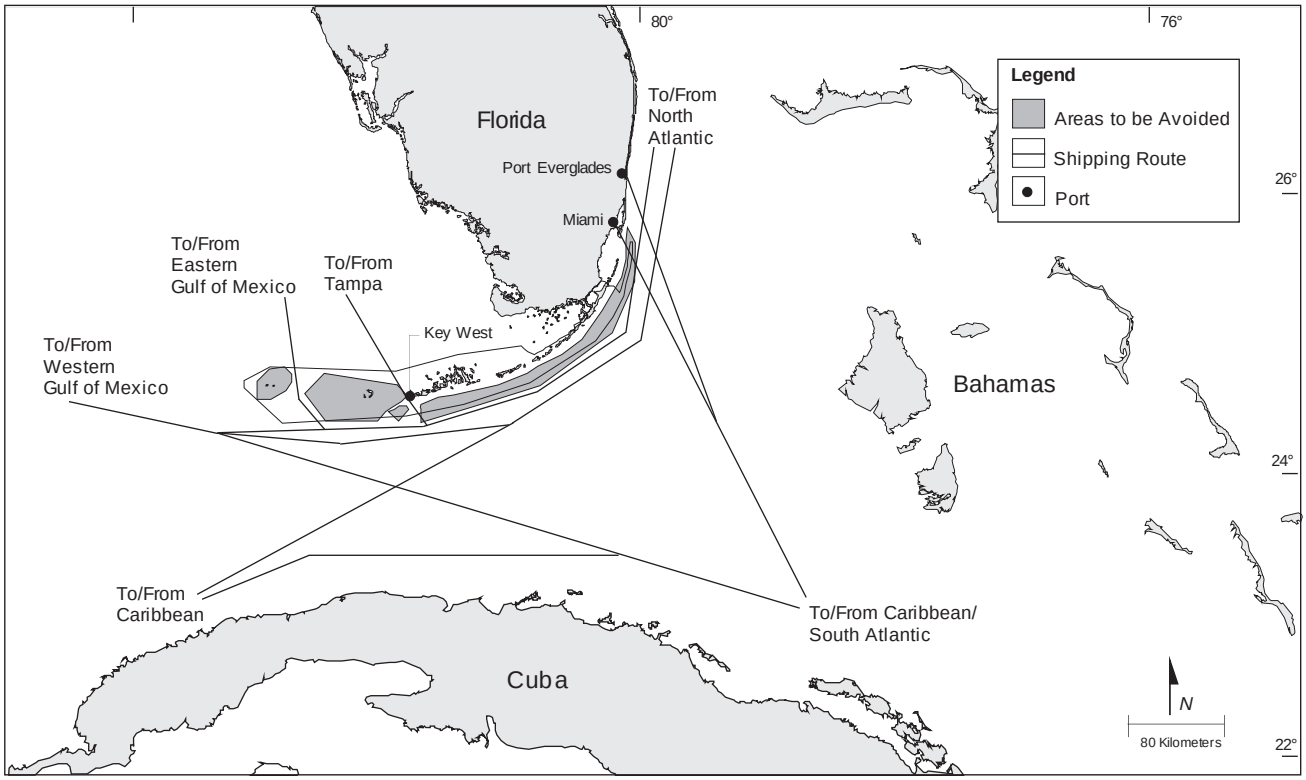
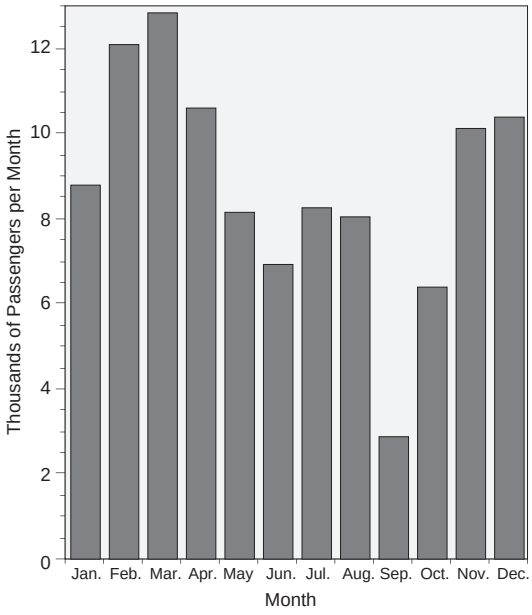


Figure 22. *Monthly Cruiseship Passengers in Key West Harbor,1988-1990*



Source: White, 1991

Cruiseships usually dock at Mallory Square, but may also dock at Pier B at Truman Annex. Two cruiseships anchor offshore at Pier B and ferry passengers to Key West. A second port is being proposed at Safe Harbor Marina on Stock Island to handle increased traffic in the event that Cuba becomes open to the cruiseship industry (Hamlin, pers. comm.). There is only a 4.5 m controlling depth to the marina, however, limiting its use to shallow-draft vessels.

Dredging. Dredging activities in the Keys are usually limited to small, private projects, the majority for dock or seawall construction at private residences. Dredging is also occasionally required for maintaining canals or expanding the dockage of a local marina. Recently, a small State-funded project in Marathon was completed to restore circulation between Florida Bay and Bonefish Bay (Helbling, pers. comm.). There are no Federal dredging projects in the Keys, but it is anticipated that the Key West Ship Channel will require maintenance dredging in the future.

Commercial Treasure Salvage Activities

Historical Significance. The Gulf Stream has historically been a major shipping route from the Caribbean basin to the North Atlantic. The Keys are located on the narrow Straits of Florida, which contain some of the most treacherous waters between the Americas and Europe (Smith et. al., in press.). Because of Spain's heavy use of this route, particularly in the 17th and 18th centuries, storms, currents, dangerous reefs and shoals, and human error have sunk hundreds of Spanish vessels, including the fleets of 1622, 1715, and 1733. Soon after such disasters, efforts were typically made to salvage the cargo and ships that were lost. In later centuries, the salvage of cargos (known as "wrecking") became a profitable business for small groups of sailors in the Keys. Federal courts were established to determine the award to be paid to the salvor by the owner or from proceeds of the sale of the cargo recovered. The success of these wrecking efforts was mixed and, as a result, some shipwrecks and cargo remained on the seabed and were covered by the sandy bottom.

As modern underwater technology such as scuba gear, metal detectors, and remote sensing devices were developed, both professional and amateur treasure hunters were able to search for lost and submerged treasures (Gerard, 1992). Federal courts traditionally applied the maritime Law of Salvage and the Law of Finds to cargo uncovered from shipwrecks that had been lost or abandoned for hundreds of years (Schoenbaum, 1987). For example, following the development of scuba equipment in the 1950s, treasure hunters in the Keys began salvaging the Spanish fleet of 1733. By the 1980s, most of the vessels in this fleet had already been found and salvaged (Miller, pers. comm.). As more treasure is found, there is less to discover and therefore the chances of finding more treasure is diminished. Some have the view that most of the treasure in the Keys has been found while others, including commercial salvors dispute this view and assert that many of the valuable tresures and artifacts, from wide dispersal patterns, have yet to be found. Regardless of one's point of view, there is an agreement that commercial treasure salvage is a very speculative venture at best.

The development of propeller-wash deflection devices (i.e., "mailboxes") enabled treasure hunters to blow crater-like holes, allowing the discovery of shipwreck material more than 20 feet below the surface of the seabed. Such mailboxes were important in Mel Fisher's 1985 discovery and recovery of the ATOCHA, which was lost with the 1622 Spanish fleet. However, indiscriminate use of mailboxes cause significant harm to natural resources as well as cultural resources, including contextual information.

While there are still recovery operations being conducted on the ATOCHA, MARGARITA, LA CAPITANA EL RUI, and the SAN JOSE DE LAS ANIMAS within the Sanctuary, most of Florida's commercial treasure salvage activity is associated with the 1715 fleet, which lies outside the Sanctuary. There has not been a significant new find in the Keys in five years.

Under the Abandoned Shipwreck Act (ASA) of 1988, neither the Law of Salvage nor the Law of Finds apply to abandoned shipwrecks in State waters. In areas of the Sanctuary under Federal jurisdiction, shipwreck recoveries (including those of the ATOCHA, MARGARITA, LA CAPITANA EL RUI), and the SAN JOSE DE LAS ANIMAS are expected to continue in a manner which does not terminate valid Federal Admiralty Court rights of access granted prior to congressional designation of the Sanctuary on November 16, 1990. However, recoveries will be subject to Sanctuary regulations in accordance with the ASA, ASA Guidelines, NMSA, the NHPA and FKNMSPA, as well as Federal Archeological Program guidelines.

Categories of Treasure Salvors. For purposes of analysis in this document, treasure salvors are grouped into three categories: 1) professional treasure salvors whose search, recovery, sale, and/or display of recovered items is a full-time endeavor and primary source of income; 2) paraprofessionals who hunt for treasure on a regular part-time basis, but for whom treasure salvage is not their primary source of income or full-time job; and 3) souvenir collectors/hobbyists who combine the search for treasure with their recreational diving activities.

Professional Treasure Salvors. The discovery of the 1715 Spanish fleet off Vero Beach in the early 1960s resulted in a treasure hunting boom in the Keys (Throckmorton, 1990). In the mid-1980s there was another surge of treasure salvage activities in South Florida. From 1985 to 1987, for example, Mel Fisher's Salvors, Inc. dove the ATOCHA and the MARGARITA with up to six boats in the water at once. The operation employed over 100 people as divers, crew, and support staff for office, laboratory, and museum work (Mathewson, pers. comm.). In addition to these activities, it was estimated that 40 to 50 people were actively conducting commercial treasure salvage during the 1980s at sites in Florida, mostly outside the Keys (Miller, pers. comm.). Treasure salvors have stated that 25 companies and over 100 people worked the 1715 Fleet and asserted that 1,000 to 2,000 people were directly or indirectly involved with tresure operations in Florida in the heyday of operations in the 1980s. While the potential for commercial treasure salvage operations is provided for in the plan, the number of companies and individuals involved directly and indirectly is not expected to reach those of the peak years in the 1980s.

Since the enactment of the ASA in 1988, and perhaps due to the unlikelihood of significant new finds, professional treasure salvors appear to have shifted their efforts to the Caribbean and other areas. Most professional treasure salvage in South Florida is currently conducted by Salvors, Inc., which has federal admiralty claims to the 1715 Fleet (outside the Sanctuary) as well as the ATOCHA and the MARGARITA (inside the Sanctuary). The company employs approximately 50 to 100 people, but this varies with the number of expeditions planned and financed. Some treasure hunters have estimated that there are numerous companies employing hundreds of workers in the Keys (Arnold, 1991; Haskins, pers. comm.; Chapman, pers. comm.). While it is difficult to precisely estimate the number of commercial treasure salvors in the Keys, commercial treasure salvors have been considered as a small business enterprise in developing the plan and permit system.

The equipment used in professional treasure salvage includes vessels, magnetometers, sonar devices, prop-wash deflectors, air lifts, metal detectors, scuba gear, tools, and other devices. The personnel involved in boat operations typically include a captain, crew, and divers. A marine archaeologist may be present to record information properly. Support personnel or services that may be utilized include researchers, conservators, coin experts, metallurgists, office staff, accountants, and lawyers.

Professional treasure salvage is a very speculative venture that typically yields little or no return on the investment made (Bauer, 1986). The annual costs of such operations can easily reach $1 million a year, and of those operations that do find treasure, few sell enough to repay costs or pay investors (Throckmorton, 1990). Given the business's speculative nature, therefore, even when treasure is discovered and recovered, the return on the investment is modest in light of the high risk involved. Treasure salvors concur that it is a highly speculative venture, but assert that there is still treasure to be found and that the public benefit if artifacts are recovered in an archeologically sound manner.

Paraprofessional Treasure Salvors. Paraprofessional treasure salvors use much of the same equipment and personnel as professional treasure hunters, but

operate on a smaller scale. The equipment and resources of a few individuals may be combined for a particular discovery/recovery operation. A small company may be set up (typically as a limited partnership) to formalize the venture. Paraprofessionals may also be involved as subcontractors for professional operators. The costs of paraprofessional operations are generally much less than that of professional operations. However, the profits from such ventures, if any, are modest. There are approximately 25 to 30 paraprofessionals currently working in the Keys, as well as some in other areas of Florida and the Caribbean (Miller, pers. comm.).

Souvenir Collectors and Hobbyists. Souvenir collectors and hobbyists conduct treasure hunting primarily in association with their recreational diving activities. They typically use metal detectors and dive from their own boat on a known vessel.

Existing Jurisdictional Responsibilities and Institutional Arrangements

This section provides an overview of the existing resource protection regime in the Florida Keys, and details its effectiveness in managing human activities and adequately protecting the Sanctuary's resources and environmental quality.

Several Federal, State, and local governmental agencies and departments and other organizations are responsible for managing individual resources and regulating their uses within the Sanctuary (see Appendix C in Volume III for a summary of existing legislative authorities). Table 14 summarizes the relevant resource management authorities. These agencies provide a system of comprehensive ecosystem management for the long-term protection of the Keys' diverse natural resources. Faced with increasing environmental threats from human activities, their capacity to perform effectively may deteriorate due to limitations in staffing, equipment, and funds available for enforcement. Also, because of the fragmentary nature of existing authorities (characterized by narrowly defined missions), coordinated policy development is difficult. As resource-use pressures continue to increase, overall management effectiveness may suffer if inter/intra-agency coordination is not achieved. The existing agencies may currently consider it within their mandate to work individually toward preventing or resolving conflicting management objectives. However, due to the inherently complex threats to the resource, a cooperative multi-agency management program is needed.

Federal

Federal agencies with primary environmental management responsibilities in the Keys are: the Sanctuaries and Reserves Division (SRD) of the Office of Ocean and Coastal Resource Management (OCRM) and the National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA) of the U.S. Department of Commerce (USDOC); the National Park Service (NPS), U.S. Fish and Wildlife Service (FWS), and Minerals Management Service (MMS) of the U.S. Department of the Interior; the U.S. Coast Guard (USCG); the Environmental Protection Agency (EPA); the U.S. Army Corps of Engineers (ACOE); and the Departments of the Army, Navy, and Air Force.

U.S. Department of Commerce

National Oceanic and Atmospheric Administration. Several NOAA line offices are directly responsible for resource management and regulation in the Keys.

Sanctuaries and Reserves Division. The National Marine Sanctuary Program is administered by the SRD within NOAA's National Ocean Service. A site-specific, comprehensive management plan is prepared for each sanctuary to ensure that resource protection, research, and interpretation activities are conducted in a coordinated manner consistent with Sanctuary goals and objectives. The SRD establishes policies and procedures in response to issues specific to the Sanctuary and develops a budget delineating expenditures for program development, operating costs, and staffing levels. Funding levels are reviewed and adjusted annually to reflect the priorities and requirements of the National Marine Sanctuary Program and evolving conditions in the Keys. The Sanctuary Superintendent is the primary spokesperson for the Sanctuary and is responsible for managing all day-to-day Sanctuary activities.

National Marine Fisheries Service. The NMFS shares responsibility with the FWS for implementing both the Marine Mammal Protection Act (MMPA) and the Endangered Species Act (ESA). Sanctuary resources protected under these Acts include several marine turtle and mammal species. The NMFS is assisted by the USCG, Florida Marine Patrol (FMP), and Sanctuary officers in enforcement operations. Under the Magnuson Fishery Conservation and Management Act, the NMFS is also charged with reviewing fishery management plans prepared by the South Atlantic and Gulf of Mexico fishery management councils, and approving all final plans. The Florida Marine Fisheries Commission works with the NMFS to ensure that the management plans are consistent with State coastal zone management programs. Sanctuary resources regulated by such plans include corals and reef fish. For example, the plan for reef fish sets bag and size limits, restricts the use of certain types of fishing gear, and establishes reporting and permit systems.

U.S. Department of the Interior

Minerals Management Service. Pursuant to the Outer Continental Shelf Lands Act (as amended), the MMS manages Outer Continental Shelf (OCS) hydrocarbon and mineral exploration, development, and production, including formulating and enforcing

Table 14. *Summary of Institutional Jurisdictions and Responsibilities*

	Natural and Cultural Resources						Living Resources		Environmental Management																	
	Soil and Water Conservation	Beach and Shore Preservation	Parks, Refuges, and Preserves	Land Aquisition for Conservation and Recreation	Outdoor Recreation, Recreational Trails, and Conservation	Historic Preservation	Saltwater Fisheries	Freshwater Fisheries	Water Resources; Water Management Districts	Commercial Development and Capital Improvements	Coastal Planning and Management; Land and Water Management														
Federal																										
U. S. Department of Commerce																										
NOAA							√	√																		
U. S. Department of State																										
U. S. Department of Transportation																										
Coast Guard																										
Federal Aviation Administration																										
U. S. Department of Interior																										
Fish and Wildlife Service	√	√	√	√	√	√					√															
National Park Service	√	√	√	√	√	√	√	√	√		√															
Minerals Management Service																										
U. S. Environmental Protection Agency									√																	
U. S. Department of Defense																										
Army Corps of Engineers																										
Army																										
Navy																										
Air Force																										
Advisory Council on Historic Preservation						√																				
State																										
Department of Environmental Protection	√	√	√	√	√	√	√	√	√	√	√															
Florida Marine Fisheries Commission							√																			
Game and Fresh Water Fish Commission								√																		
Health and Rehabilitative Services																										
Department of Commerce					√					√																
Department of Community Affairs	√	√		√		√				√	√															
Deartment of Administration																										
Department of Transportation																										
Department of State						√																				
Office of Planning and Budget																										
Department of Ag. and Consumer Services	√																									
Regional																										
Dade County																										
South Florida Regional Planning Council																										
South Florida Water Management District	√			√	√				√	√	√															
County																										
Growth Management Division																										
Building & Planning Departments					√	√				√	√															
Marine Resources		√									√															
Environmental Resources	√	√		√					√		√															
City																										
City of Key West	√	√			√						√															
City of Key Colony Beach	√	√			√						√															
City of Layton	√	√			√						√															
Other																										
South Atlantic Fishery Management Council							√																			
Gulf of Mexico Fishery Management Council							√																			
Housing Authority	√																									
Florida Keys Aqueduct Authority									√																	
Mosquito Control District																										

special lease stipulations designed to protect specific geological and biological features. The MMS also regulates activities associated with offshore oil and gas exploration and development based on the provisions of the Outer Continental Shelf (OCS) Lands Act. It has established biological lease stipulations, applied on a lease sale-by-lease sale basis, to mitigate the potential impacts of oil and gas exploration and development activities on high-relief banks and low-relief live-bottom areas of the Gulf of Mexico outer continental shelf. Additionally, the MMS has: 1) sand mining authority and 2) the ability to use OCS royalties to support the Land and Water Conservation Fund.

Fish and Wildlife Service. The FWS administers the Migratory Bird Conservation Act, the Fish and Wildlife Coordination Act, the Endangered Species Act, the Lacey Act, and a variety of other laws designed to protect the nation's anadromous fish, migratory birds, and endangered species through regulation, permitting, or coordination with other Federal agencies. The FWS also administers the National Wildlife Refuge System according to the National Wildlife Refuge System Administration Act. Four national wildlife refuges are within the boundaries of the Sanctuary: National Key Deer Refuge; Great White Heron National Wildlife Refuge; Key West National Wildlife Refuge; and the Crocodile Lake National Wildlife Refuge.

National Park Service. The NPS administers the National Park System, which includes national parks, preserves, monuments, memorials, historic sites, seashores, and battlefield parks. Three national parks and one national preserve are adjacent to Sanctuary: Dry Tortugas National Park, Everglades National Park, Biscayne National Park, and Big Cypress National Preserve. Although the NPS is not directly involved in regulation, their stewardship role results in an indirect involvement in programs affecting the Sanctuary.

Advisory Council on Historic Preservation. The National Historic Preservation Act authorizes the Secretary of the Interior to maintain a national register of “districts, sites, buildings, structures, and objects significant in American history, architecture, archaeology, and culture.” Any Federal agency conducting, licensing, or assisting an undertaking that may affect a site listed on, or eligible for listing on, the National Register must provide the Advisory Council on Historic Preservation and the State Historic Preservation Officer (SHPO) with a reasonable opportunity for comment. The criteria applied by the Council and the SHPO relate to whether the undertaking will change the quality of the site’s historical, architectural, archaeological, or cultural character.

U.S. Department of Transportation

Coast Guard. The USCG enforces all Federal laws in navigable waters under U.S. jurisdiction, in particular the Clean Water Act, the Comprehensive Environmental Response Act, the Compensation and Liability Act, and the Act to Prevent Pollution from Ships. The goal is to prevent pollution caused by vessel discharges of oil, hazardous substances, or other pollutants. The USCG is also the lead agency responsible for coordinating the response to oil and hazardous waste spills in tidal waters and, therefore, in the Sanctuary under the national contingency plan. In addition, the USCG regulates vessel traffic, maintains boater safety, and coordinates search-and-rescue operations through the Marine Safety Office and the Aids to Navigation Office.

U.S. Environmental Protection Agency

The EPA is responsible for protecting the nation's environmental quality and public health through pollution control and prevention measures. Specifically, the EPA regulates drinking water nationwide (including directing the municipal monitoring of drinking water), regulates hazardous waste storage and disposal practices, and monitors air and water quality. The agency is also responsible for the oversight of Superfund cleanup activities under CERCLA. The EPA also regulates sewage outfalls under the Clean Water Act via the National Pollutant Discharge Elimination System (NPDES). Under the NPDES program, a permit is required for the discharge of any pollutant from a point source into navigable U.S. waters, the waters of the contiguous zone, or oceanic waters. Within Florida's State waters, the EPA has delegated NPDES permitting authority to the State government. The EPA also has regulatory authority over ocean dumping under Title I of the Marine Protection, Research, and Sanctuaries Act (MPRSA). This legislation prohibits the transportation of any materials from the United States for the purpose of dumping in the territorial sea, the contiguous zone, or the ocean without an EPA-issued permit. In conjunction with the FDEP, the EPA is also responsible for developing a Water Quality Protection Plan for the Sanctuary.

U.S. Department of Defense

The Department of Defense maintains numerous facilities and training areas in the Keys, and training missions are frequently conducted by all branches of the armed services. The Navy has conducted military training within the Sanctuary, while the Air Force and Army maintain facilities in the Keys and conduct military training nearby.

Army Corps of Engineers. The ACOE issues and enforces permits for the discharge of dredged or fill material into navigable waterways (including wetlands) under section 404 of the Clean Water Act. It has jurisdiction over marine construction, excavation, and fill activities in all navigable waters of the United States. Pursuant to the Rivers and Harbors Act, the ACOE must issue a permit before any marine construction, excavation, or fill activities in these areas can be conducted. Permits may be refused when it is believed that dredge-and-fill activities may pose a threat to navigation or will have an adverse impact on living marine resources. Under Title I of the MPRSA, the ACOE is responsible for regulating the disposal of dredged materials in accordance with EPA/ACOE guidelines. The ACOE is also responsible for determining that the dumping will not degrade or endanger the marine environment, human health, or economic potentialities. Permit applications typically include requests to place fill on lots for house pads and driveways or as a base for planting trees. The ACOE regularly consults with the EPA, NMFS, and FWS regarding permits issued in the Keys.

State

State agencies with jurisdiction in the Keys are the Florida Department of Environmental Protection (FDEP); Florida Department of Community Affairs (FDCA); Florida Marine Fisheries Commission (FMFC); Department of Health and Rehabilitative Services (DHRS); Game and Fresh Water Fish Commission (GFWFC); Department of State (DOS) and Department of Commerce (DOC).

Florida Department of Environmental Protection

The FDEP was formed on July 1, 1993 as the result of a merger of the Florida Department of Natural Resources and the Florida Department of Environmental Regulation. In the legislation implementing the agency, the declaration of policy stated that "the protection, preservation, and restoration of air, water, and other natural resources, of this state are vital to the social and economic well-being and quality of life of the citizens of this state and visitors to this state." The merger was intended to provide more efficient, effective management of the State's natural resources and to protect the best interests of the public.

The FDEP provides policy directives to State agencies and regional and local governments. It also supervises regional water management districts, and delegates the authority to carry out programs to these water management districts, other State agencies, and local government agencies. To achieve these goals, the FDEP conducts regulatory programs to control or prohibit air and water pollution and to clean up or restore polluted land and water resources. It also supports research on environmental issues, and provides educational and technical assistance to the public for preventing environmental damage.

The divisions of the FDEP with natural resource management responsibilities in the Keys include: Recreation and Parks; Marine Resources; State Lands; Law Enforcement; Beaches and Shores; Water Management; Waste Management; and Water Facilities.

Recreation and Parks. The mission of the Florida Park Service (FPS) is to provide opportunities for Florida residents and visitors to experience a variety of resource-based outdoor recreation activities, while ensuring the preservation and restoration of these areas' natural and cultural resources. To accomplish its mission, the FPS develops, maintains, and operates a statewide park system that includes State parks, recreation areas, archaeological sites, historic sites, geological sites, botanical sites, preserves, and reserves.

Marine Resources. This organization is divided into several bureaus and offices responsible for managing the State marine resources, including: the Bureau of Sanctuaries and Research Reserves (BSRR); the Florida Marine Research Institute (FMRI); the Bureau of Marine Resource Regulation and Development (BMRRD); the Bureau of Marketing and Extension Services (BMES); the Office of Fisheries Management and Assistance Services (OFMAS); and the Office of Protected Species (OPS).

The BSRR is responsible for administering and managing the Looe Key and Key Largo national

marine sanctuaries and the Appalachicola and Rookery Bay national estuarine research reserves.

The FMRI has two facilities in the Keys. The long-term objective is to promote wise management of the Keys' ecosystem through research and marine education pertinent to South Florida's fisheries and the marine environment in general.

OFMAS, established in 1990, is responsible for examining recreational fisheries and fisheries management issues, emergency response to marine environmental disasters, mosquito control, aquaculture issues, the review of comprehensive management plans, and environmental education programs.

State Lands. The DSL is responsible for acquiring and managing State properties in the public interest either by managing the properties or by leasing them to other agencies. The Bureau of Submerged Lands and Preserves (BSLP) manages, protects, and enhances Florida's sovereign submerged lands. (State waters, although within the physical boundaries of the Sanctuary, are not included within the Bureau's management responsibilities.) The Bureau also manages all sovereign submerged lands within the Sanctuary, and any activities conducted on this land require prior authorization. Most are related to dredge-and-fill operations, but others also fall under the Division's review responsibilities.

Law Enforcement. The Florida Marine Patrol (FMP) enforces all State statutes, rules, and regulations within State waters, including the Sanctuary. While their primary focus is marine protection and boating safety, they are also responsible for enforcing Federal regulations in areas beyond Florida's territorial limits, under interagency agreements with the following agencies: the Department of Commerce's NMFS; the Department of the Interior's FWS; the U.S. Customs Service; and the USCG.

Beaches and Shores. The Division of Beaches and Shores (DBS) has regulatory jurisdiction for construction and excavation activities on sovereign lands seaward of the high-water line of any State tidal waters. In addition, the DBS has regulatory jurisdiction for specific construction activities within 50 feet of the mean high-water line at any riparian coastal location fronting the Gulf of Mexico or Atlantic Ocean shoreline (excluding bays, inlets, rivers, bayous, creeks, passes, etc.). Historically, the DBS has not consistently asserted regulatory jurisdiction within Monroe County. However, it has included Monroe County in the Florida Beach Restoration Management Plan.

Water Management. The FDEP manages changes in State surface water quality standards. Responsibilities include managing the state's general antidegradation policies, water quality uses, classifications and reclassifications, narrative and numeric water quality criteria, and special protection measures such as Outstanding Florida Waters (OFW) and Outstanding National Resource Waters (ONRW). In 1985 the Keys were designated as OFW (excluding canals). The OFW program is generally implemented through the DEP's permitting system, and only affects activities that require a FDEP permit. The intent is the maintenance of ambient water quality.

The FDEP also conducts water quality monitoring in compliance with the Department's quality assurance rule. The lack of financial resources devoted to monitoring efforts in the Keys is reflected by the limited water quality monitoring activities currently taking place. Such monitoring is now only done in response to specific requests or permits. The efforts of the FDEP's Marathon office are focused on tracking and enforcing violations in current regulations. No specific plans for monitoring have been completed for the Keys.

Wetland Resource Management. The FDEP processes applications for wetland resource (dredge-and-fill) permits for large-scale projects requiring work in State waters. These projects include those with more than 10 acres of dredging or filling, all commercial marinas and docking facilities, and private marinas with more than 10 slips. Permit processing is governed by the Warren S. Henderson Wetlands Protection Act of 1984. In general, the Henderson Act sets forth the criteria by which the landward extent of State waters is determined (i.e., what constitutes a wetland), when a permit is required, procedures for application and processing, and the criteria for issuance or denial.

Of special interest is a State statute on "additional criteria for dredging and filling within Outstanding Florida Waters in Monroe County." This statute is intended to provide the most stringent protection for Keys' waters under the law. It specifically protects coral, algae, sponge, and seagrass communities; outlines siting and design criteria for piers and boat-mooring facilities; and defines permitting requirements for marinas and shoreline stabilization. The criteria are specific to the natural water bodies in Monroe County.

On November 16, 1992 the FDEP delegated dredge-and-fill permitting authority to the water management districts for those projects requiring a surface water management permit. The FDEP retained dredge-and-fill permitting responsibility for landfills, wastewater treatment facilities, industrial wastewater treatment facilities, hazardous waste facilities, and other projects involving dredge-and-fill but not requiring a surface water management permit.

Pesticides. The FDEP also administers activities related to mosquito and arthropod control, particularly on State-managed lands. No significant work has been conducted on the impacts of pesticides on groundwater in the Keys.

Waste Management. The impacts of point source discharges in the Keys have been reviewed since 1977 in an attempt to improve water quality-based effluent limitations (WQBELs) for point source surface water discharges. Other projects are also reviewed for their potential water quality impacts.

The FDEP also regulates all underground storage tanks over 100 gallons containing pollutants and hazardous substances defined by CERCLA, and surface storage tanks with capacities over 550 gallons. Because of the Keys' geology and water table, underground storage tanks have special requirements and are more costly than surface storage tanks, which are more common in the Keys. As part of the SUPER Act of 1986, the FDEP is required to contract with local governments whenever possible to perform compliance and enforcement activities. The Monroe County HRS unit performs such activities in the Keys.

Water Facilities. The FDEP coordinates permitting, compliance, and enforcement activities for domestic and industrial wastewater treatment facilities. Domestic wastewater treatment plants generating over 2,000 gallons per day (gpd) flow, and all on-site wastewater treatment and disposal systems generating over 5,000 gpd are permitted by the FDEP's district offices or approved local programs. Septic tanks and On-site Disposal Systems (OSDS) generating under 5,000 gpd are permitted by FDHRS. The Domestic Wastewater Section serves as liaison for the FDEP on septic tank issues, but has no permitting authority. The 1979 Monroe County Facilities Plan recommended the construction of a centralized wastewater system only after available data confirmed the need for centralized facilities based on violations of water quality standards or threats to public health. The county's comprehensive plan recommended a long-term water quality monitoring program. However, the implementation of centralized wastewater treatment plants has not been initiated due to a lack of justifying data.

Environmental Regulation Commission. This commission consists of unpaid citizens representing various interest groups including agriculture, real estate, environmentalists, the construction industry, and private citizens. It sets air and water quality standards for the FDEP and has authority over groundwater and hazardous waste cleanup requirements, fees, and permitting regulations.

Department of Community Affairs

The DCA is responsible for planning and regulating land use by approving local government comprehensive plans and land development regulations. Planning activities are integrated on the regional, State, and local level. The DCA is made up of the Office of the Secretary, three divisions, and the Florida Housing Finance Agency.

Coastal Management Program. In 1978 the State legislature passed the Florida Coastal Management Act. NOAA's Office of Ocean and Coastal Resource Management approved the state's program in 1981, and has provided management grants of approximately $2 million per year in accordance with Section 306 of the Federal Coastal Zone Management Act. Federal approval of the state's program also mandated that Federal activities within and seaward of the coastal zone had to be consistent, to the maximum extent possible, with the policies of approved State coastal management programs.

The DCA administers the Florida Coastal Management Program (FCMP). Florida's coastal zone comprises 8,426 statute miles of tidal shoreline, encompassing 35 coastal counties, including Monroe County. The FCMP is structured as a network of State agencies that improves the effectiveness and efficiency of implementing existing laws and programs in the coastal zone.

Areas of Critical State Concern Program. The Areas of Critical State Concern (ACSC) program identifies certain regions of the state for special protection based on perceived threats to significant natural resources and/or the need to protect public facility investments. The program is authorized by a component of the Florida Environmental Land and Water Management Act of 1972. The Act sets forth criteria and procedures for designating the areas and identifies the DCA as the State agency responsible for administering the program. The objective is to

review the comprehensive plans, land development regulations, and activities in each ACSC. Areas are deemed critical when it is determined that there is a need to protect public resources from unregulated or inadequately regulated development. The ACSC program has very little jurisdiction in the Sanctuary because it ends approximately 250 feet below the mean high-water mark. However, it is important because of the limits it places on upland development and the capital improvements in water quality it requires.

Specific ACSC objectives that address water quality issues in the Sanctuary include:

- coordinating all local governments in the Keys to ensure that their comprehensive plans include a drainage element, a wastewater treatment element, and a capital improvement element, and that they are consistent with the policies of the ACSC program and the principles guiding development;

- strengthening local government planning in the Keys to the extent that the ACSC designation may be removed;

- protecting marine resources and shorelines, including wetlands, mangroves, seagrasses, coral reefs, and their respective faunas; and

- limiting the adverse effects of development on water quality throughout the Keys.

The Governor and Cabinet can designate an area by rule, setting the boundaries of an ACSC and the principles to be used for guiding development activities. Once an area is designated, affected local governments have 180 days to submit land development regulations consistent with the principles set forth in the rule. If the local government fails to submit regulations, or if its proposals are insufficient, the State land planning agency may propose development regulations for the governor's and cabinet's approval. Monroe County and the City of Key West were designated as ACSCs by the governor and cabinet in April 1975.

Florida Marine Fisheries Commission

The State legislature created the FMFC in 1983 to manage and preserve Florida’s renewable marine fishery resources by emphasizing the protection and enhancement of Florida's marine and estuarine environments.

The FMFC consists of members appointed by the governor and approved by the State Senate. It has full rule-making authority for Florida’s marine species (except endangered species) and its regulations are subject to final approval by the governor and cabinet. The FMFC's rule-making authority relates to gear, bag limits, size limits, protected species, closed areas, seasons, and egg-bearing females of certain species.

As of February 1991, the governor and cabinet had approved over 460 saltwater fishing rules recommended by the FMFC. In addition, the Commission is required to make annual recommendations regarding marine fisheries research priorities and funding for the FDEP. The Commission also has authority over 220 local laws related to saltwater fishing. In developing rules for saltwater fishing, the FMFC holds public workshops across the State in which information and views on issues are presented, and public input is solicited. From this input, the Commission drafts a proposed rule and associated regulations, which are subject to the State administrative procedures. Before any new rule is approved, the FMFC holds at least one final public meeting.

The need for comprehensive and consistent fishery management, protected species management, and fishery habitat preservation and restoration is of particular concern. Accordingly, the FMFC is working with Federal fisheries management councils to achieve the consistent management of Sanctuary resources.

Department of Health and Rehabilitative Services

The mission of the FDHRS is to protect public health. It oversees the construction, installation, and operation of individual OSDSs and implements a fee schedule designed to recover the cost of conducting the OSDS program. The FDHRS also permits injection wells for stormwater or domestic wastewater effluents of less than 2,000 gpd, and provides continuing education courses for septic tank contractors, pump-out operators, environmental health specialists, and master plumbers who install or service septic tanks. The FDHRS is also responsible for regulating private water systems, providing mosquito control, implementing beach closures, and issuing public health warnings regarding contaminated fish.

Florida Game and Fresh Water Fish Commission

The FGFWFC manages freshwater aquatic life and wild animal life and their habitats to perpetuate a diversity of species and reduce fish and wildlife habitat losses. Under Florida's constitution, the FGFWFC is responsible for protecting freshwater and upland endangered and threatened species. In addition to the specific responsibility to enforce rules with respect to the protection of listed species, Commission law enforcement offices are empowered to enforce State environmental laws.

Department of State

The Department of State has responsibilities with respect to proposed State, State-assisted, Federal, or federally assisted activities that could have an adverse impact on the Sanctuary's cultural resources. The director of the Division of Historic Resources serves as the State Historic Preservation Officer.

Division of Historical Resources. The FDHR is responsible for managing the state's historical resources, specifically those on State-owned submerged lands. All treasure, artifacts, and objects with historical and archaeological value that have been abandoned on State-owned or State-owned sovereign submerged lands belong to the State, with title vested in the FDHR for administrative and protective purposes. With respect to the Sanctuary Management Plan, the FDHR will be primarily responsible for submerged cultural resources, especially historic shipwreck sites and other abandoned objects having historical or archaeological value. The FDHR includes four bureaus: the Bureau of Archaeological Research; Bureau of Historic Preservation; Bureau of Historical Museums; and Bureau of Florida Folklife Programs.

Bureau of Archaeological Research. The chief of the Bureau of Archaeological Research is the State Archaeologist, and the office is primarily responsible for managing State-owned archaeological sites by establishing shipwreck preserves, conducting surveys and assessment studies, granting and monitoring research permits, etc. The Bureau manages a contract program for exploring and salvaging historic shipwreck sites, and has been regularly involved in coordinating the state's legal response to Federal admiralty arrests in State waters. It also receives applications for archaeological research permits for State-owned sites and monitors archaeological work after permits are granted.

Bureau of Historic Preservation. The Bureau of Historic Preservation reviews numerous private and public undertakings within the provisions of Federal and State regulations designed to protect archaeological and historical resources. For example, the Bureau reviews dredge-and-fill permit applications submitted to the ACOE, as well as any other State- or federally-funded permitted undertakings consistent with the requirements of the National Historic Preservation Act and the Florida Historic Resources Act.

Department of Agriculture and Consumer Services

Within the Keys, this agency is primarily responsible for mosquito control, and its Bureau of Entomology and Pest Control administers the state's mosquito-control program. Its responsibilities include overseeing all local mosquito-control programs, reviewing and approving all county or mosquito-control district work plans and work budgets, and administering State funding programs. In addition, the Bureau of Pesticides registers all pesticides, including mosquito-control products, for sale and distribution. Using the Bureau's authority, the Department may deny, cancel, or modify the conditions of any pesticide registration.

In Monroe County, the Mosquito Control Authority has the lead responsibility for eradicating adult mosquitoes and for conducting larval mosquito control activities. The objectives are to: 1) protect human health and safety; 2) promote the state's economic development and facilitate the enjoyment of its natural resources by reducing the number of disease-carrying arthropods; and 3) conduct arthropod control consistent with protecting the environmental and ecological integrity of all State lands and waters. Pesticides are applied under its direction via aerial or truck spraying.

Department of Commerce

Florida's Department of Commerce is not a regulatory agency and has no legislative jurisdiction. Accordingly, its efforts are focused on promoting tourism and developing the state's economy. The FDOC is comprised of three divisions: Tourism, Economic Development, and International Trade and Development. The Division of Tourism stimulates and promotes coordinated, efficient, and beneficial travel and leisure development under the oversight of the Florida Tourism Commission. The legislature created the Commission in 1991 with the authority to fund, plan, promote, and coordinate the state's tourism-related activities.

South Florida Water Management District

The FDEP has supervisory and legal authority over the regional water management districts under the Florida Water Resources Act of 1972. These districts design, construct, operate, and maintain water management facilities. They also administer flood protection programs, perform water resources technical investigations, develop water resource plans, regulate the consumption of water, and acquire and manage lands through the "Save Our Rivers" program. In addition, they have the primary authority to regulate development that impacts freshwater wetlands and estuarine systems through their dredge-and-fill, groundwater, surface water, and stormwater management permitting programs. Water management districts also plan and administer environmental restoration projects, often through programs such as Florida's Surface Water Improvement and Management (SWIM) Act. District authority extends to all State waters, and also includes the power to tax.

In 1982 the State delegated the stormwater quality permitting program for the Keys region to the SFWMD. The projects in the Keys qualify for either a surface water management general permit or exemption, due to their small size and/or the amount of impervious cover. Projects that would otherwise qualify for an exemption (because they are less than 10 acres in size) often require a general permit because they have over two acres of impervious area.

The majority of the projects in the Keys fall below the District's threshold for permitting and, as a result, are subject to the county's stormwater management ordinance, adopted in October 1992. Whether permitted by the District or the county, all final stormwater discharges must meet State water quality standards.

Regarding nonpoint source management, the FDEP has worked with the FDHRS to revise statutes for OSDSs, including developing special requirements for systems in the Keys. In addition, the 1986 Statewide Nonpoint Source Assessment included the Keys, although less than 10 percent of the area’s surface waters were assessed.

Existing research needs include an assessment of the effectiveness of traditional stormwater management practices in the Keys. There is uncertainty whether these practices produce the desired level of treatment given the region's soil, geology, and vegetative characteristics. Research is also needed on the effectiveness of traditional erosion and sediment-control practices.

County

Monroe County is a nonchartered county, and its authorities and powers emanate from the State legislature; the local government functions in accordance with the Florida constitution. A Board of County Commissioners performs the executive and legislative functions of the county government. The Board consists of five members elected at large. Each county commissioner represents one of the five county districts for a four-year term (Monroe County Year 2010 Comprehensive Plan, 1992). The government is divided into five divisions: Management Services, Public Safety, Community Services, Growth Management, and Public Works.

Monroe County manages individual resources and regulates uses throughout the Keys through its adapted comprehensive plan, which is predicated upon specific Florida statutes and administrative codes. The County has completed an updated comprehensive plan that is subject to review and amendment by the FDCA (Chapter 163, Part 2 F.S. and Chapter 9J-5 Florida Administrative Codes). Major topics of this plan include:

- future land use;
- conservation and coastal management;
- traffic circulation;
- mass transit;
- ports, aviation, and related facilities;
- housing;
- potable water;
- solid waste;
- sanitary sewer;
- drainage;
- natural groundwater aquifer recharge;
- recreation and open space;
- intergovernmental coordination; and
- capital improvements.

The Board also adopts final approved management plans.

The Monroe County Land Authority

Florida Statute 380.0552 specifies the Keys as an Area of Critical State Concern and mandates the creation of a local county land authority. It further mandates that a comprehensive plan affecting the

Keys may be enacted, amended, or rescinded by the local government, but may only become effective upon the approval of the State land planning agency. These statutes are in agreement with the Articles set forth in chapters 28-29 of the Florida Administrative Codes.

In 1991 the legislature created the Monroe County Land Authority, which functions as an independent arm of the Monroe County government. The Monroe County Board of County Commissioners serves as the Board of Directors, but none of the powers or authorities of the Commission are given to the Land Authority. Instead, the Land Authority is responsible for purchasing properties made unbuildable by the implementation of the 1986 land-use plan. A five-member Advisory Council appointed by the Land Authority considers purchase requests based on the following criteria: preservation of environmentally sensitive lands; preservation of the habitats of rare, threatened, or endangered species of plants and animals; and protection of open space, scenic corridors, and viewsheds. Purchases recommended by the Land Authority must be reviewed and approved by the State Comptroller, the DCA, and the FDEP for statutory and program compliance.

Municipalities

There are three municipalities in the Keys: Key Colony Beach, Layton, and Key West. The cities of Layton and Key Colony Beach exert jurisdiction to mean high water, and Key West exerts jurisdiction up to 500 feet off its shores. Within Key West, the main jurisdictional agency is the Port and Transit Authority, which manages operations at Mallory Square and Garrison Bight.

Other

South Atlantic and Gulf of Mexico Fishery Management Councils

The Gulf of Mexico and South Atlantic fishery management councils are two of eight councils established by the Magnuson Fishery Conservation and Management Act, as amended (Magnuson Act), 16 U.S.C. 1801 et seq. to manage fishery resources in the exclusive economic zone (EEZ). Except where modified to accommodate international boundaries, the EEZ encompasses all waters from the seaward boundary of each of the coastal states to a line on which each point is 200 nautical miles (nm) from the baseline from which the territorial sea of the United States is measured. The Councils are charged with preparing Fishery Management Plans (FMP) that define certain fisheries within their jurisdictions and establish management measures to prevent overfishing. A description of the FMP process, National Standards, and a list of the FMP's that apply in the Sanctuary waters is contained in Appendix D in Volume III.

The Gulf of Mexico and South Atlantic councils' jurisdictions overlap the FKNMS. The boundary between these two Councils coincides with a line of demarcation between the Atlantic Ocean and the Gulf of Mexico that begins at the intersection of the outer boundary of the EEZ and 83"00' W. longitude, proceeds northward along that meridian to 24"35' N. latitude, (near the Dry Tortugas), thence eastward along that parallel, through Rebecca Shoal and the Quicksand Shoal, to the Marquessas Keys, and then through the Florida Keys to the mainland at the eastern end of the Florida Bay, the line so running that the narrow waters within the Dry Tortugas Islands, the Marquessas Keys and the Florida Keys, and between the Florida Keys and the mainland, are within the Gulf of Mexico. Because State waters extend 9 nm off the Gulf coast of Florida and only 3 nm off the Atlantic side, most of the EEZ within the FKNMS is under the jurisdiction of the South Atlantic Council.

Florida Keys Aqueduct Authority

Because of the limited drinking water sources in the Keys, almost all potable water is supplied via a pipeline owned and operated by the Florida Keys Aqueduct Authority (FKAA). This public water system uses well fields and treatment facilities in Dade County for its entire supply. The FKAA is the only public water system in the Keys regulated by the DEP's Public Water System Supervision program.

Monroe County Mosquito Control District

The Monroe County Mosquito Control District (MCMCD) maintains a program of abatement for mosquitoes and other insect pests in the Keys. Its primary mission is to provide effective mosquito control, responsive to the health and safety of the county's residents and visitors, while minimizing adverse environmental impacts.

Policy decisions are made by a five-member, publicly elected board. Day-to-day management of MCMCD staff and facilities is provided by a board appointed

by the executive director. The district has approximately thirty-seven full-time staff members. The MCMCD operates from Key West to Key Largo, and serves all municipalities and the unincorporated area of the county.

Memoranda of Understanding

Federal Agreements

National Marine Fisheries Service and Office of Ocean and Coastal Resource Management, NOAA. In 1992 a memorandum of understanding was developed within NOAA, between the Assistant Administrator for Fisheries and the Assistant Administrator for Ocean Sciences and Coastal Zone Management, concerning the National Marine Sanctuary Program. This agreement established an improved level of coordination between NMFS and NOS regarding the selection and nomination of proposed marine sanctuaries, the development of fisheries regulations in proposed marine sanctuaries, and the consideration of management measures for protected species. The agreement also established improved coordination between the two agencies regarding the implementation of sanctuary management plans.

National Undersea Research Center, UNCW and Sanctuaries and Reserves Division, NOAA. In 1993 a cooperative agreement was established between NOAA's Sanctuaries and Reserves Division and NURC/UNCW to provide a framework for cooperation to aid and promote scientific, educational, planning, and management activities. This will improve the communication between the two existing organizations and help facilitate the implementation of future projects, be they educational, scientific, or management-related.

Southeast Fisheries Science Center, National Marine Fisheries Service and Sanctuaries and Reserves Division, NOAA. In 1994 an MOU was established between the director of the NMFS's Southeast Fisheries Science Center and the chief of NOAA's Sanctuaries and Reserves Division. This MOU provides a framework for cooperation to aid and promote scientific research and to translate the scientific findings into educational materials that can be used in the planning and management activities of national marine sanctuaries. An appendix to the MOU specifies that the SEFSC will be responsible for monitoring the status of living marine resources, specifically reef fish, in the Sanctuary.

Federal/State Agreements

NOAA, U.S. Coast Guard, and the Florida Department of Natural Resources. In 1990 a cooperative enforcement agreement was established between NOAA, the USCG, and the FDNR (FDEP) for law enforcement services related to the Key Largo and Looe Key national marine sanctuaries. State law enforcement officers designated as sanctuary officers by FDEP were authorized to enforce the authorities and regulations established under the Marine Protection, Research and Sanctuaries Act (MPRSA), Magnuson Fishery Conservation and Management Act (MFCMA), Marine Mammal Protection Act (MMPA), Endangered Species Act (ESA), Lacey Act, Atlantic Tuna Convention Act (ATCA), and the Fish and Wildlife Improvement Act (FWIA). Actions taken (in conjunction with NMFS special agents) include warnings, seizure of domestic vessels and cargo, and arrests for violations of the Acts. Arrests or seizures of foreign vessels can be made with the knowledge and consent of the Coast Guard. Sanctuary officers may accompany any Coast Guard vessel or aircraft to aid in enforcing regulations, and the Coast Guard may assist law enforcement officers if necessary.

Florida Department of Environmental Protection and National Ocean Service, NOAA. In 1992 the FDEP (formerly the FDNR and FDER), the Southeast Fisheries Science Center (NOAA), the Office of Ocean Resources Conservation and Assessment (NOAA), and the Office of Ocean and Coastal Resource Management (NOAA) entered into a cooperative agreement to develop aerial photography of benthic communities in Florida Bay and Biscayne Bay. Ecologists and photo-interpreters are transposing data from the photographs into a computer, then using stereoplotters to construct precise maps. Initially, these maps will be limited to the area surrounding Looe Key. However, addenda to this agreement will fund the mapping of the remaining areas of the bays within the Sanctuary. Agencies involved in the mapping effort, but not specifically included in the agreement, include ENP, the SFWMD, and the Dade County and Monroe County local governments.

NOAA and the Governor and Cabinet of the State of Florida. In 1992 NOAA and the Governor and Cabinet of Florida (the "co-trustees") entered into a cooperative agreement concerning the development of the Sanctuary's comprehensive management plan. The agreement was developed to promote and ensure the cooperation of each party in implementing

the FKNMSPA. By entering into the agreement, the co-trustees established the mechanisms for joint consultation and cooperation to ensure the protection of Sanctuary resources during the interim period prior to the final approval of the comprehensive management plan. NOAA entered into this agreement pursuant to its duties and obligations to the citizens of the United States, the FKNMSPA, the MPRSA, and other applicable Federal laws. NOAA is responsible for protecting and managing the resources of designated marine sanctuaries, and is specifically charged with implementing the policy of the United States to protect and preserve the living and nonliving resources of the Keys' environment.

Under Florida's constitution, the Florida Trustees hold title to all State lands, including sovereign submerged lands within the Sanctuary. They are also constitutionally charged with conserving and protecting the natural resources and scenic beauty associated with those lands. While Sanctuary management does not require that this title be conveyed from the State to NOAA (or involve the conveyance of the title), it does require consultation and cooperation between the State and NOAA as co-trustees regarding the comprehensive management of Sanctuary uses and the protection of Sanctuary resources. In accordance with this agreement, NOAA and the State have cooperated in the development of the Sanctuary's MP/DEIS. In addition, NOAA and the State have consulted and coordinated with each other regarding interim Sanctuary management (through permits), as well as Sanctuary resource damage cases.

Agreements with Nongovernmental Organizations

NOAA and the Pennekamp Coral Reef Institute, Inc.

In 1991 a cooperative agreement was established between NOAA and the Pennekamp Coral Reef Institute, Inc. to: 1) provide a framework for cooperation; 2) promote a program for scientific and educational activities; and 3) solicit private donations for the support of cooperative activities related to the adoptive re-use of the Carysfort Lighthouse as a research facility within the Sanctuary. The Pennekamp Coral Reef Institute, Inc. agreed to: 1) provide assistance, services, and funding for studies and projects; 2) conduct fund-raising to support the restoration of the Carysfort Lighthouse; and 3) periodically meet with NOAA to develop, discuss, and agree on projects and/or studies for the adaptive re-use of the lighthouse. Both parties also agreed to enter into supplemental agreements to accomplish projects and facilitate additional cooperative activities between the parties.

NOAA and The Nature Conservancy

In 1991 a cooperative agreement was established between NOAA's Office of Ocean and Coastal Resource Management and The Nature Conservancy to: 1) provide a framework for cooperation; 2) promote interpretive, historical, scientific, and educational activities; 3) solicit private donations for the support of such activities; 4) provide a framework for cooperation in the establishment, planning, management, protection, and public understanding of national marine sanctuaries and national estuarine research reserves; and 5) establish a FKNMS volunteer program by jointly funding a volunteer coordinator position. The initial emphasis was on the FKNMS, including the existing Key Largo and Looe Key national marine sanctuaries. The Nature Conservancy's programs in the Keys include those designed to conserve the area's marine resources. Its general objectives include exploring and preserving cooperative resource protection opportunities with NOAA in order to provide expertise and assistance through contracts or cooperative agreements.

Development of Management Alternatives

Introduction

The Florida Keys National Marine Sanctuary and Protection Act (FKNMSPA), signed into law on November 16, 1990, mandated that the Secretary of Commerce develop a comprehensive Sanctuary management plan in coordination with Federal, State, and local government authorities and a public Sanctuary advisory council. This involved an unprecedented level of planning detail, as the range of management issues, their effects on the Keys' abiotic and biotic environment, and their impacts on the conservation and consumer interest of the area are as diverse as the ecosystem itself. In addition, the number of governmental agencies with varying degrees of overlapping jurisdiction within the Sanctuary's boundary adds to the complexity of this management planning process (Figure 23). This chapter explains the Sanctuary management planning process, which was designed to carefully consider the complexity of the issues involved while incorporating comments and suggestions from public and private interests.

To develop the most comprehensive management plan possible, the issues affecting the natural and cultural resources of the Sanctuary had to be identified. Once these issues were defined, a range of management strategies (with component actions) that vary from being very restrictive regarding the use of Sanctuary resources to nonrestrictive was developed to address them. In order to satisfy NEPA requirements, NOAA considered a range of management alternatives containing the proposed strategies, and assessed the environmental consequences of each alternative. The "Preferred Alternative" for managing the Florida Keys National Marine Sanctuary was selected from this range of alternatives. This chapter is divided into three sections to address the management planning process in more detail: 1) Management Issues; 2) Management Strategies; and 3) Management Alternatives.

Management Issues

Management issues evolved from several sources of information: technical workshops focused on the status of the Keys' ecosystem, public scoping meetings related to Sanctuary designation, and a questionnaire associated with the scoping meetings surveying the public's opinion on issues and their priority.

Although the official comments on issues came from the public scoping meetings, the issues affecting the health of the Keys' ecosystem had been discussed by the scientific community, the public, and the popular media in the years leading up to the Sanctuary designation on November 16, 1990. One of the first scientific workshops focusing on the issues or threats affecting the Keys' ecosystem was described in *Results of a Workshop on Coral Reef Research and Management in the Florida Keys: A Blueprint for Action* (Miller, 1988). Other workshops focusing on environmental problems in the Keys included the Blueprint for Action Seminar (1990), sponsored by the State Attorney's Office and Reef Relief, Inc.; the Boating Impact Workshop (1990), sponsored by the Boating Impact Work Group; the Florida Keys Environmental Summit (1991), sponsored by the Florida Keys Land and Sea Trust; the Workshop on Coral Bleaching, Coral Reef Ecosystems, and Global Change (1991), sponsored by the National Science Foundation, EPA, and NOAA; and the Water Quality Workshop (1991), sponsored by NOAA's National Undersea Research Center. Participants in the workshops varied in interest, but included representatives from various user groups, concerned citizens, conservation organizations, environmental educators, and scientists. The range of issues and their importance has been reiterated at these workshops and conferences. The basic issues identified at the scoping meetings mirrored those identified in these workshops.

Management Issues Identification

Successful management requires a complete understanding of the full range of issues to be addressed through the planning process. Several steps have been taken to identify the management issues affecting the Florida Keys' ecosystem. The first official forums used to identify these issues were six public scoping meetings, held specifically to gather public input on the scope of problems currently affecting the health of the region. Two-hundred-forty-nine commentors testified at six scoping meetings held during 1991 (Table 15). In general, the comments received were constructive and focused on issues such as water quality, physical impacts to marine habitats, the need for long-term research,

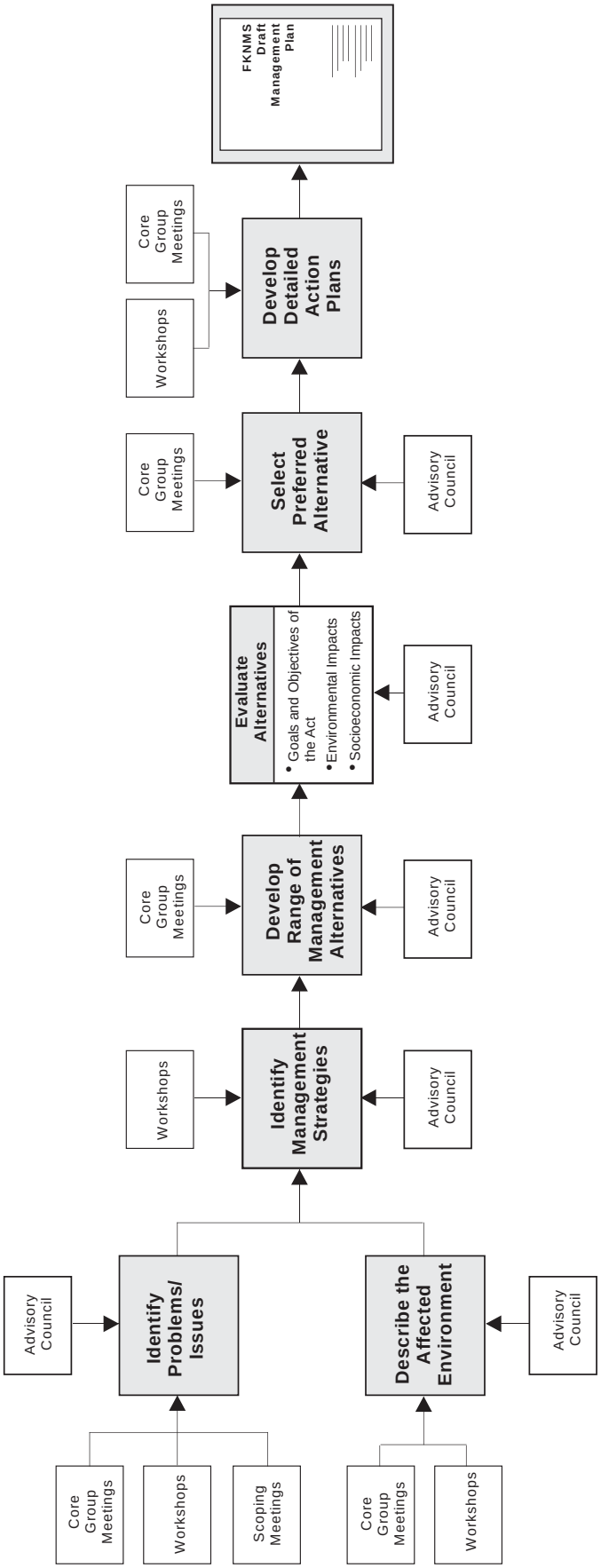


Figure 23. *Summary of the Management Plan Development Process*

Table 15. *Dates and Locations of Scoping Meetings*

Date	Location
April 10, 1991	Sheraton Key Largo Resort Key Largo, Florida
April 11, 1991	University of Miami Miami, Florida
April 15, 1991	Marathon High School Marathon, Florida
April 16, 1991	Key West High School Key West, Florida
April 17, 1991	University of South Florida Tampa, Florida
May 6, 1991	U.S. Department of Commerce Herbert C. Hoover Building Washington, D.C.

declines in the abundance and health of marine resources, and the protection of cultural and historic resources. Before and during each scoping meeting, NOAA distributed questionnaires requesting the public's help in identifying and ranking issues. Of the several thousand forms distributed, several hundred were returned, providing detailed information on specific issues. The public was also asked to submit written comments addressing these issues, and was given 30 days after the scoping meetings to respond. NOAA has compiled and considered these comments. The results of the survey forms and the written and oral comments were used to determine the management issues to be addressed in the Plan. Those issues were: 1) declining water quality; 2) physical injury to resources; 3) decline of marine resources; and 4) use conflicts.

Following these scoping meetings, the formal Core Group, comprised of Federal, State, and County agencies (Appendix B in Volume III) was established to oversee the development and implementation of the Sanctuary Management Plan. The Core Group met July 17-19, 1991 to review the issues that had been identified to date. The group removed redundancies by combining similar issues. The detailed specific issues were placed into broad categories representing six major issue areas: boating, commercial and recreational fishing, recreation, land use, land-based pollution, and natural processes. For each issue, the major impacts, causes, data assessment needs, data sources (including those individuals with available information or expertise), and the lead agency in acquiring information were determined. After the meeting, land use and land-based pollution were combined into a single issue. Natural processes was renamed water quality to better describe the issue.

The next step was to evaluate the scope and type of information identified on the data assessment worksheets. These worksheets were sent out for three rounds of review. They were first sent to the Core Group for comments regarding the accuracy of the issues identified, identification of major causes and data assessment needs, and any information that could help identify the best data sources available. They were then sent to resource managers, scientists, and others. Finally, they were sent to user groups, environmental groups, and other interested citizens for review. A considerable amount of detailed information was obtained in this consensus-building process; however, there was no significant revision of the issues, as these comments reinforced the material already compiled by the Core Group.

A series of technical working sessions was another source of refining the issues. Table 16 lists working sessions that have taken place during the management planning process.

Management Issues Description

In order to focus the development of management strategies on specific problems, members of the Core Group condensed the major issue groups into description statements. The management issues identified and described in this section are based on those statements, and are considered to be activities that may have potential resource impacts, either negative or positive, on the Sanctuary. These issues include: 1) Boating; 2) Commercial and Recreational Fishing; 3) Recreation and Cultural/Historical Resources; 4) Land Use; and 5) Water Quality. They have become the focus for the development of the Sanctuary Management Plan, and are integral in determining what management actions may be necessary in the future. Each issue identifies activities that may affect the quality and/or quantity of resources within the Sanctuary, and the problems that may arise due to multiple-use conflicts. Each issue includes a discussion of four potential impact themes: habitats; species; use and users; and water quality.

Table 16. *Florida Keys National Marine Sanctuary Workshops*

Date	Location	Topic	Participants
1991			
July 17-19	Hawk's Cay Marathon, Florida	Issue Definition	20
July 23-24	Sombrero Country Club Marathon, Florida	Mooring Buoys	30-50
September 16-18	Hawk's Cay Marathon, Florida	Benthic Mapping	60+
September 24-26	Sombrero Country Club Marathon, Florida	Education	100+
October 7-9	Rosenstiel School of Marine and Atmospheric Science Miami, Florida	Research	100+
November 13	Jaycees Center Marathon, Florida	Cultural Resources	35-40
1992			
January 27-31	Florida Keys NMS Planning Office Marathon, Florida	Zoning	135-155
February 3-7	Crowne Plaza Miami, Florida	Water Quality Technical Workshop	40
July 14-16	Hawk's Cay Marathon, Florida	Water Quality/Monitoring and Research	20
August 4-6	Hawk's Cay Marathon, Florida	Water Quality/Institutional Management and Engineering Options	25

Boating

Boating activities are directly related to the use and enjoyment of the Sanctuary, since watercraft provide access to the area and offer significant commercial and recreational opportunities throughout the year. Attention was immediately directed at boating because the FKNMSPA cited vessel groundings as one of many "serious threats to the continued vitality of the marine environments of the Florida Keys which must be addressed in order to protect their values." Impacts and conflicts from boating activities were also raised at the scoping meetings held in April and May 1991, and in comments submitted by the public following these meetings.

Boating activity in Florida has increased significantly over the last two decades. The number of vessel registrations (recreational and commercial) for 1970-71 was 235,293. By 1993, the number reached 715,516 (Sargent, 1993). In Monroe County alone, there are over 15,000 privately registered boats and over 3,000 commercial vessels that use Sanctuary waters (White, 1991). Thousands more are transported into the Keys by trailer and launched from the 59 public and private boat ramps or the 163 marinas in Monroe County. When combined with the boats visiting the Sanctuary, passing through Sanctuary waters, and stopping along the reef tract or at individual keys, the potential impacts of these vessels on the area's natural resources increase sharply.

The issue is even more significant because boating activity has increased rapidly within the Keys in recent years. For example, the number of recreational and commercial boats using the Looe Key National Marine Sanctuary more than doubled between 1985 and 1991 (Looe Key National Marine Sanctuary, 1983-1993). The range of activities (especially recreational) has also increased, resulting

in visitor-use conflicts, direct impacts on Sanctuary resources, and water quality degradation.

Boating impacts can be divided into direct and indirect categories, and further divided into major and minor subcategories. Direct impacts have quantifiable effects on the natural or cultural resources of the Sanctuary and are observable, measurable, and often long-lasting. They result in the direct loss of significant biological, ecological, economic, or aesthetically important resources. Examples of direct impacts from boating include prop dredging and prop scarring in seagrass beds, and boat groundings on coral reefs and other benthic communities. Indirect impacts are less easily quantified or qualified, and may be difficult to distinguish from impacts resulting from other activities.

Impacts have the potential to affect either the area's natural resources (habitats, species, and water quality) or to cause visitor use conflicts. In general, major impacts occur over large areas and/or in habitats that recover slowly and perhaps only partially after damage occurs (e.g., corals and seagrasses). They also may result from activities that are cumulative or persistent over time, causing accelerated degradation of Sanctuary resources. Minor impacts generally occur over smaller areas or in areas that require less time for resource recovery (e.g., groundings in sand habitats).

Habitat Impacts. A number of habitat impacts occur as a result of boating and shipping activities within the Sanctuary. The more conspicuous and long-lasting impacts occur primarily in areas of seagrasses, corals, hardbottom, and dead coral rubble. Injury to these habitats occurs from a variety of activities associated with boat operation. Some of these impacts and activities are described in the following section.

Vessel Groundings. According to a U.S. Coast Guard vessel traffic study, in September and August 1991, and January 1992, 1,500 ships transited the Straits of Florida. Shipping historically has presented a risk to the Keys' coral reefs. For example, on August 4, 1984, the M/V WELLWOOD, a 400-foot freighter loaded with animal food bound for Europe, ran aground on Molasses Reef in the Key Largo National Marine Sanctuary, resulting in the destruction of over 1,282 square meters of reef. Just over five years later, between October 25 and November 11, 1989, there were three ship groundings along the Keys' reef tract. According to Sanctuary records, these groundings resulted in over 21,000 square meters of reef being completely destroyed. These groundings, along with the deterioration of water quality and the health of the coral reef resources, were among the events and problems that led to the designation of the Sanctuary. Recent groundings include the 147-foot MISS BEHOLDEN, which caused extensive damage to the coral habitat on Western Sambo reef (March 1993), and most recently, the 166-foot University of Miami Research vessel COLUMBUS ISELIN, which ran aground on the Looe Key National Marine Sanctuary reef crest (August 1994), spilling diesel fuel as well as damaging the coral reef.

Small Boat Groundings. Boat groundings are a chronic problem within the Sanctuary. According to Sanctuary records, over 310 boats have run aground in the 103 nm^2 Key Largo National Marine Sanctuary since 1980 (Tagliareni, 1993). An additional 98 have grounded in the 5.3 nm^2 Looe Key National Marine Sanctuary since 1981 (Hartsing and Carver, 1993). Between July 1992 and May 1993, the Florida Marine Patrol recorded 97 vessel groundings in Sanctuary waters.

While attention has primarily been focused on boat groundings in coral and hardbottom habitats, they also occur in seagrass meadows, areas of dead coral rubble, and other benthic communities. The long-term impacts of groundings on corals have been well documented in the Looe Key and Key Largo sanctuaries. However, the impacts on other habitats are not well known. Grounding impacts on seagrasses vary according to the size and weight of the boat and the degree of effort required to dislodge the vessel. These impacts can be short- or long-term, depending on the amount of disturbance to the habitat and the severity of injury to the resources (e.g., whether only the blades of seagrass were cut or if entire plants were removed, including their rhizomes).

Because groundings are indiscriminate actions, specific user groups are not easily identified as major contributors to the problem. However, trends may be used to characterize small-boat groundings in general. Most small-boat groundings involve boats that average approximately 30 feet in length (Causey, 1993) and are most commonly reported along the reef tract at shallow bank or patch reefs in depths of less than 2 meters. In addition, most groundings occur at popular dive sites and are due to navigation errors, including a lack of familiarity with the area and an inability to discern water depth by observing bottom color and texture.

Direct habitat impacts of boat groundings include physical damage to seagrass beds, corals, hardbottom communities, and mangroves (all major

impacts); moderate damage to rubble habitat; and minor damage to sand and softbottom communities. Overall, groundings lead to the degradation of Sanctuary resources, resulting in decreased biological integrity and a localized negative impact on biodiversity. They also affect the aesthetic appeal of the resources, resulting in a negative economic impact on the area. The potential for oil and/or fuel spills also increases with the number of groundings, adding to the overall negative impact on the resource.

Anchoring. Over 350 mooring buoys have been installed on reefs in the Keys by the National Marine Sanctuary Program, Florida Park Service, Reef Relief, Inc. (Key West), Florida Keys Marine Sanctuary, Inc. (Marathon), and the Coral Reef Community Foundation (Islamorada). Still, anchor damage continues to have a major impact on Sanctuary habitats. Damage occurs in coral and hardbottom habitats, and is most severe on the heavily used coral reefs, especially where mooring buoys are not available. Hardbottom areas are one of the most heavily used habitats by lobster divers and other users that anchor their boats while conducting their activity. Improper anchoring techniques (e.g., type of anchor, inadequate scope of anchor line, etc.) can result in overturned or injured coral heads, injured or dislodged sponges, soft corals, or other hardbottom inhabitants. Anchoring impacts on seagrass communities are more difficult to assess, except where boats remain at anchor in the same location for a long period of time.

Most bottom-fishing for snapper and grouper in the Sanctuary takes place in the intermediate to deep reef habitat (10-35 meters). This is the most common coral reef habitat in the Sanctuary, and is used by many commercially important fish species during much of their life history. The habitat's depth and few narrow sand strips make it difficult for vessel operators to anchor only in the sand and avoid damaging the reef. The 12 mooring buoys installed in this habitat within the Looe Key National Marine Sanctuary are continuously occupied during the fishing season (Looe Key Daily Surveillance Reports). However, installing enough mooring buoys to accommodate even a small percentage of the anchoring activity in the intermediate and deep reef habitats and restricting anchoring in these habitats are only partial solutions to the anchoring problem. Additional solutions will likely depend on the implementation of other management strategies, including educating operators on anchor types and techniques and restricting the size of vessels anchoring in this habitat.

Large shrimp boats frequently anchor in the intermediate and deep reef habitats while resting or waiting for nightfall. In addition, staff from the Dry Tortugas National Park have reported large ships anchoring on Tortugas Bank, west of Fort Jefferson. The large anchors on these vessels cause significant damage in these habitats.

Prop Scarring and Prop Dredging. Seagrasses are lost through prop scarring and prop dredging, as boat propellers cut seagrass blades or leave trenches in the substrate, severing the plants' rhizomes and causing long-term damage. Seagrass impacts occur near frequently used marinas, boat ramps, subdivisions with shallow-water access to open water and other areas where propeller operation can harm seagrass beds. In these nearshore areas, prop scarring and prop dredging are the most common habitat impacts, and are often caused by inexperienced boaters and/or the lack of properly marked channels.

Over the past decade, seagrass destruction has increased throughout the Sanctuary. Sargent (1993) reported that the Keys have the highest concentration of propeller scar damage in Florida. It was estimated that approximately 5,970 ha are lightly impacted, 4,250 ha are moderately impacted, and 2,050 ha are severely impacted. Sargent (1993) defined "lightly impacted" as the presence of propeller damage in less than five percent of the area in the observer's survey plot. "Moderate impact" indicates that five to 20 percent of the seagrass was impacted, and impacts were considered severe when more than 20 percent of the seagrass within a survey plot was impacted. These impacts occur as a result of all types of vessels operating in shallow water, including personal watercraft. This is a Sanctuary-wide issue requiring a wide range of management strategies with coordinated interagency implementation.

Pollutant Discharge from Boats. Discharges from boats can result in major resource damage. Fuel, oil, contaminated bilge water, ballast, litter, and jetsam originate from boats within Sanctuary waters or are transported into the Sanctuary by natural processes such as currents and winds. Cumulative impacts are of particular concern in commonly used areas.

Backcountry Impacts. Backcountry recreational use has increased for a variety of reasons including: increased development in the Lower Keys; increased use of shallow-draft craft such as personal watercraft and fiberglass boats designed to operate in shallow water; and an increased interest in exploring the natural setting of the Keys' backcountry. Many of the

issues relevant to the backcountry habitats of the Lower Keys have been addressed in a management plan approved by the Fish and Wildlife Service for their refuges. Cross-deputization and interagency coordination will increase the potential for reducing conflicts between growing recreational use and habitat impacts in backcountry areas.

Shoreline Erosion. Waves from boating activity can cause erosion along shorelines, especially in confined areas, resulting in natural resource damages and impacts to man-made structures such as seawalls, bulkheads, etc. Erosion is especially serious in some of the narrow mangrove channels, where high levels of boating activity wash sediments out from around the prop roots of the mangroves.

Derelict Vessels. Boats of various sizes are often abandoned in nearshore waters, threatening or damaging natural habitat resources until the vessel is removed. Derelict vessels have a major impact if located over hardbottom, coral, or seagrass habitats. The source of the problem, in general, lies in the relative ease of abandoning a boat as compared to properly disposing of it in a landfill. A derelict vessel removal program, funded by the State and carried out by local governments, is currently in place.

Live-aboard Vessels. Impacts of live-aboard vessels vary by location, duration of stay, the size of the vessel, the means of securing or anchoring the vessel, and methods of waste disposal. Many live-aboard vessels in the Sanctuary substitute for low-income housing, and have become permanent homes. In other cases, they are the residences for a transient population that remains in the Keys for a short time. These vessels affect the habitat through direct impact with the bottom, shading, discharge of pollutants, and other means.

Elimination of Low-clearance Bridges. A number of new, high-clearance bridges were built in the Keys in the 1980s. As sections of older bridges with lower clearances were removed, larger boats with deeper drafts gained more direct access to backcountry areas. These vessels are more likely to impact seagrasses in shallow water because of the amount of water they draw.

Commercial Shipping and Barge Traffic. The FKNMSPA prohibits vessels over 50 m in length from entering the Area to be Avoided (ATBA) within the Sanctuary. However, certain navigable channels have been established for commercial shipping and cruise ship traffic into the port of Key West. There has been an increase in passenger cruise ships entering the Port of Key West during the past five years (Crusoe, pers. comm.).

Tug and barge traffic continues in certain areas outside the ATBA within the Sanctuary. Traffic to and from Key West was not prohibited within the ATBA because of the economic impracticality of relocating slow, westerly moving tug and barge traffic offshore into the strong easterly flowing Florida Current.

Commercial vessels, especially single-skinned fuel barges, also put the Sanctuary at risk from oil spills and substance discharges. Similarly, litter and jetsam have had a chronic impact on the area's habitat resources. The anchoring of large vessels outside of designated sites, which currently takes place, may also be of concern in the future.

Other Habitat Impacts. Although habitat impacts that result from boat overcrowding, shading, and the use of bottom paints are currently not well understood, it is clear that these occurrences may have adverse effects on Sanctuary resources and need to be investigated. Overcrowding can lead to increased user conflicts, increased pollutant discharges, and habitat loss through a variety of direct physical impacts. Shading of the benthic substrate, caused by boats and barges anchored within the Sanctuary for long periods of time, limits the productivity of certain areas.

Species Impacts. Boating activities in the Keys result in three main categories of species impact: 1) those caused by increased backcountry activities; 2) those caused by derelict vessels; and 3) those caused by motor noise.

Backcountry Activities. The increased recreational use of shallow-water habitats, including the backcountry and areas around mangrove islands, has resulted in major wildlife disturbances. Many of these impacts can be traced directly to the increased use of personal watercraft, which allow visitors access to previously unreachable areas. Conflicts between species and visitors lead to impacts on manatees, birds and their colonies (such as feeding areas, nesting areas, and staging areas), marine turtles, the American crocodile, and shallow-water fishes, as well as general habitat degradation (FWS, 1992).

Derelict Vessels. Derelict vessels can also adversely affect species within the Sanctuary, as they may injure or destroy the benthic community, which serves as critical habitat for species development.

Noise. Although the effects of motor noise on the marine resources of the Sanctuary are not fully understood, it is recognized that some species are disturbed by noise and can be significantly impacted. This problem should be more completely assessed.

Use and User Impacts.

User Conflicts. Sanctuary users depend on boats for transportation to areas where they conduct their activities. Some conflicts occur between users in heavily used areas such as the shallow bank reefs (e.g., Looe Key, Sombrero Reef, Sand Key, etc.), or between recreational and commercial fishing vessels. An example of the latter occurs most commonly at the beginning of the spiny lobster season, when fishermen are pulling traps in areas scattered with recreational dive boats. However, conflicts can also occur in areas of less concentrated activity, such as treasure hunters disturbing the seabed in the vicinity of recreational diving.

Safety. Visitor safety is also an issue with increasing boat use of Sanctuary waters. The number of boating accidents is monitored by the Florida Marine Patrol. According to their records, there has been an increase in boating accidents during the past decade.

Other conflicts occur when vessels run aground, creating safety hazards as well as jeopardizing the health of the resource. In addition, the discharge of untreated sewage from holding tanks reduces the aesthetic value of Sanctuary resources and may negatively affect visitor-use experience while participating in water-related recreation, similarly negatively impacting local businesses.

Water Quality Impacts. Boating activities can also have negative impacts on water quality as a result of groundings, pollutant discharges, and erosion.

Groundings. Groundings result in a temporary decline in water quality as sediment plumes are created during grounding and vessel removal, adversely affecting corals and other sediment-sensitive organisms.

Pollutant Discharges. Discharges from boats cause water quality degradation within the Sanctuary and may increase use conflicts, especially in water-related recreation areas.

Erosion. Erosion degrades water quality, creating sediment clouds, moving bottom sediment, and altering the configuration of the shoreline.

Issue Summary. Because boats are the mode of transportation visitors use to access Sanctuary waters, managing and regulating boating activity provides a means for protecting natural resources, balancing resource uses, and reducing or avoiding user conflicts. For example, by managing access to various habitats, such as shallows or other sensitive areas, specific visitor-use impacts can be reduced and adverse habitat impacts lessened. In this way, the number of visitors allowed access to these areas can also be monitored and managed. The appropriate use of channel markers can also reduce boating impacts on natural resources by keeping boats in areas already impacted, allowing unmarked areas a better chance of recovery.

Management must balance the continually increasing levels of boating activities with actions designed to reduce impacts on the Sanctuary's natural resources with a minimum of resource-use conflicts between multiple users.

Commercial and Recreational Fishing

Commercial and recreational fishing activities are economically important within the Sanctuary. Since some species are only caught during certain times of the year and/or in specific areas because of their seasonal movements, fishing pressure varies between areas and over time.

Many fishing methods are employed throughout the Sanctuary. Common traditional methods include hook-and-line fishing, trapping, the use of long-lines, spearfishing, hand collection by divers, netting, trawling, and sponge hooking. Other fishing activities include curio/souvenir collecting for the tourist trade and the live trade in marine life for hobbyists, commercial wholesalers, retailers, and public aquaria. This fishery includes the collection of tropical fishes, invertebrates, algae, and live rock.

Although fishing activities are important and essential Sanctuary activities, there is concern that excessive fishing could deplete certain species, disrupt marine ecosystems, and impact economic activities dependent on fishery resources. Information is incomplete about what is intentionally being removed from the Sanctuary (i.e., what species, where, when, how much, and by whom) and what direct and indirect effects that removal has on Sanctuary resources and the ecosystem as a whole. This problem has become acute as more people have moved to the Keys to use the area's resources. Many fishing methods incidentally kill organisms that are not utilized (bycatch).

Excessive bycatch mortality impacts the ecosystem by reducing the forage base and altering the food web. Bycatch mortality can also harm fisheries by killing juveniles and undersized individuals of targeted species. While the impacts of various fishing methods on habitats and species have not been adequately studied, it is clear that some fishing methods are less destructive than others.

Although the Florida Marine Fisheries Commission and Federal Fishery Management Councils regulate fisheries, they rarely have the resources or detailed information necessary to adequately manage a fishery on the geographic level of the Sanctuary. The Fishery Management Councils do not regulate ornamental fish species. Also, management is usually performed for an entire stock. Because of the intensity of use at the Sanctuary level, resources are likely to be impacted before problems manifest themselves at the stock level. Finally, current fishery management practices emphasize individual fisheries and species. Ecosystem and intraspecific interactions with fisheries are often not incorporated into such management. More precise data and improved geographic coverage by Sanctuary data collection programs would provide more useful information to improve fishery management at the ecosystem and sanctuary levels.

Information about the harvest and impacts of certain fisheries is particularly inadequate, especially for marine life fisheries and most other segments of the recreational fishery. Improved data collection, such as fishery dependent sampling, and information about various fisheries are critical for management.

Maintaining sustainable commercial and recreational fisheries is an important Sanctuary goal. An equally important goal, and potentially conflicting one, is the maintenance of biodiversity of the Sanctuary. In addition, various fishing interests compete and come into conflict within the Sanctuary. Recreational and commercial fishing activities are often in conflict because of their different objectives and potential impacts. Different fishing methods can also conflict. Shrimp trawling can destroy stone crab traps if both are conducted at the same time and place. The establishment of the Sanctuary provides a unique opportunity to help understand the relationships between fisheries, and between fishery and non-fishery activities. One mechanism to address these conflicting goals is the use of marine zoning.

Marine zones provide relatively undisturbed control areas free from fishing activity. These control areas are a critical requirement for research on the effects of human activities on fish populations and the role fish play in structuring the Keys' ecosystem. Scientific research and monitoring of resources, particularly the effects of fishing on the ecosystem, are needed to properly manage human activities in the Sanctuary.

Because fishing has cumulative, ubiquitous, and chronic effects, undisturbed areas are not available to conduct scientific research and monitor natural and man-made changes to Sanctuary ecosystems. Some undisturbed or minimally disturbed areas are necessary for scientific research and resource monitoring.

Other important fisheries issues of public and Sanctuary concern include the introduction of exotic (nonnative) species, aquaculture, and artificial reef programs. Although these are all tools used to enhance fishery production, they can be misused and damage resources. Introducing nonnative species could potentially disrupt Sanctuary ecosystems, as has occurred in Florida's terrestrial and freshwater habitats. Well-developed aquaculture programs could help the regional economy and reduce harvesting pressure on the natural stocks, while poorly designed programs could spread diseases, damage habitat, and hurt native species. Artificial reefs alter habitat, and can have beneficial or damaging impacts depending on how and where they are constructed. Although usually built to improve fishing, some reefs may aggravate overfishing problems by concentrating depleted resources and making them more vulnerable to overfishing (Bohnsack and Sutherland 1985; Bohnsack, 1989; Polovina, 1991).

Conflicting fishery management regulations are also an important issue. Sanctuary fisheries are managed by several State and Federal agencies with different programs, goals, objectives, and information. As a result, different rules exist under different jurisdictions, confusing the public, reducing compliance, and creating enforcement problems. Consistent fishery regulations in the Sanctuary would improve public cooperation and understanding.

Habitat Impacts. The following activities impact habitats within the Sanctuary.

Hook-and-Line Fishing. Hook-and-line fishing has no significant impact on seagrass habitats, but does moderately impact coral and hardbottom habitats as gear becomes entangled and damages fragile corals and other sessile organisms.

Trapping. Seagrass beds can be displaced by derelict traps and long-soaking traps. Trapping may

also impact corals and hardbottoms when these devices are placed on them, or when traps are dragged across the bottom by adverse weather or by boats. Damage from lobster and crab traps is primarily seasonal (July to April).

Netting or Trawling. Netting impacts on seagrasses occur primarily inshore as a result of repetitive trawls (e.g., bait shrimping). Impacts on coral and hardbottom habitats include the entanglement of nets and the physical "uprooting" of corals.

Spearfishing. Damage to coral and hardbottom habitats may be caused by overaggressive and indiscriminate physical contact with sensitive corals, or habitat displacement or damage when capturing species. Impacts on these habitats are particularly intense during the lobster sport-diving season.

Sponging and Tropical Fish Collecting. Sponge hooking and tropical fish collecting can result in the injury of seagrasses and damage to coral/hardbottom habitats through physical contact or habitat disturbance and removal. Tropical species collection may also involve the use of chemicals.

Live Rock Collecting. Live rock collecting occurs mainly in coral and hardbottom and rubble areas. Removal of hardbottom habitat and areas of rubble are common impacts. Seagrass and coral habitats may also be affected by this activity.

Artificial Reefs and Aquaculture. Artificial reefs generally increase the area of hardbottom, but their placement can directly reduce seagrass and other habitats through improper placement. The man-made structures may also be a physical threat to coral reefs under extreme storm conditions. Aquaculture activities can have a similar effect.

Other Concerns. Indirect effects may occur as a result of other fishing activities, including gear use, human contact, nontarget species response to prey and predator removal, changes in the habitat balance due to species removal, and removal of habitat such as sponges and live rock. Impacts occur throughout the Sanctuary, with seasonal peaks for the species sought. Incremental effects are noticeable where activities overlap. Such impacts occur relative to species reduction and shift, and thus may change the balance of the ecosystem.

Species Impacts. Most fishing activities that impact Sanctuary habitats have a corresponding effect on species abundance.

Hook-and-Line/Traps/Nets. All fishing activities directly reduce the abundance of target species throughout the Sanctuary. Hook-and-line fishing and trapping have the greatest impact in coral and hardbottom areas. Lobster, crab, and fish traps have a direct Sanctuary-wide impact by reducing the abundance of target species. Although seasonal peaks may occur, sustained netting, trapping, and hook-and-line fishing in combination with declining water quality have resulted in a continuous and cumulative decline in species abundance. Ghost traps and fish traps capture indiscriminately and cause declines in species diversity in trapping areas. The indirect impacts of these fishing methods on species diversity are unknown. Netting impacts can be high in all habitats, especially when abandoned nets continue to fish. Bycatch mortality can indiscriminately decrease species abundance.

Spearfishing. Spearfishing occurs year round, primarily in coral and hardbottom areas. Finfish spearing can cause predator/prey relationships to be imbalanced.

Sponging. Sponge hooking is practiced year round with increasing frequency within the Sanctuary, and reduces target species abundance. The removal of sponges from the hardbottom habitat alters species diversity, as they often provide essential habitat for other invertebrates and fishes.

Tropical Collecting. A reduction in target species abundance occurs when juveniles and adults are removed by tropical species collectors. Effects are greatest in coral/hardbottom areas, and are cumulative due to continuous pressure.

Live Rock Collecting. Because live rock collection mainly occurs in coral and hardbottom and rubble areas, it has a direct impact on sessile organisms. There is an unknown, indirect effect on species abundance and diversity due to substrate and habitat removal. All of these impacts are cumulative and continuous.

Artificial Reefs. Artificial reefs impact species by increasing diversity and abundance at their location. Although such reefs are located throughout the Sanctuary, they make up a very small percentage of the total area. Increases in species diversity and abundance as a result of artificial reefs placement have not yet been quantified.

Aquaculture. When conducted in open water, aquaculture can reduce habitat and species abundance and diversity. The stocking of target species in open water (which does not currently occur in the Sanctuary, but has been proposed for the future) has not been demonstrated to increase their abundance.

Other Concerns. Moderate species impacts may also occur throughout the Sanctuary through the capture or injury of wildlife by abandoned or working fishing gear. Such occurrences are sporadic; however, their impacts can become cumulative over time. Birds can become entangled by fishing lines and hooks, and turtles and diving birds can become entangled in nets. Commercial and recreational fishing can also disturb wildlife on islands.

Use and User Impacts. Conflicts between users are largely the result of increased demands on the marine resources of the Sanctuary. Conflicts range in severity from annoying to very serious, and sometimes life-threatening, situations. They fall into three general categories: 1) conflicts between commercial and recreational fishermen; 2) conflicts between recreational fishermen; and 3) conflicts between fishermen and other users.

Conflicts between commercial and recreational fishermen include commercial fishermen angering recreational anglers in the vicinity by using massive quantities of chum and potentially drawing fish from one area to another. Conversely, recreational fishermen sometimes move into commercial fishermen's chum slicks, interrupting fishing activity. Recreational anglers may react negatively to the sight of a successful commercial fisherman catching large numbers of fish, perhaps more than the recreational fisherman thinks the resource can sustain. More serious conflicts arise when high concentrations of lobster traps impede trolling grounds for some recreational anglers. The largest single conflict for commercial fishermen is molestation of lobster traps, also called "trap robbing," that some estimate causes economic losses in the millions of dollars each year. Trap robbing involves many categories of users and is a felony under State law. The most frequent complaint from both commercial and recreational fishermen involves running over trap buoys, and the entanglement and fishing gear loss that results.

Conflicts between recreational fishermen usually involve encroaching on another fisherman's chum slick, or some other invasion of a fisherman's perceived territory. In very unpopulated areas, and in some types of fisheries, these territories are quite large. The concept of territory is important to understanding recreational fishing, because many fishermen venture out for relaxation and feel the need for solitude. This feeling of "getting away" may also be disrupted for other outdoor enthusiasts if an area becomes a popular fishing spot.

The final category of conflict, between fishermen and other users of the Sanctuary, has the most serious consequences. Swimmers and divers are most likely to have a conflict with fishermen. The aesthetic and habitat impacts from lost gear, such as fishing line and sinkers wrapped around coral and fish with hooks imbedded in their mouths, are part of the concern. The potential for injury to divers and swimmers from fishing gear is also a concern, although these types of injuries are infrequent. Trolling close to the reef for barracuda is the most dangerous conflict, as serious bodily injury or death to a swimmer or diver may result. Problems also result when divers venture too far from their dive flags, or anglers come in too close to the reef. The potential exists for a diver to be hooked by a slowly trolled fishing lure or to be struck if the diver surfaces when a boat is overhead.

These types of conflicts are familiar to those who use the resource on a regular basis. The concern is that as pressure increases on Sanctuary resources, the lack of a system to address such conflicts will result in resource degradation and user dissatisfaction.

Water Quality Impacts. Since the prohibition on soaking traps in motor oil, water quality has not emerged as a major consideration with regard to impacts from fishing activities within the Sanctuary. Most of the water quality impacts caused by fishing activities are related to vessel use, and are covered under the boating issue discussion. Aquaculture in Sanctuary waters is a potential water quality concern because of the feeding and concentration of fish.

Issue Summary. Fishing has been, and continues to be, a major economic and recreational activity throughout the Keys. Various methods are used, and their impacts are a Sanctuary-wide issue. Because of the increasing number of participants, increasing quantities of resources removed, and increasing efficiency of fishing gear; the cumulative impacts and the severity of the impacts of fishing activities on Sanctuary resources have increased over the past decade. Sound strategies are needed to balance both commercial and recreational fishing activities with the preservation of the area's natural resources, and to resolve conflicts between multiple-uses.

Recreation and Cultural/Historical Resources

Over the past 20 years, the great diversity and abundance of outdoor recreation activities in the Keys have become a focal point of the local economy for both visitors and residents. Most of the recreational activities in the region are “resource-based.” That is, they are related directly to the natural environment (water-based recreation) or to man-made resources of cultural or historical significance (sight-seeing). Other “activity-based” leisure opportunities include the use of swimming pools, playgrounds, tennis courts, etc. Commercial as well as recreational uses of submerged cultural resources are considered here.

The Keys' natural environment attracts increasing numbers of visitors each year, and the nature and range of recreation activities is a consideration throughout the Sanctuary. Despite the lack of the wide beaches characteristic of the U.S. East Coast, beach activities account for almost half of the area’s visitor days (Kearney/Centaur, 1990). Many activities involve water and, therefore, occur throughout the Sanctuary. Water-related recreational activities are among the highest in multiple-use conflicts.

Recreation in the Keys includes activities ranging from sight-seeing, which may have little or no impact on resources or other users, to diving and snorkeling, which may have a direct and high impact on both. Diving and snorkeling activities account for almost 30 percent of all boating-related activities (Kearney/Centaur, 1990). Persistent conflicts exist among users of personal watercraft, recreational fishing boats, and divers.

Recreation and cultural/historic resource impacts involve the area’s water-related activities, and other activities, such as camping, hiking, and sight-seeing, which includes nature observations (bird watching, Key deer watching, etc.) and visits to cultural/historic sites (historical houses, forts, lighthouses, Indian mounds, etc.). Many of the impacts associated with recreation are discussed in the Boating or Fishing issue sections.

Major impacts to cultural/historic resources and recreation occur over a large area, and require a long recovery period. They result from a growing increase in the number of visitors to the Keys, the number of visitors involved in water-related recreation, and an increase in treasure hunting operations. Minor impacts are those involving small numbers of facilities, visitors, areas affected etc., or those for which effects are unknown. Direct impacts are easily observable and often long-lasting, resulting from the actual use of the resources (e.g., divers standing on coral). Indirect impacts reflect either the extensive land-based infrastructure associated with supporting recreation activities, or the lesser-known effects of these activities on the Keys' ecosystem (such as turbidity plumes that settle on corals and other bottom habitats following the improper use of watercraft).

Habitat Impacts. Although some of the specific impacts of recreation activities on habitats are not fully understood, some impacts are evident, and most are related to boating activities.

Boating. Habitat impacts from boating activities have been discussed in detail within the Boating issue section. Recreational boating is specifically responsible for seagrass damage through prop dredging and scarring throughout the Keys. The construction of public and private docks and marinas, ranging from single-boat ramps to large public recreation sites, also can negatively impact seagrass beds throughout the Sanctuary, even though these facilities are concentrated in specific areas, such as Key Largo and Key West. The increased boating activity resulting from the expansion and construction of boat ramps, docks, and marinas further impacts the health and abundance of these beds. Impacts on seagrasses occur primarily in nearshore and shallow-water areas and access channels, especially near canals leading to subdivisions. In backcountry areas, where waters are calmer, personal watercraft can cause injury to seagrass beds. It has been estimated that over 2,020 ha of seagrass have already been severely impacted (Sargent, 1993), including shallow-water habitats in the area’s national wildlife refuges.

Dock and marina construction can also change natural sediment transport processes and exacerbate erosion. Boat wakes contribute to habitat decline in nearshore waters, causing low-to-moderate impacts by increasing turbidity. Recreational boat groundings and anchoring damage coral/hardbottom areas. Anchors can break or scar coral, resulting in the corals being vulnerable to disease or decline.

Fishing. Overfishing by recreational users causes instability in biological communities and results in declines in target species abundance. Fishermen also lose large amounts of gear on reefs. Reef cleanups collect up to 100 pounds of lost gear each year.

Diving and Snorkeling. There are many attractive dive sites in the Sanctuary, particularly within Key Largo National Marine Sanctuary, Looe Key National Marine Sanctuary, and John Pennekamp Coral Reef State Park. The potential for major impacts accompanies the use of these areas for diving activities. Damage results from standing or walking on corals, overturning corals, or grabbing corals for locomotion while swimming. Such damage may take years to repair. Breaking corals for souvenirs and general excessive handling by divers can also impact this habitat, as can the sediment clouds created when snorkelers tread water. Overuse of certain dive areas is also significant, and too many divers at any one time may tax the reef community. The most significant impacts caused by these activities have been observed along the reef tract. Additionally, live rock removal by divers has Sanctuary-wide impacts, as it reduces the bottom habitat available for species.

Treasure Hunting Techniques. Some treasure hunting methods for artifact recovery create a significant threat to natural resources in and around a wreck site. Treasure hunters use chisels, hammers, crowbars, and propeller wash deflectors ("mailboxes") to uncover artifacts. The indiscriminate use of mailboxes, in particular, to blow away sediment can adversely affect both the cultural/historical site and the natural resources in and around the site, and can result in a decrease in future education and/or scientific value. A single mailbox blow hole can be four meters wide and just as deep (Throckmorton, 1990). Any other device capable of removing large amounts of sediments or debris may have similar effects.

Other Habitat Impacts. Other recreation activities that impact habitats include illegal camping and plant and animal collecting. Illegal camping occurs on offshore islands that are part of national wildlife refuges; vegetation destruction is the most common impact in these sensitive areas. Plant and animal collecting may also reduce the population of slow-maturing, ornamental reef fish and invertebrates that graze on algae and other sessile organisms. This may shift the ecological balance of reef areas, either abruptly or gradually, to a community dominated by fast-growing algae species. It may also lead to a reduction in the surface area available for recruitment of larval corals and other sessile organisms.

Species Impacts.

Overcollection. It is thought by many that overcollection of both small and large ornamental fish and invertebrates for personal aquariums has a direct impact on species abundance and diversity. Collection occurs in all habitats where divers and snorkelers are found. For some slow-growing species (e.g., starfish and conch), further study should be undertaken to determine the effect of species abundance on species diversity. The impact of this activity is even more significant when commercial collectors gather the same species for sale to tourists or for the aquarium trade. Overcollection of species that remove fish parasites also encourages an increase in parasitized fish on the reef. In general, these activities reduce the aesthetic and economic value of the reef environment.

Other Concerns. Ignoring catch and size limits has a direct impact on target species abundance in popular fishing areas. In addition, the degradation of shallow waters by recreational activities can damage the feeding habitats of turtles, manatees, and dolphins. Collisions between recreational vessels and marine mammals and birds are significant as well, impacting fish and wildlife nurseries. Noise from boat and watercraft motors can also have an indirect impact on species, including disturbances of bird nesting, roosting, and feeding areas. As noted earlier, illegal camping on offshore islands often results in the destruction of vegetation crucial to the life history of species. Wildlife disturbances (particularly of bird populations) by hikers and campers are common. These disturbances impact feeding and nesting habitats.

Use and User Impacts. Tourist activity near cultural/historical and archaeological sites within the Keys is significant, with land-based sites less impacted than marine sites. Typical impacts include the removal of artifacts from sunken vessels; the construction of docks and marinas that may destroy unreported sites; and the use of mailboxes that can damage the surrounding recreational areas and the artifacts themselves. Search and recovery methods that do not record and preserve all artifacts and contextual information may result in irreparable destruction of historical and cultural information. Conflicts also occur between users who want to protect all artifacts (especially shipwrecks) for education, research, and sport diving, and those involved in artifact recovery.

Water Quality Impacts. Recreational boating activities within the Sanctuary contribute to water quality degradation through pollution from boat paints, exhaust gasses, oil and human waste discharge, and improper trash disposal. Propellers also stir up sediments that block sunlight, reduce photosynthesis levels, and smother bottom-dwelling organisms.

Issue Summary. The Keys' economy is dependent on tourism and marine-related recreation. Accordingly, any measures that attempt to regulate either the number of visitors or visitor use within the Sanctuary will have a profound impact on the local economy. In 1990, for example, half of the Keys' population held a job that directly or indirectly supported outdoor recreation opportunities.

Overuse of popular areas, particularly the reef tract, is a primary concern. The increasing recreational use of these areas often leads to the depletion of the natural resources that attract users. The cumulative impacts of these activities, and their severity, need to be addressed to balance human uses and the quality of the marine environment.

The Keys also offer a variety of significant cultural and historical resources, and many have been designated in the National Register of Historic Places. Examples include the SAN JOSE shipwreck, Indian Key, Rock Mound Archaeological Site, the John Pennekamp Coral Reef State Park, Fort Zachary Taylor, Sound Key Light House, and the Dry Tortugas National Park. Seven percent of all visitor days in the Keys are spent at archaeological or historical attractions, representing a significant visitor-use issue that should be considered when formulating strategies to manage marine-related resources.

Land Use

Land-use planning is either used to separate incompatible uses from one another (e.g., residential uses from heavy industrial uses or airports), or to mitigate the impacts of incompatible uses. Growth management ensures that public-sector capital improvements track the needs of developing areas. Increasingly, growth management has been used to curb development or alter its direction when it is perceived that the impacts of growth will significantly effect a community's health, safety, or welfare. In recent years, these terms have come to embody “quality of life” and the importance of environmental as well as individual health. Land-use planning and growth management, therefore, are important issues throughout the Keys.

Major impacts are defined in terms of large numbers, large affected areas, high densities, large volumes, high concentrations, and significant periods of time. Minor impacts are the converse. Direct impacts are those considered to have a primary effect on nearshore waters or marine resources as a result of discharge or overland flow. Indirect impacts are those having an effect on an alternate medium (e.g., groundwater and the atmosphere) before impacting nearshore waters or marine resources.

Habitat Impacts. The following factors impact habitats within the Sanctuary.

Population and Growth. The current resident population of the Keys (approximately 78,000) is expected to increase to over 102,000 by the year 2010 (Monroe County Comptroller, 1993). Between 1990 and 2010, the Keys' annual seasonal population also is expected to increase by almost 20,000 from approximately 56,000. The Keys' total functional population, including both tourists and residents, has the potential to significantly impact the area's resources. As a result, tourism has both direct and indirect impacts on the Sanctuary. Direct impacts to resources result from participation in water-related activities, and indirectly affect local resources by increasing the demand for public services such as water, sewage disposal, and sanitary landfills.

Residential and Commercial Development. Continued residential development affects resources by increasing upland and wetland clearing, which promotes increased stormwater runoff and airborne dust. Development is accompanied by an increase in the demand for sewage treatment facilities, whose effluents affect ground and surface waters. As housing densities increase, sewage, stormwater, and airborne loadings also increase, causing even greater impacts. Commercial development brings similar resource impacts in terms of stormwater management and sewage treatment. Differences between residential and commercial impacts include the volume of runoff and pollutants it contains, as well as the type of sewage treatment processes used.

Canalization. Canals in South Florida are significant contributors to seagrass die-offs brought on by drought conditions and low freshwater flow through the Everglades. The water diverted to these canals previously entered Florida Bay.

Wetlands Degradation. The destruction or filling of wetlands causes increased stormwater runoff, increased turbidity at the land/water interface, and a loss of the aquatic values often associated with wetlands productivity. Mangrove removal causes a decrease in aquatic values as well.

Dredge and Fill Activities. Dredge and fill activities are currently limited in the Keys, and most permitted dredging is for the maintenance of existing and previously permitted projects. Previous dredging activities, that are no longer permitted, led to the creation of significant canals and basins that have little flushing ability and have become sediment and nutrient sinks for debris, dead seagrass, and sewage effluents.

Sewage Treatment. Sewage treatment techniques in the Keys fall into three major categories: 1) centralized treatment on both large and small scales; 2) individual anaerobic treatment units that discharge either to boreholes or drain fields; and 3) septic tanks that discharge directly to drain fields. There are also approximately 5,000 cesspits in the Keys (EPA, 1992). The Key West Sewage Treatment Plant, which serves approximately 12,000 residential and commercial operators, discharges through one nearshore outfall. Between 25,000 and 30,000 residential units throughout Monroe County are served by septic tanks. Approximately 300 residential and commercial facilities are served by small-scale centralized treatment units, and another 300 are served by individual aerobic units (EPA, 1992).

The impact of these treatment facilities varies by discharge location. In addition, the impacts of effluent nutrient loading, either through groundwater or direct discharge to nearshore waters, are related to the extent that groundwaters interface with nearshore waters, and the degree of flushing experienced by nearshore receiving waters. The result is a potential shift in benthic species composition and the possible eutrophication of receiving waters.

Nearshore waters are most significantly impacted in confined areas. Canals and basins, which are deeper than adjacent receiving waters and tend to face prevailing winds, are of particular concern because they collect floating detritus or may be so circuitous that adequate flushing cannot occur. Far-field impacts can also occur, but are often more subtle than nearshore impacts, and more difficult to observe and define.

In general, nutrients entering the Keys' nearshore waters from adjacent land areas can have an impact as they cycle through the ecosystem. Water tends to move southward through the natural passes between the islands, toward the reef tract in the Atlantic. Although nutrients often move from their source, there is currently no conclusive evidence that declines in coral cover on the reef tract are directly linked to land use.

Stormwater Runoff. With the exception of the City of Key West, stormwater is inadequately managed throughout Monroe County. Stormwater impacts are similar to those of sewage effluent and nutrient loading. However, stormwater differs in salinity, degree of turbidity, and composition and/or proportion of the chemical and biological components.

Eutrophication. Canals near large numbers of septic tanks, or receiving significant detrital loading, exhibit high levels of nutrients, chlorophyll-a, turbidity, and low dissolved oxygen levels**,** all of which contribute to eutrophication.

Algae. Algal "halos" may form around the mouths of canals as a result of epiphyte loading to adjacent seagrasses, or from the complete evolution of adjacent communities to an algal community.

Solid Waste. Although landfills within Monroe County are not lined and do not limit groundwater contamination, the impact of solid waste on Sanctuary resources remains unknown. The components of landfill effluents are also unknown, but can be assumed to include nutrients, organics, synthetic organics, and heavy metals. All four landfills in Monroe County are within 200 meters of tidal waters, and although leaching is possibly occurring, the impact on habitats is unclear.

Mosquito Control. Mosquito spraying occurs on a seasonal basis, particularly during the rainy summer season. The pesticides used generally have a relatively short half-life, but many still have some impact due to aerial spraying or salt pond site application.

Species Impacts. There is no direct evidence that upland land-use patterns have significantly reduced species abundance or diversity. However, isolated areas, particularly canals and other confined waters have been impacted. In these areas, certain types of algae can dominate, and during periods of extreme summer heat fish kills have occurred. Wildlife disturbances, particularly of shore and wading birds, have also occurred as a result of land-use activities, although most are related to recreational boating in backcountry areas.

Most permitted dredge and fill activities in the region occur at or above the mean high-water level. Direct impacts are obvious, and include the destruction of benthic marine communities. Although the extent of the impacts from mosquito-control measures is unknown, seasonal pesticide application may affect the health of larval fish and crustaceans.

Use and User Impacts. Since Sanctuary users typically participate in water-based activities, land-use activities have little or no impact on their ability to enjoy their pursuits. However, the issue of shoreside development has been raised by those concerned with the aesthetics of the natural environment.

Water Quality Impacts. Although currents and water flow from Florida Bay and the Gulf of Mexico to the Atlantic Ocean are understood, little is known about the mass loadings of nutrients and other inputs from the upland areas of the Keys, the Everglades, or South Florida. This is true of both existing and historic inputs. However, reductions in historic water flows in the Everglades, the addition of fertilizers and pesticides, and the use of on-site disposal systems (OSDSs) are all believed to impact Florida Bay.

Dredge and fill activities are known to lead to increased short-term turbidity, changes in current and water-flow patterns, and turbidity increases in areas of minimal water movement.

Issue Summary. As development has occurred in the Keys, and as growth management has been used to direct it, significant land-use impacts have been identified. These include the destruction of upland and wetland areas for the placement of infrastructure and associated development, and the direct impacts of inadequately controlled sewage and stormwater runoff that result from that growth.

All types of development can be assumed to have both direct and indirect impacts on the Sanctuary. Development has an impact on groundwaters, either through stormwater drainage or sewage effluents. Development can also have a direct influence if stormwater facilities are not in place, or if an existing facility reaches capacity and either fails or overflows. All of these potential impacts must be considered as part of a land-use management plan for the Sanctuary.

Water Quality

Water quality is affected by both natural and man-made influences, and is traditionally described based on compliance with existing standards. Such standards typically address an environment's biological oxygen demand, total suspended solids, pH, dissolved oxygen, fecal coliform, and chlorine residual levels. In the context of resource protection, however, water quality requires the consideration of temperature, salinity, light, nutrients, and toxics. In the Keys, these parameters are directly influenced by a variety of factors, including the input of pollutants into estuarine and marine environments, physical processes, and the alteration of historic drainage patterns.

Pollutant inputs affecting water quality are the result of land- and water-related human activity, as well as natural processes. Pollution may originate within the Sanctuary or may be transported from external sources via regional ocean circulation or atmospheric deposition. Within the Keys, pollutant inputs result from both point and nonpoint sources. Point sources are defined as end-of-pipe sources that discharge directly to surface waters. Wastewater treatment plants (WWTPs), industrial plants, water supply plants, and power plants are examples of point sources. In the Keys, there are currently 19 facilities actively discharging, 10 of which are WWTPs. The largest of these is the Key West sewage treatment plant, which has a 10 million gallon per day capacity (EPA, 1992). Other sources discharging to Sanctuary waters include the C-111 Canal and Model Land Canal which empty into Barnes and Card sounds, respectively. These canals are part of the South Florida Water Management District's control structures, and are operated for water supply and flood-control purposes.

Nonpoint sources, including surface runoff and groundwater inputs, can affect nutrient and other constituent concentrations within the water column, and are directly affected by land use, soil type, and rainfall. Groundwater quality within the Keys is affected by the 670 injection wells and 30,000 septic tanks and cesspits, whose relative proximity to the surface can impact marine waters near the shoreline. Additionally, marinas, live-aboards, and boats contribute to nonpoint pollution through maintenance and refueling activities, and wastewater and bilge discharges.

External pollution sources are defined as those outside the immediate area which, via regional ocean circulation or atmospheric deposition, affect the Sanctuary's water quality. Examples include exchanges with Florida and Biscayne bays, and, in a broader context, the marine waters of Florida's southwest continental shelf, as potentially affected by human activities within the eastern portion of the Gulf of Mexico. Florida Bay has experienced recent and significant declines in seagrasses, an increase in problematic algal conditions, and a general decline in water quality. Although the impacts resulting from human activities are unclear, indirect evidence

suggests that changes in the quantity, timing, and quality of freshwater delivered to Florida Bay have precipitated these declines (EPA, 1992).

Other pollutant sources within the Sanctuary include the ocean dumping of glass, wood, paper products, and other hazardous materials by commercial shipping operations. A major oil or chemical spill could cause catastrophic water quality problems. Although the Keys have never experienced a major spill, small spills from refueling activities degrade water quality on a daily basis.

Major water quality impacts are defined as conditions having persistent and deleterious effects on marine resources (e.g., die-offs or declines, community alterations, reductions in recruitment success), and exhibit observable, widespread trends. Minor impacts are those lacking persistence and/or occurring over a very limited area. Direct impacts involve cases where the pollutant source can be identified. Indirect impacts occur when natural processes/factors alter or combine with a pollutant source, altering the pollutant's effect(s) on a Sanctuary resource. An example of an indirect water quality impact would be circulation changes that concentrate, dilute, or flush a pollutant input.

Habitat Impacts.

Loss of Seagrass. The seagrass beds of South Florida, including those of Florida Bay and along the reef tract, cover an estimated 5,500 km^2. In the summer of 1987, a massive seagrass die-off occurred in Florida Bay, resulting in the loss of over 4,000 ha (EPA, 1992). Information suggests that the die-off occurred in response to a combination of ambient conditions that inhibited the sustainability of the seagrass community. The susceptibility to increased organic loadings from domestic wastes in artificial waterways and dead-end canals within the Keys also resulted in seagrass losses.

Loss of Coral/Hardbottom. Both natural and human-induced factors have affected the Sanctuary's coral and hardbottom communities. Stresses include: disease; pollution; algal fouling and smothering; sedimentation; temperature extremes; salinity variations; decreases in water clarity; and physical damage. Even minor changes in water temperature, nutrient levels, or salinity caused by the quality of waters surrounding the Sanctuary can impact coral recruitment and development.

Mangrove Communities. Mangrove communities play a significant role in stabilizing the shoreline and preventing erosion. Although little is known concerning recent mangrove die-offs, there appears to be a rough spatial correlation with adjacent areas of high salinity in Florida Bay. Pore water salinity concentrations of up to 150 ppt have been recorded in the higher relief mangroves where the die-offs have been concentrated (EPA, 1992).

Species Impacts. Extremes in temperature, salinity, algal productivity and/or dissolved oxygen have been associated with periodic fish kills, coral bleaching, and seagrass and sponge die-offs. Seasonal extremes can affect species tolerances at both ends of the survival range. For example, winter cold fronts can dramatically decrease water temperatures in Florida Bay, and subsequently affect adjacent reef environments when wind-induced transport forces waters through the major tidal passes of the Middle Keys. In addition, summer temperatures and calm winds have resulted in biologically stressed oxygen conditions, and have been associated with seagrass die-offs and fish kills.

Use and User Impacts. The Keys' major industry is tourism. The biggest attraction for these tourists is the marine environment surrounding the Keys. As water quality declines, so does the ability of the region to draw tourists. A drastic reduction in nearshore water quality and the loss of the live coral reef could cause a decline in Monroe County's tourist and real estate industries.

Issue Summary. Recent declines in coral recruitment, increases in the frequency of fish kills, and seagrass die-offs are the result of declines in Sanctuary water quality. Preserving and improving the region's water quality is essential to maintaining the richness and diversity of its natural resource base.

Management Strategies

Management strategies are the foundation for the set of actions that will be implemented through the Management Plan. They set out a conceptual course for dealing with management issues, and detail the conditions that must be fulfilled to successfully address specific problems. A strategy must contain certain elements to be practical to management, including information on costs, schedules, respon-

sible institutions, prerequisites, financing, regulatory requirements, staffing and other resource requirements, and the geographic extent of the action that will be implemented.

The process used to develop this Management Plan has been described as "back-to-front," in that some management activities are proposed before the information needed to fully evaluate their impacts is available. The data collection and detailed analysis required prior to implementing these activities will occur as part of the continuous management process. One of the keys to ensuring the success of this process was the development of strategy descriptions that provided an "operational level" of detail. This detail provides planners with a realistic picture of the steps required to fully implement a strategy. The detailed descriptions of these strategies (including their component activities) are the foundation of the "action plans" that have been developed as part of the Preferred Alternative.

The Strategy Development Process

The strategy development process was based directly on the management issues identified. The first work session focusing on strategy development was held in February 1992 in Marathon, Florida. This session was designed to: 1) develop a list of strategies from which management alternatives could be developed; 2) describe the strategies in enough detail to enable planners to judge their effectiveness and feasibility; and 3) characterize the potential impacts of a subset of the strategies (e.g., high-priority strategies) on users and the environment.

NOAA and its planning partners organized a four-day work session and invited Federal, State, and local managers and scientists with expertise and/or experience in the Keys. Agencies with Sanctuary management interests added participants to the list, and the public was invited to attend in an observer capacity. Participants were asked to list, describe, and characterize management strategies or actions that could be used to meet the objectives of the FKNMSPA, the Act designating the Sanctuary. A structured process was developed to obtain the information required to proceed in the management plan development process. A detailed description of this work session is available in the technical document *Florida Keys National Marine Sanctuary Management Plan: Management Strategy Identification and Description Workbook* (May, 1992). The following is a summary of the session.

Prerequisite materials developed for the session included forms for recording information, packages explaining the process to be used, and background materials to help stimulate the development of management strategies. The last item helped participants focus more clearly on the management issues and provided important information on Sanctuary-related problems identified at previous workshops. The issue-oriented approach was critical to obtaining the best information from the participants. Additional materials provided to each issue/strategy group included summaries of the zoning, mooring buoy, education, and research workshops conducted by NOAA and others; draft text of the "Description of the Affected Environment" chapter of this Plan; and draft text of the Phase 1, Water Quality Protection Program document produced for EPA and the State of Florida (EPA, 1992).

A "knowledge-engineering" approach was used to gather information at the session. Knowledge-engineering is a technique that applies organization and structure to the process of directing, acquiring, and encoding what is known about a subject or problem. This approach made the maximum use of the existing knowledge and experience base to identify, characterize, and assess the range of management strategies or actions that could be used to address the issues identified at the scoping meetings.

The session was composed of two separate parts. Part 1, "Strategy Identification and Description," involved a set of issue-group sessions where participants were asked to identify and describe possible management strategies. In Part 2, "Strategy Characterization," participants were asked to describe the impacts the strategies might have if implemented.

Strategy Identification and Description. Participants were first assigned to two of six issue groups. In Round 1, these groups completed the first five steps of the strategy identification and description process (Figure 24). In Round 2, participants moved to their second issue group and completed steps six through 11. Two rounds were conducted to ensure that strategies were reviewed by more than one group and that a wide range of ideas was generated. A sample of a completed strategy description sheet is included in Appendix E in Volume III. Participants in each issue group conducted a priority evaluation at the end of the strategy identification and description session. Strategies were classified as either high, medium, or low priority. Approximately 150 strategies were considered high priority by the participants.

Strategy Characterization. For the characterization sessions, participants were divided into groups focusing on the themes of habitats, species, use and users, and water quality, and followed the steps shown in Figure 25. Because of the large number of strategies developed at the session (almost 300), only the high-priority strategies were characterized. For each strategy, impacts were characterized both spatially and temporally as either high, medium, or low. The impact categories reviewed by each group are shown in Table 17. Impacts were characterized in two spatial categories: those occurring in a specific area and those occurring Sanctuary wide. Strategies could have either a positive or negative impact in each of the categories. The potential impacts of strategies were also evaluated based on current effects (within the next two years) and future effects (more than two years after implementation). A strategy could have no impact in some of these categories. The process was designed to ensure the consistency of characterizations by having the same group of participants examine the same theme for all strategies. The sheets used to record the characteristics also had room for notes and assumptions. Appendix F in Volume III contains a sample strategy characterization sheet.

Participants. The session's participants were selected from Federal, State, and local agencies with management responsibilities in the Keys. They were chosen based on their knowledge of the local and regional issues related to the Sanctuary and their expertise regarding the establishment and maintenance of resource-management programs. A list of the participants and their organizational affiliations appears in Appendix B in Volume III.

Products. The products generated during the session were designed to provide Federal, State, and local planners with enough information to make reasonable decisions about the range of possible management strategies, the potential impacts of these strategies, and preliminary ideas regarding how to package strategies into management alternatives.

The primary product developed was the set of strategy description sheets. These sheets were used to record the initial thoughts of the participants on the most important temporal, spatial, and additional attributes of each strategy. Not all of the description sheets were completed at the same level of detail, as some strategies proved to be prerequisites for others. For example, a strategy to research the effects of boating, diving, and other activities on Sanctuary

Figure 24. *Part 1: Strategy Identification and Description*

Round 1

Step 1 - List strategies. Participants in each of the six issue groups were asked to list strategies that should be considered to address their issue. Each group listed at least 30 strategies.

Step 2 - Assign strategies to individuals. Each strategy was assigned to an individual (usually the person who proposed it) to describe.

Step 3 - Review example strategy description as group. The facilitator used an overhead transparency to describe how to complete the strategy description sheet.

Step 4 - Individuals describe/define strategies in detail. Participants completed description sheets for their assigned strategies.

Step 5 - *Revise strategy descriptions as group*. Each sheet was presented to the issue group on an overhead transparency. The sheets were revised by the group.

Participants then moved to their secondary issue group and followed steps 6 through 11.

Round 2

Step 6 - Review list of strategies from first group. Participants were asked to examine the list of previously developed strategies.

Step 7 - Identify new strategies. After reviewing the list, participants suggested new strategies.

Step 8 - Assign new strategies to individuals. Each new strategy on the list was assigned to an individual for description.

Step 9 - Individuals describe/define strategies in detail. Participants completed strategy description sheets for their assigned strategies.

Step 10 -Revise all strategy descriptions as group. Each strategy description sheet was presented to the group on an overhead transparency. The sheets were revised by the group.

Step 11- Prioritize strategies. Strategies were prioritized as high, medium, or low based on the consensus of the group.

Step 1 - Develop characterization criteria. Each group was asked to develop criteria that would be used to characterize the impacts each strategy might have on their theme (habitats, species, etc.). These criteria concerned what impacts would be considered negative and positive and what degree of impact would lead to a high, medium, or low "priority rating."

Step 2 - Characterize all high-priority strategies. Each group characterized the impacts of all of the high-priority strategies with regards to their theme. These characterizations included both spatial and temporal attributes, and became the raw material for the characterization matrices.

resources should be completed before a strategy establishing carrying capacities is developed.

Another product resulting from the work session was the set of impact characterizations for all high-priority strategies. The symbols on these characterization sheets were designed to emphasize desirable (positive) versus undesirable (negative) impacts.

Post-Work Session Activities. All strategies were entered into a data base, and a list of strategies organized by issue and priority was produced. In addition, redundant strategies were combined into new strategies and characterized; strategy description sheets were edited for clarity; tables summarizing strategy characterizations were developed; and issue statements were revised and abbreviated.

Table 17. *Impact Categories Used to Characterize Strategies*

Habitats	**Species**
• Corals	• Commercial/ Recreational: Food
• Hardbottoms	• Commercial/ Recreational: Ornamental
• Seagrasses	• Diversity
• Algal Communities	• Keystone
• Mangrove	• Distribution
• Sediments	• Wildlife
• Submerged Cultural Resources	
Use & Users	**Water Quality**
• User Conflicts	Confined/Nearshore/Offshore:
• Benefits	• Nutrient Concentrations
• Burdens	• Toxic Concentrations
• Match Burdens/Benefits	• Salinity and Temperature
	• Disolved Oxygen

The 273 original strategies were reviewed and, where significantly similar, combined into new strategies. Redundancy was anticipated because of the overlap among issues. Also, while participants were asked to focus on the issue for their group, they were not prohibited from proposing strategies related to other groups.

Twenty-eight new strategies were created by combining 62 originally formulated at the work session. Based on the priority levels assigned to the original strategies, 26 of the new strategies were ranked as high priority and two as medium priority. If any of the original strategies that were included in the new strategy were classified as high priority, the new strategy was also labeled as high priority.

Other Strategy Sources. The Sanctuary Advisory Council Strategy Work Session, held in June 1992 in Key Largo, provided another source of management strategies and revisions. At this session, the Council reviewed the proposed strategies and commented on how they could be improved. They also identified issues that had not been addressed in the existing strategies. The session resulted in the adoption or revision of 47 new management strategies.

Because the strategy development process was iterative, strategies were continually revised and refined as comments were received from the Core Group, the Sanctuary Advisory Council, NGOs, and the public. This allowed NOAA to integrate the most current and wide-ranging ideas into the strategies while the Management Plan development process evolved. It also required NOAA to remain flexible to strategy modification as new information became available, and reinforced the fact that this flexibility must be part of the continuous management process, following the implementation of the Management Plan. A table tracking the development of strategies appears in Appendix I in Volume III of the DEIS/MP.

Management Alternatives

This section describes the development of a series of management alternatives and the placement of strategies into these alternatives, each of which has a different thrust with respect to resource protection and user impacts. The development and consideration of a series of management alternatives are required by the National Environmental Policy Act (NEPA) as part of the Sanctuary's environmental impact assessment process. A preferred alternative is selected from these alternatives for implementa-

tion. In previous sanctuary planning processes, alternatives have been based on variations of the sanctuary boundary. However, a much more detailed and comprehensive approach was taken in developing the management alternatives for the Florida Keys Sanctuary.

Management Alternatives Development

Management alternatives were developed by the Core Group during several work sessions designed to define the most appropriate level and scope of Sanctuary management. Input was also received from of a number of public and private interests including (but not limited to) departments and agencies within the Federal, State of Florida, and Monroe County governments; national, state, and local nongovernmental groups; industry and trade groups; the Sanctuary Advisory Council; and the citizens of Monroe County.

The interagency Core Group first met to identify a suitable number of alternatives. They were divided into three groups and asked to develop four to eight different alternatives, and describe their general objectives and thrusts. Standard terminology was established by each group to describe management alternatives consistently. Draft alternatives were reviewed in plenary, and similar alternatives were combined. Initially, six alternatives were considered, ranging from "No Action" to the most restrictive of uses of Sanctuary resources, including a "least administrative cost" alternative. Further discussion and refinements determined that the least administrative cost alternative should be eliminated, since it was essentially the same as "No Action."

The five remaining alternatives represent different levels of regulatory control over Sanctuary resources and restriction of uses, with Alternative I the most restrictive and Alternative V (No Action) the least restrictive. Generally, strategies are not exclusive to any management alternative. That is, most of the management strategies in Alternative IV are also in Alternatives III and II, but are augmented with accelerated implementation schedules, and/or include additional restrictions. The thrust and scope of each alternative is described below.

Alternative I

Alternative I represents the most resource conservation at the expense of Sanctuary use and access. It would ensure ecosystem protection by prohibiting nearly all traditional uses (all consumptive uses) of Sanctuary resources, and by imposing strict water quality standards. Only research activities would be permitted in Sanctuary waters under this alternative. While Alternative I would meet the goals of the FKNMSPA regarding resource protection, it would not adequately balance the high level of protection with the restrictions on current and future users. For example, a strategy included in this alternative might ban the harvest of all resources within the Sanctuary, significantly impacting users. Another strategy that might appear in this alternative would ban diving and snorkeling activities on most reefs, if not throughout the Sanctuary. This action would also have an unreasonable impact on users and the economy of the Keys. Accordingly, Alternative I is neither a practical nor a desirable management alternative.

Alternative II

Alternative II represents a resource conservation approach that facilitates access and use of the Sanctuary. It would ensure a high degree of ecosystem protection through extensive regulations prohibiting or limiting many traditional resource uses within the Sanctuary, using zoning and other techniques, and by improving water quality. Alternative II meets the goals of the Act regarding resource protection without imposing the significant impacts on current and future users seen in Alternative I. That is, under Alternative II, most traditional uses of the Sanctuary could continue, but in some cases there would be spatial and/or temporal modifications (i.e., areal and seasonal restrictions through zoning) regarding where these uses may occur. Land-use activities impacting Sanctuary waters would be minimized under this alternative.

Alternative III

Alternative III represents a more traditional approach to Sanctuary use and access than either Alternatives I or II. It would ensure a higher degree of ecosystem protection than currently in place by prohibiting or limiting some traditional uses through zoning and other techniques, and by improving water quality. Like Alternatives I and II, Alternative III meets the goals of the Act regarding resource protection, but would not have as significant an impact on current and future users. This alternative maintains many traditional Sanctuary uses, but some areal and/or seasonal modifications would be required.

Alternative IV

Alternative IV represents the least restrictive of the mid-range approaches to Sanctuary use and access. It is designed to ensure some degree of ecosystem protection through zoning and other techniques, and

Zoning: An Illustration of the Strategy and Management Alternatives Development Process

Management zones help protect areas from resource degradation, can be used to separate incompatible uses, and facilitate research and education by establishing special locations for these activities. Zoning was specifically identified in the FKNMSPA as a means of achieving environmental protection, and comments were received as early as the scoping meetings regarding the benefits of zoning to protect the Sanctuary's resources.

Because of its importance, zoning has received at least as much attention as any other component of the Management Plan. Its role in the success of the Sanctuary, and the public interest it has generated, prompted the Core Group to work with the Sanctuary Advisory Council and its constituent groups in a close and coordinated manner uncommon in sanctuary planning processes.

The process used to develop the zoning plan was similar to that used for other action plans, up to the drafting of the strategy descriptions. The issue statements helped frame the problem. A series of five zoning workshops were held with different interest groups to formulate a preliminary list of zone types. The Advisory Council further refined the zone types. The Core Group then developed strategy descriptions for each zone type. Once these descriptions were developed, a variety of issues still had to be considered, including how areas already being managed would be zoned, and where the new zones would be placed.

Based on further discussions, an Existing Management Areas strategy was developed to recognize the areas already under special resource management regimes. It was also determined that Special-use Areas would be used to achieve particular management objectives, including facilitating the recovery and restoration of damaged Sanctuary resources, accommodating activities not normally permitted in the Sanctuary, providing research and education opportunities, and providing for specific access to resources in a manner that avoids user conflicts.

Originally, Wildlife Management Areas only included those sites listed in the FWS Backcountry Plan for the Lower Keys. However, the Core Group added sites in the Middle and Upper Keys during their October 1992 meeting. At their December 1992 meeting, the Advisory Council added more sites and presented NOAA with recommendations on how these sites would best fit into the three mid-range management alternatives.

First drafts of Sanctuary Preservation Areas and Replenishment Reserves were mapped by the Sanctuary planning staff in Marathon. The Core Group then modified this material, establishing the starting point for a more deliberate set of work sessions with the Advisory Council.

The first of these sessions, held in December 1992, focused on the general areas to be included in a recommendation from the Council. The public was encouraged to attend these sessions, and to provide comments on how they believed they would be affected by the types of zones and proposed locations. This list of zone types and locations was based on all sites identified in Alternatives II, III, and IV. Because of the lack of detailed data on the proposed sites, the Council formed a subcommittee to examine these zones further, and asked NOAA to provide them with a process and the information necessary to conduct a more objective analysis of the zoning alternatives. This request led to the next set of work sessions.

The Sanctuary Advisory Council's subcommittee met with NOAA in February 1993 to: 1) develop criteria for selecting Sanctuary Preservation Areas (SPAs) and Replenishment Reserves; 2) apply the criteria to the areas proposed by the Core Group; and 3) develop a subset of zones to be examined further. The criteria used to select areas for consideration as proposed SPAs included: protection of representative critical/rare habitats; the long-term impacts on areas of critical economic value; water quality; accessibility by user groups; areas where user conflicts are minimized; research potential; and geographic distribution in the Sanctuary. The criteria used for Replenishment Reserves included consideration of level of habitat and species diversity representative of the Keys' ecosystem; ownership of nearby waterfront property; water quality; existing Sanctuary management areas; areas within the Sanctuary with proposed restrictions; management of adjacent areas; socioeconomic impact on displaced user groups; environmental and socioeconomic impacts on other areas from displacing existing users; sufficient size to include a range of habitats; and the long-term impacts from establishing Replenishment Reserves in areas of critical economic value.

Working in coordination with their constituents, the subcommittee reviewed benthic habitat maps, maps and information on activities and use levels, and high-resolution aerial photography covering the subset of proposed zones. This information was used to draw preliminary boundaries on nautical charts and the aerial photographs. The subcommittee also visited several locations in the Upper Keys to examine the amount of resource protection provided by the proposed zones, to evaluate the size of the zones, and to gain insight on possible impacts to users. As a result, some zone boundaries were refined.

NOAA generated materials relevant to the zones proposed by the subcommittee and supplied descriptions of how each zone met the criteria, maps of the proposed boundaries, and data on the size of each area and the percentage of the Sanctuary that would be included. The subcommittee then reviewed these materials with their constituent groups.

The subcommittee met again in late February 1993 to make final adjustments to zone boundaries and to present their proposal to the public and the full Sanctuary Advisory Council. NOAA provided aerial photography and nautical charts delineating the zones proposed by the subcommittee, as well as the zones proposed by the Core Group for Alternatives IV and II, to help the Advisory Council in their deliberations. The Council voted on the subcommittee's proposal and recommended that 19 SPAs, four "research-only" SPAs, two Replenishment Reserves, and one "Special-use" Replenishment Reserve be included in Alternative III. NOAA and the Core Group reviewed the Council's recommendation, and used their expertise to modify and refine zoning proposals for Alternatives IV and II. NOAA later reclassified the "research-only" SPAs as Special-use Areas. Finally, pursuant to Section 304 (a)(5) of the NMSA, the South Atlantic and Gulf of Mexico Fishery Management Councils were consulted on these zoning alternatives

Figures 27-29 are maps of the proposed zones included in each of the mid-range alternatives. Detailed maps of the proposed zones in the Preferred Alternative appear in the Zoning Action Plan in Volume I.

by improving water quality. Alternative IV meets the goals of the Act regarding resource protection, but would not have as significant a positive impact on habitats, species, or water quality as either Alternatives II or III. It would not impact current or future users as significantly as Alternatives I through III. Almost all traditional Sanctuary uses would continue, but some areal and/or seasonal modifications would be required.

Alternative V

Alternative V represents no modification of current Sanctuary use and access policies. This is commonly referred to as the "no action" alternative. No additional regulations, education, administrative actions, research, or economic incentives would be proposed to improve the condition of the Sanctuary or the quality of user experiences. The alternative would not ensure an increase in ecosystem protection, and would not restrict Sanctuary users from any traditional activities. Alternative V does not meet the goals of the Act regarding resource protection. It would have no positive impacts on habitats, species, water quality, or user conflicts. In addition, maintaining current policies would pose significant long-term threats to resources throughout the Sanctuary.

These alternatives contain the full set of proposed strategies for Sanctuary management to ensure that the goals and intent of the FKNMSPA are met. Actions within these strategies cover activities on land and water and cross many governmental jurisdictions. It is clear that no single agency (whether Federal, State, or local) has the regulatory authority or resources to implement all of these actions. The specific actions that make up alternatives are described in detail elsewhere in this document.

Placing Strategies into Alternatives

The first step in placing strategies into alternatives was to identify and describe how each alternative might address the issues and affect species, habitats, use/users, and water quality. A summary matrix was developed for each alternative. Next, each activity/effect was assigned a proposed action from the list of strategies that would meet the objectives. Thus, the proposed strategies were assigned to alternatives. This also provided an opportunity to identify actions for which no strategy had been developed.

Base Strategies. The Core Group felt that a subset of the proposed strategies was essential to the protection of Sanctuary resources regardless of which alternative, other than Alternative V, was chosen. These were termed "base" strategies. Once they were identified, the Core Group moved on to grading the remaining alternatives.

Grading Strategies across Alternatives. Grading the remaining strategies across alternatives was necessary to provide for a range of resource protection and use restrictions, and to ensure comprehensive management through zoning where the zones could be modified as necessary to appropriately manage resources and address user conflicts. The iterative planning process resulted in a revised set of alternatives (based on refinements in strategies). The strategies included in the three mid-range alternatives appear in Table 18. Appendix G in Volume III also contains a complete list of the strategies in each of the three mid-range alternatives. A description of how the alternatives were evaluated and compared in order to select the Preferred Alternative appears later in this volume.

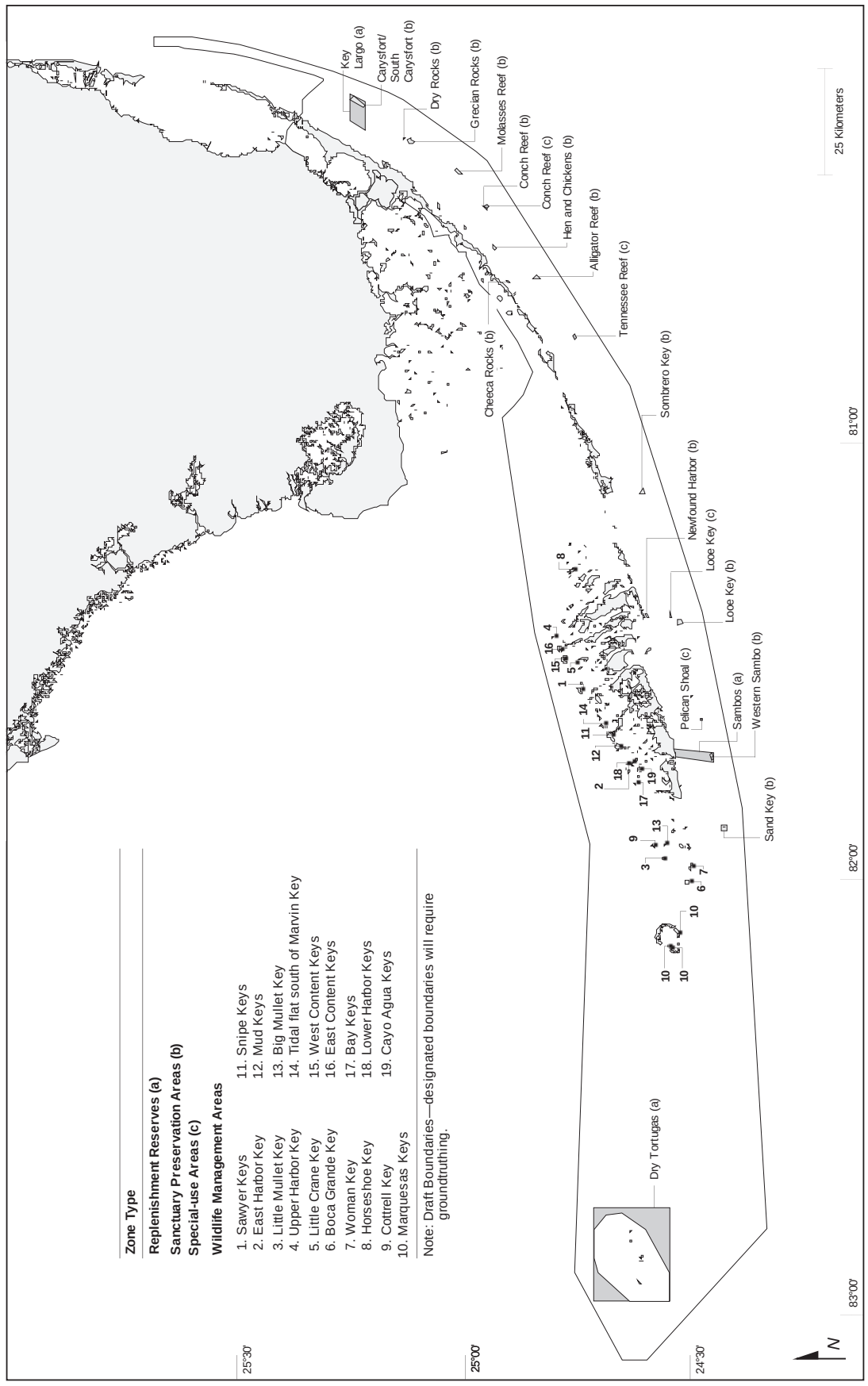


Figure 26. *Zoning Scheme for Alternative IV*

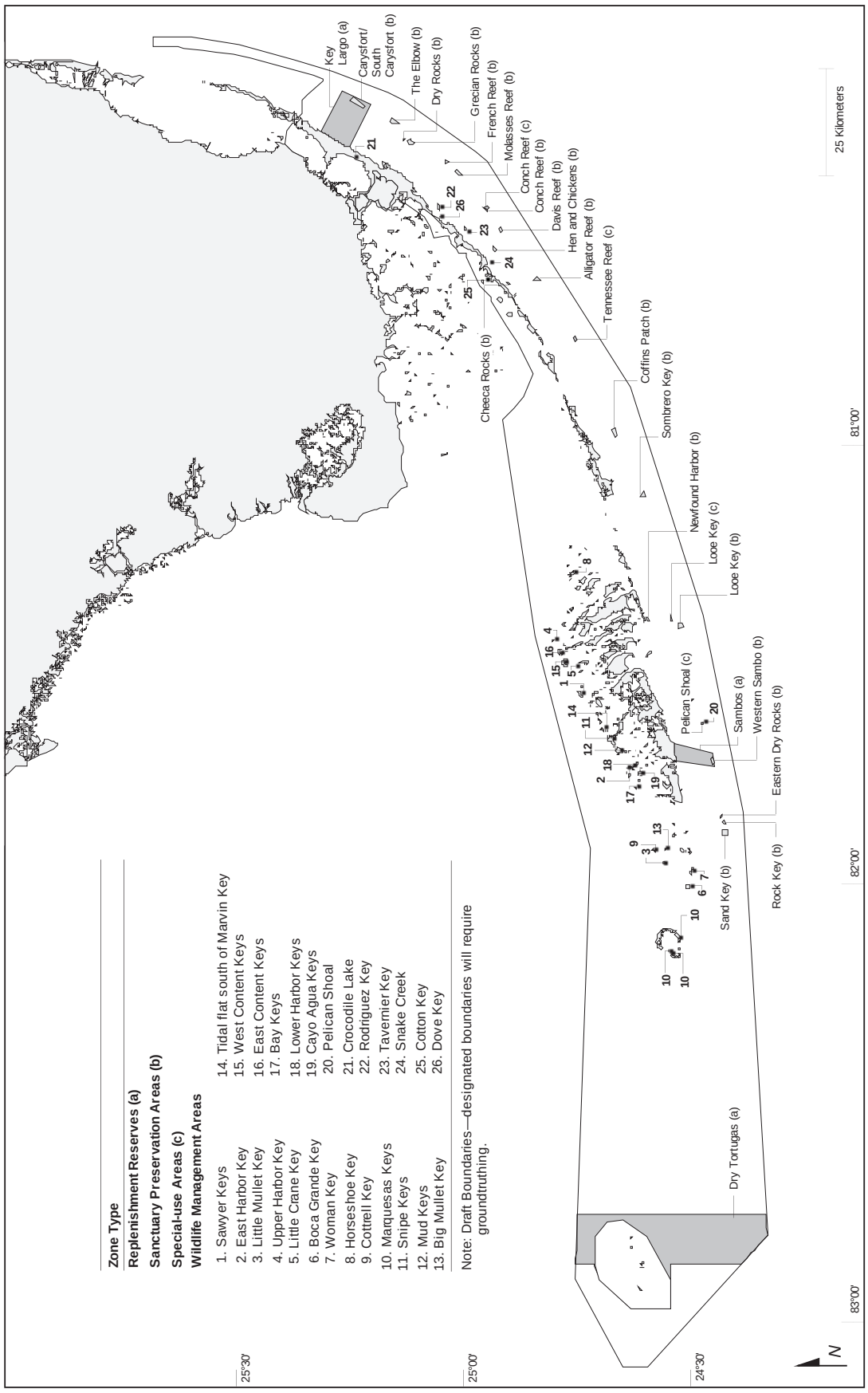


Figure 27. *Zoning Scheme for Alternative III*

Figure 28. *Zoning Scheme for Alternative II*

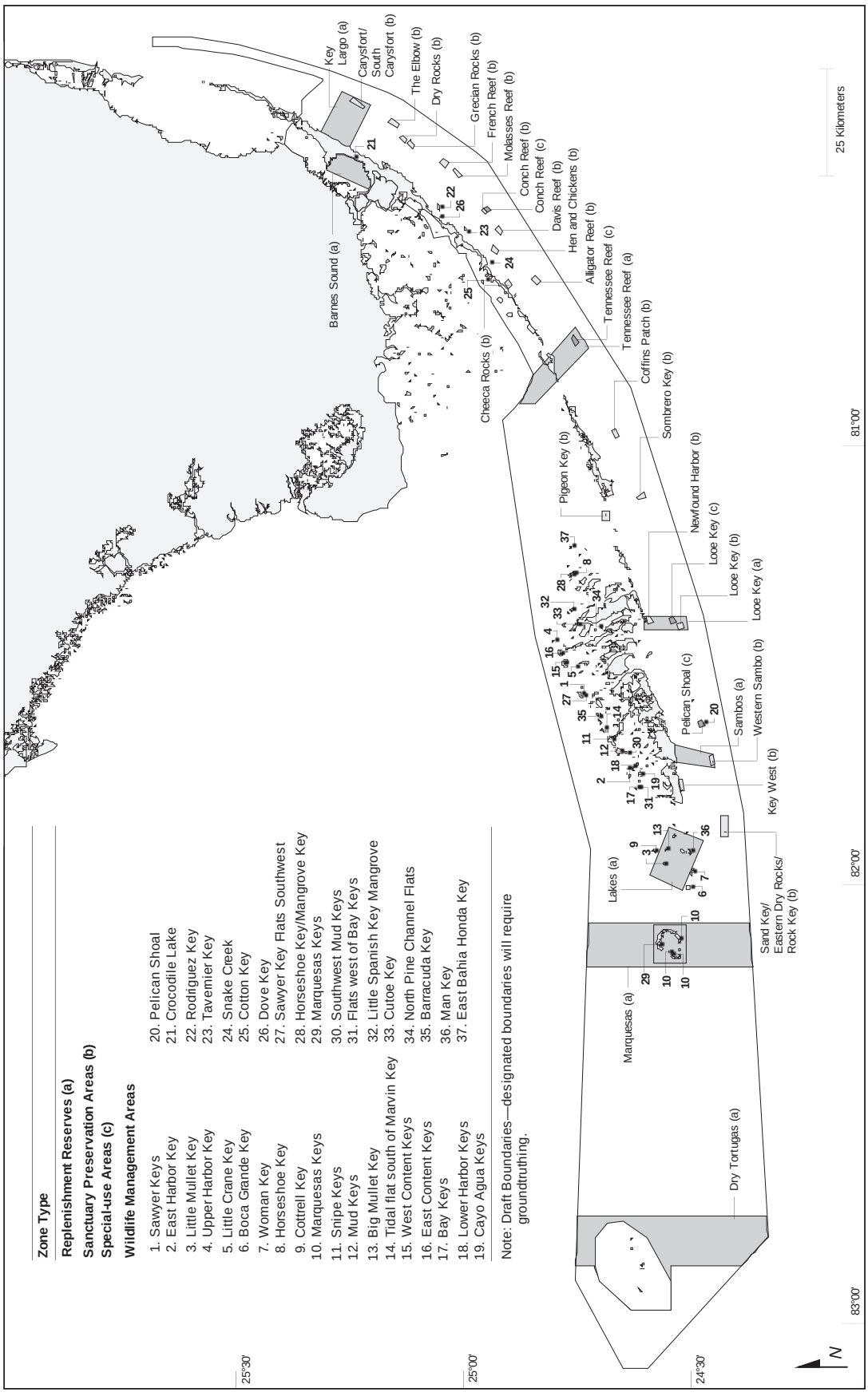


Table 18. *Mid-range Alternative Strategies*

IV	III	II
Boating		
B.1.a. *Boat Access* Conduct a survey to assess public and private boat access throughout the Sanctuary to develop a low-impact access plan. Implement low-cost administrative changes for public access (e.g., signage, timing restrictions, closures, etc.).	**B.1.b. *Boat Access*** Conduct a survey to assess public and private boat access throughout the Sanctuary to develop a low-impact access plan; direct new public access to low-impact areas; and modify as appropriate any access affecting sensitive areas throughout the Sanctuary.	**B.1.c. *Boat Access*** Conduct a survey to assess public and private boat access throughout the Sanctuary to develop a low-impact access plan; implement restrictions on new public access; and require modification of public and private access to reduce impacts to resources and user conflicts throughout the Sanctuary.
B.2.a. *Habitat Restoration* Continue ongoing habitat restoration activities and monitor recovery processes.	**B.2.b. *Habitat Restoration*** Conduct a program of restoration research at representative habitat sites within the Sanctuary; develop a restoration plan and implement restoration in severely impacted areas. Monitor recovery processes.	**B.2.c. *Habitat Restoration*** Conduct a program of restoration research at representative habitat sites within the Sanctuary; develop a restoration plan and implement restoration in all impacted areas. Monitor recovery processes.
B.3.a. *Derelict Vessels* Develop a removal and disposal plan for derelict and abandoned vessels throughout the Sanctuary and streamline the existing permitting process for the removal of derelict and abandoned vessels from high-use and sensitive areas.	**B.3.b. *Derelict Vessels*** Develop and implement a removal and disposal plan for derelict and abandoned vessels, streamline the permitting process, and require the removal of all derelict and abandoned vessels throughout the Sanctuary.	**B.3.b. *Derelict Vessels*** Develop and implement a removal and disposal plan for derelict and abandoned vessels, streamline the permitting process, and require the removal of all derelict and abandoned vessels throughout the Sanctuary.
B.4.a. *Channel Marking* Establish a channel and "significant features" marking system and associated regulations regarding boat speeds and wakes to reduce natural resource damages, and implement in sensitive areas (corals, hardbottoms, some mangrove creeks, submerged aquatic vegetation).	**B.4.b. *Channel Marking*** Establish a channel/waterway marking system throughout the Sanctuary.	**B.4.b. *Channel Marking*** Establish a channel/waterway marking system throughout the Sanctuary.
B.5.a. *Boat Groundings* Develop a response plan for boat groundings throughout the Sanctuary.	**B.5.a. *Boat Groundings*** Develop a response plan for boat groundings throughout the Sanctuary.	**B.5.a. *Boat Groundings*** Develop a response plan for boat groundings throughout the Sanctuary.
B.6.a. *Additional Enforcement* Add 10 sanctuary enforcement officers to deploy in high-use and sensitive areas.	**B.6.b. *Additional Enforcement*** Add 30 sanctuary enforcement officers to deploy in high-use and sensitive areas.	**B.6.c. *Additional Enforcement*** Add 50 sanctuary enforcement officers to deploy throughout the Sanctuary.
B.7.a. *Pollution Discharges* Reduce pollution discharges (e.g., sanitary wastes, debris, and hydrocarbons) from vessels by enforcing existing regulations, assessing the need for additional regulations, and implementing and enforcing new regulations (i.e., upcoming regulation restricting discharge in State waters). Change the environmental crimes category associated with discharges from felony to civil offense, thereby removing the need to prove criminal intent.	**B.7.a. *Pollution Discharges*** Reduce pollution discharges (e.g., sanitary wastes, debris, and hydrocarbons) from vessels by enforcing existing regulations, assessing the need for additional regulations, and implementing and enforcing new regulations (i.e., upcoming regulation restricting discharge in State waters). Change the environmental crimes category associated with discharges from felony to civil offense, thereby removing the need to prove criminal intent.	**B.7.a. *Pollution Discharges*** Reduce pollution discharges (e.g., sanitary wastes, debris, and hydrocarbons) from vessels by enforcing existing regulations, assessing the need for additional regulations, and implementing and enforcing new regulations (i.e., upcoming regulation restricting discharge in State waters). Change the environmental crimes category associated with discharges from felony to civil offense, thereby removing the need to prove criminal intent.

Table 18. *Mid-range Alternative Strategies (Continued)*

IV	III	II
B.8.a*. User Fees* Conduct a boating fee assessment study to evaluate and reallocate sanctuary-related fees.	**B.8.b*. User Fees*** Conduct a boating fee assessment study to evaluate and reallocate sanctuary-related fees; implement appropriate impact fees.	**B.8.b*. User Fees*** Conduct a boating fee assessment study to evaluate and reallocate sanctuary-related fees; implement appropriate impact fees.
B.9.a*. Visitor Registration* Establish a voluntary visitor registration program to assess user activity in the Sanctuary.	**B.9.a*. Visitor Registration*** Establish a voluntary visitor registration program to assess user activity in the Sanctuary.	**B.9.a*. Visitor Registration*** Establish a voluntary visitor registration program to assess user activity in the Sanctuary.
B.10.a*. Damage Assessment* Establish damage assessment standards for vessel groundings in the Sanctuary.	**B.10.a*. Damage Assessment*** Establish damage assessment standards for vessel groundings in the Sanctuary.	**B.10.a*. Damage Assessment*** Establish damage assessment standards for vessel groundings in the Sanctuary.
B.11.a*. Special-use Permits* Establish permits (e.g., for researchers, educators, emergency response personnel, salvors, salvage operators, animal rescue operations) to conduct activities otherwise prohibited within the Sanctuary; facilitate simplified permitting.	**B.11.a *Special-use Permits*** Establish permits (e.g., for researchers, educators, emergency response personnel, salvors, salvage operators, animal rescue operations) to conduct activities otherwise prohibited within the Sanctuary; facilitate simplified permitting.	**B.11.a *Special-use Permits*** Establish permits (e.g., for researchers, educators, emergency response personnel, salvors, salvage operators, animal rescue operations) to conduct activities otherwise prohibited within the Sanctuary; facilitate simplified permitting.
B.12.a. *Cross Deputization* Expand Federal/State/local cooperative law enforcement and cross-deputization programs and prioritize enforcement areas.	**B.12.a. *Cross Deputization*** Expand Federal/State/local cooperative law enforcement and cross-deputization programs and prioritize enforcement areas.	**B.12.a. *Cross Deputization*** Expand Federal/State/local cooperative law enforcement and cross-deputization programs and prioritize enforcement areas.
B.13.a. *Salvaging/Towing* Establish regulations and procedural guidelines for commercial salvaging and towing of vessels in need of assistance.	**B.13.b. *Salvaging/Towing*** Establish regulations and procedural guidelines for commercial salvaging and towing of vessels in need of assistance. Implement permitting for salvaging and towing throughout the Sanctuary and establish an operator training program.	**B.13.c. *Salvaging/Towing*** Establish regulations and procedural guidelines for commercial salvaging and towing of vessels in need of assistance. Implement permitting for salvaging and towing throughout the Sanctuary and require operator training.
B.15.a. *Mooring Buoy Impacts* Conduct an assessment of current mooring buoy technology to determine impacts to resources and to evaluate which are the most environmentally sound, cost-effective, and functional for use in sanctuary waters. Develop a comprehensive mooring buoy plan providing for the maintenance of buoys, the placement of buoys as needed, and the implementation of vessel size limits at mooring buoys in sensitive areas.	**B.15.b. *Mooring Buoy Impacts*** Conduct an assessment of current mooring buoy technology to determine impacts to resources and to evaluate which are the most environmentally sound, cost-effective, and functional for use in sanctuary waters. Develop a comprehensive mooring buoy plan providing for the maintenance of buoys, the placement of buoys as needed, and the implementation of vessel size limits at mooring buoys throughout the Sanctuary.	**B.15.b. *Mooring Buoy Impacts*** Conduct an assessment of current mooring buoy technology to determine impacts to resources and to evaluate which are the most environmentally sound, cost-effective, and functional for use in sanctuary waters. Develop a comprehensive mooring buoy plan providing for the maintenance of buoys, the placement of buoys as needed, and the implementation of vessel size limits at mooring buoys throughout the Sanctuary.
B.16.a. *Dock Permitting* Identify subdivisions and coastal areas where dock construction should be prohibited due to inadequate surrounding water depths and the presence of important marine resources. Coordinate the Federal, State, and local permitting process for dock construction.	**B.16.a. *Dock Permitting*** Identify subdivisions and coastal areas where dock construction should be prohibited due to inadequate surrounding water depths and the presence of important marine resources. Coordinate the Federal, State, and local permitting process for dock construction.	**B.16.a. *Dock Permitting*** Identify subdivisions and coastal areas where dock construction should be prohibited due to inadequate surrounding water depths and the presence of important marine resources. Coordinate the Federal, State, and local permitting process for dock construction.

Table 18. *Mid-range Alternative Strategies (Continued)*

IV	III	II
B.17.a. *PWC Management* Develop and implement regulations for the operation of PWC and other motorized vessels within 100 yards of sensitive or critical areas, other boats, and people in the water. Develop and implement regulations and procedural guidelines for commercial PWC rental operations.	**B.17.b. *PWC Management*** Develop and implement regulations for the operation of PWC and other motorized vessels within 200 yards of sensitive or critical areas, other boats, and people in the water. Develop and implement regulations and procedural guidelines for commercial PWC rental operations.	**B.17.c. *PWC Management*** Develop and implement regulations for the operation of PWC and other motorized vessels within 300 yards of sensitive or critical areas, other boats, and people in the water. Develop and implement regulations and procedural guidelines for commercial PWC rental operations.
Fishing		
F.1.a. *Consistent Regulations* Establish a protocol for developing and revising regulations and implement a consistent set of fisheries regulations throughout the Sanctuary.	**F.1.a. *Consistent Regulations*** Establish a protocol for developing and revising regulations and implement a consistent set of fisheries regulations throughout the Sanctuary.	**F.1.a. *Consistent Regulations*** Establish a protocol for developing and revising regulations and implement a consistent set of fisheries regulations throughout the Sanctuary.
F.3.a. *Stocking* Develop and conduct a research program to assess the impacts of stocking programs on the genetic integrity of native stocks within the Sanctuary. The program will also be used to develop and implement appropriate regulations on the stocking of native and non-native species to protect the genetic integrity of native stocks.	**F.3.b. *Stocking*** Implement a moratorium on stocking activities. Assess existing research on the impacts of stocking on the genetic integrity of native stocks. Conduct research on natural stock recovery and its role in maintaining genetic integrity. Conduct a re-evaluation of stocking options. The length of the moratorium will depend on the length and results of the assessment.	**F.3.b. *Stocking*** Implement a moratorium on stocking activities. Assess existing research on the impacts of stocking on the genetic integrity of native stocks. Conduct research on natural stock recovery and its role in maintaining genetic integrity. Conduct a re-evaluation of stocking options. The length of the moratorium will depend on the length and results of the assessment.
	F.4.b. *Mariculture Alternatives* Assess, develop, and promote mariculture alternatives for all commercially harvested marine species. Support efforts to eliminate the harvest and landing of live rock.	**F.4.c. *Mariculture Alternatives*** Develop and implement mariculture alternatives for all commercially harvested marine species. Support efforts to eliminate the harvest and landing of live rock.
F.5.a. *Limited Entry* Assess limited-entry fisheries options for specific sanctuary fisheries. Develop appropriate regulations that ensure the long-term sustainability of sanctuary fisheries.	**F.5.b. *Limited Entry*** Assess limited-entry fisheries options for specific sanctuary fisheries. Develop appropriate regulations that ensure the long-term sustainability of sanctuary fisheries. Implement appropriate regulations on a fishery-by-fishery basis.	**F.5.c. *Limited Entry*** Assess limited-entry fisheries options for specific sanctuary fisheries. Develop appropriate regulations that ensure the long-term sustainability of sanctuary fisheries. Implement regulations for all sanctuary fisheries.
F.6.a. *Fisheries Sampling* Enhance the resolution of existing commercial and recreational fisheries-dependent sampling programs to provide statistics on catch and effort at the sanctuary level. Initiate a fisheries-independent sampling program to measure sanctuary-level prerecruitment of economically important species. Conduct a fisheries inventory of species, sizes, ages, harvest, by-catch, timing, distribution, users, socioeconomics, and gear.	**F.6.b. *Fisheries Sampling*** Enhance the resolution of existing commercial and recreational fisheries-dependent and independent sampling programs to provide statistics on catch and effort. This will be accomplished by establishing statistical areas based on "completeness criteria" including scientific need. Initiate fisheries-independent sampling programs to measure the prerecruitment of economically important species within the statistical areas.	**F.6.b. *Fisheries Sampling*** Enhance the resolution of existing commercial and recreational fisheries-dependent and independent sampling programs to provide statistics on catch and effort. This will be accomplished by establishing statistical areas based on "completeness criteria" including scientific need. Initiate fisheries-independent sampling programs to measure the prerecruitment of economically important species within the statistical areas.

Table 18. *Mid-range Alternative Strategies (Continued)*

IV	III	II
F.7.a. *Artificial Reefs* Conduct research on the impacts of artificial reefs on fish and invertebrate populations for long-term management including location, size, materials, etc. Monitor and evaluate habitat modifications caused by the installation of marine structures. Assess and develop regulations for artificial reef construction and evaluate habitat suitability for artificial reefs.	**F.7.a. *Artificial Reefs*** Conduct research on the impacts of artificial reefs on fish and invertebrate populations for long-term management including location, size, materials, etc. Monitor and evaluate habitat modifications caused by the installation of marine structures. Assess and develop regulations for artificial reef construction and evaluate habitat suitability for artificial reefs.	**F.7.c. *Artificial Reefs*** Implement a three-year moratorium on artificial reef development. Conduct research on the impacts of artificial reefs on fish and invertebrate populations for long-term management including locations, size, materials, etc. Monitor and evaluate habitat modifications caused by the installation of marine structures. Assess and develop regulations for artificial reef construction and evaluate habitat suitability for artificial reefs.
F.8.a. *Exotic Species* Implement regulations to prevent the release of exotic species into the Sanctuary.	**F.8.a. *Exotic Species*** Implement regulations to prevent the release of exotic species into the Sanctuary.	**F.8.a. *Exotic Species*** Implement regulations to prevent the release of exotic species into the Sanctuary.
F.9.a. *Gear Removal* Develop a program for the removal of lost or out-of-season fishing gear, and implement in all areas of the Sanctuary.	**F.9.a *Gear Removal*** Develop a program for the removal of lost or out-of-season fishing gear, and implement in all areas of the Sanctuary.	**F.9.a *Gear Removal*** Develop a program for the removal of lost or out-of-season fishing gear, and implement in all areas of the Sanctuary.
F.10.a. *Bycatch* Conduct an assessment of methods used to harvest commercial and recreational marine species including corals, fish, and invertebrates. Develop and implement regulations to reduce the effects of current fishing practices on nontargeted species.	**F.10.a. *Bycatch*** Conduct an assessment of methods used to harvest commercial and recreational marine species including corals, fish, and invertebrates. Develop and implement regulations to reduce the effects of current fishing practices on nontargeted species.	**F.10.a. *Bycatch*** Conduct an assessment of methods used to harvest commercial and recreational marine species including corals, fish, and invertebrates. Develop and implement regulations to reduce the effects of current fishing practices on nontargeted species.
F.11.a. *Gear/Method Impacts* Conduct research on alternative fishing gear and methods that minimize impacts on habitat. Implement a voluntary program to encourage the use of low-impact gear and methods. Characterize harvesting stresses affecting outer and inshore reefs and hardbottom ecosystems.	**F.11.b. *Gear/Method Impacts*** Conduct research on alternative fishing gear and methods that minimize impacts on habitat. Implement a voluntary program to encourage the use of low-impact gear and methods. Implement regulations to require the use of low-impact gear and methods in priority areas. Characterize harvesting stresses affecting outer and inshore reefs and hardbottom ecosystems.	**F.11.c. *Gear/Method Impacts*** Conduct research on alternative fishing gear and methods that minimize impacts on habitat. Implement regulations to require the use of low-impact gear and methods sanctuary-wide. Characterize harvesting stresses affecting outer and inshore reefs and hardbottom ecosystems.
F.12.a. *Finfish Traps* Eliminate all finfish traps within the Sanctuary, excluding those set for bait fish.	**F.12.a. *Finfish Traps*** Eliminate all finfish traps within the Sanctuary, excluding those set for bait fish.	**F.12.a. *Finfish Traps*** Eliminate all finfish traps within the Sanctuary, excluding those set for bait fish.
F.14.a. *Spearfishing* Conduct an assessment of spearfishing practices and impacts to develop and implement regulations in high-priority areas.	**F.14.a. *Spearfishing*** Conduct an assessment of spearfishing practices and impacts to develop and implement regulations in high-priority areas.	**F.14.c. *Spearfishing*** Conduct an assessment of spearfishing practices and impacts to develop and implement regulations throughout the Sanctuary.
F.15.a. *Sponge Harvest* Develop and conduct a research program to assess the impacts of current sponge harvest methods on the resource and the habitats in which they occur. Develop and implement regulations for high-priority areas.	**F.15.b. *Sponge Harvest*** Develop and conduct a research program to assess the impacts of current sponge harvest methods on the resource and the habitats in which they occur. Develop and implement regulations throughout the Sanctuary.	**F.15.c. *Sponge Harvest*** Establish a three-year moratorium on the harvest of sponges. Develop and conduct a research program to assess the impacts of current sponge harvest methods on the resource and the habitats in which they occur. Develop regulations for implementation after the moratorium.

Table 18. *Mid-range Alternative Strategies (Continued)*

IV	III	II
Land Use		
L.1.a. *Marina Pumpout* Require marinas that have pump-out requirements to install pump-out facilities.	**L.1.a. *Marina Pumpout*** Require marinas that have pump-out requirements to install pump-out facilities.	**L.1.a. *Marina Pumpout*** Require marinas that have pump-out requirements to install pump-out facilities.
L.2.a. *Marina Operations* Conduct an assessment of marina (10 slips or more) compliance with current regulations and standards, including OSHA standards for marina operations. Evaluate interagency cooperation in marina permit review process and initiate action to eliminate conflicts in agency jurisdictions. Improve marina siting criteria to ensure that only appropriate deep water access will be permitted and to provide for the proper handling of noxious materials.	**L.2.a. *Marina Operations*** Conduct an assessment of marina (10 slips or more) compliance with current regulations and standards, including OSHA standards for marina operations. Evaluate interagency cooperation in marina permit review process and initiate action to eliminate conflicts in agency jurisdictions. Improve marina siting criteria to ensure that only appropriate deep water access will be permitted and to provide for the proper handling of noxious materials.	**L.2.a. *Marina Operations*** Conduct an assessment of marina (10 slips or more) compliance with current regulations and standards, including OSHA standards for marina operations. Evaluate interagency cooperation in marina permit review process and initiate action to eliminate conflicts in agency jurisdictions. Improve marina siting criteria to ensure that only appropriate deep water access will be permitted and to provide for the proper handling of noxious materials.
L.3.a. *Fueling/Maintenance* Evaluate procedures to avoid or reduce fuel spillage during refueling operations. Initiate remedial solutions to any problems identified.	**L.3.b. *Fueling/Maintenance*** Evaluate procedures to avoid or reduce fuel spillage during refueling operations. Initiate remedial solutions to any problems identified. Require the establishment of paved and curbed containment areas for boat maintenance activities such as hull scraping and repainting, mechanical repairs, and lubrication. Require the creation of secondary containment, generally in the form of curbing or synthetic liners, for areas where significant quantities of hazardous or toxic materials are stored.	**L.3.b. *Fueling/Maintenance*** Evaluate procedures to avoid or reduce fuel spillage during refueling operations. Initiate remedial solutions to any problems identified. Require the establishment of paved and curbed containment areas for boat maintenance activities such as hull scraping and repainting, mechanical repairs, and lubrication. Require the creation of secondary containment, generally in the form of curbing or synthetic liners, for areas where significant quantities of hazardous or toxic materials are stored.
L.4.a. *RV Pumpout* Revise regulations to require public and private RV parks to provide pump-out facilities, and implement requirements within three years.	**L.4.a. *RV Pumpout*** Revise regulations to require public and private RV parks to provide pump-out facilities, and implement requirements within three years.	**L.4.a. *RV Pumpout*** Revise regulations to require public and private RV parks to provide pump-out facilities, and implement requirements within three years.
L.5.a. *RV Waste Reduction* Expand enforcement activities to reduce illegal waste disposal from RVs.	**L.5.a. *RV Waste Reduction*** Expand enforcement activities to reduce illegal waste disposal from RVs.	**L.5.a. *RV Waste Reduction*** Expand enforcement activities to reduce illegal waste disposal from RVs.
	L.6.b. *Mobil Pumpout* Establish a mobile pump-out service through the local government or a franchise with a private contractor which would serve to pump-out live-aboard vessels moored outside of marina facilities. Encourage the use of existing, and the construction of additional, shore-side facilities such as dingy docks, parking areas, showers, and laundries for use by live-aboards.	**L.6.b. *Mobil Pumpout*** Establish a mobile pump-out service through the local government or a franchise with a private contractor which would serve to pump-out live-aboard vessels moored outside of marina facilities. Encourage the use of existing, and the construction of additional, shore-side facilities such as dingy docks, parking areas, showers, and laundries for use by live-aboards.

Table 18. *Mid-range Alternative Strategies (Continued)*

IV	III	II
L.7.a. *SWD Problem Sites* Conduct an assessment to identify solid waste disposal sites that pose threats to water quality and/or sensitive areas, based on the results of EPA's Water Quality Plan. Intensify existing monitoring programs around landfills to ensure that no leaching is occurring into marine waters. If problems are discovered, evaluate and implement appropriate remedial actions such as boring or mining, upgrading closure, collecting and treating leachate, constructing slurry walls, and excavating and hauling landfill contents.	**L.7.a. *SWD Problem Sites*** Conduct an assessment to identify solid waste disposal sites that pose threats to water quality and/or sensitive areas, based on the results of EPA's Water Quality Plan. Intensify existing monitoring programs around landfills to ensure that no leaching is occurring into marine waters. If problems are discovered, evaluate and implement appropriate remedial actions such as boring or mining, upgrading closure, collecting and treating leachate, constructing slurry walls, and excavating and hauling landfill contents.	**L.7.a. *SWD Problem Sites*** Conduct an assessment to identify solid waste disposal sites that pose threats to water quality and/or sensitive areas, based on the results of EPA's Water Quality Plan. Intensify existing monitoring programs around landfills to ensure that no leaching is occurring into marine waters. If problems are discovered, evaluate and implement appropriate remedial actions such as boring or mining, upgrading closure, collecting and treating leachate, constructing slurry walls, and excavating and hauling landfill contents.
L.8.a. *Containment Options* Initiate a study to investigate the feasibility of various solid waste containment/ relocation options.	**L.8.b. *Containment Options*** Initiate a study to investigate the feasibility of various solid waste containment/ relocation options. Implement containment/ relocation options where appropriate within five years.	**L.8.b. *Containment Options*** Initiate a study to investigate the feasibility of various solid waste containment/ relocation options. Implement containment/ relocation options where appropriate within five years.
L.9.a. *SWD Policy Compliance* Comply with Monroe County policies on solid waste disposal.	**L.9.a. *SWD Policy Compliance*** Comply with Monroe County policies on solid waste disposal.	**L.9.a. *SWD Policy Compliance*** Comply with Monroe County policies on solid waste disposal.
L.10.a. *HAZMAT Handling* Conduct an assessment and inventory of hazardous materials handling and use in the Florida Keys including facilities, types and quantities of materials, and transport/ movement. Add information to the FDEP/ EPA/Monroe County GIS database.	**L.10.a. *HAZMAT Handling*** Conduct an assessment and inventory of hazardous materials handling and use in the Florida Keys including facilities, types and quantities of materials, and transport/ movement. Add information to the FDEP/ EPA/Monroe County GIS database.	**L.10.a. *HAZMAT Handling*** Conduct an assessment and inventory of hazardous materials handling and use in the Florida Keys including facilities, types and quantities of materials, and transport/ movement. Add information to the FDEP/ EPA/Monroe County GIS database.
L.11.a. *HAZMAT License* Establish licensing requirements for commercial handlers of hazardous materials and biohazardous waste within three years to reduce mishandling and illegal disposal.	**L.11.a. *HAZMAT License*** Establish licensing requirements for commercial handlers of hazardous materials and biohazardous waste within three years to reduce mishandling and illegal disposal.	**L.11.a. *HAZMAT License*** Establish licensing requirements for commercial handlers of hazardous materials and biohazardous waste within three years to reduce mishandling and illegal disposal.
	L.12.b. *HAZMAT Collection* Establish a program to increase the availability of hazardous materials collection and transfer stations for nonlicensed users (e.g., households, etc.) within three years.	**L.12.b. *HAZMAT Collection*** Establish a program to increase the availability of hazardous materials collection and transfer stations for nonlicensed users (e.g., households, etc.) within three years.
L.14.a. *Dredging Prohibition* Prohibit new dredge and fill permits unless public interest is demonstrated.	**L.14.b. *Dredging Prohibition*** Prohibit new dredge and fill permits unless public interest is demonstrated and there will be little or no environmental degradation.	**L.14.c. *Dredging Prohibition*** Prohibit new dredge and fill permits.
L.15.a. *Dredging Regulation* Conduct an inventory and assessment of current or recent maintenance dredging activities throughout the Sanctuary.	**L.15.b. *Dredging Regulation*** Conduct an inventory and assessment of maintenance dredging activities throughout the Sanctuary. Implement low-impact dredging methods for all maintenance dredging. Avoid maintenance dredging whenever possible.	**L.15.b. *Dredging Regulation*** Conduct an inventory and assessment of maintenance dredging activities throughout the Sanctuary. Implement low-impact dredging methods for all maintenance dredging. Avoid maintenance dredging whenever possible.

Table 18. *Mid-range Alternative Strategies (Continued)*

IV	III	II
L.16.a. *Water-use Reduction* Initiate a study to investigate the feasibility of water-use reduction and re-use options and thresholds.	**L.16.b. *Water-use Reduction*** Initiate a study to investigate the feasibility of water-use reduction and re-use options and thresholds. Implement a plan for water-use reduction and re-use for major users within five years.	**L.16.c. *Water-use Reduction*** Initiate a study to investigate the feasibility of water-use reduction and re-use options and thresholds. Implement a plan for water-use reduction and re-use for all users within five years.
L.17.a. *Dredge and Fill Authority* Establish consistent interagency regulatory authority addressing all dredge and fill activities.	**L.17.a. *Dredge and Fill Authority*** Establish consistent interagency regulatory authority addressing all dredge and fill activities.	**L.17.a. *Dredge and Fill Authority*** Establish consistent interagency regulatory authority addressing all dredge and fill activities.
L.18.a. *Wetland Dredge and Fill* Restrict wetland dredge and fill permitting.	**L.18.b. *Wetland Dredge and Fill*** Restrict wetland dredge and fill permitting.	**L.18.b. *Wetland Dredge and Fill*** Restrict wetland dredge and fill permitting.
L.19.a. *Growth Impacts* Conduct an evaluation of the Monroe County Growth Plan for ecological impacts on the Sanctuary. Identify and recommend additional options to minimize short- and long-term impacts.	**L.19.a. *Growth Impacts*** Conduct an evaluation of the Monroe County Growth Plan for ecological impacts on the Sanctuary. Identify and recommend additional options to minimize short- and long-term impacts.	**L.19.a. *Growth Impacts*** Conduct an evaluation of the Monroe County Growth Plan for ecological impacts on the Sanctuary. Identify and recommend additional options to minimize short- and long-term impacts.
L.20.a. *Public Access* Conduct an assessment of existing public access to shoreline areas. Develop standards and guidelines for improvements to, and construction of, public access areas.	**L.20.b. *Public Access*** Conduct an assessment of existing public access to shoreline areas. Develop standards and guidelines for improvements to, and construction of, public access areas. Acquire shoreline areas for developing and/or regulating public access.	**L.20.b. *Public Access*** Conduct an assessment of existing public access to shoreline areas. Develop standards and guidelines for improvements to, and construction of, public access areas. Acquire shoreline areas for developing and/or regulating public access.
Recreation		
R.1.a. *SCR Management* Develop and implement a program to manage submerged cultural resources (SCRs). Conduct an inventory of SCRs and assess survey and extraction techniques within the Sanctuary. Require permitting throughout the Sanctuary.	**R.1.b. *SCR Management*** Develop and implement a program to manage SCRs. Conduct an inventory of SCRs and assess survey and extraction techniques within the Sanctuary. Require permitting throughout the Sanctuary.	**R.1.c. *SCR Management*** Develop and implement a program to manage SCRs. Conduct an inventory of SCRs and assess survey and extraction techniques within the Sanctuary. Require permitting throughout the Sanctuary.
R.2.a. *Recreation Survey* Establish a routine survey of recreational activities and use levels within the Sanctuary through a survey of charter and recreational-for-hire vessels, intercept surveys at access points and launch sites, and periodic field surveys.	**R.2.a. *Recreation Survey*** Establish a routine survey of recreational activities and use levels within the Sanctuary through a survey of charter and recreational-for-hire vessels, intercept surveys at access points and launch sites, and periodic field surveys.	**R.2.c. *Recreation Survey*** Establish a routine survey of recreational activities and use levels within the Sanctuary through a survey of charter and recreational-for-hire vessels, intercept surveys at access points and launch sites, and periodic field surveys. Establish a permitting and enforcement system to regulate use levels (e.g., number of boats, divers, etc.) for charter and recreational-for-hire vessels.

Table 18. *Mid-range Alternative Strategies (Continued)*

IV	III	II
R.5.a. *Carrying Capacity* Conduct a program to study and implement carrying-capacity limits for recreation activities by: 1) assessing the effects of recreation and boating activities on sanctuary resources; 2) establishing recreational user carrying capacities that minimize wildlife disturbances and other adverse impacts on natural resources; and 3) enforcing carrying-capacity limits in highly sensitive areas.	**R.5.b. *Carrying Capacity*** Conduct a program to study and implement carrying-capacity limits for recreation activities by: 1) assessing the effects of recreation and boating activities on sanctuary resources; 2) establishing recreational user carrying capacities that minimize wildlife disturbances and other adverse impacts on natural resources; and 3) enforcing carrying-capacity limits in high-use areas and for highly sensitive habitats throughout the Sanctuary.	**R.5.c. *Carrying Capacity*** Conduct a program to study and implement carrying-capacity limits for recreation activities by: 1) assessing the effects of recreation and boating activities on sanctuary resources; 2) establishing recreational user carrying capacities that minimize wildlife disturbances and other adverse impacts on natural resources; and 3) enforcing carrying-capacity limits throughout the Sanctuary.
R.7.a. *Coral Touching* Prohibit contact with corals in high-use, sensitive, and vulnerable areas.	**R.7.a. *Coral Touching*** Prohibit contact with corals in high-use, sensitive, and vulnerable areas.	**R.7.a. *Coral Touching*** Prohibit contact with corals in high-use, sensitive, and vulnerable areas.
Water Quality		
W.1.a. *OSDS Demonstration Project* Conduct a demonstration project to evaluate alternate, nutrient-removing OSDSs.	**W.1.a. *OSDS Demonstration Project*** Conduct a demonstration project to evaluate alternate, nutrient-removing OSDSs.	**W.1.a. *OSDS Demonstration Project*** Conduct a demonstration project to evaluate alternate, nutrient-removing OSDSs.
W.2.a. *AWT Demonstration Project* Conduct a demonstration project to evaluate the installation of a small expandable AWT plant to serve an area of heavy OSDS use with associated water quality problems.	**W.2.a. *AWT Demonstration Project*** Conduct a demonstration project to evaluate the installation of a small expandable AWT plant to serve an area of heavy OSDS use with associated water quality problems.	**W.2.a. *AWT Demonstration Project*** Conduct a demonstration project to evaluate the installation of a small expandable AWT plant to serve an area of heavy OSDS use with associated water quality problems.
W.3.a. *Wastewater Management Systems* Establish authority for and implement inspection/enforcement programs to eliminate all cesspits and enforce existing standards for all OSDSs and package plants.	**W.3.b. *Wastewater Management Systems*** Establish authority for and implement inspection/enforcement programs to eliminate all cesspits and enforce existing standards for all OSDSs and package plants. Develop targets for reductions in wastewater nutrient loadings necessary to restore and maintain water quality and sanctuary resources. Develop and implement a Sanitary Wastewater Master Plan that evaluates options for upgrading existing systems beyond current standards or constructing community sewage treatment plants based on nutrient reduction targets, cost and cost effectiveness, reliability/compliance considerations, and environmental and socioeconomic impacts.	**W.3.b. *Wastewater Management Systems*** Establish authority for and implement inspection/enforcement programs to eliminate all cesspits and enforce existing standards for all OSDSs and package plants. Develop targets for reductions in wastewater nutrient loadings necessary to restore and maintain water quality and sanctuary resources. Develop and implement a Sanitary Wastewater Master Plan that evaluates options for upgrading existing systems beyond current standards or constructing community sewage treatment plants based on nutrient reduction targets, cost and cost effectiveness, reliability/compliance considerations, and environmental and socioeconomic impacts.

Table 18. *Mid-range Alternative Strategies (Continued)*

IV	III	II
W.4.a. *Wastewater Disposal, City of Key West* Upgrade effluent disposal for the City of Key West's wastewater treatment plant. Evaluate deep-well injection, including the possibility of effluent migration through the boulder zone into sanctuary waters. Evaluate options for the re-use of effluent, including irrigation and potable re-use. Discontinue use of ocean outfall and implement deep-well injection, aquifer storage, and/or re-use. Implement nutrient reduction technologies for effluent prior to disposal or re-use.	**W.4.a. *Wastewater Disposal, City of Key West*** Upgrade effluent disposal for the City of Key West's wastewater treatment plant. Evaluate deep-well injection, including the possibility of effluent migration through the boulder zone into sanctuary waters. Evaluate options for the re-use of effluent, including irrigation and potable re-use. Discontinue use of ocean outfall and implement deep-well injection, aquifer storage, and/or re-use. Implement nutrient reduction technologies for effluent prior to disposal or re-use.	**W.4.a. *Wastewater Disposal, City of Key West*** Upgrade effluent disposal for the City of Key West's wastewater treatment plant. Evaluate deep-well injection, including the possibility of effluent migration through the boulder zone into sanctuary waters. Evaluate options for the re-use of effluent, including irrigation and potable re-use. Discontinue use of ocean outfall and implement deep-well injection, aquifer storage, and/or re-use. Implement nutrient reduction technologies for effluent prior to disposal or re-use.
W.5.a. *Water Quality Standards* Develop and implement water quality standards, including biocriteria, appropriate to sanctuary resources.	**W.5.a. *Water Quality Standards*** Develop and implement water quality standards, including biocriteria, appropriate to sanctuary resources.	**W.5.a. *Water Quality Standards*** Develop and implement water quality standards, including biocriteria, appropriate to sanctuary resources.
W.6.a. *NPDES Prog. Delegation* Delegate administration of the NPDES program for Florida Keys dischargers to the State of Florida.	**W.6.a. *NPDES Prog. Delegation*** Delegate administration of the NPDES program for Florida Keys dischargers to the State of Florida.	**W.6.a. *NPDES Prog. Delegation*** Delegate administration of the NPDES program for Florida Keys dischargers to the State of Florida.
	W.7.b. *Resource Monitoring of Surface Discharge* Require all NPDES-permitted surface dischargers to develop resource monitoring programs.	**W.7.b. *Resource Monitoring of Surface Discharge*** Require all NPDES-permitted surface dischargers to develop resource monitoring programs.
W.8.a. *OSDS Permitting* Improve interagency coordination for industrial wastewater discharge permitting. Combine OSDS permitting responsibilities in one agency for commercial establishments, institutions, and multi-family residential establishments utilizing injection wells.	**W.8.a. *OSDS Permitting*** Improve interagency coordination for industrial wastewater discharge permitting. Combine OSDS permitting responsibilities in one agency for commercial establishments, institutions, and multi-family residential establishments utilizing injection wells.	**W.8.a. *OSDS Permitting*** Improve interagency coordination for industrial wastewater discharge permitting. Combine OSDS permitting responsibilities in one agency for commercial establishments, institutions, and multi-family residential establishments utilizing injection wells.
W.9.a. *Laboratory Facilities* Establish an interagency laboratory capable of processing monitoring and compliance samples.	**W.9.a. *Laboratory Facilities*** Establish an interagency laboratory capable of processing monitoring and compliance samples.	**W.9.a. *Laboratory Facilities*** Establish an interagency laboratory capable of processing monitoring and compliance samples.
W.10.a. *Canal WQ* Inventory and characterize dead-end canals/basins and investigate alternative management strategies to improve their water quality.	**W.10.b. *Canal WQ*** Inventory and characterize dead-end canals/basins and investigate alternative management strategies to improve their water quality. Implement improvements (consistent with the strategies developed for wastewater and stormwater) in known hot spots throughout the Sanctuary.	**W.10.c. *Canal WQ*** Inventory and characterize dead-end canals/basins and investigate alternative management strategies to improve their water quality. Implement improvements (consistent with the strategies developed for wastewater and stormwater) throughout the Sanctuary.
	W.11.b. *Stormwater Retrofitting* Identify and retrofit stormwater hot spots using "Best Management Practices", such as grass parking, swales, pollution control structures, and detention/retention facilities. Control stormwater runoff in areas handling toxic and hazardous materials. Install swales and detention facilities along limited sections of US 1.	**W.11.c. *Stormwater Retrofitting*** Identify and retrofit stormwater hot spots and degraded areas using Best Management Practices", such as grass parking, swales, pollution control structures, and detention/retention facilities. Control stormwater runoff in areas handling toxic and hazardous materials. Install swales and detention facilities along numerous sections of US 1.

Table 18. *Mid-range Alternative Strategies (Continued)*

IV	III	II
W.12.a. *Stormwater Permitting* Require that no development in the Florida Keys be exempted from the stormwater permitting process.	**W.12.a. *Stormwater Permitting*** Require that no development in the Florida Keys be exempted from the stormwater permitting process.	**W.12.a. *Stormwater Permitting*** Require that no development in the Florida Keys be exempted from the stormwater permitting process.
W.13.a. *Stormwater Management* Require local governments to enact and implement stormwater management ordinances and comprehensive stormwater management master plans. Petition the EPA to include the Florida Keys in the stormwater NPDES program if adequate stormwater management ordinances and administrative capabilities to manage such ordinances are not in place by a certain date.	**W.13.a. *Stormwater Management*** Require local governments to enact and implement stormwater management ordinances and comprehensive stormwater management master plans. Petition the EPA to include the Florida Keys in the stormwater NPDES program if adequate stormwater management ordinances and administrative capabilities to manage such ordinances are not in place by a certain date.	**W.13.a. *Stormwater Management*** Require local governments to enact and implement stormwater management ordinances and comprehensive stormwater management master plans. Petition the EPA to include the Florida Keys in the stormwater NPDES program if adequate stormwater management ordinances and administrative capabilities to manage such ordinances are not in place by a certain date.
W.14.a. *Best Management Practices* Institute a series of Best Management Practices and a public education program to prevent pollutants from entering stormwater runoff.	**W.14.a. *Best Management Practices*** Institute a series of Best Management Practices and a public education program to prevent pollutants from entering stormwater runoff.	**W.14.a. *Best Management Practices*** Institute a series of Best Management Practices and a public education program to prevent pollutants from entering stormwater runoff.
W.15.a. *HAZMAT Response* Improve and expand oil and hazardous materials response programs throughout the Sanctuary.	**W.15.a. *HAZMAT Response*** Improve and expand oil and hazardous materials response programs throughout the Sanctuary.	**W.15.a. *HAZMAT Response*** Improve and expand oil and hazardous materials response programs throughout the Sanctuary.
W.16.a. *Spill Reporting* Establish a reporting system to ensure that all spills in and near the Sanctuary are reported to sanctuary managers and managers of impacted areas within the Sanctuary. Establish a geo-referenced sanctuary spills database.	**W.16.a *Spill Reporting*** Establish a reporting system to ensure that all spills in and near the Sanctuary are reported to sanctuary managers and managers of impacted areas within the Sanctuary. Establish a geo-referenced sanctuary spills database.	**W.16.a *Spill Reporting*** Establish a reporting system to ensure that all spills in and near the Sanctuary are reported to sanctuary managers and managers of impacted areas within the Sanctuary. Establish a geo-referenced sanctuary spills database.
W.17.a *Mosquito Spraying* Refine the aerial spraying program to further reduce aerial spraying over marine areas.	**W.17.a. *Mosquito Spraying*** Refine the aerial spraying program to further reduce aerial spraying over marine areas.	**W.17.c. *Mosquito Spraying*** Eliminate all aerial pesticide spraying within five years.
W.18.a. *Pesticide Research* Develop and implement an independent research program to assess and investigate the impacts of, and alternatives to, current pesticide practices. Modify the Mosquito Control Program as necessary on the basis of research findings.	**W.18.a. *Pesticide Research*** Develop and implement an independent research program to assess and investigate the impacts of, and alternatives to, current pesticide practices. Modify the Mosquito Control Program as necessary on the basis of research findings.	**W.18.a. *Pesticide Research*** Develop and implement an independent research program to assess and investigate the impacts of, and alternatives to, current pesticide practices. Modify the Mosquito Control Program as necessary on the basis of research findings.
W.19.a. *FL Bay Freshwater Flow* The Steering Committee for the Water Quality Protection Program shall take a leading role in restoring the historical freshwater flow to Florida Bay. In addition, sanctuary representatives should work with the appropriate Federal, State, and local agencies to ensure that restoration plans and surface water management and improvement plans for South Florida and the Everglades are compatible with efforts to maintain water quality within the Sanctuary.	**W.19.a. *FL Bay Freshwater Flow*** The Steering Committee for the Water Quality Protection Program shall take a leading role in restoring the historical freshwater flow to Florida Bay. In addition, sanctuary representatives should work with the appropriate Federal, State, and local agencies to ensure that restoration plans and surface water management and improvement plans for South Florida and the Everglades are compatible with efforts to maintain water quality within the Sanctuary.	**W.19.a. *FL Bay Freshwater Flow*** The Steering Committee for the Water Quality Protection Program shall take a leading role in restoring the historical freshwater flow to Florida Bay. In addition, sanctuary representatives should work with the appropriate Federal, State, and local agencies to ensure that restoration plans and surface water management and improvement plans for South Florida and the Everglades are compatible with efforts to maintain water quality within the Sanctuary.

Table 18. *Mid-range Alternative Strategies (Continued)*

IV	III	II
W.20.a. *WQ Monitoring* Conduct a long-term, comprehensive water quality monitoring program as described in the EPA Water Quality Protection Program.	**W.20.a. *WQ Monitoring*** Conduct a long-term, comprehensive water quality monitoring program as described in the EPA Water Quality Protection Program.	**W.20.a. *WQ Monitoring*** Conduct a long-term, comprehensive water quality monitoring program as described in the EPA Water Quality Protection Program.
W.21.a. *Predictive Models* Develop phased hydrodynamic/water quality models and coupled, landscape-level ecological models to predict and evaluate the outcome of in-place and proposed water quality management strategies.	**W.21.a. *Predictive Models*** Develop phased hydrodynamic/water quality models and coupled, landscape-level ecological models to predict and evaluate the outcome of in-place and proposed water quality management strategies.	**W.21.a. *Predictive Models*** Develop phased hydrodynamic/water quality models and coupled, landscape-level ecological models to predict and evaluate the outcome of in-place and proposed water quality management strategies.
W.22.a. *Pollutant Assessment* Develop a segmentation framework to identify surface water areas sharing common hydrographic properties affecting water quality. Determine the susceptibility of each segment to pollutants based upon all loadings (i.e., land- and water-based) and segment specific hydrographic properties affecting their retention.	**W.22.a. *Pollutant Assessment*** Develop a segmentation framework to identify surface water areas sharing common hydrographic properties affecting water quality. Determine the susceptibility of each segment to pollutants based upon all loadings (i.e., land- and water-based) and segment specific hydrographic properties affecting their retention.	**W.22.a. *Pollutant Assessment*** Develop a segmentation framework to identify surface water areas sharing common hydrographic properties affecting water quality. Determine the susceptibility of each segment to pollutants based upon all loadings (i.e., land- and water-based) and segment specific hydrographic properties affecting their retention.
W.23.a. *Leachate Transport* Conduct a hydrologic/geologic assessment of leachate transport (e.g., from injection wells, land fills, storage tanks, etc.) into nearshore waters. Determine whether, and in what quantities, groundwater nutrients are reaching sanctuary waters including the Florida Reef Tract.	**W.23.a. *Leachate Transport*** Conduct a hydrologic/geologic assessment of leachate transport (e.g., from injection wells, land fills, storage tanks, etc.) into nearshore waters. Determine whether, and in what quantities, groundwater nutrients are reaching sanctuary waters including the Florida Reef Tract.	**W.23.a. *Leachate Transport*** Conduct a hydrologic/geologic assessment of leachate transport (e.g., from injection wells, land fills, storage tanks, etc.) into nearshore waters. Determine whether, and in what quantities, groundwater nutrients are reaching sanctuary waters including the Florida Reef Tract.
W.24.a. *Florida Bay Influence* Conduct research to understand the effect of water transport from Florida Bay on water quality and resources in the Sanctuary.	**W.24.a. *Florida Bay Influence*** Conduct research to understand the effect of water transport from Florida Bay on water quality and resources in the Sanctuary.	**W.24.a. *Florida Bay Influence*** Conduct research to understand the effect of water transport from Florida Bay on water quality and resources in the Sanctuary.
W.25.a. *WQ Impact Research* Conduct research to identify and document causal linkages between water quality (e.g., levels of pollutants, nutrients, salinity, temperature, etc.) and ecological problems in each major ecosystem.	**W.25.a. *WQ Impact Research*** Conduct research to identify and document causal linkages between water quality (e.g., levels of pollutants, nutrients, salinity, temperature, etc.) and ecological problems in each major ecosystem.	**W.25.a. *WQ Impact Research*** Conduct research to identify and document causal linkages between water quality (e.g., levels of pollutants, nutrients, salinity, temperature, etc.) and ecological problems in each major ecosystem.
W.26.a. *Indicators* Develop diagnostic indicators of water quality problems (e.g., tissue C:N:P ratios, alkaline phosphate activity, and shifts in community structure by habitat). Conduct research to identify and evaluate indicators (biochemical and ecological measures to provide early warning of widespread ecological problems) in each type of ecosystem.	**W.26.a. *Indicators*** Develop diagnostic indicators of water quality problems (e.g., tissue C:N:P ratios, alkaline phosphate activity, and shifts in community structure by habitat). Conduct research to identify and evaluate indicators (biochemical and ecological measures to provide early warning of widespread ecological problems) in each type of ecosystem.	**W.26.a. *Indicators*** Develop diagnostic indicators of water quality problems (e.g., tissue C:N:P ratios, alkaline phosphate activity, and shifts in community structure by habitat). Conduct research to identify and evaluate indicators (biochemical and ecological measures to provide early warning of widespread ecological problems) in each type of ecosystem.

Table 18. *Mid-range Alternative Strategies (Continued)*

IV	III	II
W.27.a. *Other Monitoring Tools* Conduct research to identify and evaluate innovative monitoring tools and methodologies to detect pollutants and identify cause/effect relationships involving water quality and biological resources.	**W.27.a. *Other Monitoring Tools*** Conduct research to identify and evaluate innovative monitoring tools and methodologies to detect pollutants and identify cause/effect relationships involving water quality and biological resources.	**W.27.a. *Other Monitoring Tools*** Conduct research to identify and evaluate innovative monitoring tools and methodologies to detect pollutants and identify cause/effect relationships involving water quality and biological resources.
W.28.a. *Regional Database* Establish a regional database and data management system for recording research results and biological, physical, and chemical parameters associated with sanctuary monitoring programs.	**W.28.a. *Regional Database*** Establish a regional database and data management system for recording research results and biological, physical, and chemical parameters associated with sanctuary monitoring programs.	**W.28.a. *Regional Database*** Establish a regional database and data management system for recording research results and biological, physical, and chemical parameters associated with sanctuary monitoring programs.
W.29.a. *Diss. of Research Findings* Develop a program to disseminate scientific research results including an information exchange network, conferences, and support for the publication of research findings in peer-reviewed scientific journals.	**W.29.a. *Diss. of Research Findings*** Develop a program to disseminate scientific research results including an information exchange network, conferences, and support for the publication of research findings in peer-reviewed scientific journals.	**W.29.a. *Diss. of Research Findings*** Develop a program to disseminate scientific research results including an information exchange network, conferences, and support for the publication of research findings in peer-reviewed scientific journals.
W.31.a. *Global Change* Examine the effects of global climate change on the organisms and ecosystems of the Keys.	**W.31.a. *Global Change*** Examine the effects of global climate change on the organisms and ecosystems of the Keys.	**W.31.a. *Global Change*** Examine the effects of global climate change on the organisms and ecosystems of the Keys.
W.32.a. *Advisory Committee* Establish a technical advisory committee for coordinating and guiding research and monitoring activities.	**W.32.a. *Advisory Committee*** Establish a technical advisory committee for coordinating and guiding research and monitoring activities.	**W.32.a. *Advisory Committee*** Establish a technical advisory committee for coordinating and guiding research and monitoring activities.
W.33.a. *Ecological Monitoring* Develop and implement a sanctuary-wide, intensive ecosystem monitoring program. The objective of the program will be to monitor the status of various biological and ecological indicators of system components throughout the Sanctuary and adjacent areas in order to discern the local and system-wide effects of human and natural disturbances and assess the overall health of the Sanctuary.	**W.33.a. *Ecological Monitoring*** Develop and implement a sanctuary-wide, intensive ecosystem monitoring program. The objective of the program will be to monitor the status of various biological and ecological indicators of system components throughout the Sanctuary and adjacent areas in order to discern the local and system-wide effects of human and natural disturbances and assess the overall health of the Sanctuary.	**W.33.a. *Ecological Monitoring*** Develop and implement a sanctuary-wide, intensive ecosystem monitoring program. The objective of the program will be to monitor the status of various biological and ecological indicators of system components throughout the Sanctuary and adjacent areas in order to discern the local and system-wide effects of human and natural disturbances and assess the overall health of the Sanctuary.
Zoning		
Z.1.a. *Wildlife Management Areas* Establish wildlife management areas that restrict access to especially sensitive wildlife populations and habitats. Such areas would include bird nesting, resting, or feeding areas and turtle nesting beaches. Restrictions could prohibit use, modify the way areas are used or accessed, and specify time periods when use is prohibited.	**Z.1.b. *Wildlife Management Areas*** Establish wildlife management areas that restrict access to especially sensitive wildlife populations and habitats. Such areas would include bird nesting, resting, or feeding areas and turtle nesting beaches. Restrictions could prohibit use, modify the way areas are used or accessed, and specify time periods when use is prohibited.	**Z.1.c. *Wildlife Management Areas*** Establish wildlife management areas that restrict access to especially sensitive wildlife populations and habitats. Such areas would include bird nesting, resting, or feeding areas and turtle nesting beaches. Restrictions could prohibit use, modify the way areas are used or accessed, and specify time periods when use is prohibited.

Table 18. *Mid-range Alternative Strategies (Continued)*

IV	III	II
Z.2.a. *Replenishment Reserves* Replenishment Reserves are designed to encompass large, contiguous diverse habitats. They are intended to provide natural spawning, nursery, and permanent residence areas for the replenishment and genetic protection of marine life and to protect and preserve all habitats and species. These reserves are intended to protect areas that represent the full range and diversity of resources and habitats found throughout the Sanctuary. The intent is to meet these objectives by minimizing human influences within these areas.	**Z.2.b. *Replenishment Reserves*** Replenishment Reserves are designed to encompass large, contiguous diverse habitats. They are intended to provide natural spawning, nursery, and permanent residence areas for the replenishment and genetic protection of marine life and to protect and preserve all habitats and species. These reserves are intended to protect areas that represent the full range of diversity of resources and habitats found throughout the Sanctuary. The intent is to meet these objectives by minimizing human influences within these areas.	**Z.2.c. *Replenishment Reserves*** Replenishment Reserves are designed to encompass large, contiguous diverse habitats. They are intended to provide natural spawning, nursery, and permanent residence areas for the replenishment and genetic protection of marine life and to protect and preserve all habitats and species. These reserves are intended to protect areas that represent the full range of diversity of resources and habitats found throughout the Sanctuary. The intent is to meet these objectives by minimizing human influences within these areas.
Z.3.a. *Sanctuary PreservationAreas* Establish nonconsumptive Sanctuary Preservation Areas in a select number of areas that are experiencing a high degree of conflict between consumptive and nonconsumptive uses and in discrete areas that are currently experiencing significant population or habitat declines. These areas will provide for the protection and sustenance of resources, particularly select marine species in high-use and biologically important areas.	**Z.3.b *Sanctuary Preservation Areas*** Establish nonconsumptive Sanctuary Preservation Areas in a number of areas that are experiencing a high degree of conflict between consumptive and nonconsumptive uses, and in discrete areas that are currently experiencing significant population or habitat declines. These areas will provide for the protection and sustenance of resources, particularly select marine species in high-use and biologically important areas.	**Z.3.c *Sanctuary Preservation Areas*** Establish nonconsumptive Sanctuary Preservation Areas in numerous areas that are experiencing a high degree of conflict between consumptive and nonconsumptive uses, and in discrete areas that are currently experiencing significant population or habitat declines. These areas will provide for the protection and sustenance of resources, particularly select marine species in high-use and biologically important areas.
Z.4.a. *Existing Management Areas* Establish an Existing Management Area that recognizes areas that are managed by other agencies where restrictions already exist. Management of these areas within the Sanctuary may require additional regulations or restrictions to adequately protect resources. Any additional management measures will be developed and implemented in coordination with the agency having jurisdictional authority.	**Z.4.a. *Existing Management Areas*** Establish an Existing Management Area that recognizes areas that are managed by other agencies where restrictions already exist. Management of these areas within the Sanctuary may require additional regulations or restrictions to adequately protect resources. Any additional management measures will be developed and implemented in coordination with the agency having jurisdictional authority.	**Z.4.a. *Existing Management Areas*** Establish an Existing Management Area that recognizes areas that are managed by other agencies where restrictions already exist. Management of these areas within the Sanctuary may require additional regulations or restrictions to adequately protect resources. Any additional management measures will be developed and implemented in coordination with the agency having jurisdictional authority.
Z.5.a. *Special-use Area* Establish zones to address special-use activities and concerns within the Sanctuary. These zones can be used to set aside areas for educational and scientific purposes, restorative, monitoring, or research activities or to establish areas that confine or restrict activities such as power boat racing and personal watercraft use in order to minimize impacts on sensitive habitats and to reduce user conflicts. This zone type will also establish live-aboard areas and mooring fields in areas where adverse environmental impacts will be minimal.	**Z.5.a. *Special-use Area*** Establish zones to address special-use activities and concerns within the Sanctuary. These zones can be used to set aside areas for educational and scientific purposes, restorative, monitoring, or research activities or to establish areas that confine or restrict activities such as power boat racing and personal watercraft use in order to minimize impacts on sensitive habitats and to reduce user conflicts. This zone type will also establish live-aboard areas and mooring fields in areas where adverse environmental impacts will be minimal.	**Z.5.c. *Special-use Areas*** Establish zones to address special-use activities and concerns within the Sanctuary. These zones can be used to set aside areas for educational and scientific purposes, restorative, monitoring, or research activities or to establish areas - limited in size and number - that confine or restrict activities, such as powerboat racing and personal watercraft use, in order to minimize impacts on sensitive habitats and to reduce user conflicts. This zone type will also establish a limited number of live-aboard areas and mooring fields in areas where adverse environmental impacts will be minimal.

Table 18. *Mid-range Alternative Strategies (Continued)*

IV	III	II
Education		
E.1.a. *Printed Materials* Develop printed materials to promote public awareness, specifically targeting boaters and divers/snorkelers, of the impacts of their activities on the Sanctuary's resources and environmental quality. Promote the proper use of equipment used for these activities in order to minimize adverse impacts to natural resources. Materials will include brochures, posters, newsletters and contributions to periodicals. Distribute materials in bulk to high-interception locations (e.g., marinas, boat ramps, dive shops, etc.).	**E.1.b. *Printed Materials*** Develop printed materials to promote public awareness of the impact of their activities, both land- and water-related, on the Sanctuary's resources and environmental quality. Promote the proper use of equipment used for these activities in order to minimize adverse impacts to natural resources. Materials will include brochures, posters, newsletters, contributions to periodicals, environmental nautical charts, color environmental atlases, and a color periodical. Distribute materials in bulk to high-interception locations (e.g., marinas, boat ramps, dive shops, other businesses etc.) and include bulk mailings as a means of distribution.	**E.1.b. *Printed Materials*** Develop printed materials to promote public awareness of the impact of their activities, both land- and water-related, on the Sanctuary's resources and environmental quality. Promote the proper use of equipment used for these activities in order to minimize adverse impacts to natural resources. Materials will include brochures, posters, newsletters, contributions to periodicals, environmental nautical charts, color environmental atlases, and a color periodical. Distribute materials in bulk to high-interception locations (e.g., marinas, boat ramps, dive shops, other businesses etc.) and include bulk mailings as a means of distribution.
E.2.a. *Audio-Visual Media* Inventory and use existing videos, films, and audio materials portraying activities in the Florida Keys and their impacts on sanctuary resources. Materials will be available from sanctuary offices.	**E.2.b. *Audio-Visual Media*** Inventory and use existing videos, films, and audio/visual environmental education materials portraying activities in the Florida Keys and their impacts on sanctuary resources. Produce a limited number of audios/videos to address gaps in available materials and to address major activities including boating, fishing, diving, etc. Materials will be available at sanctuary offices and will be distributed to key locations (dive shops, etc.) throughout South Florida.	**E.2.b. *Audio-Visual Media*** Inventory and use existing videos, films, and audio/visual environmental education materials portraying activities in the Florida Keys and their impacts on sanctuary resources. Produce a limited number of audios/videos to address gaps in available materials and to address major activities including boating, fishing, diving, etc. Materials will be available at sanctuary offices and will be distributed to key locations (dive shops, etc.) throughout South Florida.
E.3.a. *Signs/Displays/Exhibits* Develop signs/displays at high-use areas and public and private boat ramps to inform participants in water-based activities of regulations and environmentally sound practices, provide navigation information, and promote awareness of sensitive areas. Produce portable displays with information on sanctuary resources, regulations, environmental quality, etc. A limited number of signs will be multi-lingual.	**E.3.b. *Signs/Displays/Exhibits*** Develop signs/displays at high-use areas, all public and some private boat ramps, and some public beach access areas to inform participants in water-based activities of regulations and environmentally sound practices, provide navigation information, and promote awareness of nearby sensitive areas. Portable displays will also be produced with information on sanctuary resources, regulations, environmental quality, etc. Most of the signs will be multi-lingual. Targeted multi-media displays will be developed with information and impacts on the Sanctuary relevant to the activity targeted. A number of wayside exhibits will be installed. Develop a user-friendly computer system containing information on regulations, access, recreational sites, environmental etiquette, etc. for visitor use at selected sites throughout the Sanctuary within five years.	**E.3.b. *Signs/Displays/Exhibits*** Develop signs/displays at high-use areas, all public and some private boat ramps, and some public beach access areas to inform participants in water-based activities of regulations and environmentally sound practices, provide navigation information, and promote awareness of nearby sensitive areas. Portable displays will also be produced with information on sanctuary resources, regulations, environmental quality, etc. Most of the signs will be multi-lingual. Targeted multi-media displays will be developed with information and impacts on the Sanctuary relevant to the activity targeted. A number of wayside exhibits will be installed. Develop a user-friendly computer system containing information on regulations, access, recreational sites, environmental etiquette, etc. for visitor use at selected sites throughout the Sanctuary within five years.

Table 18. *Mid-range Alternative Strategies (Continued)*

IV	III	II
E.4.a. *Training/Workshops/School Programs* Develop oportunities for instruction and training. This will include programs conducted by teachers, Sanctuary staff, and volunteers. Training programs (e.g., Coral Reef Classroom, submerged cultural resources, etc.) will also be provided for teachers, environmental professionals, business owners and operators, and law enforcement officials.	**E.4.b. *Training/Workshops/School Programs*** Develop oportunities for instruction and training. This will include programs (both on the primary and secondary level) conducted by teachers, Sanctuary staff, and volunteers. Participation in existing environmental education programs would also be established, and some programs would be expanded. Training programs (e.g., Coral Reef Classroom, submerged cultural resources, etc.) will also be provided for teachers, environmental professionals, business owners and operators, and law enforcement officials.	**E.4.b. *Training/Workshops/School Programs*** Develop oportunities for instruction and training. This will include programs (both on the primary and secondary level) conducted by teachers, Sanctuary staff, and volunteers. Participation in existing environmental education programs would also be established, and some programs would be expanded. Training programs (e.g., Coral Reef Classroom, submerged cultural resources, etc.) will also be provided for teachers, environmental professionals, business owners and operators, and law enforcement officials.
E.5.a. *PSAs* Establish a program to promote Sanctuary goals and activities through public service announcements (PSAs) in Monroe County that presents an overview of the Sanctuary, its resources, and their ecological significance for limited "no-cost" distribution to radio, cable television stations, and newspapers. Develop limited editorial/ contributions for other printed media. PSAs will focus on participants in water-related activities (boaters, divers, etc.). These materials will also be organized into a press packet.	**E.5.b. *PSAs*** Establish a program to promote Sanctuary goals and activities through public service announcements (PSAs) in South Florida, with some national and international public exposure, that presents an overview of the Sanctuary, its resources and their ecological significance for routine distribution to radio, cable television stations, and newspapers. Develop editorial/contributions for other printed media. Funds will be spent on routine media exposure. PSAs would focus on participants in water-related and other activities that affect the Sanctuary (boaters, divers, household etc.). These materials will also be organized into a press packet.	**E.5.b. *PSAs*** Establish a program to promote Sanctuary goals and activities through public service announcements (PSAs) in South Florida, with some national and international public exposure, that presents an overview of the Sanctuary, its resources and their ecological significance for routine distribution to radio, cable television stations, and newspapers. Develop editorial/contributions for other printed media. Funds will be spent on routine media exposure. PSAs would focus on participants in water-related and other activities that affect the Sanctuary (boaters, divers, household etc.). These materials will also be organized into a press packet.
	E.6.b. *Advisory Council* Establish an education advisory council to advise educators on education goals, priorities and funding sources for the Sanctuary. A full-time staff person will be provided.	**E.6.b. *Advisory Council*** Establish an education advisory council to advise educators on education goals, priorities and funding sources for the Sanctuary. A full-time staff person will be provided.
E.7.a. *Promotional* Promote educational materials and other information about the Sanctuary and its resources at existing sanctuary offices.	**E.7.b. *Promotional*** Promote educational materials, including bilingual materials and other information about the Sanctuary and its resources, at existing sanctuary offices and Chambers of Commerce. Establish an interagency visitor center with the U.S. DOI and the Florida DEP.	**E.7.c. *Promotional*** Promote educational materials, including bilingual materials and other information about the Sanctuary and its resources, in a visitor center established by and dedicated solely to the Sanctuary. Other smaller centers will be established at major resort locations. Booths/displays will be established in remote locations.
		E.9.c. *Ecotourism Promoter* Establish an ecotourism coordinator/ promoter position for the Sanctuary within three years.

Table 18. *Mid-range Alternative Strategies (Continued)*

IV	III	II
E.10.a. *Public Forum* Establish a program to ensure public involvement throughout South Florida in Sanctuary activities by holding public meetings and promoting Sanctuary awareness to extracurricular groups.	**E.10.b. *Public Forum*** Establish a program to ensure public involvement throughout South Florida in Sanctuary activities by holding public meetings and promoting Sanctuary awareness to extracurricular groups. A Sanctuary "hot line" will be established for the public to report information concerning the Sanctuary. A program will also be established to provide Sanctuary sponsorship of contests/awards.	**E.10.b. *Public Forum*** Establish a program to ensure public involvement throughout South Florida in Sanctuary activities by holding public meetings and promoting Sanctuary awareness to extracurricular groups. A Sanctuary "hot line" will be established for the public to report information concerning the Sanctuary. A program will also be established to provide Sanctuary sponsorship of contests/awards.
E.11.a. *Special Events* Organize, support, and/or participate in special events (e.g., trade shows, expositions, grand openings, etc.) that allow for the exchange of Sanctuary information. The Sanctuary will co-sponsor a limited number of conferences and workshops.	**E.11.b. *Special Events*** Organize, support, and/or participate in special events (e.g., trade shows, expositions, grand openings, etc.) that allow for the exchange of Sanctuary information.The Sanctuary will co-sponsor a number of conferences and workshops, with selected sole sponsorship of some events. This would include a "Sanctuary Awareness Week" and a "grand opening" to the Sanctuary. The Sanctuary Program would co-sponsor other "awareness" events/weeks (e.g., National Fishing Week, etc.).	**E.11.b. *Special Events*** Organize, support, and/or participate in special events (e.g., trade shows, expositions, grand openings, etc.) that allow for the exchange of Sanctuary information.The Sanctuary will co-sponsor a number of conferences and workshops, with selected sole sponsorship of some events. This would include a "Sanctuary Awareness Week" and a "grand opening" to the Sanctuary. The Sanctuary Program would co-sponsor other "awareness" events/weeks (e.g., National Fishing Week, etc.).

Environmental Consequences of Management Alternatives

Introduction

This chapter compares the differences in environmental impacts among the management alternatives being considered for the Florida Keys National Marine Sanctuary Draft Environmental Impact Statement/Management Plan, focusing primarily on three mid-range alternatives that achieve the purposes of the FKNMSPA. Evaluating and comparing the potential environmental impacts of each alternative involve assessing the impacts to the natural environment of implementing the proposed management strategies. This is an important step in the process of selecting a preferred management alternative.

Review of Management Alternatives. The development and review of management alternatives are required by the National Environmental Policy Act (NEPA) as a part of the Draft Environmental Impact Statement (DEIS) development process. A series of alternatives with varied levels of resource protection and use restrictions was generated from the strategies developed at the February 1992 Strategy Work Session in Marathon, FL. Specific strategies were not produced for Alternatives I (total restriction of uses, except for research) and V (status quo/no action), because these alternatives do not meet the requirements of the FKNMSPA and NMSA to protect resources and facilitate multiple uses. Strategies included in Alternative IV are generally included in Alternatives III and II; the latter contain increased levels of protection, additional regulations or management actions, or require implementation over a broader area. Alternatives III and II also contain strategies not included in Alternative IV.

Environmental Impact Characterizations. Environmental impact characterizations were developed by Federal, State, local, and private resource managers and scientists, were refined by the Core Group, and further refined by NOAA as the strategy revision process progressed. In describing the environmental impacts of each alternative, it was assumed that all strategies would be implemented completely.

The process used to determine the environmental impacts of the management alternatives paralleled the strategy development process. The environmental impacts of 137 proposed "high-priority" strategies were initially characterized during the February 1992 Strategy Work Session. Strategies were characterized based on their potential impacts on specific attributes of three thematic categories: water quality, habitats, and species (Figure 30). The criteria used to characterize strategies included whether impacts were considered positive or negative, the degree of impact (high, medium, or low), and the spatial and temporal attributes of the proposed management actions.

Figure 29. *Environmental Impact Attributes by Theme*

Water Quality
- Nutrients
- Toxics
- Temperature/Salinity
- Dissolved Oxygen

Habitats
- Corals
- Hardbottom
- Seagrasses
- Algal Communities
- Mangroves
- Sediments
- Submerged Cultural Resources

Species
- Commercial/Recreational Food
- Commercial/Recreational Ornamental
- Keystone
- Diversity
- Distribution
- Wildlife

NOAA and the Core Group revised the initial characterizations to reflect any changes in the level of protection offered by the strategies, as graded across the three mid-range alternatives. Characterizations were also updated to complement any additional information included during the development of a particular strategy. Strategies developed by the Sanctuary Advisory Council (SAC), other nongovernmental organizations, the public, and the EPA were characterized using the same criteria as those developed at the February 1992 Strategy Work Session.

Development and Organization of Impacts Information. The revised strategy characterizations were organized in tables to compare the environmental

impacts of each alternative. The tables identified the attributes that were the focus of protection, and the relative impacts of individual strategies. The overall impacts of each alternative were also summarized and compared. The Core Group used these tables to develop the draft text describing the environmental impacts of each alternative. NOAA edited and organized this material and created summary tables comparing strategy impacts across alternatives. These tables were then further reviewed and edited by the Core Group over several months.

The overall description of environmental impacts was given to the SAC in June 1993 to help them recommend a preferred management alternative. The descriptions were also reviewed by NOAA's Sanctuaries and Reserves Division and Office of General Counsel, and were revised to focus only on those strategies that will either have a significant level of action during the first year after implementation of the Management Plan, or will have a high degree of potential environmental impact (i.e., "key strategies").

Organization. This chapter contains an overall description of the environmental impacts of each alternative, providing a detailed assessment of potential environmental impacts. It is organized by theme, and includes a list of "key strategies" for each theme. Three summary tables, organized by alternative and issue, compare potential impacts, environmental impacts, and significant management actions across alternatives. The major differences among the environmental impacts of each alternative are also included in a separate column, providing a simple means of comparing these impacts.

Constraints and Limitations. These characterizations provide sufficient detail to objectively compare the various environmental impacts of proposed actions for the three mid-range management alternatives. However, the Management Plan also proposes an ongoing management process that will implicitly involve a continued assessment of environmental impacts as strategies are implemented over time.

Environmental Impacts: Water Quality

Pollution from both land-based and water-related activities degrades water quality and habitats and can harm the species dependent on them. Strategies in the three mid-range alternatives address water quality problems by focusing on reducing nutrients, toxicants, and other pollutants. The potential for reducing pollutant levels increases from Alternative IV to II. Several strategies also provide for limited improvements in hydrographic properties such, as salinity, temperature, and dissolved oxygen. Each alternative addresses point and nonpoint pollutant sources, and concentrates on improving confined and nearshore waters. Because of their increasingly restrictive measures, Alternatives III and II have a greater potential for providing long-term, Sanctuary-wide benefits (Table 19). The key strategies most likely to affect water quality are listed below.

Key Strategies Affecting Water Quality

L.19	Growth Management
W.3	Wastewater Management Systems
W.19	Florida Bay Freshwater Flow
W.24	Florida Bay Influence
W.25	Water Quality Impacts
W.33	Ecological Monitoring

Key Issues

Growth Management. Coordinating with Monroe County on issues related to growth management (L.19) is more likely to lead to improvements in all water quality parameters than any other strategy. This strategy will link the research activities and water quality improvement goals of the Sanctuary Management Plan and the EPA Water Quality Protection Plan with Monroe County's growth management policies, potentially resulting in significant improvements in confined and nearshore waters in the short term, and offshore water quality improvements in the long term. This strategy offers the same level of protection across the three mid-range alternatives, and provides a significant improvement in water quality protection compared to the status quo (Alternative V) by ensuring that the Federal, State, and local governments work together to limit the negative impacts of future growth.

Marinas/Boat Discharge. Recent evidence suggests that nutrients and toxicants related to marina opera-

Table 19. *Overall Environmental Impacts by Alternative: Water Quality*

Alternative IV Impacts	Alternative III Impacts	Alternative II Impacts	Comparative Impacts
Boating • Minimal improvement in existing water quality • Emphasis on reducing toxicants • Slight reduction in nutrients • Focus on confined and nearshore waters • ***Significant actions:*** - Hire 10 new enforcement officers - Prohibit discharges from vessels - Initiate cross-deputization	• Minimal improvement in existing water quality • Emphasis on reducing toxicants • Slight reduction in nutrients • Focus on confined and nearshore waters * ***Further actions:*** - Hire 30 new enforcement officers	• Minimal improvement in existing water quality • Emphasis on reducing toxicants • Significant reduction in toxicants in sensitive areas • Slight reduction in nutrients • Focus on confined and nearshore waters * ***Further actions:*** - Hire 50 new enforcement officers	• **Alternative III** offers slightly greater water quality protection than Alternative IV through increased enforcement • **Alternative II** offers slightly greater water quality protection than Alternative III through increased enforcement
Fishing • Negligible improvement in existing water quality	• Negligible improvement in existing water quality	• Negligible improvement in existing water quality	• Fishing strategies in **all Alternatives** offer negligible improvements in existing water quality
Land Use • Moderate improvement in existing water quality • Emphasis on reductions in nutrients and toxicants • Focus on confined and nearshore waters • Some Sanctuary-wide impacts • ***Significant actions:*** - Coordinate growth management policies - Restrict wetland dredge and fill - Install pump-out facilities - Reduce fuel spillage during refueling	• Significant improvement in existing water quality • Emphasis on reductions in nutrients and toxicants • Focus on confined and nearshore waters • Some Sanctuary-wide impacts * ***Further actions:*** - Establish containment areas for boat maintenance - Initiate water-use reduction and re-use for major users	• Significant improvement in existing water quality • Emphasis on reductions in nutrients and toxicants • Some improvement in hydrographic parameters • Focus on confined and nearshore waters • Some Sanctuary-wide impacts * ***Further actions:*** - Initiate water-use reduction and re-use for all users	• **Alternative III** offers significantly more water quality protection than Alternative IV - Toxicant levels will be significantly reduced by containment areas - Hydrographic parameters such as salinity, temperature, and dissolved oxygen will be improved by water-use reduction and re-use for major users • **Alternative II** offers slightly more water quality protection than Alternative III - Hydrographic parameters such as salinity, temperature, and dissolved oxygen will be improved by water-use reduction and re-use for all users
Recreation • Negligible improvement in existing water quality	• Negligible improvement in existing water quality	• Negligible improvement in existing water quality	• Recreation strategies in **all Alternatives** offer negligible improvement in existing water quality

* ***Further actions:*** Actions different than, or in addition to, those proposed in the previous alternative

Table 19. *Overall Environmental Impacts by Alternative: Water Quality (continued)*

Alternative IV Impacts	Alternative III Impacts	Alternative II Impacts	Comparative Impacts
Water Quality • Significant improvement in existing water quality • Emphasis on reducing nutrients and toxicants • Some improvement in hydrographic parameters • Focus on confined and nearshore waters and Florida Bay • Minimal Sanctuary-wide impacts • ***Significant actions:*** - Conduct research on hydrographic parameters - Conduct research to reduce pollutants - Conduct research to restore benthic communities - Conduct research on the impacts of land use practices - Implement Sanctuary-wide ecosystem monitoring program - Implement efforts to restore freshwater flow to Florida Bay - Enforce existing standards for OSDS and package plants - Eliminate all cesspits - Upgrade the Key West wastewater treatment plant	• Significant improvement in existing water quality • Reduction in nutrients and toxicants is greater than Alternative IV • Some improvement in hydrographic parameters • Focus on confined and nearshore waters and Florida Bay • Moderate Sanctuary-wide impacts * ***Further actions:*** - Initiate techniques to improve water quality in dead-end canals and basins in known hot spots/critical areas - Implement improvements to control stormwater runoff in known problem areas - Develop a Sanitary Wastewater Master Plan	• Significant improvement in existing water quality • Reduction in nutrients and toxicants same as Alternative III • Some improvement in hydrographic parameters • Focus on confined and nearshore waters and Florida Bay • Moderate Sanctuary-wide impacts * ***Further actions:*** - Initiate techniques to improve water quality in dead-end canals and basins throughout the Sanctuary - Implement improvements to control stormwater runoff in degraded areas and along more sections of US 1	• **Alternative III** offers substantially more water quality protection than Alternative IV - Using engineering techniques to improve water quality in confined waters and to control runoff in site-specific areas will potentially improve all water quality parameters in many locations - Development of a Sanitary Wastewater Master Plan addresses water quality problems in the long term • **Alternative II** offers slightly more water quality protection - Using engineering techniques to improve water quality in confined waters and to control runoff in more areas has the potential to improve all water quality parameters in many more locations
Zoning • Minimal improvement in existing water quality • Slight reduction in nutrients and toxicants • Significant improvement in site-specific locations • ***Significant actions:*** - Establish zones for research and restoration activities - Establish zones to restrict high-impact activities - Establish live-aboard areas	• Minimal improvement in existing water quality • Slight reduction in nutrients and toxicants • Significant improvement in site-specific locations * ***Further actions:*** - Increase the number and size of research and restoration zones - Reduce the number and size of zones allowing high-impact activities and live-aboard areas	• Minimal improvement in existing water quality • Slight reduction in nutrients and toxicants • Significant improvement in site-specific locations * ***Further actions:*** - Increase the number and size of research and restoration zones - Reduce the number and size of zones allowing high-impact activities and live-aboard areas	• The level of water quality protection increases from **Alternative IV to Alternative II** - Increasing the size and number of protected areas and decreasing the size and number of areas where high-impact activities can occur will increase the potential for improvements in water quality across Alternatives

* ***Further actions:*** Actions different than, or in addition to, those proposed in the previous alternative

Table 19. *Overall Environmental Impacts by Alternative: Water Quality (continued)*

Alternative IV Impacts	Alternative III Impacts	Alternative II Impacts	Comparative Impacts
Education • No direct improvements in water quality • Potential to educate users about issues, consequences of their activities, and regulations • ***Significant actions:*** - Develop/distribute print and audio-visual materials - Conduct formal and informal training - Establish a volunteer support base - Develop public forums and special events	• No direct improvements in water quality • Potential to educate users about issues, consequences of their activities, and regulations greater than Alternative IV * ***Further actions:*** - Conduct field trips and on-site training - Coordinate with existing environmental education programs - Establish interagency visitor centers with Federal and State agencies	• No direct improvements in water quality • Potential to educate users about issues, consequences of their activities, and regulations greater than Alternative III * ***Further actions:*** - Establish a Sanctuary visitor center	• The level of educational outreach increases from **Alternative IV to Alternative II** - Expanding training programs, promotional activities, and visitor contact will increase the opportunities to educate people about water quality issues

* ***Further actions:*** Actions different than, or in addition to, those proposed in the previous alternative

tions are directly linked to degraded water quality in confined and nearshore waters (Heatwole, 1987; Rios, 1990; Snedaker, 1990). Only eight marinas in the Keys have sewage pump-out facilities, with two of these servicing private clubs (Antonini et al., 1990). As a result, many boats pump waste directly into the water, increasing nutrient levels. Requiring the installation of pump-out facilities at marinas (L.1) will encourage boaters to properly dispose of their waste, leading to reduced nutrient and turbidity levels and increases in dissolved oxygen levels. This strategy offers the same level of protection across the three mid-range alternatives, and provides a significant improvement compared to the status quo (Alternative V).

Toxicant loads will also be slightly reduced by implementing short-term remedial actions to reduce fuel spillage (L.3.a, Alternative IV). However, these pollutants would be significantly reduced by both attempting to reduce fuel spillage and establishing containment areas for boat maintenance and repair (L.3.b, Alternatives III and II). Although existing marina operation regulations, including OSHA standards, indirectly address water quality problems, compliance has been inconsistent. Stricter enforcement of OSHA regulations (L.2) will lead to improved water quality in confined and nearshore areas.

Water quality studies have linked the discharge of sewage from boats and live-aboard vessels to degradation in confined and nearshore waters (Heatwole, 1987; Rios, 1990). There are almost 9,000 boat slips in the Keys (Kearney/Centaur, 1990), approximately 16,000 pleasure boats registered in Monroe County (Shermyen, 1991), and an estimated 1,400 live-aboard vessels in the Sanctuary. The environmental impact of discharges from these vessels, especially in concentrated areas such as Boot Key Harbor, can be significant (FDER, 1990). Strategy B.7 provides significant improvements in water quality compared to the status quo (Alternative V) by aggressively enforcing current regulations, assessing the need for additional regulations, and supporting the upcoming regulation restricting discharge in State waters. In addition, modifying the environmental crimes category associated with illegal discharges by adding a civil offense component will make it easier to enforce and discourage illegal discharges.

Water Use and Re-use. Developing a plan to encourage improved wastewater treatment and increased water re-use through new re-use options, thresholds, and water-use reduction incentives (L.16.a, Alternative IV) would indirectly improve conditions in confined and nearshore waters. This plan also would help to reduce nutrient loadings to all Sanctuary waters. The potential for improvements will increase through the implementation of a water-use reduction and re-use plan for major users (L.16.b, Alternative III), and would increase even more significantly if all users are included (L.16.c, Alternative II).

Dredge and Fill. Wetlands act as a natural buffer by filtering stormwater before it enters the marine environment. Dredge and fill activities increase stormwater runoff and the potential for nutrients, toxicants, turbidity, and reduced dissolved oxygen levels to impact confined and nearshore waters. To address these problems, the Sanctuary would support Monroe County's policies to eliminate dredge and fill activities in undisturbed wetlands (L.18.a, Alternative IV), and mitigation banking will be considered to replace impacted wetlands. Strategy L.18.b (Alternatives III and II) will provide increased wetland protection by requiring that all new dredge and fill projects in functional disturbed wetlands pass a public interest test.

Research and Monitoring. Each of the three mid-range alternatives addresses the lack of available data regarding water quality problems and impacts. They include base strategies to confront the problems and influences of Florida Bay, initiate general water-quality research, and provide for the establishment of comprehensive monitoring programs. These activities alone will provide a significant improvement in research and monitoring efforts compared to the status quo (Alternative V).

Florida Bay. Over the past century, the flow of freshwater reaching Florida Bay has been significantly reduced, affecting temperature, salinity, and dissolved oxygen levels (Richards, 1989; EPA, 1992). The quality, quantity, timing, and distribution of freshwater flow have been linked to the vitality and distribution of habitats supporting the Bay's fauna and flora (Lindall and Saloman, 1977; Schomer and Drew, 1982). A reduction in freshwater flow, coupled with a lack of significant hurricanes impacting the Bay, has also been associated with the current seagrass die-off and resulting increase in nutrient levels (Zieman, 1989). Strategy W.19 will pursue short- and long-term solutions designed to improve these flows. In addition, the water management plans for Florida Bay and adjacent areas will be reviewed to ensure that water quality improvement goals are not compromised.

Florida Bay's water quality problems may also impact the Florida Reef Tract; studies have shown that tidal currents and storms can transport Bay waters to the reef, adversely affecting the ecosystem (Voss, 1988; Jaap, 1990; Szmant, 1991). Implementing strategy W.24 will continue this research and complement efforts to re-establish the Bay's environmental quality.

General Research. Other research strategies address water quality conditions throughout the Sanctuary, and provide baseline information for making management decisions addressing water quality variability and its impact on resources. Research efforts include: the development of predictive ecological models (W.21); the assessment of physical processes and their interaction with pollutants (W.22); an examination of the impacts of groundwater transport and leachate (W.23); the identification of causal linkages between poor water quality and ecological problems (W.25); the development of diagnostic indicators of poor water quality (W.26); and the development of new tools and methods to help determine water quality impacts (W.27). Each of these strategies provides the same level of research for the three mid-range alternatives.

Monitoring. Two Sanctuary-wide comprehensive monitoring programs are proposed in each of the three mid-range alternatives. Strategy W.20 will implement a long-term comprehensive water quality monitoring program to identify areas with poor water quality, and to evaluate the effectiveness of management actions designed to improve water quality. Strategy W.33 will establish a Sanctuary-wide ecosystem monitoring program that will: 1) provide resource managers with information on the status of the health of living resources and the ecosystem; 2) help to determine relationships between water quality and the ecosystem as a basis for management action; and 3) evaluate the effectiveness of management actions such as zoning.

Domestic Wastewater. The proper treatment and disposal of domestic wastewater are critical to reducing adverse water quality impacts. The use of an estimated 30,000 septic systems and cesspits, coupled with soils and bedrock with high porosity and low organic content, has resulted in substandard wastewater treatment and an increase in the potential for nutrients and toxicants to degrade ground- and surfacewater in confined and nearshore areas (EPA, 1992). Evidence suggests that domestic wastewater is the main source of increased nutrient levels in the confined and nearshore waters of the Sanctuary (EPA, 1993). Implementing an aggressive inspection/enforcement program (W.3.a, Alternative IV) would improve water quality by eliminating cesspits and requiring that all on-site disposal systems and package plants operate according to established standards. Increased benefits are expected if the inspection/enforcement program is complemented by the development and implementation of a Sanitary Wastewater Master Plan that requires existing systems to be upgraded beyond current standards (W.3.b, Alternatives III and II). Strategy W.4 addresses the problems associated with wastewater disposal in the City of Key West. Discontinuing the use of the ocean outfall, upgrading the wastewater treatment plant, and evaluating options for the re-use of properly treated effluent will significantly reduce the level of nutrients discharged to Sanctuary waters (EPA, 1993).

Stormwater. Uncontrolled stormwater runoff can lead to water quality degradation through increases in sediment, toxicant, and nutrient loading. Despite their vulnerability to the impacts of stormwater, the Keys have a limited number of stormwater management systems (EPA, 1993). Strategy W.11.b (Alternative III) will identify and retrofit stormwater systems in "hot spots"/critical areas throughout the Sanctuary that exhibit obvious adverse impacts, and will require the installation of control systems in areas that handle toxic and hazardous materials. Sediment, toxicant, and nutrient loads will be significantly reduced in these areas. Strategy W.11.c (Alternative II) requires the application of these same methods in more areas throughout the Sanctuary. However, it is not known whether this action would have a significantly greater positive impact on water quality than concentrating only on hot spots.

Canals. Canals and dead-end basins act as traps for nutrients, toxicants, sediments, and weeds, and are particularly susceptible to pollutant impacts. This has been indicated through low dissolved oxygen and pH levels, and elevated biochemical oxygen demand (BOD) in several canals throughout the Keys. Low dissolved oxygen levels are also found where these canals empty into nearshore waters (FDER, 1987). Conducting an inventory and assessment of canals and developing solutions to improve their water quality (W.10.a, Alternative IV) would provide the information needed to develop programs to limit pollution in these areas. Strategy W.10.b (Alternative III) will improve water quality more significantly by implementing mitigation actions in canals and basins identified as hot spots throughout the Sanctuary. Strategy W.10.c (Alternative II) would lead to in-

creased improvements by requiring mitigation actions in all canals and basins throughout the Sanctuary.

Zoning. Although zoning will have little direct impact on improved water quality, strategy Z.5.a (Alternative IV) could be used to set aside areas for scientific research, monitoring, or restoration activities, or to confine high-impact activities that have detrimental impacts on the Sanctuary's water quality. These areas may completely restrict any water-related activities that may negatively impact water quality. Strategies Z.5.b (Alternative III) and Z.5.c (Alternative II) add to the overall water quality improvements provided by these zones by increasing the number of research, restoration, and monitoring areas, and by reducing the size and number of areas where high-impact activities will be allowed.

Environmental Impacts: Habitats

The habitats of the Keys are closely interrelated and are influenced by both natural stresses and human-generated pollution. Coral reefs and seagrass communities are vulnerable to weather and climate fluctuations, physical damage resulting from human activities, and water quality degradation. In addition, the Keys' once-extensive mangrove forests have declined, primarily due to residential and commercial development (Snedaker, 1990).

Strategies within the three mid-range alternatives address habitat-related issues by focusing on coral, seagrass, and mangrove communities, with a general increase in the level of restrictions from Alternative IV to Alternative II (Table 20). Because of the interrelationships among habitats, other habitats, such as hardbottom, algal communities, and sediments, will also benefit from the actions in these alternatives. Each alternative addresses site-specific locations, as well as specific habitats throughout the Sanctuary. Alternatives III and II, however, provide more habitat protection over a broader area than Alternative IV. Alternative V, which represents the "no-action" status quo, would not protect habitats from continued degradation. Alternative I would provide maximum habitat protection by placing severe restrictions on numerous activities currently allowed in the Sanctuary. The key strategies most likely to affect Sanctuary habitats are listed below.

Key Strategies Affecting Habitats

B.6	Additional Enforcement
B.12	Cross-deputization
L.19	Growth Management
R.5	Carrying Capacity
Z.1	Wildlife Management Areas
Z.2	Replenishment Reserves
Z.3	Sanctuary Preservation Areas
Z.5	Special-use Areas

Key Issues

Growth Management. In 1990 the total resident population of the Keys was over 78,000, an increase of 15,000 people since 1980, and a 160 percent increase since 1950. Development and other growth-related activities have severely impacted the area's already limited terrestrial habitats (Kruer, 1992), and have led to the decline of many confined and nearshore habitats (Voss, 1988; Jaap, 1990). Strat-

Table 20. *Overall Environmental Impacts by Alternative: Habitats*

Alternative IV Impacts	Alternative III Impacts	Alternative II Impacts	Comparative Impacts
Boating • Emphasis on coral and seagrass protection • Some protection for mangrove and hardbottom habitats • Focus on sensitive areas • ***Significant actions:*** - Implement and enforce existing and proposed protective measures - Hire 10 new enforcement officers - Mark channels in sensitive areas - Establish damage assessment standards - Regulate boat discharges - Regulate salvaging and towing activities - Support existing restoration activities - Direct new access to low-impact areas - Manage existing access sites - Implement vessel size limits at buoys in sensitive areas	• Emphasis on coral and seagrass protection • Some protection for mangrove and hardbottom habitats, and sediments • Focus on high-use and sensitive areas * ***Further actions:*** - Hire 30 new enforcement officers - Initiate habitat restoration in severely impacted areas - Implement a permitting system for salvaging and towing activities - Mark channels in high-use and sensitive areas - Modify existing access sites - Implement vessel size limits at buoys in high-use and sensitive areas	• Emphasis on coral and seagrass protection • Some protection for mangrove and hardbottom habitats, and sediments • Focus on entire Sanctuary * ***Further actions:*** - Hire 50 new enforcement officers - Initiate habitat restoration for impacted areas throughout the Sanctuary - Manage public access - Restrict new access - Mark channels throughout the Sanctuary - Require salvaging/towing operator training - Implement vessel size limits at buoys throughout the Sanctuary	• **Alternative III** provides moderate increases in protection to coral, seagrass, mangrove and hardbottom habitats, and sediments compared to Alternative IV - Developing a habitat restoration program significantly benefits critical habitats such as coral and seagrass - Exhibiting environmentally sound salvaging and towing techniques will be a prerequisite for obtaining a permit - Modifying existing access sites will improve habitats in nearshore areas - Marking channels in more locations will allow for additional habitat improvements • **Alternative II** offers slightly greater protection to hardbottom, seagrass, and mangrove habitats compared to Alternative III - Habitat restoration will be significantly expanded - Managing and restricting public access will benefit sensitive sites, primarily seagrass, mangrove, and other nearshore habitats - Marking channels throughout the Sanctuary will allow for additional habitat improvements
Fishing • Limited impact on habitat improvement • Focus on coral, hardbottom, and seagrass habitats • ***Significant actions:*** - Address fisheries-related habitat issues through implementation of consistent regulations - Prevent the release of exotic species in the Sanctuary - Increase the use of biodegradable fishing gear	• Moderate impact on habitat improvement • Focus on coral, hardbottom, and seagrass habitats • Regulatory and spatial components of many strategies increase compared to Alternative IV * ***Further actions:*** - Require low-impact biodegradable fishing gear in selected areas - Reduce the number of fishing devices through limited entry for selected fisheries	• Moderate impact on habitat improvement • Significant benefits to coral, hardbottom, and seagrass habitats • Regulatory and spatial components of many strategies increase compared to Alternative III * ***Further actions:*** - Require low-impact biodegradable fishing gear throughout the Sanctuary - Reduce the number of fishing devices through limited entry for all fisheries	• **Alternative III** provides moderate increases in protection to coral, seagrass, & hardbottom habitats compared to Alternative IV - Increasing the use of biodegradable fishing gear will benefit critical habitats - Limited entry on a fishery-by-fishery basis will help reduce the total number of fishermen and fishing devices • **Alternative II** provides slightly more protection to coral, seagrass, and hardbottom habitats than Alternative III

* ***Further actions:*** Actions different than, or in addition to, those proposed in the previous alternative

Table 20. *Overall Environmental Impacts by Alternative: Habitats (continued)*

Alternative IV Impacts	Alternative III Impacts	Alternative II Impacts	Comparative Impacts
Fishing (cont.) • Significant actions (cont.) - Remove lost or out-of-season fishing gear	**Not Applicable**	**Not Applicable**	- Requiring biodegradable fishing gear throughout the Sanctuary and limited entry to all fisheries will increase the benefits to critical habitats - Limited entry for all fisheries will help reduce the total number of fishermen and fishing devices
Land Use • Minimal impact on improving habitats • Focus on seagrass, algal, and mangrove habitats • Benefits most noticeable in confined and nearshore areas • ***Significant actions:*** - Reduce impacts of nutrient loading, stormwater discharge, dredge and fill, and solid waste disposal through growth management - Install pump-out facilities - Implement OSHA marina regulations - Reduce fuel spillage from marina operations	• Minimal impact on improving habitats • Focus on seagrass, algal, and mangrove habitats • Benefits to habitats in confined and nearshore areas greater than Alternative IV * ***Further actions:*** - Require containment areas at marinas to trap toxic and hazardous materials	• Minimal impact on improving habitats • Focus on seagrass, algal, and mangrove habitats • Benefits to habitats in confined and nearshore areas same as Alternative III * ***Further actions:*** - None	• **Alternatives III and II** offer the same level of increased protection to habitats when compared to Alternative IV - Containment areas will reduce the risk of pollutants harming habitats in confined and nearshore areas • Growth management would have the greatest overall impact in each Alternative
Recreation • Moderate impact on improving habitats • Focus on coral and hardbottom habitats • Some improvements in seagrass areas • Improvements primarily in site-specific locations • ***Significant actions:*** - Identify and implement carrying capacities in highly sensitive areas - Identify and inventory habitats found in conjunction with submerged cultural resources (SCR) - Restrict extraction techniques for SCR	• Moderate impact on improving habitats • Focus on coral, seagrass, and hardbottom habitats • Improvements primarily in site-specific locations * ***Further actions:*** - Enforce carrying capacities for highly sensitive habitats and in high-use areas throughout the Sanctuary	• Significant impact on improving habitats • Focus on coral, seagrass, and hardbottom habitats • Improvements primarily in site-specific locations throughout the Sanctuary * ***Further actions:*** - Enforce carrying capacities for all habitats throughout the Sanctuary	• **Alternative III** offers slightly more habitat protection than Alternative IV - Instituting carrying capacities in site-specific areas will reduce direct and cumulative impacts of recreational activities • **Alternative II** significantly increases the level of protection compared to Alternative III - Instituting carrying capacities for all habitats throughout the Sanctuary offers the most habitat protection

* ***Further actions:*** Actions different than, or in addition to, those proposed in the previous alternative

Table 20. *Overall Environmental Impacts by Alternative: Habitats (continued)*

Alternative IV Impacts	Alternative III Impacts	Alternative II Impacts	Comparative Impacts
Water Quality • Actions are specifically designed to improve water quality • Improvements in water quality could significantly improve habitats	• Actions are specifically designed to improve water quality • Improvements in water quality could significantly improve habitats	• Actions are specifically designed to improve water quality • Improvements in water quality could significantly improve habitats	• Water Quality strategies in **all Alternatives** offer similar levels of habitat protection
Zoning • High level of protection for all habitats • Improvements throughout the Sanctuary • ***Significant actions:*** - Restrict access to representative habitats; areas with high biological diversity; and shallow, heavily used reefs - Restrict high-impact activities - Establish live-aboard areas - Establish habitat restoration areas	• High level of protection for all habitats • Improvements throughout the Sanctuary increase compared to Alternative IV * ***Further actions:*** - Increase the number and size of Sanctuary Preservation Areas and Replenishment Reserves - Reduce the number and size of zones allowing high-impact activities and live-aboard areas	• High level of protection for all habitats • Improvements throughout the Sanctuary increase compared to Alternative III * ***Further actions:*** - Increase the number and size of Sanctuary Preservation Areas and Replenishment Reserves - Reduce the number and size of zones allowing high-impact activities and live-aboard areas	• The level of protection increases from **Alternative IV to Alternative II** - Increasing the size and number of protected areas and decreasing the size and number of areas where high-impact activities can occur will increase the potential for improvements to habitats across Alternatives
Education • No direct habitat improvement • Initial focus on habitats at greatest risk • Potential to educate users about issues, consequences of activities, and regulations • ***Significant actions:*** - Develop/distribute print and audio-visual materials - Install informational signs/displays at high-use areas - Develop public forums and special events	• No direct habitat improvement • Initial focus on habitats at greatest risk • Potential to educate users about issues, consequences of activities, and regulations greater than Alternative IV * ***Further actions:*** - Conduct field trips and on-site training - Coordinate with existing environmental education programs - Establish interagency visitor centers with Federal and State agencies - Conduct a "Sanctuary Awareness Week" - Install a permanent wayside exhibit station	• No direct habitat improvement • Initial focus on habitats at greatest risk • Potential to educate users about issues, consequences of activities, and regulations greater than Alternative III * ***Further actions:*** - Establish a Sanctuary visitor center - Conduct a series of "Environmental Awareness Weeks" - Conduct training programs on habitat restoration techniques - Install several wayside exhibit stations	• Level of educational outreach increases from **Alternative IV to Alternative II** - Expanding training programs, promotional activities, and visitor contact will increase the opportunities to educate users about habitat issues

* ***Further actions:*** Actions different than, or in addition to, those proposed in the previous alternative

egy L.19 addresses these problems by linking the research activities and habitat-improvement goals of the Sanctuary's Management Plan and the EPA Water Quality Protection Plan with Monroe County's growth management policies. This will result in significant improvements in the protection and enhancement of terrestrial habitats and marine habitats in confined and nearshore areas. Important components of this strategy include: the establishment of a population "build-out" to reduce residential impacts on the surrounding environment; a program to direct new development to high-density, disturbed subdivisions supported by centralized facilities; and the development of an intergovernmental land acquisition program to preserve natural lands. This strategy offers the same level of habitat protection across each of the three mid-range alternatives, and provides significant environmental protection compared to the status quo (Alternative V), by ensuring that Federal, State, and local government agencies work together to limit the negative impacts of future growth.

Zoning. The Keys contain habitats found nowhere else in North America, which together form a diverse, interrelated ecosystem that has become increasingly vulnerable to human disturbances. The growth of the resident population and increase in the level of tourism have added to the stress on the region's natural resources, and led to numerous user conflicts. Marine zoning is a new concept, but has proved to be a valuable management tool for protecting habitats and addressing user conflicts in other areas (Dugan and Davis, 1993; Bohnsack, pers. comm.). Four zoning strategies, each of which provides a high level of habitat protection, have been developed for the three mid-range alternatives.

Wildlife Management Zones (Z.1) will limit access to sensitive habitats, especially in backcountry areas. Replenishment Reserves (Z.2) and Sanctuary Preservation Areas (Z.3) will provide significant protection to representative habitats; areas that support high levels of biological diversity; areas important for sustaining other natural resources; shallow, heavily used reefs; and areas experiencing a high degree of conflict between consumptive and nonconsumptive uses. Special-use Zones (Z.5) will protect seagrass, mangrove communities, and sediments by confining activities known to have adverse environmental impacts. Zoning will also be used to set aside areas requiring habitat restoration. The level of protection provided by each type of zone increases from Alternative IV to Alternative II through the designation of larger and more numerous areas. Zones where restricted activities are allowed would be smaller and less numerous as the level of protection increases.

Carrying Capacity. Recreational and commercial activities are important to the Keys' economy, and are dependent on a healthy and diverse ecosystem. Recreational activities, particularly fishing, snorkeling, and scuba diving, have become increasingly popular, further stressing already vulnerable habitats. In 1990, for example, 1.3 million people visited John Pennekamp Coral Reef State Park, 339,000 visited Bahia Honda State Park, and 19,400 visited Dry Tortugas National Park (White, 1991). In addition, commercial fishing, combined with population growth and a growing demand for fisheries products, has raised concerns about the increasing impacts of commercial activities on habitats (Bohnsack, 1991).

Evidence suggests that the direct and cumulative impact of the increasing number of people using the limited and sensitive habitats of the Keys can lead to damage and degradation (Voss, 1988). The level of use that different habitats can tolerate, however, is not well-understood. Strategy R.5.a (Alternative IV) would address this problem by establishing a program to identify the carrying-capacity levels of different habitats and areas. This would provide the basis for managing carrying-capacity limits in areas deemed highly sensitive to overuse. Strategy R.5.b (Alternative III) increases habitat protection by managing identified carrying-capacity limits in highly sensitive habitat areas and high-use areas throughout the Sanctuary. Strategy R.5.c (Alternative II) would provide even more protection by establishing and managing carrying-capacity limits for all habitats throughout the Sanctuary. The enforcement of carrying-capacity limits primarily benefits those habitats at greatest risk, such as corals. Carrying-capacity limits would not be necessary in the most restrictive alternative (Alternative I), because all high-impact activities would be prohibited in most, if not all, areas of the Sanctuary.

Restoration. Restoration projects in the Keys can enhance habitats after disruptive events. For example, in 1981 the Florida Keys Aqueduct Authority authorized a new pipeline, contingent on the restoration of the seagrass beds north of Key Largo that would be impacted by its construction. A survey of the impacted area showed a high level of regrowth 10 months after the project was completed (Thorhaug, 1983). The continuation of ongoing habitat restoration efforts is vital for the protection and enhancement of the Sanctuary's resources.

Strategy B.2.a (Alternative IV) encourages continued restoration activities, and establishes a monitoring program for restoration sites. Strategy B.2.b (Alternative III) increases the potential for more areas to be restored by developing and adopting a restoration plan for severely impacted areas. Strategy B.2.c (Alternative II) offers additional enhancement by implementing the plan in all impacted areas throughout the Sanctuary. Strategies in all three alternatives focus on those habitats considered at highest risk: coral, seagrasses, mangroves, and hardbottoms.

Vessel Groundings. Vessel groundings of even small boats can significantly damage corals, seagrasses, and other habitats. Damage occurs both through direct habitat destruction, and as a result of fuel and cargo spills. As vessel traffic continues to increase throughout the Keys, the need to establish improved standards regarding damage assessment procedures, litigation practices, and response times increases as well. Strategy B.10 addresses this need by establishing a standard assessment methodology for vessel groundings. This strategy provides the same level of restriction in each of the three mid-range management alternatives, and provides more habitat protection than the status quo (Alternative V).

Grounding-related damages also can occur through improper towing and salvaging techniques. Establishing and encouraging environmentally sound methods of towing and salvaging (B.13.a, Alternative IV) offer some habitat improvement compared to the status quo (Alternative V). However, implementing towing and salvage standards through a permit system (B.13.b, Alternative III) will provide more significant improvements. Requiring training for towing and salvage operators (B.13.c, Alternative II) would provide some additional improvements.

Access. Users traveling within the Sanctuary can impact habitats at their point of entry (e.g., boat ramps, marinas, etc.), along their travel route, and at their final destination. Three strategies have been designed to address these impacts. First, an inventory of public and private boat ramps and use levels will be conducted to provide information for restricting the development of new access points to locations where access has less impact on the environment, and for managing existing access locations (B.1.a, Alternative IV). Strategy B.1.b (Alternative III) addresses existing problem areas by requiring that modifications be made to public ramps currently having an adverse impact on adjacent sensitive areas. Strategy B.1.c (Alternative II) provides additional protection by requiring modifications to both public and private ramps, and implementing restrictions on new public access areas.

Properly marked channels will reduce the short- and long-term impacts of boat traffic on all shallow-water habitats. The channel marking scheme proposed in Alternative IV (B.4.a) focuses only on sensitive areas. Strategies B.4.b and B.4.c (Alternatives III and II) will implement channel marking in high-use and sensitive areas and throughout the Sanctuary, respectively, increasing the amount of habitat protected.

Mooring buoys have been used successfully at the Key Largo and Looe Key national marine sanctuaries and at other locations throughout the Keys to minimize the direct impacts of anchoring and the cumulative effects of overuse. Mooring buoys may result in habitat damage in specific areas by attracting more users to them. However, when used, monitored and managed properly, mooring buoys have positive benefits by minimizing anchor damage and controlling resource use. Strategy B.15.a (Alternative IV) would protect habitats by establishing a comprehensive mooring buoy plan that includes site-selection criteria, a program to monitor use and impacts, and the implementation of vessel size limits at buoys in sensitive areas. Alternatives III and II offer more habitat protection than Alternative IV by implementing vessel size limits in high-use and sensitive areas and throughout the Sanctuary, respectively.

Marinas/Boat Discharge. The relatively high levels of nutrients and toxicants found in waters near marina operations (Heatwole, 1987; Rios, 1990; Snedaker, 1990) can have a detrimental impact on adjacent nearshore habitats. Eutrophic conditions, resulting from increased nutrient inputs, can have a particularly harmful impact on seagrasses in these areas (Zieman, 1975b). Nutrient levels in site-specific locations will be reduced by ensuring that all marinas which have pump-out requirements install pump-out facilities (L.1). This will also enhance habitat health by reducing turbidity and increasing dissolved oxygen levels. Habitats will also benefit from short-term remedial actions designed to reduce toxicant loads due to fuel spillage during refueling operations (L.3.a, Alternative IV). Establishing containment areas for boat maintenance and repair activities (L.3.b, Alternatives III and II), in conjunction with reducing fuel spillage, will provide additional habitat benefits. Also, stricter enforcement of OSHA regulations regarding marina operations (L.2) would improve water quality and enhance habitat growth.

Eutrophic and polluted conditions associated with sewage discharge from boats and live-aboard vessels in confined and nearshore waters can also adversely impact habitats (Heatwole, 1987; Rios, 1990). Strategy B.7 will provide significant habitat improvements compared to the status quo (Alternative V) by aggressively enforcing current regulations regarding pollution discharges from vessels, assessing the need for additional regulations, and supporting the upcoming regulation restricting discharge in State waters. In addition, an effort to change the environmental crimes category associated with boat discharges by adding a civil offense will make it easier to obtain a conviction and discourage illegal discharges.

Fishing. Commercial and recreational fishing activities can have both direct and indirect adverse impacts on habitats. Lost, abandoned, or improperly used gear can destroy corals and seagrass, and overstressing individual species may have detrimental impacts on the habitats in which they are found. Several strategies within the mid-range alternatives address these problems.

Consistent Regulations. The implementation of a consistent set of fisheries regulations throughout the Sanctuary (F.1) will benefit almost all habitats by comprehensively addressing many habitat-related fisheries issues. This strategy provides the same level of protection in each of the mid-range alternatives, and will significantly improve current fisheries management practices compared to the status quo (Alternative V). The strategy complements the work being done by the Florida Marine Fisheries Commission and the Gulf of Mexico and South Atlantic fishery management councils.

Limited Entry. One of the objectives of limited entry is to reduce damage to the habitats on which species depend for food and survival. This will result from a reduction in the number of fishing devices affecting these habitats. Limited-entry options will be assessed through Strategy F.5.a (Alternative IV). Strategy F.5.b (Alternative III) adds the operational detail necessary to protect habitats by implementing limited-entry options for selected fisheries, including those associated with habitats that are either damaged or in severe decline. Implementing limited-entry options for all Sanctuary fisheries (F.5.c, Alternative II) would result in a slight increase in habitat protection through further restrictions on the number of fishing devices that could harm habitats.

Gear/Methods. Seagrass, coral, and hardbottom habitats are particularly vulnerable to the impacts of fishing gear and methods (Bohnsack, 1993). Lobster traps can damage corals or seagrasses on which they rest. Developing a program to remove gear that has been lost, abandoned, or is being used out of season (F.9) will benefit the habitats currently being impacted. Volunteers are an important component of this strategy, and will be trained to remove gear with minimal damage to the environment. No comprehensive gear-removal program currently exists within the Keys (Alternative V, status quo).

Developing and promoting the use of gear and methods that minimize harmful impacts to corals, seagrasses, and other vulnerable habitats (F.11.a, Alternative IV) will also help protect these areas. Requiring the use of low-impact gear and methods in priority areas (F.11.b, Alternative III) or throughout the Sanctuary (F.11.c, Alternative II) will further increase the level of habitat protection provided by this strategy.

Exotic Species. The uncontrolled release of nonnative species can seriously impact Sanctuary habitats. For example, a newly introduced species may feed exclusively on a particular plant or animal, causing unforeseen changes in the native community, or it may host a damaging disease or parasite (Courtenay, 1979). Implementing regulations to prevent the release of exotic species in the Sanctuary (F.8) will address this issue and provide significant protection to the Keys' ecosystem. There are currently few safeguards to prevent the introduction of exotic species into Sanctuary waters.

Submerged Cultural Resources. Habitat threats from activities related to submerged cultural resources range from damage incurred by large numbers of divers and snorkelers visiting a site, to disturbances caused by large-scale exploration and recovery techniques (Clausen, 1990). The "mailbox" technique, using prop wash to uncover buried treasure, can be particularly destructive to the wreck/artifact, the wreck site, and the surrounding habitats (particularly coral and seagrasses) that may be impacted by prop wash or buried by the displaced sediment (Hudson, pers. comm.). The development of a Submerged Cultural Resources Management Plan (R.1.a-c, Alternatives IV, III, and II) addresses these concerns, and ensures that habitats and resources are not damaged by unsound exploration and recovery methods. This strategy will provide the same level of habitat protection across each of the three mid-range alternatives, offering significant improvements in protection compared to the status quo (Alternative V).

Environmental Impacts: Species

The Keys' ecosystem supports a diverse assemblage of species, including those commercially and recreationally important, unique to the area, or spatially limited due to habitat constraints. Stresses on species within the Sanctuary include the impacts of land-based activities, habitat declines, and recreational and commercial fishing (Alevizon and Bannerot, 1990). The impacts of fishing are particularly significant because recreational fishing is the area's primary tourist-related boating activity, and commercial fishing is the fourth largest industry in the region (White, 1991). The strategies in each of the three mid-range management alternatives will protect species by focusing on economically important food and ornamental species, keystone species, and wildlife. These alternatives will help enhance species diversity, abundance, and distribution. Alternatives III and II will provide benefits to more species over a larger area of the Sanctuary than Alternative IV (Table 21) or the status quo (Alternative V). The key strategies most likely to affect species are listed below.

Key Strategies Affecting Species

F.1	Consistent Regulations
F.5	Limited Entry
F.8	Exotic Species
F.9	Gear Removal
L.19	Growth Management
Z.1	Wildlife Management Areas
Z.2	Replenishment Reserves
Z.3	Sanctuary Preservation Areas
Z.5	Special-use Areas

Key Issues

Growth Management. The land-based activities of a growing coastal population pose serious threats to many species within the Sanctuary, including fishes, invertebrates, and wildlife (Antonius, 1982; Deisler, 1982; FWS, 1992). Habitat destruction resulting from coastal development, water quality degradation, and overharvesting can also lead to species declines. The criteria for developing the Monroe County Comprehensive Plan include the preservation of marine resource areas, terrestrial wildlife resource areas, and habitat-related resource areas such as wetlands (Roberts and Todd, 1991). Federal and State agency coordination with Monroe County to develop a plan that meets these criteria (L.19) will reduce the direct and indirect impacts of population growth and development on species by preserving the habitats on which they depend, and reducing the levels of pollutants that threaten them. This strategy provides the same level of protection in each of the three mid-range alternatives, and offers significantly increased species protection compared to the status quo (Alternative V) by ensuring that Federal, State, and local government agencies work together to limit the negative impacts of future growth.

Zoning. Species depend on a variety of habitats for food, shelter, and areas for reproduction during their life stages. Some are migratory and utilize numerous habitats, while others are critically linked to one habitat type. The degradation of a particular habitat can, therefore, have a dramatic impact on the health of the species that depend on it to survive. Overharvesting may also impact species, altering the structure of year classes, and ultimately impacting community composition (Alevizon and Bannerot, 1990; Bohnsack, 1990; Rowley, 1992).

Zoning is a method of protecting species populations that has had demonstrated success in wildlife management and in other national marine sanctuaries, particularly by enhancing diversity, abundance, and distribution patterns. Wildlife Management Zones (Z.1) are designed to limit access to sensitive areas for the benefit of marine and terrestrial species, including amphibians, reptiles, birds, and mammals. Replenishment Reserves (Z.2) are designed to enhance species biodiversity, serve as ecological monitoring sites, and separate incompatible activities. They protect species by limiting consumptive activities in selected contiguous habitat areas, and also provide natural spawning, nursery, and permanent residence areas for a variety of species. Sanctuary Preservation Areas (Z.3) are designed to protect species by limiting consumptive activities on and around selected reefs and nearshore habitats. They protect intensively used areas that are critical to sustaining and protecting certain marine species. Special-use Zones (Z.5) provide significant protection to species by setting aside areas for research, restoration, and recovery efforts. The number and/or size of Special-use Zones increases from Alternative IV to II. Maintaining the status quo (Alternative V) would allow for the continued degradation of species and their habitats, and would increase the risk of population declines among certain species.

Carrying Capacity. The overuse of Sanctuary resources causes habitat degradation that can disrupt the community structure of an area and seriously impact species. Easy access to recreational

Table 21. *Overall Environmental Impacts by Alternative: Species*

Alternative IV Impacts	Alternative III Impacts	Alternative II Impacts	Comparative Impacts
Boating • Moderate overall benefit to species • Emphasis on protecting wildlife, important food and ornamental species, and keystone species • Slight increase in species diversity and distribution • ***Significant actions:*** - Hire 10 new enforcement officers - Increase enforcement of fishery laws - Confine boat traffic to properly marked channels - Use mooring buoys to confine boating impacts to manageable areas - Support existing restoration activities	• Moderate overall benefit to species • Emphasis on protecting wildlife, important food and ornamental species, and keystone species • Slight increase in species diversity and distribution * ***Further actions:*** - Hire 30 new enforcement officers - Initiate habitat restoration in severely impacted areas	• Significant overall benefit to species • Emphasis on protecting wildlife, important food and ornamental species, and keystone species • Moderate increase in species diversity and distribution * ***Further actions:*** - Hire 50 new enforcement officers - Initiate habitat restoration for all impacted areas throughout the Sanctuary - Establish channel marking throughout the Sanctuary	• **Alternative III** provides moderate increases in species protection compared to Alternative IV - Restoring damaged habitats will benefit species dependent on them for survival - Additional enforcement will protect species • **Alternative II** offers slightly greater species protection compared to Alternative III - Increasing restoration efforts will increase the benefits to species - Marking channels throughout the Sanctuary will significantly benefit wildlife and other species - Additional enforcement will protect species
Fishing • Moderate benefit to species • Focus on economically important food and ornamental species and keystone species • ***Significant actions:*** - Implement consistent fisheries regulations - Prevent the release of exotic species - Eliminate finfish traps - Develop a removal plan for lost and out-of-season fishing gear - Promote low-impact fishing gear and methods	• Moderate benefit to species • Focus on economically important food and ornamental species and keystone species • Significant benefits to wildlife and species diversity and distribution • Regulatory and spatial components of many strategies increase compared to Alternative IV * ***Further actions:*** - Implement regulations to establish limited entry for specific fisheries - Require low-impact fishing gear in priority areas	• Significant benefit to species • High level of protection for all species • Regulatory and spatial components of many strategies increase compared to Alternative III * ***Further actions:*** - Implement regulations to establish limited entry for all fisheries - Require low-impact biodegradable fishing gear throughout the Sanctuary	• **Alternative III** offers moderately greater species protection than Alternative IV - Limited entry for specific fisheries will benefit species by matching the number of fishermen and fishing devices with species productivity and carrying capacity - Requiring low-impact fishing gear in priority areas will increase species protection by protecting their habitats • **Alternative II** offers significantly greater species protection than Alternative III - Limited entry for all fisheries will increase species protection - Requiring low-impact fishing gear throughout the Sanctuary will protect more habitats and therefore more species

* ***Further actions:*** Actions different than, or in addition to, those proposed in the previous alternative

Table 21. *Overall Environmental Impacts by Alternative: Species (continued)*

Alternative IV Impacts	Alternative III Impacts	Alternative II Impacts	Comparative Impacts
Land Use • Minimal benefit to species • Focus on keystone species, wildlife, and species diversity and distribution • Nutrient and toxicant reductions in confined and nearshore areas would benefit species • ***Significant actions:*** - Reduce impacts of nutrient loading, stormwater discharge, dredge and fill, and solid waste disposal through growth management - Install pump-out facilities - Implement OSHA marina regulations - Reduce fuel spillage from marina operations	• Benefits to species increase slightly compared to Alternative IV • Focus on keystone species, wildlife, and species diversity and distribution • Nutrient and toxicant reductions in confined and nearshore areas will benefit species in those areas * ***Further actions:*** - Require containment areas at marinas to trap toxic and hazardous materials	• Benefit to species same as Alternative III • Focus on keystone species, wildlife, and species diversity and distribution • Nutrient and toxicant reductions in confined and nearshore areas will benefit species in those areas * ***Further actions:*** - None	• **Alternatives III** and **II** offer a similar level of species protection - Reducing the amount of pollutants entering confined and nearshore waters will directly benefit the species in those areas • Growth management would have the greatest overall impact in each Alternative
Recreation • Minimal benefit to species • Focus on economically important food and ornamental species, keystone species, and wildlife • Improvements primarily in site-specific locations • ***Significant actions:*** - Identify and implement carrying capacities in highly sensitive areas	• Moderate benefit to species • Focus on economically important food and ornamental species, keystone species, and wildlife • Improvements in species diversity and distribution • Improvements primarily in site-specific locations * ***Further actions:*** - Enforce carrying capacities for highly sensitive habitats and in high-use areas throughout the Sanctuary	• Significant benefit to species • Focus on economically important food and ornamental species, keystone species, and wildlife • Improvements in species diversity and distribution • Improvements primarily in site-specific locations * ***Further actions:*** - Enforce carrying capacities for all habitats throughout the Sanctuary	• **Alternative III** offers slightly more species protection than Alternative IV - Instituting carrying capacities in more locations will reduce direct and cumulative impacts of recreational activities • **Alternative II** significantly increases the level of species protection over Alternative III - Instituting carrying capacities for all habitats throughout the Sanctuary offers the most species protection
Water Quality • Actions are specifically designed to improve water quality • Improvements to water quality could benefit species	• Actions are specifically designed to improve water quality • Improvements to water quality could benefit species	• Actions are specifically designed to improve water quality • Improvements to water quality could benefit species	• **All Alternatives** offer the same level of species protection

* ***Further actions:*** Actions different than, or in addition to, those proposed in the previous alternative

Table 21. *Overall Environmental Impacts by Alternative: Species (continued)*

Alternative IV Impacts	Alternative III Impacts	Alternative II Impacts	Comparative Impacts
Zoning • High level of species protection • Improvements throughout the Sanctuary • ***Significant actions:*** - Limit consumptive activities within selected contiguous areas - Limit consumptive activities within Sanctuary Preservation Areas - Establish Wildlife Management Areas	• High level of species protection • Improvements throughout the Sanctuary increase compared to Alternative IV * ***Further actions:*** - Increase the number and size of Sanctuary Preservation Areas and Replenishment Reserves - Reduce the number and size of zones allowing high-impact activities and live-aboard areas	• High level of species protection • Improvements throughout the Sanctuary increase compared to Alternative III * ***Further actions:*** - Increase the number and size of Sanctuary Preservation Areas and Replenishment Reserves - Reduce the number and size of zones allowing high-impact activities and live-aboard areas	• The level of protection increases from **Alternative IV to Alternative II** - Increasing the size and number of protected areas and decreasing the size and number of areas where high-impact activities can occur will increase the potential for protecting species across Alternatives
Education • No direct benefits to species • Initial focus on species at greatest risk • Potential to educate users about issues, consequences of their activities, and regulations • ***Significant actions:*** - Develop/distribute print and audio-visual materials focusing on critical species - Install informational signs/displays at high-use areas - Establish training and volunteer programs related to species problems - Develop public service announcements (PSA) targeted at Sanctuary rules and regulations governing species - Develop public forums and special events	• No direct benefits to species • Initial focus on species at greatest risk • Potential to educate users about issues, consequences of their activities, and regulations greater than Alternative IV * ***Further actions:*** - Conduct field trips and on-site training - Coordinate with existing environmental education programs - Establish interagency visitor centers with Federal and State agencies	• No direct benefits to species • Initial focus on species at greatest risk • Potential to educate users about issues, consequences of their activities, and regulations greater than Alternative III * ***Further actions:*** - Establish a Sanctuary visitor center - Train volunteers for specific species-related tasks	• The level of educational outreach increases from **Alternative IV to Alternative II** - Expanding training programs, promotional activities, and contact with visitors will increase the opportunities to educate users about species issues

* ***Further actions:*** Actions different than, or in addition to, those proposed in the previous alternative

sites in the Keys has increased the burden on numerous habitats and the species with which they are associated. In addition, commercial and recreational fishing activities have increased, raising concerns about the direct and cumulative impacts of harvesting methods and overfishing on species populations (Bohnsack, 1990,1991). The impacts of these activities and others, such as boating, scuba diving, and snorkeling, must be studied further to establish viable carrying-capacity levels. Once such information is collected, it could be used to develop additional management actions aimed at reducing the impacts resulting from overuse. After activity levels are identified, carrying capacities will be implemented in highly sensitive areas (R.5.a, Alternative IV), helping to reduce wildlife disturbances; enhance species diversity, abundance, and distribution; and protect species from the direct impacts of overuse. Strategy R.5.b (Alternative III) increases the level of species protection by enforcing identified carrying-capacity limits in highly sensitive habitats and high-use areas throughout the Sanctuary. Strategy R.5.c (Alternative II) would increase species protection and enhancement even more significantly through the enforcement of carrying-capacity limits in all habitats throughout the Sanctuary.

Consistent Regulations. Implementing consistent fisheries regulations throughout the Sanctuary (F.1) will significantly benefit species. Reducing the administrative complexity and duplication of regulations will expedite enforcement, increase public awareness, and promote compliance with fisheries regulations. The strategy will ensure that the goals of long-term ecosystem maintenance and optimum sustainable yields are addressed. It provides the same level of protection across each of the three mid-range alternatives, and comprehensively addresses the impacts of current regulations, as well as the need for new regulations. This strategy provides a significant improvement in species protection compared to the status quo (Alternative V), and complements the work of the Florida Marine Fisheries Commission and the Gulf of Mexico and South Atlantic Fishery Management Councils.

Limited Entry. The limited spatial distribution of many species in the Keys, combined with an increasing demand for fisheries products, has already adversely impacted the distribution and abundance of certain species (Bohnsack, 1991). For example, evidence suggests that fishing pressure has been a factor in the decline of species such as sponge, queen conch, and snook (Seaman and Collins, 1983). Limited entry is one method of managing the overharvest of certain species. Strategy F.5.a (Alternative IV) assesses existing limited-entry programs to determine their applicability in the Sanctuary. Alternative III (F.5.b) will implement limited-entry options for fisheries in need of protection or with low stock abundance. Implementing limited-entry options for all fisheries (F.5.c, Alternative II) would further increase species protection.

Gear/Methods. The use of improper fishing gear and methods can have a negative impact on both targeted and nontargeted species. It is well documented that lost, abandoned, and improperly designed gear has historically impacted many species, including amphibians, reptiles (specifically turtles), birds, fish, and mammals (Lund, 1978c-e; Odell, 1990). Establishing a gear-removal program (F.9) will help prevent species from being killed in traps or other gear that has been lost, abandoned, or used out of season. The strategy provides increased species protection compared to the status quo (Alternative V), because no comprehensive gear-removal program currently exists within the Sanctuary.

Finfish traps can kill numerous nontargeted species as well. Strategy F.12 complements existing State laws and the South Atlantic Fishery Management Council regulations that make the use of such traps illegal. Increased enforcement and the eventual elimination of these traps will benefit species abundance, diversity, and community composition, and reduce pressures on vulnerable species such as grouper. Strategy F.11.a (Alternative IV) addresses the issue of damage to the habitats upon which species depend by requiring research on low-impact fishing gear and methods and promoting their use. Requiring the use of low-impact gear and methods in priority areas (F.11.b, Alternative III) or throughout the Sanctuary (F.11.c, Alternative II) will increase the level of habitat protection and benefit species. In Alternative I, the most restrictive alternative, these strategies are unnecessary, as all high-impact activities would be prohibited in most, if not all, of the Sanctuary.

Exotic Species. Releasing nonnative species into an environment can disrupt the ecology of that area. For example, exotic species can out-compete native species for food, shelter, and spawning areas; introduce devastating diseases or parasites; or alter the host community, causing other species to decline or become extinct (Courtenay, 1979; Courtenay and Robins, 1989). Regulations prohibiting the release of nonindigenous species (F.8) will be implemented to protect native species and the habitats they utilize.

The level of species protection this strategy provides is the same for each of the three mid-range alternatives, and will be a significant improvement over the status quo (Alternative V), because few safeguards currently exist to prevent the introduction of nonindigenous species.

Marina Operations. Declining water quality and the resulting habitat degradation affect species abundance, diversity, distribution, and health. Increased concentrations of nutrients and toxicants can lead to these conditions, and have been found in confined and nearshore waters associated with marina operations in the Sanctuary (Heatwole, 1987; Rios, 1990; Snedaker, 1990). Benthic organisms are particularly vulnerable to toxicants that become trapped in sediments. Therefore, species will benefit from short-term remedial actions to reduce fuel spillage (L.3.a, Alternative IV). In addition, the installation of containment areas for boat maintenance and repair operations (L.3.b, Alternatives III and II), combined with reductions in fuel spillage, will significantly reduce the amount of toxic materials entering the water column. Species will also benefit from reduced nutrient levels resulting from the installation of pump-out facilities at marinas (L.1), and water quality improvements resulting from stricter enforcement of OSHA regulations regarding marina operations (L.2).

Access. With approximately 125 boat ramps and 165 marinas having direct access to Sanctuary waters, access to habitats and species is relatively easy. The heavy use of these access points impacts wildlife and marine species that utilize nearshore areas. Strategy B.1.a (Alternative IV) addresses species-related problems by using the data from an inventory of access points and use levels to manage existing sites, and to restrict the development of new access points to areas where access will have less of an effect on the environment. This strategy will protect species in heavily used nearshore areas and help to protect the habitats on which they depend. Strategy B.1.b (Alternative III) will further protect species by requiring modifications to existing public ramps that currently have an adverse impact on adjacent sensitive areas. Modifying both public and private ramps and implementing restrictions on new public access areas (B.1.c, Alternative II) would provide additional protection to the habitats on which species depend.

To complement the carrying-capacity strategy (R.5), Alternative IV protects species at heavily used sites by establishing a comprehensive mooring buoy plan that includes site-selection criteria, a program to monitor use and impacts, and vessel size limits at buoys installed in sensitive locations. Species will benefit from reduced use levels in these areas. Alternatives III and II offer an increased level of species protection by requiring vessel size limits in high-use and sensitive areas and throughout the Sanctuary, respectively.

Restoration. Species abundance, diversity, and distribution are intricately related to the habitats on which they depend for their survival. As habitats decline, the indigenous species with which they are associated must find new areas to utilize and/or adapt to changing conditions. Many species in the Keys are vulnerable to changing habitat conditions, and their populations decline with the loss of habitat (Alevizon and Bannerot, 1990; Florida Natural Areas Inventory, 1990). Restoration activities and restoration site monitoring (B.2.a, Alternative IV) will help to reduce the decline of vulnerable habitats and their associated species. Strategies B.2.b (Alternative III) and B.2.c (Alternative II) will increase the number of restoration activities, providing additional benefits to species through improved habitats or habitat gains.

Additional Activities Affecting All Themes

Enforcement. Increasing the number of enforcement officers (B.6) and establishing cross-deputization (B.12) will lead to more consistent enforcement of regulations related to improving water quality and protecting habitats and species. Implementing cross-deputization and improving coordination among the agencies responsible for enforcement are included in each of the three mid-range alternatives, and provide significantly improved resource protection compared to the status quo (Alternative V). In addition, increasing the number of enforcement officers from Alternative IV to Alternative II will directly improve the ability to enforce regulations over a wider area of the Sanctuary. Specific enforcement activities in each mid-range alternative focus on protecting high-risk habitats such as corals, seagrasses, and mangroves; protecting threatened or endangered species, or those exhibiting low stock abundance; and improving the Sanctuary's water quality.

Education. Education, interpretation, and the promotion of public awareness of the Sanctuary's natural resources, and the impacts to these resources, are important goals of the National Marine Sanctuary Program. Although difficult to quantify, the benefits of a sound education program include the establishment of a knowledgeable volunteer base;

the development of programs to provide Sanctuary-related information to the public; and the encouragement of community cooperation, participation, and pride in the Sanctuary. The education strategies in the three mid-range alternatives provide an increasing level of educational activities designed to inform users about the Sanctuary's resources, and the environmental consequences of their actions. The strategies build on and expand existing educational programs, such as those currently in place at the Key Largo and Looe Key National Marine Sanctuaries. The benefits of the education strategies are similar for water quality, habitats, and species, and represent a significant improvement over the status quo (Alternative V).

Socioeconomic Impacts of Management Alternatives

Please note: This section has been supplemented by the assessment of cost and benefits conducted pursuant to E.O. 12866 and attached in Appendix M of Volume III.

Introduction

This chapter compares the differences in socioeconomic impacts among the management alternatives being considered for the Draft Environmental Impact Statement/Management Plan, focusing primarily on three mid-range alternatives that achieve the purposes of the FKNMSPA. Evaluating and comparing the potential socioeconomic impacts of each alternative involve assessing how implementing the proposed management strategies will directly and indirectly affect user groups and/or industries, as well as the local economy. In conjunction with evaluating and comparing impacts on the natural environment, this socioeconomic assessment is an important step in the process of selecting a preferred management alternative.

Review of Management Alternatives. The development and review of management alternatives are required by the National Environmental Policy Act (NEPA) as a part of the Draft Environmental Impact Statement (DEIS) development process. This DEIS evaluates the potential positive and negative environmental and socioeconomic impacts of proposed management actions and their significance, given the goals and purposes of the NMSA and FKNMSPA.

As noted in the previous chapter describing impacts to the natural environment, specific strategies were not produced for either Alternative I (total restriction of uses, except for research) or V (status quo/no action), because these alternatives do not meet the requirements of the NMSA and FKNMSPA to protect resources and facilitate multiple uses. Strategies in Alternative IV are generally included in Alternatives III and II, with the latter containing increased restrictions, additional regulations or management actions, or requiring implementation over a broader area. Alternatives III and II also contain strategies not included in Alternative IV.

Intent of the Assessment

This socioeconomic impact assessment summarizes the potential impacts of proposed management strategies on various user groups and the local economy. The types of impacts are discussed in qualitative terms. The extent of economic impacts (e.g., sales, employment, income, etc.) and economic values (i.e., net values above costs to produce a good or service) associated with various uses are quantified where practicable. In some cases, specific scenarios are used to illustrate the possible magnitude of impacts. However, only general assessments of the magnitude of potential impacts are possible.

Focus of Assessment. Of the 98 proposed management strategies, the Core Group and NOAA selected 24 that are expected to have the largest impacts in terms of either benefits or costs, or that differed significantly across alternatives. These 24 strategies became the focus of a socioeconomic assessment conducted by Bell and Sorensen (1993) to complement this management plan. In addition, strategies that are regulatory in nature, or that will be implemented in the short term, are also included in this socioeconomic impacts discussion. Collectively, these are called "key strategies."

Additional Sources of Information. To supplement the work of Bell and Sorensen on treasure hunting, NOAA researched additional information sources, including Florida State files, Admiralty Court files, and periodicals (Varmer et al., 1993) to provide a more complete picture of this issue.

Information on the effects of proposed actions on human activities was also derived as part of the process to develop a Sanctuary zoning scheme. The criteria developed for, and used by, the Sanctuary Advisory Council and the constituent groups they represent in identifying potential Sanctuary Preservation Areas and Replenishment Reserves included a consideration of the economic impacts of establishing these areas. The criteria for establishing Sanctuary Preservation Areas (SPAs) included identifying and evaluating an area's economic value, user accessibility, and user conflicts. Specific information was gathered on the types of activities/users, relative level of use, relative value of the area, current user conflicts and levels of conflict, and the activities occurring adjacent to the site that could be impacted. In addition, field observations at seven SPAs in the Upper Keys provided information on the number and type of boats present, and uses of these areas at one point in time. This information included input from local fishermen and dive operators who accompanied Advisory Council members to the proposed sites.

The criteria for establishing Replenishment Reserves included describing long-term economic value and identifying economic effects on displaced user groups; impacts on other areas and users caused by restrictions or displacement to other areas; and the ownership of adjacent property. Specific information provided to support the establishment of each proposed area included the types of activities and users affected, type of impact (e.g., restriction, displacement), alternative sites for displaced users, and the impact(s) of these users on other areas.

This information, although qualitative in nature, was used to refine the zones and minimize negative impacts on users. It provides reliable data on the relative effects of strategy implementation on human activities, and is included in the issue discussions that follow.

Costs. The cost information provided refers to negative impacts such as expected losses in user values, income, or employment. Management cost estimates developed at the November 1992 Institutional Arrangements and Approximate Costs Work Session, a meeting of Federal, State and local officials with responsibilities in the Keys, were reviewed and included in this assessment. These cost estimates represent the participants' educated estimates, based on their experience. Low- and high-range estimates were given for both capital and annual operating costs, and costs for each proposed management strategy across the mid-range alternatives. Another source of cost information is the EPA-funded study (EPA, 1993) completed as part of the development of the Water Quality Protection Program. This study provided cost estimates for the major water quality strategies, based on engineering studies.

Organization. Summaries of the socioeconomic impacts are organized by issue. For each issue, key strategies are identified. The impacted user groups and expected socioeconomic costs and benefits are described for each key strategy, noting any long-term versus short-term socioeconomic impacts. A discussion of impacts on the businesses and institutions dependent on affected user groups for sales, employment income, and tax revenues are included where practicable. The remaining strategies are then summarized, and are followed by a comparison of the expected impacts and benefits for each of the mid-range alternatives. A tabular summary of impacts is also provided for each issue.

The interrelated nature of the issues around which this DEIS/Management Plan is organized results in discussions of the socioeconomic impacts of implementing management actions on various topics of significant concern in several places. Table 22 indicates the issues in which discussions of zoning, submerged cultural resources, and fishing are found.

Constraints. Although little information is available for some strategies, value and economic impact information is provided where data are available. For water quality, education, and zoning strategies, management costs and cost-effectiveness were the only quantitative measures included. In addition, an assessment of the economic efficiency and economic impact measures was added for water quality strategies. Despite the lack of comprehensive and consistent data, the relative nature of this assessment provides sufficient information on the positive and negative impacts and benefits to evaluate and compare proposed alternatives, and select a preferred alternative.

Interpretation of Assessments

Short-term and long-term impacts on society and the local economy are two key aspects of this assessment. The magnitude of an activity, its economic value, and the degree of the local community's economic dependence on the activity are detailed.

Some strategies may have short-term negative impacts on certain segments of the local economy. For example, some water quality strategies require capital investment, and may result in indirect costs. Short-term negative impacts are derived by assuming all other factors remain constant. However, if no water quality management actions are taken, water quality will continue to degrade. Continued degrada-

Table 22. *Tracking of Primary Concerns*

Primary Concerns	Issues: Boating	Education	Fishing	Land Use	Recreation	Water Quality	Zoning
Zoning	√		√		√		√
Submerged Cultural Resources					√		
Fishing	√		√		√		√

tion threatens tourism and recreation activities, such as scuba diving, snorkeling, and fishing, which have high economic values, and account for a high percentage of the local employment and income. Without proper management, the local economy could experience large losses in economic values, employment, and income. On the other hand, proposed management actions to protect or improve water quality will have significant long-term benefits.

Increases in the quantity or quality of the Sanctuary's natural and historic resources, increases in local incomes, and declines in water quality in other areas may all increase demand for Sanctuary resources and offset the effects of cost increases. Thus, cost increases for certain users may not result in decreased demand. Demand may increase less than it would have without the cost increases. Demand may even increase over time, despite certain cost increases, because of conservation of the Sanctuary and its resources. Long-term potential impacts are discussed to the extent to which an activity is at risk by factors affecting the quantity and quality of natural and historic resources.

Overview of the Local Economy

The economy of Monroe County and the Florida Keys is driven by recreation and tourism, commercial fishing activities, and retirement communities. These three “industries” account for over 80 percent of the local economy (Bell, 1991). In addition, the U.S. military and State government also contribute significantly to the local economic base. The remainder of the local economy largely supports these basic industries.

In 1990 about two million tourists visited the Keys, totalling about 13 million days, with a direct spending impact of almost $800 million. With total gross sales amounting to approximately $1.6 billion, tourist visitors account directly for about half of all gross sales in the region. In addition, Keys' residents participated in about 17 million days of recreation activities, with a total expenditure impact of about $16 million in 1990. Recreation and tourism activities (and their associated support structures) account for about 51 percent of employment and 58 percent of income by place of work (Kearney/Centaur, 1990). By 1992 the tourist population was estimated to range between 3.6 million and 4.1 million persons (MacMinn, pers. comm.). The spending impact associated with this larger tourist population will have also increased significantly.

Water-related activities account for about 61 percent of all recreation and tourism. The nonmarket user value of such activities to both residents and tourists is estimated at approximately $660 million per year. Using extremely conservative assumptions (i.e., no growth in total recreation activity and constant value per activity day) and a real rate of interest of three percent (i.e., interest net of inflation), the asset value of the Keys for water-related recreation is approximately $22 billion (1990 dollars) (Leeworthy, 1991).

Commercial fishing in the Sanctuary had an ex-vessel value of about $46 million in 1990. The economic impact of commercial fishing in the Keys was estimated by Rockland (1988). In 1986, the ex-vessel value of all Monroe County seafood landings was approximately $27.4 million. The value at the harvesting, wholesale, retail, and restaurant levels was estimated to be about $41 million, $14.8 million of which was income supporting almost 1,200 jobs.

Another significant aspect of the local economy is the magnitude of its "retirement community." Florida is a popular area for retirees because of the climate, low taxes, low cost of living, and variety of natural resources that support leisure activities. Accordingly, major sources of income in Monroe County include social security, pensions and return from investments outside the county.

Overview of Common Themes

The $1.6 billion economy of the Keys is dependent on the maintenance of a high-quality marine environment. Over the last decade, that environment has been increasingly degraded. The provisions and regulations of the management plan address the major issues in order to protect the quality of the resources. Consequently, there are some common themes from natural resource and environmental economics that are relevant to assessing management strategies. All proposed strategies impact some aspect of Sanctuary resources, either directly or indirectly. Sanctuary resources (both natural and historic) can be considered assets that produce a flow of goods and services with both market and nonmarket values to users and nonusers.

Nonmarket Value. The concept of nonmarket value is relevant to the Keys. The area's natural resources are considered public resources, not common property or privately owned. Total market value cannot be determined for some natural resources, known as "nonmarket goods and services." For example, coral reefs have both a market and

nonmarket value. While a market value for the amount of live rock collected and other uses of coral can be determined, there are intrinsic benefits/values to the public that cannot be readily defined in monetary terms, such as the role of coral in providing habitat for tropical fish, or the aesthetic appeal that attracts many divers and snorkelers to the Keys. In addition, coral reefs are also valued by those who appreciate their existence, although they may not use the resource. Nonmarket value is important to acknowledge because when these common, public resources are damaged or lost, their value often cannot be readily quantified for damage assessment and/or restoration purposes. Accordingly, nonmarket goods and services are an integral part of the Keys' economy.

Trade-offs. There may be cases where trade-offs occur between the effects of strategy implementation on economic values and economic impact. Restrictions may increase the costs of consumptive use. However, protecting a resource may not only increase its quality and value, but have a long-term economic benefit to both consumptive and nonconsumptive users. This possibility of trade-offs exists for all user groups. For example, some of the proposed SPAs will displace current commercial and recreational fishermen, as well as tropical fish collectors, to nonzoned areas. This may result in increased costs to fishermen and consumers from displacement, as well as decreased sales, employment, income, and tax revenues for the local economy dependent on this activity. The protection provided by these zoned areas may have economic value to nonconsumptive users. In addition, there may be long-term benefits for consumptive users if resource degradation can be stopped or reversed. The assessments attempt to indicate if such a trade-off might be expected.

Interrelationships of Strategies. The interrelationships among strategies that impact user groups and the local economy cannot be overlooked. For example, both the marina pump-out and mobile pump-out strategies attempt to limit vessel pollution. Implementation of just one of these strategies would provide only limited benefits. Both strategies are designed to improve water quality conditions, and produce benefits that will affect the many water-related activities on which the local economy depends.

Socioeconomic Impacts: Boating

The user groups most likely to be impacted by the proposed boating strategies are those participating in water-related recreation/tourism activities, commercial fishing, marina use, and commercial shipping.

Key Boating Strategies

The boating strategies are expected to provide positive socioeconomic benefits (Table 23). The strategies that will have the most significant socioeconomic effect on user groups are: Channel Marking (B.4), Pollution Discharges (B.7), Special-use Permits (B.11), Salvaging/Towing (B.13), and PWC Management (B.17). Since recreational boating demand is relatively price-inelastic, it will continue to be strong regardless of cost increases. Only small negative impacts on the local tourist trade would be expected. These impacts may not be actual declines from current use and associated income levels, but a slower expansion of future demand than would have occurred otherwise.

Key Boating Strategies

B.4: Channel Marking
B.7: Pollution Discharges
B.11: Special-use Permits
B.13: Salvaging/Towing
B.17: PWC Management

B.4: Channel Marking. This strategy will likely have an overall positive impact on boaters, as a result of decreased degradation of seagrass meadows. While the use of regulatory markers instructing boaters to travel in marked channels may result in increased fuel costs for those currently boating in seagrass meadows, this cost will be offset by increased access to previously inaccessible areas. This strategy would be implemented throughout the Sanctuary in Alternatives II and III, and only in sensitive areas in Alternative IV. Consequently, Alternatives II and III will provide the greatest benefit. If no action is taken, as would be mandated in Alternative V, resource degradation will continue.

B.7: Pollution Discharges. This strategy addresses threats of pollution from the disposal of waste and the exploration for, and development of, hydrocarbons. The FKNMSPA prohibits the exploration and development of minerals throughout the Sanctuary. All of the strategies address the threat of pollution, the

Table 23. *Boating Strategy Socioeconomic Impacts Across Alternatives*

Alternative IV Impacts	Alternative III Impacts	Alternative II Impacts
User Groups ■ Water-related recreation/tourism • Benefits: increased incomes • Costs: increase in negative impacts from slower expansion in tourism ■ Commercial fishing • Benefits: increased incomes ■ Vessel operation • Costs: increased	**User Groups** ■ Water-related recreation/tourism • Benefits: increased incomes • Costs: negative impacts from slower expansion in tourism ■ Commercial fishing • Benefits: increased incomes ■ Vessel operation • Costs: increased **Strategies** ■ Increased restriction • B.1, B.2, B.3, B.4, B.6, B.8, B.13, and B.15	**User Groups** ■ Water-related recreation/tourism • Benefits: increased incomes • Costs: negative impacts from slower expansion in tourism ■ Commercial fishing • Benefits: increased incomes ■ Vessel operation • Costs: increased **Strategies** ■ Increased restriction • B.1, B.2, B.3, B.4, B.6, B.13, and B.15

enforcement of existing laws, the application of supplemental Sanctuary regulations to improve the enforcement of existing laws, and the provision of additional protection from pollution. The difference in the strategies is best evaluated by comparing the variations in zoning strategy alternatives. As the demand for recreation is price-inelastic, it will not decrease substantially in the face of rising costs. The negative impacts on boating costs should be minimal, and would be offset by an increase in value and enjoyment.

There should be no additional adverse economic impact if existing restrictions on minerals and wastes are incorporated into Sanctuary regulations. There may be some economic impacts from supplemental Sanctuary regulations by precluding the discharge of wastes or other pollution threats throughout the Sanctuary. There may also be additional economic impacts on boaters due to the restriction on any discharges from vessels in zoned areas. However, the water quality improvement that will result should increase the value of the Sanctuary to recreational users and the tourist industry. In addition, since the demand for recreation is price-inelastic, it should not decrease the demand even if prices rise. The economic impact on boaters is expected to be minimal. However, even if costs are greater than expected, they may be offset by the economic benefits associated with resource conservation.

Positive economic impacts would occur, assuming improvements in water quality and other natural resources take place due to the restrictions on pollution discharges throughout the Sanctuary. These restrictions would not include wastes from traditional fishing operations and vessel discharges allowed by Coast Guard regulations. Additional positive economic impacts are expected in connection with the restrictions on any vessel discharge in zoned areas, with the only exceptions being engine exhaust and cooling water. The resulting improvements in water quality and other natural resources will economically benefit recreational uses of the Sanctuary, as well as research, education, and other Sanctuary activities. Scuba diving, snorkeling, glass-bottom boat rides, and recreational and commercial fishing would directly benefit from a reduction in pollution. The improved water quality may improve the value of Sanctuary resources to users, in turn resulting in increased charges to users from operators and tourist-related industries. However, this cost to direct users would have a related benefit to the local economy.

Overall, operators may experience minimal economic impacts, but those costs would likely be passed on to the consumers, who are generally willing to pay for improvements in water quality and other natural resources. The additional restrictions on pollution will not only improve the physical and natural environment, but also the socioeconomic conditions of tourism industries related to the Sanctuary's recreational use. Pollution prevention may also benefit fishing activities, if there is a corresponding increase in the size and quality of fish stocks.

B.11: Special-use Permits. The Special-use Permits strategy should not have an adverse economic impact on most users. Within the Sanctuary, it will establish a permitting scheme for concession-type or commercial activities that would otherwise be prohibited. It may increase costs for those permittees currently operating commercial or concession-type activities in the Sanctuary, by potentially placing conditions on their activities or imposing a permit user fee.

B.13: Salvaging/Towing. The Salvaging/Towing strategy is expected to have minimal socioeconomic impacts. The primary user groups that would be affected by this strategy are commercial salvage and towing businesses. There are no standards or requirements proposed specifically for salvaging/towing at this time. However, this activity is subject to future regulation. To the extent that any salvaging/towing involves activities prohibited by the regulations, or otherwise injures Sanctuary resources, such as coral reefs or seagrass meadows, a permit would be required. Through permits or subsequent regulations, salvaging/towing operations may be required to meet specific requirements (e.g., notification of authorities, authorized site observer, use of trained operators, use of environmentally sound techniques). While such requirements may involve some increase in cost of salvaging/towing operations, these requirements should benefit user groups involved in water-related activities by decreasing the potential for damage to Sanctuary resources.

This strategy would include more direct and immediate costs to salvaging/towing operations under Alternative II, because a permit and training program would be required before any salvaging/towing is conducted in the Sanctuary. No additional costs would be involved under Alternative IV, since no salvaging/towing permits or training would be required. There will be some incremental costs under Alternative III, as permits would be required on a case-by-case basis, depending on whether the salvaging/towing involves an activity that would otherwise be prohibited. Training for salvaging/towing will not be required under Alternative III.

B.17: PWC Management. The user group that would be most affected by this strategy is PWC rental operators, who would be required to train their employees in safe and environmentally sound methods of PWC use. These operations would also be required to have emergency communication capabilities, have rescue and chase vessels available, mark their rental operation areas, and have personnel available who are trained in first aid and CPR. These requirements are not currently part of State or Federal law. Consequently, PWC rental operations would incur additional costs that would likely be passed on to renters. However, the benefits gained from imposing these restrictions (e.g., increased operator safety) could exceed the costs of implementing the strategy. No specific regulations for PWC operations are proposed at this time, but such regulations will be considered as part of the ongoing management process.

The only component of this strategy proposed for immediate implementation would require that any motorized vessel (including PWC) operate at idle speed within 200 yards of sensitive areas, including residential shorelines, edges of flats, and locations used by wading or nesting birds. These requirements would benefit Sanctuary users by reducing adverse impacts on natural resources and wildlife. However, they would impose additional restrictions on boaters and PWC operators.

Other Boating Strategies

Each of the remaining boating strategies would either protect or restore resources damaged by boating activities. Snorkeling, scuba diving, and recreational and commercial fisheries activities would benefit most significantly from the implementation of these strategies. Recent damage assessment cases regarding boat groundings in the Key Largo National Marine Sanctuary have shown that even extremely small amounts of habitat destruction (relative to Sanctuary-wide resources) can have significant negative impacts on economic user values. Thus, all boating strategies are expected to have relatively high socioeconomic benefits.

Comparative Impacts

Alternative IV. The low level of restriction provided by this alternative would cause low short-term costs to boaters. However, serious socioeconomic impacts are associated with the inevitable decline in resource quality allowed by this alternative. This less-restrictive alternative would, in the long term, result in decreased user value and net income, as well as decreased employment, if water quality declines significantly.

Alternative III. This alternative offers moderate increases in resource protection compared to Alternative IV. Increased restrictions would occur in the Boat Access (B.1), Habitat Restoration (B.2), Derelict

Vessels (B.3), Channel Marking (B.4), Additional Enforcement (B.6), User Fees (B.8), Salvage/Towing (B.13), and Mooring Buoy Impacts (B.15) strategies. Minimal increases in potential long-term socioeconomic benefits are directly linked to this increased resource protection. The costs associated with implementing this alternative would be between those of Alternatives II and IV.

Alternative II. Within this alternative, strategies B.1, B.2, B.3, B.4, B.6, B.13, and B.15 would provide increased protection compared to Alternative III. This more-restrictive alternative would result in long-term increases in user value, but possibly a small decline in income and employment. A much smaller decline is likely over the long term than would occur without protection. Insufficient information is available to draw conclusions about the relative socioeconomic benefits of increased levels of protection. This alternative would be the most expensive to implement.

Socioeconomic Impacts: Fishing

The Sanctuary is among the nation's most popular recreational fishing destinations. Rockland (1988) estimated that in 1986 the Keys' recreational fisheries generated $63.6 million in local output, $21.3 million in local income, and approximately 1,800 local jobs. The Keys also support an important commercial fishing industry. For example, in 1986 commercial fisheries in the area generated about $14.8 million in local income and about 1,200 jobs (Rockland, 1988). Recreational fisheries currently account for about five percent of all local income, and commercial fisheries make up an additional three percent. Eight percent of all local income, therefore, is dependent on the Sanctuary's fishery resources.

The cumulative impacts of all fishing strategies are expected to be positive, with relatively low impacts on any particular user group. There may, however, be small negative impacts on the commercial shrimp fishery and commercial sponge harvesters due to regulatory requirements that affect gear and methods of harvest.

Key Fishing Strategies

Eight of the 13 fishing strategies are assessed in this section. Five strategies, Aquaculture Alternatives (F.4), Limited Entry (F.5), Bycatch (F.10), Gear/Method Impacts (F.11), and Sponge Harvest (F.15), are expected to have the greatest socioeconomic impact on user groups. The remaining strategies, Artificial Reefs (F.7), Finfish Traps (F.12), and Spearfishing (F.14), will also impact Sanctuary users, but will be addressed in proposed NOAA regulations. Table 24 provides a summary comparison across Alternatives II, III, and IV.

F.4: Aquaculture Alternatives. Aquaculture alternatives will be permitted in the Sanctuary to minimize or offset the negative impacts to tropical fish collectors and live rock harvesters whose activities are being prohibited. This strategy would result in additional costs from consultation with the Sanctuary Program.

Table 24. *Fishing Strategy Socioeconomic Impacts Across Alternatives*

Alternative IV Impacts	Alternative III Impacts	Alternative II Impacts
User Groups ■ Commercial fishing • Benefits: increased incomes ■ Recreational fishing • Benefits: increased incomes ■ Water-related recreation/tourism • Benefits: small increases, personal income increases	**User Groups** ■ Commercial fishing • Benefits: increased incomes ■ Recreational fishing • Benefits, increased incomes ■ Water-related recreation/tourism • Benefits: moderate increases, personal income increases **Strategies** ■ Increased restriction • F.3, F.5, F.6, F.11, and F.15 ■ Additional • F.4	**User Groups** ■ Commercial fishing • Benefits: increased incomes ■ Recreational fishing • Benefits: increased incomes ■ Water-related recreation/tourism • Benefits: moderate increases, personal income increases **Strategies** ■ Increased restriction • F.4, F.5, F.6, F.7, F.11, F.14, and F.15

Key Fishing Strategies

F.4: Aquaculture Alternatives
F.5: Limited Entry
F.7: Artificial Reefs
F.10: Bycatch
F.11: Gear/Method Impacts
F.12: Finfish Traps
F.14: Spearfishing
F.15: Sponge Harvest

However, there would be additional costs for aquaculture operations due to limitations or conditions placed on where and how the aquaculture operations may be conducted. In addition, this activity may require a special-use permit. Within Alternative IV, aquaculture may be conducted throughout the Sanctuary. Within Alternative II, aquaculture is not permitted in the Sanctuary. Within Alternative III, aquaculture may be permitted in areas of the Sanctuary that lack significant natural resource habitats, such as corals and seagrass meadows.

F.5: Limited Entry. Open access commercial fisheries have faced exploitation, overcapitalization and stock depletion. Both the State of Florida and NMFS have initiated limited entry, in the form of a trap-reduction program for spiny lobster, to address these problems. However, limited-entry schemes that focused on effort were not successful in achieving management objectives (i.e., either improving total catch or increasing the total catch value) (Bell and Sorensen, 1993). The use of individual transferable quotas (ITQs), however, has been successful. Such quotas allocate shares of the total allowable catch. Fish can then be harvested by the most efficient methods, at whatever time maximizes return. Under a limited-entry scheme using ITQs, fisheries could realize significant socioeconomic benefits. This strategy would be implemented by the State and the Gulf of Mexico and South Atlantic Fishery Management Councils.

This strategy would vary from an assessment of limited-entry options (Alternative IV) to the protection of all fisheries (Alternative II). In Alternative III, it would impose regulations on a fishery-specific basis. Limiting the scope of applications to selected fisheries would result in negative impacts on other fisheries that are already overfished or fully exploited.

F.7: Artificial Reefs. Artificial reefs are currently subject to State and Federal regulation. The National Artificial Reef Plan (NOAA Technical Memorandum NMFS OF-6, 1985) establishes Federal guidance for the design, construction, and location of artificial reefs permitted under section 10 of the Rivers and Harbors Act, section 404 of the Clean Water Act, and section 4(e) of the Outer Continental Shelf Lands Act. The State of Florida has its own comprehensive artificial reef management plan, which embraces the National Plan and allows for individual county or regional plans (Florida Artificial Reef Development Plan, 1992).

Artificial reefs are generally designed to enhance recreational and commercial fishing opportunities, and fishermen are the primary users. However, other users could include glass-bottom boat charters and recreational divers. As a result of these activities, the construction of artificial reefs may contribute positively to South Florida's economy.

Within Alternative II, which would not allow the construction and placement of any new artificial reefs in the Sanctuary, fishermen and other users may be impacted by this strategy. Within Alternative IV, artificial reefs would be allowed throughout the Sanctuary, so user impacts would be minimal. Within Alternative III, the construction of new artificial reefs would not be permitted in zoned areas or in the vicinity of natural reefs, but would be permitted in other areas of the Sanctuary. In both Alternatives III and IV, those constructing and placing artificial reefs may incur additional costs due to additional requirements above and beyond the existing artificial reef plans for protecting and managing Sanctuary resources and uses.

F.10: Bycatch. Bycatch is the catch of nontargeted or undersized targeted species by commercial fishing operations. Although no bycatch regulations are proposed currently, this activity may be regulated under the Magnuson Act, State law, and/or the NMSA. Any such fishing regulation would only be proposed in coordination with NMFS, the Fishery Management Councils and the State as part of the continuing management process. The issue of bycatch compounds the problem of overfishing in the Sanctuary. Finfish stocks have been reduced dramatically by shrimp fishery bycatch. The implementation of bycatch reduction devices (BRDs), as proposed in this strategy, would decrease the conflicts between these fisheries and improve finfish stocks. However, as bycatch is reduced, the shrimp catch may decrease, causing operating costs to increase, and pricing some shrimpers out of business. Economic impacts on the finfish industry may be minimal or negative due to assimilation of capital and labor from the shrimp industry. In addition, if overfishing in

common areas is not addressed, this strategy may result in decreased yields in recreational and commercial finfisheries.

F.11: Gear/Method Impacts. Restrictions on fishing gear and methods designed to minimize impacts on coral, hardbottom areas, seagrass meadows and other significant habitat will have socioeconomic benefits for recreation users. Some commercial fishermen may encounter additional costs from such restrictions. However, this may be offset by fisheries improvements due to the prevention of further habitat degradation. Modifying the type of gear used by commercial fishermen will reduce overfishing, bycatch, and ghost fishing. Modifying fishing gear will also alleviate negative impacts on coral reefs, hardbottom, and seagrasses, preserving the recreational value to divers. A decrease in habitat destruction will benefit fishermen by enhancing stocks of finfish.

Alternative II would apply gear/method restrictions throughout the Sanctuary, and would thus have positive socioeconomic impacts on recreational users, and possibly commercial fishermen, if stocks or fishery quality improve along with the habitat. Alternative III would only restrict use in certain areas, minimizing various costs for some commercial fishermen, but having relatively fewer benefits for recreational users and other fishermen. Alternative IV would only utilize voluntary compliance with regulations. The draft regulations would prohibit the use of explosives, poisons, electrical charges, bleach, and oil as fishing methods. There are also proposed prohibitions against bottom trawls, dredges, fish sleds, and similar gear. The cost of switching to low-impact gear and methods is outweighed by the socioeconomic benefits to other recreational and commercial users.

F.12: Finfish Traps. This strategy, which would require the removal of finfish traps except those set for bait fish, would adversely impact commercial fishermen operating in a small portion of the Sanctuary within the Gulf of Mexico. However, because it will eliminate ghost traps and the catch of nontargeted species, the strategy will benefit fishery stocks, and ultimately commercial fishermen.

F.14: Spearfishing. This strategy includes restrictions on the type of gear, bag limits, and closure of areas to spearfishing. Within Alternative II, restricting the activity throughout the Sanctuary would impact spearfishermen. Within Alternative III, spearfishermen who primarily use zoned areas would incur relocation costs. Alternative IV would have the same restrictions as Alternative III, but the zoned areas would be smaller, and there would be less impact on spearfishermen. However, the impacts on spearfishermen should be minimal, since the activity would still be allowed in most of the Sanctuary. In addition, the zoned areas prohibiting such fishing are not those currently preferred by spearfishermen. There may be some benefits to habitat, species composition, and abundance as a result of these restrictions. If so, there would be a corresponding economic benefit for nonconsumptive users. Research on the impacts of spearfishing will be conducted as part of the continuous management process.

F.15: Sponge Harvest. Within Alternative II, a three-year moratorium on sponge harvesting would be implemented. Regulations would be developed for sponge harvesting after the moratorium. This would have a significant effect on sponge harvesters, who rely primarily on sponges in the Sanctuary for their livelihood. These harvesters would incur costs due to relocating operations to areas outside the Sanctuary. Under Alternative III, regulations would be developed that govern the harvest of sponges throughout the Sanctuary. These regulations may include bag limits, an increase in minimum size, and/or the designation of areas closed to harvesting. This would adversely impact sponge harvesters, but the overall costs would be less than Alternative II. Under Alternative IV, sponge harvesting would be prohibited in high-priority areas. Only sponge harvesters operating in areas to be closed would be impacted.

Other Fishing Strategies

The Consistent Regulations strategy (F.1) is expected to have significant socioeconomic benefits. Inconsistent regulations currently make enforcement difficult and promote a lack of compliance. The two levels of protection (Alternative IV and Alternatives II/III) offered by the Stocking strategy (F.3) would range from a research program to assess the impacts of stocking programs, to the implementation of an indefinite moratorium on stocking activities. The Fisheries Sampling strategy (F.6) would improve the statistical data on commercial and recreational fisheries stocks. The information developed would be useful in the protection and proper management of economically important species. The Exotic Species strategy (F.8) would prevent the release of such species into the Sanctuary, thereby protecting the native species and benefiting user groups that depend on them. The Gear Removal strategy (F.9) would involve voluntary compliance, and would have

little or no socioeconomic impact on fishermen. It may, however, have positive impacts on boaters and scuba divers.

Comparative Impacts

Alternative IV. While this alternative would have the lowest short-term costs and lowest level of restriction across the mid-range alternatives, the long-term implication is resource depletion with corresponding negative socioeconomic impacts.

Alternative III. This alternative would offer moderate increases in resource protection compared to Alternative IV, with minimal increases in potential long-term socioeconomic benefits.

Alternative II. This alternative would be the most costly to implement, and the level of protection offered would differ significantly from Alternative III. Socioeconomic benefits would increase moderately, while costs would increase significantly.

Socioeconomic Impacts: Land Use

Land-use management in the Keys is vital to the Sanctuary's environmental health. Although the Sanctuary does not include land above the mean high-tide mark, land-use activities that are likely to destroy, cause the loss of, or injure any Sanctuary resource are subject to the National Marine Sanctuary Act consultation process. The relationship between land use and water quality is critical, because a significant portion of the Keys' economy is dependent on income from water-related activities such as diving, boating, wildlife observation, and fishing. As water quality and the quantity and quality of the related habitat declines, the demand for these activities decreases as participants seek substitute sites. In some cases, making land-use decisions in favor of conservation may cause short-term losses in income; however, the long-term sustainability of a healthy economy and the value of the many nonmarket goods and services are dependent on good environmental quality (Table 25).

Table 25. *Land-use Strategy Socioeconomic Impacts Across Alternatives*

Alternative IV Impacts	Alternative III Impacts	Alternative II Impacts
User Groups ■ Boaters • Costs: minimal income impacts ■ Marinas • Costs: possible short-term decrease in income from increased cost to boaters • Benefits: potential for long-term increases in income from wetland development and dredge and fill activities that will restrict the supply of future marinas ■ Other water-related recreation users • Benefits: increased incomes ■ Commercial fishing • Benefits: increased incomes	**User Group** ■ Boaters • Costs: minimal income impacts ■ Marinas • Costs: possible short-term decrease in income from increased cost to boaters • Benefits: potential for long-term increases in income from wetland development and dredge and fill activities that will restrict the supply of future marinas ■ Other water-related recreation • Benefits: increased incomes ■ Commercial fishing • Benefits: increased incomes **Strategies** ■ Increased restriction • L.3, L.8, L.14, L.15, L.16, L.18 and L.20 ■ Additional • L.6 and L.12	**User Groups** ■ Boaters • Costs: minimal income impacts ■ Marinas • Costs: possible short-term decrease in income from increased cost to boaters • Benefits: potential for long-term increases in income from wetland development and dredge and fill activities that will restrict the supply of future marinas ■ Other water-related recreation • Benefits: increased incomes ■ Commercial fishing • Benefits: increased incomes **Strategies** ■ Increased restriction • L.14 and L.16

Key Land-use Strategies

Eleven of the 19 land-use strategies are discussed in this section. The cumulative socioeconomic benefit from all land-use strategies would be significant. Protective measures would restrict supply relative to demand, potentially resulting in increases in economic rents (returns above normal profits) for existing establishments. Property values would rise as land use and other supply restrictions are put into effect. In a study of environmental regulations and land-use restriction, Beaton (1991) found that property values increased after regulations and restrictions were imposed. The cumulative impact of the land-use strategies within the three mid-range alternatives would likely have the same type of impact on income and property values in the Keys.

Key Land-use Strategies

- L.1: Marina Pump-out
- L.2: Marina Operations
- L.3: Fueling/Maintenance
- L.6: Mobile Pump-out
- L.7: SWD Problem Sites
- L.8: Containment Options
- L.9: SWD Policy Compliance
- L.14: Dredging Prohibition
- L.15: Dredging Regulations
- L.18: Wetland Dredge and Fill
- L.20: Public Access

L.1: Marina Pump-out. The provisions of this strategy are consistent across the three mid-range alternatives. The secondary containment options included in this strategy (e.g., additional paving and curbing) would be very costly, especially considering the uncertainty of the socioeconomic benefits. For example, a $19,000 pump-out facility was recently installed at John Pennekamp Coral Reef State Park, but it would have cost over $1 million if a package plant had not been in place to accept the waste produced. Still, studies have shown that the cost of pump-out facilities could be passed on to vessel owners, as the demand for marina services is relatively inelastic (Bell and Leeworthy, 1984).

L.2: Marina Operations. The provisions of this strategy are consistent across the mid-range alternatives. The strategy would require a comprehensive assessment of marina compliance with current regulations. Marina siting criteria would also be improved. All user groups associated with marinas and water-related activities would benefit from reduced pollutant loading.

L.3: Fueling/Maintenance. Within Alternatives II and III, this strategy would require the establishment of paved and curbed containment areas for boat maintenance activities such as hull scraping and repainting, mechanical repairs, fueling, and lubrication. These options would be quite expensive, and it is unclear whether the socioeconomic benefits would equal or exceed the costs of implementation. Within Alternative IV, this strategy would require an evaluation of procedures and remedial solutions, with minimal socioeconomic benefits.

L.6: Mobile Pump-out. This strategy is included in Alternatives II and III, but not in Alternative IV. Mobile pump-out provisions will help mitigate the impacts of boating activities and marina operations within the Sanctuary. Although this strategy would result in small positive socioeconomic benefits through a decrease in pollution from live-aboards, the impact on live-aboards is unknown, as the strategy does not specify what facilities would be supplied, or how they would be paid for.

L.7: SWD Problem Sites and L.9: SWD Policy Compliance. High levels of demand for development, and a limited amount of usable land, make solid waste disposal a significant problem in the Keys. Solid waste is currently transported to a landfill in Pompano Beach at a cost of $75/ton. This landfill has a remaining life of 46 years. Strategy L.7 would provide for the evaluation and implementation of appropriate remedial actions at problem sites. Strategy L.9 would require compliance with Monroe County policies on solid waste disposal. Participants in water-related recreation and commercial fishermen would be positively impacted if a viable option for the containment and/or relocation of solid waste is implemented.

L.8: Containment Options. The provisions of this strategy would require both a study of various containment/relocation options and the implementation of appropriate options within five years. Within Alternative IV, the strategy would only require a feasibility study of options, with no commitment to implementation. The implementation of containment/relocation options would increase the cost of waste disposal, while protecting water quality. These costs would be incurred by residents and businesses. As good water quality is vital to the Keys' economy, the long-term benefits of this strategy would exceed the costs.

L.14: Dredging Prohibition. Alternative II would prohibit new dredge and fill permits; Alternative III would allow permits if public interest is demonstrated, and little or no environmental degradation is likely, and Alternative IV would allow permits if public interest is demonstrated. The socioeconomic benefits of restricting all new permits would be significant, but the cost burden placed on new development would be significant as well. Conversely, Alternative IV would allow costly degradation of area wetlands, benefiting development interests at the expense of long-term public needs.

L.15: Dredging Regulations. In the mid-range alternatives, this strategy would provide for an inventory and assessment of current and recent maintenance dredging activities throughout the Sanctuary. Only Alternatives II and III, however, would require low-impact dredging methods for all maintenance dredging. While low-impact dredging may increase the operational costs of maintenance, the reduced impacts to sensitive Sanctuary habitats (e.g., corals, seagrasses, and mangroves) would benefit all user groups.

L.18: Wetland Dredge and Fill. Wetlands represent a market failure, because owners are unable to charge for the economic services these areas provide. Unless prevented, wetland owners will convert such land to uses that may be suboptimal from an economic standpoint. There are many varied socioeconomic benefits derived from wetlands. They provide habitat for fish, birds, and other wildlife; act as a pollution filter; remove sediment; and provide flood control, groundwater recharge, and recreational opportunities. Saltwater or marine wetlands are linked to nearly 92 percent of the value of Florida's commercial fish harvest. Bell (1989) estimated the recreational fishery value per wetland acre to be $7,082 and $923 on the east and west coast of Florida, respectively (1984 dollars). Using the saltwater marsh acre value of approximately $1,450 (1992 retail) for commercial fisheries, and approximately $5,500 (1992 dollars) for recreational fisheries, the estimated value that saltwater marsh contributes to fisheries surrounding Monroe County (using the 645 km^2 reported by NOAA in 1986) is $246 million for commercial fisheries, and $877 million for recreational fisheries.

Within both Alternatives II and III, this strategy would reduce the degree of wetland destruction currently occurring. The cost of residential and business development would increase as the supply of suitable land becomes limited. However, while this strategy would increase costs, Sanctuary users would benefit because saved wetlands provide runoff buffers and habitats for threatened and endangered species.

L.20: Public Access. There is increasing concern that access to public resources is being restricted by increased privatization of the coastline. Florida addresses this concern through a program that leases submerged lands to marinas at a 30 percent discount if they open the marina on a first-come, first-serve basis. However, the costs of increased public access, both in economic terms and in damage to resources, must be considered. Resource damage includes anchor damage, groundings, impacts caused by scuba divers on the reef, and impacts of fishing and spearfishing on target species. Also with increased public access, the marginal socioeconomic benefit received is expected to decrease as congestion produces diminishing returns. In this case, crowding is considered a negative externality.

Public access must be addressed in conjunction with the carrying-capacity of the resource, both in physical and economic dimensions. Restricting public access would, in the long term, have significant socioeconomic benefits. However, trade-offs will occur between the total amount of use and its total value. Maximizing the economic value of the resource may conflict with maximizing sales, employment, and income impacts in the short term.

This strategy would provide greater protection in Alternatives III and II (compared to Alternative IV) through the acquisition of shoreline areas to improve public access while protecting habitat. Florida currently has three programs to acquire land: Conservation and Recreational Lands (CARL); Save Our Coasts (SOC); and the Land Acquisition Trust Fund (LATF). Alternative III has the potential to provide significant benefits if the provision of public access is consistent with the resource's carrying-capacity. Within Alternative IV, no actions would be taken to improve public access.

Comparative Impacts

The majority of the land-use strategies offer two levels of protection (Alternative IV and Alternatives II/III). Only the Dredging Prohibition strategy (L.14) offers three different levels of protection. The differences in costs and benefits among these three levels constitute the bulk of the differences among the mid-range alternatives.

Alternative IV. This alternative proposes no further action in a number of the strategies, and therefore provides no socioeconomic benefits.

Table 26. *Recreation Strategy Socioeconomic Impacts Across Alternatives*

Alternative IV Impacts	Alternative III Impacts	Alternative II Impacts
User Groups ■ SCR divers • Benefits: increased incomes ■ Treasure hunters • Costs: Potential lost incomes ■ Other water-related recreation users • Benefits: increased incomes	**User Groups** ■ SCR divers • Benefits: increased incomes ■ Treasure hunters • Costs: potential lost incomes ■ Other water-related recreation users • Benefits: increased incomes **Strategies** ■ Increased restriction • R.5 (Responsible for an increase in benefits and cost)	**User Groups** ■ SCR divers • Benefits: increased incomes ■ Treasure hunters • Costs: potential lost incomes ■ Other water-related recreation users • Benefits: increased incomes **Strategies** ■ Increased restriction • R.2 and R.5 (Benefits unclear due to possible negative externalities)

Alternative III. This alternative effectively limits costs while maximizing socioeconomic benefits.

Alternative II. This alternative contains many of the same provisions as Alternative III. The difference in estimated costs and benefits between the alternatives is undetermined, however, and the complete prohibition of dredging activities proposed in strategy L.14 would raise the cost of this alternative.

Socioeconomic Impacts: Recreation

The Keys are a major tourist destination. In 1990 1.86 million out-of-state tourists visited Monroe County, totalling 12.87 million tourist-days. Although estimating the number of instate tourists is more difficult, the uniqueness of the Keys' climate and the reef system also make it a major tourist destination for Florida residents. Given the area's high level of use, proper management is crucial to maintaining its recreational value.

People who visit the Keys participate in a wide variety of activities that affect the Sanctuary (e.g., boating, fishing, diving, etc.). The overuse or misuse of Sanctuary resources will lead to a lessening of both the utility and value of the area.

Key Recreation Strategies

Of the recreation strategies, the SCR Management (R.1) and Carrying Capacity (R.5) strategies have the potential for causing the greatest socioeconomic impact. The Coral Touching (R.7) strategy will benefit Sanctuary resources, but restrictions will make dive operations more difficult. The impacts of the Recreation Survey (R.2) strategy are negligible, except within Alternative II, where charter boat operators will be affected. Table 26 provides a summary comparison across Alternatives II, III, and IV.

Key Recreation Strategies

R.1: SCR Management
R.2: Recreation Survey
R.5: Carrying Capacity
R.7: Coral Touching

R.1: SCR Management. Because of the Keys' importance as a major trade route, as well as its natural reef structure, a significant number of shipwrecks have occurred in the waters in and around the Sanctuary. Four-hundred-and-fifty submerged cultural resources (SCRs) have been logged within the Keys, and an estimated 900 sites may be located in the area. Many direct and indirect socioeconomic benefits are derived from these SCRs. They attract scuba divers, snorkelers, souvenir collectors, historians, and marine archaeologists. Kearney/Centaur (1990), for example, estimated that over 846,000 scuba divers and snorkelers visit the Keys annually, with a large portion participating in SCR diving. Leeworthy (1991) estimated that each diver in the Keys has a daily recreational user value of $319.36, for a total user value of $197.6 million annually. The wrecks also provide a unique habitat for tropical and sport fish, contributing to the area's recreational fishing value, and provide educational opportunities

for historians. The minimum total regional impact attributed to SCR visitors in 1990 was $163.5 million (Bell and Sorensen, 1993).

Most shipwrecks in the Keys have already been salvaged. New technological developments have helped locate wrecks in deeper waters, but because most of the waters surrounding the Keys are relatively shallow, this technology is not likely to lead to a significant number of new wreck discoveries. This hypothesis is supported by files of the State and the Admiralty Court. There are currently no significant salvage contracts in the State-managed portion of the Sanctuary and, except for the ATOCHA and the MARGUERITA, there have been no significant treasure finds in the Sanctuary's Federal portion, either. Accordingly, there has been a shift in treasure hunting to the Caribbean and other areas of the world. Also, recent changes in various laws have occurred, making it less likely that the treasure hunters will gain title to future finds.

Based on these laws, and the unlikelihood of new significant finds in the Keys, the regulation and management of SCRs within the Sanctuary is not expected to have a significant socioeconomic impact. While the likelihood of another significant treasure find is speculative, private recovery will still be possible, and the negative economic impacts on treasure hunters from the proposed SCR management strategies should be minimal (Varmer et al., 1993). Such impacts could result from prohibitions on recovery operations in protected zones and areas containing coral and/or seagrass meadows. The costs involved with managing SCRs include establishing a staff, organizing the SCR survey, and continuing the supervision of the sites.

R.2: Recreation Survey. Information from the recreation survey established by this strategy will enable management decisions to be made on costs (associated with permits, regulations, and other requirements) that may be imposed on users. Alternatives III and IV should not impact any user groups. However, within Alternative II, survey information would be used to establish a permitting and enforcement system to regulate use levels (e.g., number of boats, divers, etc.), and the strategy would have a negative impact on charter and rental boat operations.

R.5: Carrying Capacity. High levels of recreational use have major physical and biological impacts on Sanctuary resources. The effects of this use may reduce the value of the recreational experience in the Keys. This strategy would establish recreational carrying capacities to minimize wildlife disturbances and other adverse effects. It would be enforced only in highly sensitive areas in Alternative IV, in high-use and highly sensitive habitats in Alternative III, and throughout the Sanctuary in Alternative II. If special-use permits are implemented, additional user fee costs would be incurred.

Because the regional economy is dominated by recreation, any limitation on carrying capacities that reduces the level of recreational activity would have a negative socioeconomic effect. For example, Bell and Sorenson (1993) estimated that a five percent reduction in visitation would result in the loss of approximately $23 million in regional incomes, and over 1,000 jobs. However, because the annual user value of recreation (estimated at $653 million) exceeds the annual value of income generated by the regional economy (estimated at $463 million), the benefits of a carrying-capacity management policy have the potential to exceed the losses incurred by the local economy, assuming user values rise as a result of the imposed limits. Implementing carrying-capacity limits would also involve increased costs. However, the benefits gained from such limits may balance or exceed the costs incurred.

R.7: Coral Touching. This strategy should have a positive impact on most user groups (e.g., divers, snorkelers, and charter operators) because it will limit the potential damage to corals, protecting this primary resource attraction. However, there are concerns that the restrictions could negatively impact the dive charter industry, by making it potentially liable for damages caused by divers and charter vessels anchoring near corals. Within Alternative II, coral touching would be prohibited throughout the Sanctuary, resulting in potentially significant impacts on the dive/charter industry. In addition, some revenues may be lost if divers choose not to dive to avoid accidentally touching coral. There may also be additional costs for gear or other buoyancy-control methods designed to help divers avoid coral touching. Within Alternative III, coral touching is only prohibited in protected zones, but the removal or injury of coral is prohibited throughout the Sanctuary. Accordingly, there would be some of the same costs and impacts as in Alternative II, but they should be significantly less severe. In addition, there may be some shifting of dive/charter sites that would involve some additional costs that could be passed on to the users. The impacts of Alternative IV would be similar to Alternative III, but because the protected zones are smaller, they would not be as significant.

Comparative Impacts

Alternative IV. This alternative would offer the least restriction, and the least positive socioeconomic impact.

Alternative III. This alternative would provide more restrictions than Alternative IV, or the same restrictions over a larger area. Carrying-capacity limits would be enforced in highly sensitive and high-use areas, and the recreational users of these areas would be impacted.

Alternative II. This alternative would be the most restrictive, as it requires a permitting and enforcement system to regulate use levels (e.g., number of boats, divers, etc.) for charter and recreational-for-hire vessels. It would also establish carrying-capacity limits for recreational activities throughout the Sanctuary, displacing some users. This alternative would have the greatest socioeconomic impact on both commercial and recreational users.

Socioeconomic Impacts: Water Quality

Monroe County's economic base is heavily dependent on tourism and water-related activities. These activities, in turn, depend on waters of consistently high quality. However, pollutant discharges in the Sanctuary, most of which can be attributed to wastewater treatment methods in Monroe County, have degraded the area's water quality.

Because water-related activities such as snorkeling and scuba diving depend on clean, clear water to maintain high user values, the tourist industry would suffer the greatest losses if the county's wastewater disposal problems are ignored. Other water-related activities/user groups that rely on good water quality include beach users, boaters, PWC users, glass-bottom boat operators, and visitors observing wildlife.

In addition, the continuing and improved health of commercial and recreational fisheries depends on maintaining a satisfactory level of surface and groundwater quality. These resources are currently overfished, and may disappear if the habitats used by target species (e.g., seagrasses, coral, and sponge beds) are reduced by diminishing water quality.

If wastewater management strategies are implemented, the county's economy would encounter short-term losses due to higher costs, with no immediate improvement in water quality. Passed on to users, these higher costs may result in a lower number of visitors participating in water-related activities. High-cost improvements may also result in site substitution in the short term, until costs level off. However, over the long term, water quality would improve, and the costs of implementing protective strategies would also decrease over time. Increases in income and water quality would, in the long term, increase demand and, therefore, the value of water-related activities, offsetting any short-term losses.

Unless the Keys' wastewater treatment problem is properly addressed with a balanced plan, irreversible environmental damage may result. The costs of implementing protective strategies may be insignificant compared to the consequences of taking no action. The negative long-term economic impacts from lost revenues could threaten the livelihood of county residents. Conversely, negative impacts may also be compounded by expensive and relatively ineffective strategies, with low cost/benefit ratios. An alternative must be selected that maximizes both environmental and economic benefits.

Key Water Quality Strategies

Most user groups, especially water-related recreation users and commercial fishermen, will benefit from the water quality strategies in the mid-range alternatives. All benefits are assumed, and are considered long-term potential benefits (Table 27). The key assumption is that if water quality strategies are not implemented (Alternative V), the goods and services upon which these user groups depend will degrade and may eventually be eliminated. Of the 32 water quality strategies, seven, OSDS Demonstration Project (W.1); AWT Demonstration Project (W.2); Wastewater Management Systems (W.3); Wastewater Disposal, City of Key West (W.4), Canal Water Quality

Key Water Quality Strategies

- W.1: OSDS Demonstration Project
- W.2: AWT Demonstration Project
- W.3: Wastewater Management Systems
- W.4: Wastewater Disposal, City of Key West
- W.6: NPDES Program Delegation
- W.10: Canal Water Quality
- W.11: Stormwater Retrofitting
- W.12: Stormwater Permitting
- W.15: HAZMAT Response
- W.32: Advisory Committee

Table 27. *Water Quality Strategy Socioeconomic Impacts Across Alternatives*

Alternative IV Impacts	Alternative III Impacts	Alternative II Impacts
User Groups ■ Water-related recreation/tourism industry • Benefits: increased incomes ■ Commercial fishing • Benefits: increased incomes ■ Residents and business owners • Costs: increase, but many incomes depend on industries tied to water quality	**User Groups** ■ Water-related recreation/tourism industry • Benefits: increased incomes ■ Commercial fishing • Benefits: increased incomes ■ Residents and business owners • Benefits: possible advanced wastewater treatment cost decrease **Strategies** ■ Increased restriction • W.3 and W.10 ■ Additional • W.7 and W.11	**User Groups** ■ Water-related recreation/tourism industry • Benefits: increased incomes ■ Commercial fishing • Benefits: increased incomes ■ Residents and business owners • Benefits: possible advanced wastewater treatment cost decreases **Strategies** ■ Increased restriction • W.10, W.11, and W.17

(W.10); Stormwater Retrofitting (W.11); and HAZMAT Response (W.15), are expected to have the greatest socioeconomic impact on users. Three other strategies are addressed in this section because their implementation is expected before or within the first year following the adoption of the Management Plan. Qualitative discussions of impacts on user groups are provided for all strategies except W.15, which includes quantitative estimates as well.

W.1: OSDS Demonstration Project and W.2: AWT Demonstration Project. In general, little is known about the impacts of long-term on-site disposal system (OSDS) use, illegal cesspit use, or the effectiveness of advanced wastewater treatment plants (AWTs) in Monroe County. Forty-four percent of all wastewater flow is currently treated by OSDSs (24,000) and cesspits (5,000), 16 percent is treated by package plants (200), and 40 percent is treated by wastewater treatment plants in Key West (Sorensen, 1993). Cesspits have a much greater negative environmental impact than OSDSs. The implementation of the AWT Demonstration Project strategy (W.2) would address this uncertainty through a demonstration and monitoring project. If the results reveal economic and environmental benefits, coupled with decreased operational costs over the long run, users may convert to cleaner AWT plants. In addition, AWTs may be the most cost-efficient method of reducing nutrient loads, if economies of scale exist for AWTs. This would entail the added socioeconomic benefit of lowering overall costs of wastewater treatment for residents and business establishments.

W.3: Wastewater Management Systems. Under each of the mid-range alternatives, this strategy would require inspection/enforcement programs for OSDS and package plants, and the elimination of cesspits. Alternatives II and III also include targets for wastewater nutrient loadings, and the development and implementation of a Stormwater Master Plan. Although no single water quality strategy is expected to have a significant socioeconomic impact on any user group, this strategy may have larger socioeconomic benefits on those activities dependent on water clarity, such as scuba diving and snorkeling. Although glass-bottom boat operations also depend on low turbidity, positive impacts would be minimal, due to the small number of user days associated with this activity. The commercial fishing industry would receive only small positive impacts, assuming the issue of common property is properly addressed (see fishing issue discussion). Commercial fisheries rely on a combination of strategies designed for stock enhancement and improved management. Recreational fisheries have greater economic value than commercial fisheries, and historically, management efforts to control catch have been more successful when targeting recreational users.

W.4: Wastewater Disposal, City of Key West. This strategy would require that the effluent disposal at

Key West's wastewater treatment plant be upgraded through the implementation of nutrient reduction technologies, deep-well injection aquifer storage and/or re-use, and discontinuing the use of ocean outfall. This strategy would reduce direct nutrient loadings to surface waters, providing equal benefits and requiring equal costs, regardless of the alternative chosen.

W.6: NPDES Program Delegation. Within each of the mid-range alternatives, this strategy would delegate administration of the NPDES program for Florida Keys' dischargers to the State of Florida. The program would benefit permittees and the State of Florida by streamlining the current process. No costs are expected.

W.10: Canal Water Quality. The provisions of this strategy are progressively more restrictive from Alternative IV to Alternative II. For example, although all of the alternatives would require an inventory of dead-end canals and basins, only Alternative II would require that improvements be implemented throughout the Sanctuary. Alternative III would only require improvements in known hot spots. The impacts of this strategy regarding the connection between canal water quality, overall Sanctuary water quality, and water-based activities are unknown. Due to uncertainties about the impacts of nutrient loadings in dead-end canals on Sanctuary nearshore waters, only small positive benefits can be predicted where improvements are implemented.

W.11: Stormwater Retrofitting. This strategy would not be implemented under Alternative IV, and would be more restrictive within Alternative II than Alternative III. Within all alternatives, loadings of sediment, toxics, and nutrients to Sanctuary waters would be reduced through engineering methods. Due to uncertainties about the impacts of nutrient loadings in dead-end canals on Sanctuary nearshore waters, only small positive benefits can be predicted where improvements are implemented.

W.12: Stormwater Permitting. This strategy would require that no development in the Keys be exempted from the stormwater permitting process. This action would benefit all user groups by potentially decreasing the negative impact that stormwater has on Sanctuary waters. However, due to uncertainties about the impacts of nutrient loadings in dead-end canals on Sanctuary nearshore waters, only small positive benefits can be predicted.

W.15: HAZMAT Response. In assessing this strategy, a survey addressing tourist response to a simulated oil spill was used to estimate economic impacts on the county. The hypothetical study showed that in 1987, 55.2 percent of all tourists would leave the Keys if an oil spill occurred, resulting in an estimated loss of between $22 million and $55 million in personal income. Annual user value losses were estimated at between $60 million and $160 million, as a result of a similar hypothetical spill in 1990 (Bell, 1993). The provisions of this strategy are consistent across the mid-range alternatives.

W. 32: Advisory Committee. This strategy would require the establishment of a technical advisory committee to coordinate and guide research and monitoring activities. The undetermined costs and benefits of this strategy would be the same across the mid-range alternatives.

Other Water Quality Strategies

Other strategies that are expected to have socioeconomic impacts include Mosquito Spraying (W.17) and Pesticide Research (W.18), both of which would reduce pesticide use in the Sanctuary. In general, the individual positive impacts of implementing water quality strategies would be minimal, compared to the strategies in combination. Across all strategies there is a potential for large socioeconomic benefits, both in terms of economic value, and sales and employment in the local economy.

Comparative Impacts

Wastewater Management Systems (W.3), Canal WQ (W.10), Stormwater Retrofitting (W.11), and Mosquito Spraying (W.17) are the only water quality strategies that differ by level of protection across alternatives. These strategies have therefore become the basis for determining the comparative impacts of the mid-range alternatives.

Alternative IV. Alternative IV would provide few measures designed to limit water quality degradation; therefore, few socioeconomic benefits would occur. While short-term costs would be low, the long-term costs of continued water quality degradation would be high, and would affect all user groups.

Alternative III. Alternative III would provide significant increases in water quality, regarding both nutrient and toxic inputs. It would, therefore, have significant long-term potential benefits for water quality-dependent activities.

Table 28. *Zoning Strategy Socioeconomic Impacts Across Alternatives*

Alternative IV Impacts	Alternative III Impacts	Alternative II Impacts
User Groups ■ Commercial fishermen • Costs: short-term loss of fishing area • Benefits: potential for long-term increase in stock abundance ■ Other water-related recreation users • Benefits: increased income	**User Groups** ■ Commercial fishermen • Costs: short-term loss of fishing area • Benefits: potential for long-term increase in stock abundance ■ Other water-related recreation users • Benefits: increased income **Strategies** ■ Increased restriction • Z.1, Z.2, and Z.3 (Responsible for an increase in benefits. Costs are unknown)	**User Groups** ■ Commercial fishermen • Costs: short-term loss of fishing area • Benefits: potential long-term increase in stock abundance ■ Other water-related recreation users • Benefits: increased income **Strategies** ■ Increased restriction • Z.1, Z.2, Z.3, and Z.5 (It is unclear which strategies would have the greatest benefits)

Alternative II. Alternative II would involve only small additional Sanctuary-wide reductions in both nutrients and toxics compared to Alternative III, and would therefore result in few additional socioeconomic benefits. The costs associated with implementing strategies W.3 and W.11 make implementing this alternative impractical.

Socioeconomic Impacts: Zoning

As mandated by FKNMSPA, zoning has been proposed to ensure the protection of Sanctuary resources. Each of the five proposed zone types is designed to reduce damage to resources and threats to environmental quality, while allowing uses that are compatible with resource protection. The zones will protect habitats and species by limiting consumptive and/or conflicting user activities, allowing resources to evolve in a natural state, with minimal human influence. The protection of these resources is also vital to the local economy, which is dependent on the preservation of the Keys' unique natural resources.

Key Zoning Strategies

Sanctuary Preservation Areas (SPAs) and Replenishment Reserves are expected to have the greatest socioeconomic impact on user groups, while Wildlife Management Zones and Special-use Zones are expected to have a negligible socioeconomic impact due to their size and location. Existing Management Areas are expected to have no additional socioeconomic impact, since these areas are already in place.

Key Zoning Strategies

Z.1: Wildlife Management Areas
Z.2: Replenishment Reserves
Z.3 Sanctuary Preservation Areas
Z.4: Existing Management Areas
Z.5 Special-use Areas

Table 28 provides a summary comparison across Alternatives II, III, and IV.

Z.1: Wildlife Management Zones. This strategy would affect user groups participating in wildlife observation, or seeking access to these areas. Users participating in wildlife observation would see a small socioeconomic benefit, due to greater assurances of continued wildlife and habitat protection. However, most of these zones are already within three national wildlife refuges and are under restrictions established by the FWS**.** As a result, the strategy is likely to have minimal socioeconomic impacts on Sanctuary users.

Z.2: Replenishment Reserves**.** These zones will limit consumptive activities, while allowing recreational activities that are compatible with resource protection. The proposed Key Largo Replenishment Reserve may displace some users, such as commercial lobster fishermen. Lobster fishermen, tropical species collectors, and recreational and commercial fishermen may also be displaced by the Sambos Reserve. Although these zones would prohibit commercial and recreational fishing, they are expected to have an overall benefit by protecting

spawning and recruitment stocks from overfishing, promoting genetic diversity within the fishery, producing "spill-over" benefits to other nonprotected areas through the migration of individuals across boundaries, and providing important baseline data for use in managing fisheries in other areas. The zones become slightly larger and/or more numerous moving from Alternative IV to Alternative II.

Z.3: Sanctuary Preservation Areas. These zones will focus on the protection of shallow, heavily used reefs where user conflicts occur, and where concentrated visitor activity leads to resource degradation. As with Replenishment Reserves, the groups that will benefit are those that value an abundance and diversity of marine wildlife, including commercial and recreational fishermen and participants in water-related recreation activities. However, tropical fish collectors, lobster fishermen, recreational fishermen, and spearfishermen displaced from these areas, will be negatively impacted. The zones become slightly larger and/or more numerous moving from Alternative IV to Alternative II.

Z.4: Existing Management Areas. Because these areas are already established by Federal, State, or local authorities with competent jurisdiction in the Sanctuary, this strategy will have minimal socioeconomic impact.

Z.5: Special-use Zones. This strategy will have negligible socioeconomic impacts on users because only a small number of areas will be established. Academic and scientific communities will be the primary beneficiaries of this zone type. The areas proposed under Alternative III should have minimal impact on primary user groups, since one zone (Looe Key) is already protected, and two of the remaining zones are low-use areas. This strategy is the same for Alternatives IV and III. Alternative II would limit the number of zones that may be established for high-impact activities.

Comparative Impacts

The primary zoning differences between alternatives are the size and number of the SPAs and Replenishment Reserves that would be established. Moving from Alternative IV to Alternative II, the benefits to user groups from enhanced fish stocks would increase. However, increasing the number of these zones would displace more users, such as recreational fishermen. Overall, the benefits of these zones are expected to outweigh the costs to displaced user groups.

Alternative IV. This alternative would provide the least protection and socioeconomic benefits. The SPAs and Replenishment Reserves would not provide the level of protection and resulting long-term benefits offered by the other alternatives.

Alternative III. This alternative would provide slightly larger and more numerous SPAs and Replenishment Reserves than Alternative IV. The increased number and size of these zone types would provide a moderate increase in benefits to user groups.

Alternative II. This alternative would provide the greatest level of Sanctuary protection through the use of SPAs, Replenishment Reserves, and Special-use Zones. It would, therefore, provide the greatest socioeconomic benefits associated with resource protection, such as long-term stock abundance.

Socioeconomic Impacts: Education

The education strategies within the three mid-range alternatives are expected to have significant positive socioeconomic impacts (Table 29). Educating the public through workshops and school programs, special events (e.g., poster contests and a "Kids' Week"), brochures and newsletters, signs and displays, and public service announcements, for example, would increase public awareness about the Sanctuary. This heightened awareness would result, both directly and indirectly, in improved environmental conditions and equal socioeconomic benefits to all user groups.

Key Education Strategies

Of the 10 education strategies, the Printed Materials strategy (E.1) is expected to have the greatest socioeconomic impact on user groups. In addition, the Signs/Displays/Exhibits (E.3) and Public Service Announcements (E.5) strategies are expected to result in significant positive socioeconomic impacts, as they will affect all users. Positive impacts would

Key Education Strategies

E.1: Printed Materials
E.3: Signs/Displays/Exhibits
E.4: Training/Workshops/School Programs
E.5: Public Service Announcements

Table 29. *Education Strategy Socioeconomic Impacts Across Alternatives*

Alternative IV Impacts	Alternative III Impacts	Alternative II Impacts
User Groups ■ All user groups	**User Groups** ■ All user groups **Strategies** ■ Increased restriction • E.1, E.2, E.3, E.4, E.5 E.7, E.10, and E.11 ■ Additional • E.6	**User Groups** ■ All user groups **Strategies** ■ Increased restriction • E.1, E.2, E.3, E.4, E.5 , E.6, E.7, and E.11 ■ Additional • E.9

also result from the Training, Workshops, and School Programs (E.4) strategy's provisions to increase the knowledge and appreciation of Sanctuary resources, promote and support environmental education in Monroe County and State schools, provide environmental education workshops for educators, and support adult environmental education.

E.1: Printed Materials, E.3 Signs/Displays/Exhibits and E.5 Public Service Announcements. Encouraging voluntary compliance with Sanctuary regulations through education may prove an invaluable alternative to using enforcement personnel. Through the Education Program, identical goals of Sanctuary resource preservation may be achieved with lower operational costs. The distribution of printed materials (E.1) is expected to have the greatest positive impact on user groups. Other strategies, such as Signs/Displays/Exhibits (E.3) and Public Service Announcements (E.5), would also prove economically beneficial through renewed public awareness and respect for the Sanctuary and its habitats. In Alternative IV, Signs/Displays/Exhibits would establish an information program using portable informative displays, some of which would be multilingual. In addition, Alternatives IV and II would require the development of a user-friendly computer system with information on regulations, access, recreational opportunities, etc.

E.4 Training/Workshops/School Programs. Although the benefits for specific user groups from Sanctuary education and training programs are difficult to predict, their overall success has been illustrated at sanctuaries where similar programs have been adopted. Strategy E.4 would increase the knowledge and appreciation of Sanctuary resources through classes, workshops, and in-school presentations. Alternatives II and III have similar provisions for more sophisticated technical training, while the requirements for Alternative IV would provide only some basic training. All user groups would benefit equally from increased environmental awareness, and a clearer understanding of Sanctuary goals and objectives. The benefits of this strategy would be greatest in Alternatives II and III.

Other Education Strategies

All of the remaining education strategies would have positive socioeconomic impacts. These strategies would establish audio-visual materials (E.2), an interagency visitor center (E.7), an education advisory council (E.6), and a forum for special events (E.11). The cumulative effects of these strategies would benefit all Sanctuary users.

Comparative Impacts

The Printed Materials (E.1), Audio-visual Materials (E.2), Signs/Displays/Exhibits (E.3), PSAs (E.5), Advisory Council (E.6), Promotional (E.7), Public Forum (E.10), and Special Events (E.11) strategies vary in their level of protection across alternatives. In each strategy, the scope of services and the targeted audience would increase from Alternative IV to Alternative II, with greater expected benefits occurring in the more protective alternatives.

Alternative IV. This alternative would provide a limited level of educational services. While low in operating costs, it would produce far fewer benefits than either Alternative II or Alternative III.

Alternative III. This alternative would provide moderate increases in educational services compared to Alternative IV, with moderate increases in potential long-term socioeconomic benefits as a result.

Alternative II. This alternative would be the most ambitious and the most costly to implement. Benefits under this alternative would be minimal compared to those expected within Alternative III. Costs, however, would increase significantly because of the expense of programs that are unique to this alternative, particularly the development a new visitor center.

Implementation Costs

The total annual operations and maintenance costs for implementing each mid-range management alternative range from approximately $4 million, for a minimal amount of resource protection, to $12 million, for significantly more resource protection (Table 30). These estimates are based on implementation cost ranges generated by resource managers and experts at a workshop held in Marathon, FL on October 21-22, 1992, and are approximations only. These costs will be borne by the Federal, State, and county governments and NGO partners who have a stake in the long-term health of the Sanctuary. A discussion of possible funding sources is found in the Preferred Alternative/Management Plan chapter in Volume I.

Table 30. *Estimated Annual Operations and Maintenance Costs for Implementing Mid-range Management Alternatives*

Issue	Cost (millions of dollars) Alternative IV	Alternative III	Alternative II
Administration	0.62	0.90	1.24
Boating	1.60	2.70	3.50
Education	0.10	0.10	1.70
Fishing	1.50	1.70	4.10
Recreation	0.30	1.20	1.20
Total	**4.12**	**6.60**	**11.74**

Water Quality Improvements. The total annual operations and maintenance costs for improving water quality in each mid-range alternative vary from over $4 million for Alternative IV, $9.3 million for Alternative III, and $12 million for Alternative II.

These estimates do not include major capital improvements. The Water Quality Protection Program developed by EPA and the State of Florida identified several strategies that require costly capital improvements. For example, Strategy W.3 calls for a range of activities, such as upgrading septic systems at a cost of over $42 million, to constructing community sewage plants at a cost of over $200 million. Strategy W.11 calls for stormwater retrofitting along sections of US 1; this strategy will cost up to $200 million, depending on the size and number of sites retrofitted. These costs are contained in the Phase II report of the Water Quality Protection Program (EPA, 1993).

Future Considerations

In the future, it may be appropriate to conduct a more detailed socioeconomic impact analysis of selected strategies, using traditional methods such as cost-benefit analysis or cost-effectiveness analysis. Such a determination would be based on the nature of the problem, as well as the limitations on available data and resources. Cost-benefit analyses examine the socioeconomic implications of proposed actions by comparing economic impacts with values. They provide decisionmakers with more comprehensive information about the overall result of a given project or policy change than the rather limited picture conveyed by economic impact analyses.

Selection of the Preferred Alternative

Introduction

The National Marine Sanctuaries Act (NMSA) and the Florida Keys National Marine Sanctuary and Protection Act of 1990 (FKNMSPA) mandate the development of a management plan that protects Sanctuary resources, facilitates Sanctuary use, and is compatible with the primary objective of resource protection. These requirements relate directly to the environmental and socioeconomic concerns of the National Environmental Policy Act (NEPA). In addition, the FKNMSPA requires NOAA to incorporate the Water Quality Protection Program regulations developed by the U.S. EPA and Florida Department of Environmental Protection in the Sanctuary's Comprehensive Management Plan, where consistent with the goals of the Sanctuary.

After considering the five proposed management alternatives and conducting an extensive analysis of Alternatives II-IV, NOAA has selected Alternative III as the Preferred Management Alternative. The process used to select the Preferred Alternative included considering recommendations of both the Sanctuary Advisory Council and the Core Group. It also required carefully examining the impacts of each alternative on the region's natural resources and human activities. This chapter outlines the process used to select Alternative III as the Preferred Alternative. It describes the Federal, State, and local benefits of this alternative, and describes how Alternative III compares with the other alternatives on key strategies by issue.

Advisory Council Recommendation

The FKNMS Advisory Council was established to provide a forum for public input into the management planning process. The Council has met regularly since it was formed in early 1992 to provide NOAA with commentary and guidance on all aspects of management plan development, and to receive input from their constituencies. On July 29-30, 1993, the Advisory Council met in Marathon, Florida to: 1) receive public comment on the five proposed alternatives submitted for their review; 2) consider the merits of each alternative; and 3) provide NOAA with a recommendation for a preferred alternative. The Council did not find Alternative I and V to be reasonable, and, therefore, focused on Alternatives II, III, and IV. It provided NOAA with comments representing the Advisory Council's consensus of opinion, and individual concerns regarding the environmental and socioeconomic impacts of the alternatives.

The Council found Alternative III to be the most reasonable for managing the Sanctuary, but suggested changes to some strategies to provide the level of resource protection required to fulfill the intent of the statutes. Consequently, the Council recommended Alternative III with modifications to selected strategies. The Council passed this recommendation by a vote of 17 to 0, with one abstention.

Core Group Recommendation

The Core Group met in Silver Spring, Maryland on August 4-6, 1993 to review the Advisory Council's recommendation, and agreed with the Council's Preferred Alternative and most of their suggested modifications. After carefully reviewing the Council's recommendation and examining all available information on environmental and socioeconomic impacts, the Core Group unanimously selected Alternative III as the Preferred Alternative.

General Rationale

Alternatives I and V were eliminated from consideration early in the evaluation process because they would not adequately achieve the environmental and economic requirements of the NEPA, NMSA, FKNMSPA, and other applicable Federal, State, and local laws. Alternative I focuses solely on resource protection, and would not allow for compatible uses of the Sanctuary. While it would have positive environmental impacts, this alternative would have significant negative socioeconomic impacts, such as virtually closing down commercial and recreational fishing and prohibiting many other recreational uses. Alternative I would not satisfy the FKNMSPA goal not to restrict activities that do not adversely affect Sanctuary resources.

Alternative V (no action) would have negative environmental and socioeconomic impacts over the long term, and would not accomplish the resource protection goals of the NMSA and FKNMSPA. Without the implementation of a management plan, continued environmental degradation will occur. This environ-

mental degradation is inconsistent with the FKNMSPA mandate, and ultimately will lead to significant losses of revenue, jobs, and investments in the marine-based tourism, recreation, and commercial fishing industries. These impacts are not consistent with the FKNMSPA goal of facilitating multiple Sanctuary uses.

The following section describes how Alternative III is consistent with the goals and policies of overlapping jurisdictions and concerns of Federal, State, and local governments.

Federal Concerns

Alternative III provides the level of comprehensive Sanctuary management that assures adherence to the policy and purpose of the Sanctuary's designation (Sec. 3 [a] and [b]) as stated in the FKNMSPA. The impacts of activities adversely affecting Sanctuary resources, as defined in section 302(8) of the National Marine Sanctuaries Act (NMSA) of 1972 (16 USC, 1431 et seq. as amended), are mitigated with the greatest level of environmental protection, while producing the least adverse socioeconomic impact on affected user groups.

Alternative III complies with the mandates for the development of a comprehensive management plan for the FKNMS, and promotes all public and private Sanctuary uses consistent with resource protection. It includes a zoning scheme that minimizes negative socioeconomic impacts on Sanctuary users, while providing positive environmental and socioeconomic consequences commensurate with the Sanctuary's purpose. Zoning proposals included in Alternative III will provide resource protection for heavily used portions of the Sanctuary that are economically important to many commercial activities (such as dive operations, which represent a large user group), while not overly restricting other commercial and recreational interests in the Sanctuary.

In addition, NOAA has involved Federal, State, and local agencies; resource managers; scientists; a citizens' Sanctuary Advisory Council; and user groups in compiling the management strategies contained in all alternatives. These groups were also instrumental in helping NOAA select Alternative III as the Preferred Alternative.

Alternative III incorporates elements of the Water Quality Protection Program developed by the EPA and FDEP. Strategies addressing water quality were selected because of their anticipated effectiveness in resolving water quality issues with the most beneficial environmental consequences, and the least negative socioeconomic impacts.

In contrast, in the short term, Alternative IV would have fewer negative socioeconomic impacts on Sanctuary users, but would not adequately address the long-term environmental impacts that currently are degrading Sanctuary resources. Alternative II would provide greater environmental protection than Alternatives IV and III, but would place a greater economic burden on some of the Sanctuary's commercial and recreational users.

State Concerns

Alternative III provides the best option to accomplish the Sanctuary's intended goals to protect the resources of the Florida Keys, educate the public about the marine environment, and manage human uses in a manner that will not restrict activities that do not have an adverse effect on Sanctuary resources.

The management strategies in Alternative III will provide a balanced set of actions for managing marine resources throughout the entire Sanctuary, and will help protect the invaluable natural resources upon which the local economy depends. This comprehensive set of strategies addresses all resource management issues related to recreation, boating, fishing, land use, environmental education, water quality, and zoning. These strategies provide the policy basis for the new regulations required to effectively manage marine resources and avoid conflicts among user groups. They are designed to sustain resources, while allowing users who depend on them for their livelihood to continue their activities in a fair and reasonable manner that will not cause degradation.

The principles of marine ecosystem management incorporated into Alternative III will provide benefits to the State of Florida that will be realized through effective marine resource protection, positive socioeconomic impacts, and increased administrative efficiency. The State's focus on ecosystem management will also be enhanced by the Federal legislation and the resulting management strategies of this alternative.

Geographically, the Sanctuary covers an area large enough to allow for effective ecosystem management. Since the Sanctuary incorporates virtually all Florida Keys' State waters, effective coordinated management of the Sanctuary ecosystem must be

compatible with Florida's management goals. Alternative III provides that compatibility, as well as the enhanced opportunity for Florida to accomplish these goals under the authority of NMSA and FKNMSPA.

Alternative III's holistic ecosystem management approach will enable effective, cooperative resource management among all involved Federal, State, and local agencies. It will allow the management goals of all agencies with sites within or near the Sanctuary's boundaries to be accomplished more easily and successfully, and will allow each of the existing management programs and the Sanctuary to complement each other and support resource protection throughout the ecosystem. Through cross-deputization, the State can substantially increase the ability of officers to regulate the destruction of vital marine resources in State waters under the authority of the civil enforcement provisions of the NMSA. The management capability provided in Alternative III is also consistent with State protected areas, including aquatic preserves; State parks and recreation areas; outstanding Florida waters; the Area of Critical State Concern designation. It is also consistent with State-Federal management agreements, such as cooperative efforts designed to manage the federally designated national wildlife refuges that overlap with State sovereign submerged lands, and regulations of the Florida Marine Fisheries Commission.

Local Concerns

Many of the strategies in Alternative III support the current regulations or planned goals, objectives, and policies set forth in the Monroe County Comprehensive Management Plan. In the long run, the FKNMS management effort can help the County in its own planning efforts. Significant public dollars will be required to accomplish either set of planning goals. Many of these are common to both management efforts, and can be developed cooperatively, and with joint resources. For example, Alternative III incorporates elements of the Water Quality Protection Program developed by the EPA and FDEP. This plan has contributed significantly to the County's growth management plan, saving considerable time and effort that would have been spent to develop similar information.

Monroe County also has an opportunity to coordinate the implementation of its land use and water quality strategies with those of the Sanctuary. The management capability provided in Alternative III is also consistent with local resource protection efforts, such as the Boating Impacts Management Plan and the Growth Management Plan developed for Monroe County.

Public involvement has been substantial during the Management Plan development phase. NOAA's foresight in involving government agencies at all levels, resource managers and scientists, a citizens' Sanctuary Advisory Council, and user groups in developing management strategies and alternatives is commendable. These groups were instrumental in providing NOAA with their recommendation for the Preferred Alternative. Early participation and the advocacy of the Sanctuary Advisory Council have provided opportunities for public participation throughout the planning process.

Alternative III's management approach will allow effective, cooperative management among all government agencies both within or adjacent to Sanctuary boundaries. It will allow the existing management programs and Sanctuary to complement each other and support resource protection. This integrated, coordinated approach to management will reduce the redundancy of overlapping agency authorities and fill in gaps. In addition, the resource protection it provides will benefit many user groups. Few users will be negatively impacted by restrictions on their activities, as such restrictions are site-specific and not Sanctuary-wide, to fulfill the Sanctuary goals. The presence of the Sanctuary is also expected to increase property values because of improved environmental conditions.

Basis for Selection

This section describes why Alternative III has been selected over Alternatives II and IV. The discussion is organized by issue, and focuses on those strategies whose impacts vary across alternatives, or those with the greatest environmental and socioeconomic impacts.

Boating Strategies

Alternative III offers the greatest environmental protection with the least negative socioeconomic impacts of the three mid-range alternatives. Although Alternative II generally would provide greater environmental protection than Alternatives III and IV, the cost of implementation and the burden on Sanctuary users render this alternative impractical. Alternative IV would have a lower negative economic impact and

be less of a burden on users, but would not provide the environmental protection specified as most desirable by the NMSA and FKNMSPA.

Strategy B.1 (Boat Access). This strategy will reduce resource impacts from boating activities throughout the Sanctuary.

- Alternative III will provide environmental protection by initiating a boating access plan that: 1) directs new public access to low-impact areas (i.e., marinas and mooring areas); and 2) requires the modification of access ramps directly affecting sensitive areas (e.g., seagrasses, mangroves, and hardbottoms) throughout the Sanctuary.

- Alternative IV would not offer the geographic coverage necessary for this strategy to be effective, nor does it represent a comprehensive solution regarding access concerns in sensitive areas.

- Alternative II would provide broader geographic coverage and, therefore, would be more effective; however, strategy implementation throughout the Sanctuary would be very costly.

Strategy B.2. (Habitat Restoration). This strategy will promote research and development of new technologies to restore and enhance coral, seagrass, and mangrove habitats in the Sanctuary.

- Alternative III would allow for the development and implementation of a restoration plan for severely impacted areas.

- Alternative IV would only allow for the continuation of ongoing restoration activities, and would not adequately address other impacted areas.

- Alternative II would provide greater environmental protection than Alternatives III and IV; however, implementation at all impacted areas within the Sanctuary would be cost-prohibitive.

Strategy B.3 (Derelict Vessels). This strategy will reduce direct and indirect impacts to natural resources from derelict and abandoned vessels.

- Alternatives III and II would provide the greatest environmental protection by providing a plan for removing derelict vessels throughout the Sanctuary, based on the prioritization of problem areas and the consideration of funding constraints. Accordingly, high-use and sensitive areas will receive the greatest focus.

- Alternative IV would not provide adequate resource protection, as it would not require the removal of derelict vessels, even from high-use and sensitive areas.

Strategy B.4 (Channel Marking). This strategy will reduce damage to natural resources caused by boating activities.

- Alternatives III and II will reduce the damage to natural resources by implementing a detailed and comprehensive plan for high-use and sensitive areas within the Sanctuary. This will include setting priorities and identifying problem areas to be addressed first. Environmental benefits will result from: 1) marking frequently used channels, shallow-water reefs, shoals, and other significant features; and 2) reducing erosion from various causes.

- Alternative IV would not effectively protect Sanctuary resources, due to the limited spatial extent of strategy implementation (i.e., sensitive areas only).

Strategy B.6 (Additional Enforcement). This strategy will increase the presence of law enforcement officers (LEOs) on the water to protect Sanctuary resources and reduce user conflicts.

- Alternative III will increase resource protection by adding 30 LEOs to patrol Sanctuary waters.

- Alternative IV would add only 10 LEOs, which would not ensure an adequate level of resource protection.

- Alternative II would add 50 LEOs, which will be very costly to fund without impacting users.

Strategy B.8 (User Fees). This strategy examines mechanisms for generating funds for Sanctuary management and related research.

- Alternatives III and II will provide sound resource protection and management by applying mechanisms, including user fees, for generating funds for use in Sanctuary management. A fair and equitable method of determining impact fees that will not cause undue burdens on user groups will be provided.

- Alternative IV would provide less potential funding for future Sanctuary management by not committing to an impact fee plan.

Strategy B.13 (Salvaging/Towing). This strategy will reduce damage to natural resources resulting from improper vessel salvage procedures.

- Alternative III will provide an appropriate level of Sanctuary resource protection by: 1) establishing regulations and procedural guidelines for commercial salvaging and vessel towing operations; 2) requiring permits for commercial salvaging and towing operations; and 3) establishing a salvage operator training program that will reduce the impacts of inexperienced salvage operators.

- Alternative IV would not provide adequate resource protection, as this strategy would not be implemented throughout the Sanctuary.

- Alternative II would require training for all commercial salvaging and towing operations as part of the permit process, a program that would be too costly to implement.

Strategy B.15 (Mooring Buoys). This strategy will decrease user conflicts, prolong mooring buoy life, and reduce the risk of vessel groundings.

- Alternatives III and II will provide adequate resource protection through the development and implementation of a comprehensive mooring buoy plan throughout the Sanctuary. Areas of immediate concern will be prioritized, with problem areas given principle consideration.

- Under Alternative IV, the mooring buoy plan would be implemented in sensitive areas only, providing limited resource protection.

Strategy B.17 (Personal Watercraft Management). This strategy will reduce damage to natural resources in the Sanctuary due to the improper operation of motorized boats and personal watercraft (PWC), and will address user conflicts.

- Alternative III will reduce conflicts between Sanctuary visitors and PWC users. It provides adequate resource protection by offering the most enforceable options regarding the distance PWCs and other motorized vessels must maintain from other Sanctuary users, edges of flats, and other sensitive areas.

- The 100-yard buffer proposed in Alternative IV would not provide adequate resource protection from improper PWC/motorized vessel operations.

- The 300-yard buffer zone proposed in Alternative II would create an undue burden on users, particularly on PWC operators, because such a wide separation prevents reasonable use and access from shore.

Fishing Strategies

As the Preferred Alternative, Alternative III will provide beneficial environmental impacts through an increased protection of natural resources. It offers greater protection than Alternative IV, but less protection than Alternative II, which would provide more natural resource protection at a significantly higher economic and social cost to users.

Strategy F.3 (Stocking). This strategy will build on stock research conducted elsewhere to determine the effect of fish stocking on the genetic integrity of native species in the Sanctuary.

- Alternatives III and II will protect species and habitats by implementing a moratorium on stocking activities until adequate research is conducted to prevent damaging impacts resulting from such activities. Through appropriate research, these alternatives will prevent: 1) the spread of diseases from hatcheries to wild populations; 2) the genetic alteration of wild stocks from hatchery selection; and 3) economic waste by ensuring the survival of released species. This strategy should have no detrimental economic impacts because wild stocking is not currently practiced in the Sanctuary.

- Alternative IV would not provide for a moratorium on stocking programs while potential problems are being adequately researched. This would increase the chances for environmental damage from ill-advised stocking activities.

Strategy F.4 (Aquaculture Alternatives). This strategy will reduce fishing pressures on commercially harvested marine species, and help to satisfy the commercial demand for these species.

- Alternative III will provide moderate protection for harvested species by reducing the fishing pressure on wild populations. Research and promotion of appropriate aquaculture operations help to satisfy public demand. This alternative will mostly benefit species with particularly high economic value, such as those in the ornamental aquaria trade and expensive food species. Research and regulations will protect the environment by ensuring that aquaculture operations are environmentally compatible.

- Alternative IV would not provide any strategy for aquaculture, thus allowing continued and possibly increasing pressure on wild stocks.

- Alternative II would increase environmental protection by developing regulations to reduce or eliminate the harvest of wild stocks, once effective aquaculture techniques are developed for particular species. However, this alternative could cause economic hardship among those fishery participants who cannot make the transition to aquaculture operations. The increased environmental protection provided does not justify the additional costs.

Strategy F.5 (Limited Entry). This strategy will access existing fishery regulatory programs that limit the number of persons, vessels, or fishing gear units using specific Sanctuary fisheries.

- Alternative III would require the implementation of appropriate limited-entry mechanisms for selected fisheries in the Sanctuary. By adjusting fishing efforts and harvests to support such activities, specific habitats will be better protected and certain species will be protected from overexploitation. This alternative will provide economic benefits to the fishing industry by reducing the chances of fishery collapse and overexploitation. Also, economic revenue to fishermen would be higher and more stable, and overcapitalization of the fishery is less likely to occur.

- Alternative IV does not require the implementation of regulations to ensure the long-term sustainability of Sanctuary resources, thus increasing the chances of economic disruption from overfishing and overcapitalization. Fishing interests in applicable fisheries are, therefore, likely to generate less income than in Alternative III.

- Alternative II would require the implementation of regulations limiting entry to all Sanctuary fisheries. The cost of implementing this alternative could be considerable, due to data needs and administrative requirements. Also, this alternative would not provide significant economic benefits to many currently overfished fisheries.

Strategy F.6 (Fisheries Sampling). This strategy will evaluate and modify existing commercial landing and recreational creel census programs, which provide statistically based management data for regulating take.

- Alternatives III and II will improve fisheries sampling, effort levels, and catch, thereby providing more precise and accurate data on resource status and use. This data can be used by managers to protect the resource and the economic viability of fisheries by allowing more response from appropriate fishery management agencies. Fishery problems are more likely to be anticipated or detected during early development stages, before they become acute and cause detrimental environmental and economic consequences. Fishery management agencies will then be able to better respond to local conditions and individual fisheries. Fishermen will benefit economically, because recruitment monitoring will provide better anticipation of future stock conditions and allow them to act accordingly. Also, the effects of environmental changes caused by human and natural events will have a greater chance of being recognized and associated with specific causal mechanisms. Distinct statistical areas will be established under Alternatives III and II.

- Alternative IV would provide significantly less resolution in fishery sampling, allowing for overexploitation and environmental damage to stocks from fishery operations. Poorer sampling will also increase the chances of economic disruption.

Strategy F.11 (Gear/Method Impacts). This strategy will reduce impacts to corals, hardbottoms, seagrasses, and other habitats through the development of alternative gear designs and types.

- Alternative III will increase habitat protection through regulations requiring low-impact gear and methods in priority areas. It will provide the

best balance between environmental protection and implementation costs.

- Alternative IV would rely on voluntary programs to reduce habitat damage caused by destructive fishing methods, and would be significantly less effective than Alternative III.

- Alternative II would mandate the use of low-impact gear throughout the Sanctuary. In non-sensitive habitats, this alternative would provide only minor environmental benefits, but at much greater overall costs to the fishery.

Strategy F.14 (Spearfishing). This strategy will determine the impacts of spearfishing on species composition and abundance, reduce incidental habitat damage, and reduce user conflicts.

- Alternatives III and IV will develop and impose spearfishing regulations in high-priority areas (i.e., areas exhibiting a low stock abundance, and areas vulnerable to resource depletion due to high use or extreme user conflicts).

- Alternative II would develop and implement regulations throughout the Sanctuary, but at considerable administrative, enforcement, and social costs, that are unnecessary in nonsensitive habitats or locations. The additional environmental benefits are not likely to be justified by the increased costs and hardships imposed on users.

Strategy F.15 (Sponge Harvest). This strategy will: 1) determine harvesting methods with low adverse impacts on both species and habitats through research and assessment activities; and 2) identify areas exhibiting low abundance, low recovery rates, and habitat damage.

- Alternative III will increase the protection of habitat and certain sponge species from overharvesting throughout the Sanctuary by implementing appropriate research-based regulations.

- Alternative IV would provide less protection than Alternative III by requiring the development and implementation of appropriate regulations for sponge harvesting only in high priority areas.

- Alternative II would impose a three-year moratorium on sponge harvesting to allow for the development of appropriate regulations. This would create a hardship on fisheries with questionable benefits, because no scientific basis exists for adopting such a moratorium.

Recreation Strategies

The recreation strategies in each of the mid-range alternatives provide increased resource protection in site-specific areas through carrying-capacity limits and submerged cultural resource management. Their implementation will have positive impacts on habitats and species compared to the status quo. However, they will have little direct impact on water quality. A prohibition on the unauthorized removal of historic resources throughout the Sanctuary appears in each of the mid-range alternatives. A permit may be available if proper research and recovery is documented in the permit application, and minimal adverse impact to Sanctuary resources is expected.

Alternative III will provide immediate increased protection to coral reefs and other natural resources by prohibiting commercial salvage in areas where such resources may be harmed, and by prohibiting coral touching in certain areas. Protecting the integrity of natural resources will, in the long term, provide benefits to recreational divers, charter boat operators, boaters, and other users involved in tourism, whose activities require good water quality, a diverse and healthy ecosystem, and the protection of Sanctuary resources of historical significance.

Strategy R.1 (Submerged Cultural Resource Management). This strategy protects submerged cultural resources (SCR) from disturbances through an SCR Management Plan/Program and maintains these resources for research, education, science, and recreational activities. Habitat protection increases from Alternative IV to II.

- Alternative III provides immediate protection to submerged cultural resources and natural resources. Objectives are not duplicated by requiring permits for charter/rental vessels and carrying capacities. This alternative is primarily based on the Abandoned Shipwreck Act (ASA) guidelines, NOAA policy statements, NOAA permit decisions, and various meetings and discussions between representatives of NOAA and the State of Florida. Alternative III is needed because the current State regulation on SCRs does not adequately protect natural resources. Alternative III is also based on cooperation with the State on interim permits

granted to: 1) the Scott/SMRI for the NORTHERN LIGHT; 2) Dr. Molinari; 3) Chapman/Fisher for the ATOCHA and the MARGUERITA; 4) Duncan Mathewson; and 5) Don Washington. This alternative does not permit commercial salvage in certain areas (e.g., protected areas, coral/seagrass areas, or areas with significant natural/historical resources) that potentially would be harmed by excavation, but permits private recovery in relatively barren areas where natural resources will not be adversely harmed. Restoration conditions will be considered case-by-case, where possible, and privately financed. Recovery will be conducted in an environmentally and archaeologically sound manner using the ASA guidelines and the Federal Archaeological Program for land sites in the marine environment.

Alternative III also requires individuals interested in treasure hunting to obtain a permit for conducting their activities. The purpose of the permit is to protect natural resources that will generate long-term benefits to resource users. Permits require a professional archaeologist to supervise research and recovery efforts, and contain an agreement for the division of recovered items. The artifacts will be divided equally between discoverer/recoverer and the government, with possible case-specific exceptions.

Alternative III is preferred and consistent with a zoned management approach. It promotes the spirit of compromise by utilizing different parts of the ASA guidelines prohibiting treasure hunting in zoned areas and near coral and seagrass beds, while allowing private recovery in other areas when conducted in an environmentally and archaeologically sound manner.

- Alternative IV would allow treasure hunting throughout the Sanctuary, and extend the 80/20 split between discoverer/recoverer and the government in current Florida agreements to Federal submerged lands and waters. The qualifications and methodology requirements are also more lax under Alternative IV than under Alternatives II and III. Thus, Alternative IV would have negative environmental and socioeconomic impacts on tourism over the long term. The State also reports that historical resource protection under the current system is of concern, due to the lack of compliance with archaeological guidelines. This alternative would not have a negative impact on the treasure hunting industry. However, Alternative III will provide greater control mechanisms to ensure that an environmentally and archaeologically sound recovery is conducted.

- Alternative II would be based primarily on existing regulations and policies applied in other national marine sanctuaries, including the MONITOR and Monterey Bay. Current policy/guidelines/regulations in other national marine sanctuaries would be strictly applied throughout the FKNMS. The ASA guidelines reflect a compromise among preservationists, recreational users, and treasure hunters. While strict adherence to the ASA guidelines prohibiting treasure hunting and souvenir collection in sanctuaries and reserves would justify this alternative, it would eliminate the treasure hunting industry throughout the Sanctuary. While Alternative II would provide increased resource protection, it would have a negative socioeconomic effect on many users. By comparison, Alternative III allows commercial treasure hunting activities to the extent compatible with resource protection.

Strategy R.2 (Recreation Survey). This strategy will provide data on the types, levels, users, and locations of recreational activities within the Sanctuary to enable better planning for management concerns (e.g., access to sensitive or heavily used areas, user conflicts, and adverse impacts to resources).

- The plan for routine surveys of recreational use in Alternatives III and IV will assist in identifying specific access and carrying-capacity problems and issues, as well as high-use areas where user conflicts occur.

- In addition to the surveys, Alternative II would require a permitting system to regulate use for charter and rental vessels. This is very restrictive, and may place an economic burden on charter and rental facilities, which make up a significant sector of the local economy.

Strategy R.5 (Carrying Capacity). This strategy will provide information used to reduce impacts to Sanctuary resources from recreational activities, by determining the carrying capacities of different habitats.

- Alternative III offers more protection than would Alternative IV by increasing the geographic coverage to both high-use and highly sensitive areas throughout the Sanctuary.

- In Alternative IV, carrying-capacity limits would be enforced only in highly sensitive areas.

- Alternative II would have a significant socio-economic impact on all users through the enforcement of carrying-capacity limits, and the regulation of charter and rental vessels throughout the Sanctuary. Alternative II would also detract from the ability to focus on areas needing protection. In contrast, Alternative III limits will be enforced only in select areas, and will not regulate charter and rental vessel use.

Zoning Strategies

Alternative III will adequately protect diverse habitats. Alternative II would provide more protection of habitats than Alternatives III and IV, but at a significantly higher economic and social cost to users than Alternative III. Alternative IV would provide increased resource protection over the status quo, but far less protection than Alternative III.

Strategy Z.1 (Wildlife Management Areas). This strategy will reduce the disturbance to wildlife populations and their habitats.

- Alternative III complements the management efforts of the FWS. The Wildlife Management Areas contained in this alternative include all the areas proposed by the FWS in their Backcountry Management Plan, as well as other areas. Providing a regulatory framework under the cooperative enforcement agreement makes it possible to apply Sanctuary enforcement within the boundaries of wildlife refuges and other existing management areas.

- Alternative IV would protect fewer areas than Alternative III, and thus, would inadequately protect diverse habitats.

- Alternative II would protect more areas than Alternatives III and IV. However, management of these areas would be very difficult and costly.

Strategy Z.2 (Replenishment Reserves). This strategy will establish Replenishment Reserves to protect Sanctuary resources, such as habitats and species, by limiting consumptive activities while continuing to allow recreational activities compatible with resource protection. These reserves will: 1) protect the habitat and food supply of commercially important fish; 2) protect many fisheries from collapse; 3) provide critically needed, long-term control areas in currently exploited areas where scientific research can be conducted without direct human disturbance; and 4) improve resource monitoring to distinguish between changes caused by human and natural events.

- The size and distribution of the Replenishment Reserves proposed in Alternative III will not cause undue hardship on any single user group in the Sanctuary, but will result in significant areas being protected from harvesting activities. The short-term economic burdens on a limited number of fishermen (who will be displaced to other areas of the Sanctuary) will be compensated for over the long term by an improvement in the Sanctuary's environment and resources. Specifically, the Replenishment Reserves proposed in Alternative III will be the most effective tool used by Sanctuary managers to protect the biodiversity of Sanctuary resources as described in Section 7(a)(2) of the FKNMSPA.

- The Reserves that would be established in Alternative IV would be smaller and fewer in number than those in Alternative III, thus providing inadequate protection of diverse habitats.

- In Alternative II, the number and size of reserves would increase, but the increased protection would be very costly in terms of management, enforcement, and user impacts. For this reason, Alternative II is not financially practical.

Strategy Z.3 (Sanctuary Preservation Areas). This strategy will establish nonconsumptive Sanctuary Preservation Areas to enhance the reproductive capabilities of renewable resources, protect areas critical for sustaining and protecting important marine species, and reduce conflicts in high-use areas.

- Alternative III will provide economic benefits by providing an enhanced habitat and greater resource protection, while allowing traditional activities to continue in areas surrounding the zones.

- Alternative IV would provide minimal protection of diverse habitats. The proposed Sanctuary Preservation Areas would be smaller and fewer than those in Alternative III.

- Alternative II would provide larger and more numerous Sanctuary Preservation Areas than either Alternatives III or IV. Managing these areas would be more difficult and costly, and many users would be impacted, as sites where commercial and recreational activities currently occur are designated for protection.

Strategy Z.5 (Special-use Areas). This strategy will be used to set aside areas for specific uses to reduce user conflicts and adverse environmental effects from high impact activities.

- Alternative III will provide numerous areas for research and other special uses. The number and size of these areas will not cause undue hardship on any user group.

- Alternative IV would contain more of these areas, and the areas may be larger in size. This alternative would not provide the level of resource protection found in Alternative III.

- Alternative II would allow for fewer and smaller areas, and the types and levels of activities permitted in these areas would be more restricted than in Alternative III. The increased resource protection provided by this alternative would be minimal, while the management costs and negative socioeconomic impacts would be much higher than in Alternative III.

Land Use Strategies

The strategies in Alternative IV will result in direct positive environmental impacts such as water quality improvement, particularly near improved marine facilities, docks, marinas, and other shoreside facilities. Alternatives II and III, however, will provide more water quality improvements in the long term by reducing the level of heavy metals and other toxicants entering Sanctuary waters from boat maintenance operations. Alternative III is preferred when environmental impacts are evaluated against costs, because several strategies in Alternative II would be far more costly to implement, and would provide no significant improvement in environmental conditions.

Strategy L.3 (Boat Maintenance). This strategy requires an evaluation of refueling operations through a detailed inventory of fueling facilities and an assessment of typical fuel-handling techniques. Little effort is now directed at containing and collecting wastes associated with boat maintenance activities (e.g., bottom scraping and mechanical repairs) within the Sanctuary.

- Alternatives III and II contain the same proposed actions, and will provide water quality improvements by reducing pollution. Containment areas will be established to prevent paint chips, paint dust, and other toxicants from entering surface waters. Also, the establishment of secondary containment for hazardous or toxic material storage areas will reduce the chance of these substances entering the ground or surface waters.

- Alternative IV would provide fewer water quality improvements in containment areas than Alternatives II and III, and would not adequately meet Sanctuary goals.

Strategy L.8 (Containment Options). This strategy involves researching methods of solid waste disposal (other than landfill creation) to determine what regulations are necessary to meet State recycling goals, implement retail packaging standards, and require source separation.

- Alternatives III and II require the study of containment and relocation options for solid waste facilities within the Sanctuary, and the implementation of appropriate recommendations within five years. Leachate from solid waste facilities within the Keys includes nutrients, heavy metals, and other toxicants. The environmental impacts of implementing these alternatives are low and site-specific, but will include water quality, species, and habitat improvements. Small negative socioeconomic impacts will result for various users. All landowners within the Sanctuary will be impacted by additional solid waste fees; however, this negative impact could be mitigated by Federal and State grants/assistance in implementing the improvements, thus reducing any economic burden. These alternatives also provide a mechanism for implementing the recommendations of containment and relocation studies that will improve nearshore water quality and the character of associated biota at a limited direct cost to the public. The overall socioeconomic impact to the Sanctuary will be positive.

- Alternative IV would not require the implementation of any recommendations made in the containment and relocation studies. Accordingly, there would be no environmental or socioeconomic impacts. Monroe County has already assessed containment options, but the options for solid waste facility relocation and alternative disposal technologies have not been examined in detail.

Strategies L.14 (Dredging Prohibitions), L.15 (Dredging Regulations), and L.18 (Wetland Dredge and Fill). Positive environmental impacts will result from the implementation of these strategies. However, some negative socioeconomic impacts may result from development restrictions on wetlands, which may decrease the property values of undeveloped lands. Developed residential and commercial properties should increase in value, which may offset ad valorem deficits due to restrictive guidelines. In contrast, the positive environmental impacts of these strategies are significant, and will result from the reduction and/or elimination of resource destruction. As wetland resource degradation will be halted, Sanctuary users may continue to use the resources at current levels.

- Alternative III will: 1) reduce and/or eliminate the destruction of wetland and submerged resources; 2) improve water quality in areas that might have otherwise been dredged; 3) eliminate the suspension of sediments and associated toxicants; and 4) maintain species and habitat character. This alternative will prohibit new dredging permits unless they are in the public interest, or if no environmental degradation will occur.

- Alternative IV would provide fewer restrictions on dredge and fill activities, and no new restrictions on maintenance dredge and fill operations would be considered. The positive environmental impacts that result from Alternative IV would be significantly less than for Alternatives II and III.

- Alternative II would prohibit new dredging altogether, even where no environmental degradation would occur and the public would benefit from these activities. The economic burden associated with implementing this alternative would be significant.

Strategy L.20 (Public Access). This strategy will provide information on problems associated with existing public access areas, including habitat damage and user conflicts.

- Alternatives III and II will require an assessment of existing public access to shoreline areas and the Sanctuary. In addition, they will provide for the development of standards for improving and constructing public access areas, and emphasize the acquisition of some access areas through existing acquisition programs. These alternatives will provide primarily for the improvement of shallow-water habitats within the Sanctuary by controlling access to damage-prone areas. Some negative socioeconomic impacts will result from the potential reduction of easily developed sites with marine access, or through the acquisition of some of these sites. This strategy would limit future development on some properties with marine access. However, most user groups, including commercial fishermen, fishing guides, and dive operators, will not be negatively impacted.

- Alternative IV would not involve the acquisition of marine access points. Socioeconomic benefits would be high, as the development potential for properties with marine access would remain higher than that of property acquired to control public access. Damage to sensitive shallow-water habitats would continue, due to uncontrolled access. Alternative IV would not provide for resource protection as adequately as Alternatives III and II.

Water Quality Strategies

These strategies will focus on reducing the amount of nutrients and toxicants entering Sanctuary waters. A combination of engineering, management, and institutional options will address known problems. In addition, a research and monitoring program will allow for the effectiveness of pollution control strategies to be measured, and the relationships between water quality and living resources to be examined. Alternative III contains all of the strategies in the Water Quality Protection Program developed by the EPA and FDEP. It is a comprehensive list that addresses all water quality problems, including far-field influences. Accordingly, it meets the resource protection purposes for which the Sanctuary was designated. These strategies will have positive socioeconomic impacts on users who are dependent on water-related activities requiring good water

quality. Scuba diving, snorkeling, and commercial and recreational fishing may be directly affected by changes in water quality conditions.

Strategy W.3 (Wastewater Management Systems). This strategy will reduce the amount of pollutants entering the groundwater by enforcing existing standards.

- Alternatives III and II will involve research to estimate the level of wastewater nutrient loading reduction needed to restore/maintain water quality and Sanctuary resources. They will have positive environmental impacts by significantly improving existing water quality conditions within the Sanctuary. These alternatives are comprehensive, and address all known water quality problems, including far-field influences. They also recognize that limited information is available in certain areas, and recommend an extensive research and monitoring program. Implementing engineering, management, and institutional options addressing known problem areas within the Sanctuary will reduce the amount of nutrients and toxicants entering Sanctuary waters. Additionally, exhibits will be used to educate local residents and visitors about Sanctuary regulations and the South Florida ecosystem. The education program implemented by this strategy will facilitate compatible uses, and reduce user conflicts by educating the public about environmental sensitivity and the specific needs of various users. Public awareness and appreciation of Sanctuary resources will increase significantly, and behavior that results in the degradation of Sanctuary resources will decrease.

- Although it would be the least costly to implement, Alternative IV would rely on the enforcement of, and compliance with, existing regulations and technologies to address water quality problems, while focusing primarily on research and monitoring and assessment activities. The implementation of specific actions to address known problem areas, such as dead-end canals and basins, is minimal in this alternative, and would result in further water quality degradation. Alternative III, however, addresses all known problem areas and calls for the application of improved technologies where feasible.

Strategy W.7 (Surface Discharges). This strategy requires all NPDES-permitted surface discharges to develop resource monitoring programs.

- Alternatives III and II will provide additional positive benefits by establishing a mechanism to evaluate the environmental impacts of point source discharges.

- Alternative IV does not contain this strategy, and therefore is less desirable in terms of resource protection.

Strategy W.10 (Canal Water Quality). This strategy examines water quality in nearshore confined areas, with an emphasis on dead-end canals and basins where reduced circulation increases the risk of: 1) dissolved oxygen reduction; 2) dissolved and particulate pollutant retention; and 3) benthic/pelagic environment impacts. Water quality in dead-end canals influences real estate values. Property on canals with good water quality is more marketable, and subsequently has a higher value, than similar property on canals with poor water quality. Implementing improvements in dead-end canals will be a learning process, as managers use monitoring to assess which improvements significantly impact water quality, and what improvements have the highest cost/benefit ratios.

- Alternative III will provide a logical approach to implementing improvements in critical areas and dead-end canals that are recognized as hot spots. It meets the purpose for which the Sanctuary was designated and it complies with the requirements of Section 8 of the FKNMSPA. As required by the Act, this alternative recommends priority corrective actions and compliance schedules that address point and nonpoint sources of pollution to restore and maintain the chemical, physical, and biological integrity of the Sanctuary.

- Alternative IV would focus only on the inventory and assessment of dead-end canals and basins. No improvements are planned for implementation. This would be the least costly alternative in the short term, but would allow current resource degradation to continue and possibly increase. Alternative IV would not provide improvements in current or future water quality.

- Alternative II would implement improvements in dead-end canals and basins throughout the

Sanctuary. Without knowing how effective certain improvements will be, implementing a Sanctuary-wide improvement program could result in great expense with minimal improvements to water quality, as emphasis is not focused on critical areas.

Strategy W.11 (Stormwater Retrofitting) This strategy will reduce sediments, toxicant, and nutrient loadings using various engineering methods.

- In Alternative III, the geographic coverage will include hot spots and limited sections of US 1.
- Alternative IV does not contain this strategy, and therefore, is less desirable in terms of resource protection.
- In Alternative II, stormwater retrofitting would be extended to degraded areas and numerous sections of US 1. The additional financial burden of extending this strategy would be cost-prohibitive and not realistically achievable through traditional funding mechanisms.

Education Strategies

The NMSA and the FKNMSPA recognize that public education regarding the Sanctuary and its resources is essential to effective resource protection and management. Although the impact of educational strategies is hard to gauge, awareness is clearly a key to environmental stewardship.

Strategies E.1 (Printed Materials), E.2 (Audiovisual Media), E.3 (Signs/Displays/Exhibits), E.4 (Training/Workshops/School Programs), E.5 (Public Service Announcements), E.7 (Promotional Materials), E.9 (Ecotourism Promoter), E.10 (Public Forum), and E.11 (Special Events). These strategies provide for the development of printed materials; audiovisual materials; a library for private and public use; displays and signs; training programs; public service announcements; an education advisory council; visitor booths; periodic public meetings; and presentations to promote Sanctuary awareness, resources, and environmental quality.

- Alternative III will provide an education program that fulfills the purposes of the Acts. Programs established through this alternative will include such public outreach endeavors as support of local school systems through teacher training and field trips; environmental education of law enforcement officers; educational opportunities for adults; regular public meetings on Sanctuary issues; special events such as “Kids' Week,” “Sanctuary Awareness Week,” and festivals; lecture series; interagency visitor centers; and a “hotline” to assist in enforcement. The education program will facilitate compatible uses and reduce user conflicts by educating the public about environmental sensitivity and the specific needs of various users. Alternative III will significantly increase the public’s awareness of the importance of Sanctuary resources and will help decrease behavior that results in resource degradation. Outside of areas where there is targeted, direct regulation, the education programs in Alternative III will provide the best means to change user behavior that adversely affects Sanctuary resources. While education cannot totally replace enforcement, a well-designed program is necessary to effectively enforce all Sanctuary regulations. Therefore, without an effective education program, the mandate of resource protection as instructed in the MPRSA and the FKNMSPA will not be met. The increased awareness brought about by the educational program in Alternative III will, in the long term, generate positive environmental impacts for all users once resource protection increases.
- Alternative IV would not provide as many broad educational opportunities as Alternatives II and III. It would provide for the development of a limited number and type of printed materials to educate residents and visitors about the impacts of their land-based activities on Sanctuary resources. The lower profile and smaller audience addressed by actions in this alternative would not provide an adequate level of public awareness, resulting in a continued decline in environmental quality. In addition, Alternative IV would not provide for the development of additional audio-visual products or the translation of educational materials into other languages. Failure to provide these additional translated materials and educational products would result in the inability to relate messages to many in the South Florida population and international audiences. This alternative would not establish an education advisory council, an expanded volunteer program, or visitor centers that would make the Sanctuary program more efficient.

- Alternative II is very similar to Alternative III. The main differences are the creation of an ecotourism promoter position, and the establishment of a visitor center dedicated solely to the FKNMS. The Sanctuary Advisory Council recommends, and NOAA concurs, that ecotourism promotion is a commercial endeavor better left to private enterprise. A shared facility would provide interagency cooperation and collaboration more efficiently than a visitor center dedicated solely to the Sanctuary. However, building and operating such a facility would be fiscally prohibitive.

Recognizing that unlimited funding for Sanctuary programs does not exist, Sanctuary managers must find new and innovative ways to accomplish resource protection. Cooperative agreements with nongovernmental organizations and other Federal, State, and local agencies are a very effective way to stretch financial resources while providing for increased interagency communication. Using volunteers to assist staff in implementing strategies will also stretch financial resources, while providing an opportunity for participants to develop a sense of trusteeship of Sanctuary resources. Redundancy must be avoided. An education advisory council would guard against duplication and help to identify cooperative opportunities. Alternative III provides the best mechanisms to meet these needs.

Conclusions

Under NEPA, the management alternatives were assessed with respect to their environmental and socioeconomic impacts. The positive environmental impacts and associated beneficial economic impacts to the tourist industry outweigh any potential negative impacts.

Alternative III was selected as the Preferred Alternative because it most closely meets the resource protection goals of the NMSA and the FKNMSPA, while facilitating current Sanctuary uses and user activities. It focuses on the resource problems identified through the planning process, and provides flexibility in addressing issues as they are raised as part of a dynamic and continuous management process. In addition, this alternative recognizes the role of Federal, State, and local management in meeting Sanctuary objectives, and seeks to integrate them for maximum effectiveness.

Table 31 contains a list of the strategies in the Preferred Alternative, organized by issue. Complete descriptions of these strategies are found in Appendix H in Volume III.

Table 31. *Management Strategies Organized by Issue*

Boating					
B.1	Boat Access	B.7	Pollution Discharges	B.12	Cross Deputization
B.2	Habitat Restoration	B.8	User Fees	B.13	Salvaging/Towing
B.3	Derelict Vessels	B.9	Visitor Registration	B.15	Mooring Buoy Impacts
B.4	Channel Marking	B.10	Damage Assessment	B.16	Dock Permitting
B.5	Boat Groundings	B.11	Special-use Permits	B.17	PWC Management
B.6	Additional Enforcement				
Fishing					
F.1	Consistent Regulations	F.7	Artificial Reef	F.11	Gear/Method Impacts
F.3	Stocking	F.8	Exotic Species	F.12	Finfish Traps
F.4	Aquaculture Alternatives	F.9	Gear Removal	F.14	Spearfishing
F.5	Limited Entry	F.10	Bycatch	F.15	Sponge Harvest
F.6	Fisheries Sampling				
Land Use					
L.1	Marina Pumpout	L.8	Containment Options	L.15	Dredging Regulation
L.2	Marina Operations	L.9	SWD Policy Compliance	L.16	Water-use Reduction
L.3	Fueling/Maintenance	L.10	HAZMAT Handling	L.17	Dredge and Fill Authority
L.4	RV Pumpout	L.11	HAZMAT License	L.18	Wetland Dredge and Fill
L.5	RV Waste Reduction	L.12	HAZMAT Collection	L.19	Growth Impacts
L.6	Mobile Pumpout	L.14	Dredging Prohibition	L.20	Public Access
L.7	SWD Problem Sites				
Recreation					
R.1	SCR Management	R.5	Carrying Capacity	R.7	Coral Touching
R.2	Recreation Survey				
Water Quality					
W.1	OSDS Demonstration Project	W.12	Stormwater Permitting	W.23	Leachate Transport
W.2	AWT Demonstration Project	W.13	Stormwater Management	W.24	Florida Bay Influence
W.3	Wastewater Management Systems	W.14	Best Management Practices	W.25	WQ Impact Research
W.4	Wastewater Disposal, City of Key West	W.15	HAZMAT Response	W.26	Indicators
W.5	Water Quality Standards	W.16	Spill Reporting	W.27	Other Monitoring Tools
W.6	NPDES Program Delegation	W.17	Mosquito Spraying	W.28	Regional Database
W.7	Resource Monitoring of Surface Discharge	W.18	Pesticide Research	W.29	Dissemination of Research Findings
W.8	OSDS Permitting	W.19	Florida Bay Freshwater Flow	W.31	Global Change
W.9	Laboratory Facilities	W.20	WQ Monitoring	W.32	Advisory Committee
W.10	Canal WQ	W.21	Predictive Models	W.33	Ecological Monitoring
W.11	Stormwater Retrofitting	W.22	Pollutant Assessment		
Zoning					
Z.1	Wildlife Management Areas	Z.3	Sanctuary Preservation Areas	Z.5	Special-use Areas
Z.2	Replenishment Reserves	Z.4	Existing Management Areas		
Education					
E.1	Printed Materials	E.4	Training/Workshops/School Programs	E.7	Promotional
E.2	Audio-Visual Media	E.5	PSAs	E.10	Public Forum
E.3	Signs/Displays/Exhibits	E.6	Advisory Council	E.11	Special Events

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Acronyms

Acronym	Meaning
ACSC	Areas of Critical State Concern
AICUZ	Air Installation Compatible Use Zones
APPS	Act to Prevent Pollution from Ships
ARPA	Archaeological Resources Protection Act
ASA	Abandoned Shipwreck Act
ATBAs	Areas to be Avoided
ATCA	Atlantic Tuna Convention Act
AWT	Advanced Wastewater Treatment
BMES	Bureau of Marketing and Extension Services
BMRRD	Bureau of Marine Resource Regulation and Development
BP	Before Present
BRD	Bycatch Reduction Devices
LP	Bureau of Submerged Lands and Preserves
BSRR	Bureau of Sanctuaries and Research Reserves
CAA	Clean Air Act
CARL	Conservation and Recreation Lands
CBRA	Coastal Barrier Resources Act of 1972
CBRS	Coastal Barrier Resources System
CCC	Coastal Coordinating Council (Florida)
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CDP	Census Designated Place
CFR	Code of Federal Regulations
CMWG	Channel Marking Working Group
CSA	Continental Shelf Associates
CWA	Clean Water Act
CZM	Coastal Zone Management
CZMA	Coastal Zone Management Act of 1972
DARRF	Damage Assessment and Restoration Revolving Fund
DBS	Division of Beaches and Shores
DCA	Department of Community Affairs
DEIS/MP	Draft Environmental Impact Statement/Management Plan
DEMA	Dive Equipment Manufacturers Association
DMR	Department of Marine Resources (Monroe County)
DO	Dissolved Oxygen
DRI	Development of Regional Impact
EIS	Environmental Impact Statement
EMAP	Environment Monitoring and Assessment Program
ENP	Everglades National Park
EPA	Environmental Protection Agency
ESA	Endangered Species Act
F.S.	Florida Statutes
FAA	Federal Aviation Act of 1958
FAC	Florida Administrative Code
FAP	Federal Archaeological Program
FCD	Flood Control District
FCMP	Florida Coastal Management Program
FCREPA	Florida Committee on Rare and Endangered Plants and Animals
FCRES	Florida Committee on Rare and Endangered Species
FDA	Florida Department of Agriculture
FDACS	Florida Department of Agriculture and Consumer Services

Acronym	Meaning
FDBS	Florida Division of Beaches and Shores
FDCA	Florida Department of Community Affairs
FDEP	Florida Department of Environmental Protection
FDHR	Florida Division of Historical Resources
FDHRS	Florida Department of Health and Rehabilitative Services
FDMR	Florida Division of Marine Resources
FDEP	Florida Department of Environmental Protection
FDER	Florida Department of Environmental Regulation
FDNR	Florida Department of Natural Resources
FDOC	Florida Department of Commerce
FDOI	Florida Department of the Interior
FDOS	Florida Department of State
FDOT	Florida Department of Transportation
FDRP	Florida Division of Recreation and Parks
FDSL	Florida Division of State Lands
FEIS	Final Environmental Impact Statement
FGFWFC	Florida Game and Fresh Water Fish Commission
FDHRS	Florida Department of Health and Rehabilatative Services
FDMR	Florida Division of Marine Resources
FIO	Florida Institute of Oceanography
FIRE	Finance, Insurance, and Real Estate Trades
FKAA	Florida Keys Aqueduct Authority
FKARA	Florida Keys Artificial Reef Association
FKNMS	Florida Keys National Marine Sanctuary
FKNMSPA	Florida Keys National Marine Sanctuary and Protection Act
FMFC	Florida Marine Fisheries Commission
FMP	Florida Marine Patrol
FMP	Fishery Management Plan
FMRI	Florida Marine Research Institute
FNAI	Florida Natural Areas Inventory
FPS	Florida Park Service
FWIA	Fish and Wildlife Improvement Act
FWS	Fish and Wildlife Service (U.S. Dept. of Interior)
GDM	General Design Memorandum
GIS	Geographic Information System
GPS	Global Positioning System
HAPC	Habitat Area of Particular Concern
HAZMAT	Hazardous Materials
IMC	Interagency Management Committee
ITQ	Individual Transferrable Quota
JPCRSP	John Pennekamp Coral Reef State Park
LA	Lacey Act
LATF	Land Acquisition Trust Fund
LEO	Law Enforcement Officer
LKNMS	Looe Key National Marine Sanctuary
MBTA	Migratory Bird Treaty Act
MCMCD	Monroe County Mosquito Control District
MFCMA	Magnuson Fishery Conservation and Management Act
MMPA	Marine Mammal Protection Act
MMS	Minerals Management Service
MOA	Memoranda of Agreement
MOU	Memoranda of Understanding
MPPRCA	Marine Plastic Pollution Research and Control Act of 1987
MPRSA	Marine Protection, Research, and Sanctuaries Act

Acronym	Meaning
NCP	National Contingency Plan
NDP	Natural Disaster Planning
NEPA	National Environmental Policy Act
NERR	National Estuarine Research Reserve
NFWF	National Fish and Wildlife Foundation
NGOs	Nongovernmental Organizations
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NMS	National Marine Sanctuary
NMSA	National Marine Sanctuaries Act
NOAA	National Oceanic and Atmospheric Administration
NOS	National Ocean Service (NOAA)
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NPS	Nonpoint Source
NURC	National Underwater Research Center
OCRM	Office of Ocean and Coastal Resource Management
OCS	Outer Continental Shelf
OCSLA	Outer Continental Shelf Lands Act
ODA	Ocean Dumping Act of 1972
OFMAS	Office of Fisheries Management and Assistance Services
OFW	Outstanding Florida Water
ONRW	Outstanding Natural Resource Waters
OPA	Oil Pollution Act of 1990
OPS	Office of Protected Species
ORCA	Office of Ocean Resources Conservation and Assessment (NOAA)
OSDS	On-site Disposal System
OSP	Optimum Sustainable Population
PADI	Professional Association of Dive Instructors
PAED	Planning Analysis Area/Enumeration District
PL	Public Law
PRP	Potentially Responsible Parties
PSA	Public Service Announcement
PSD	Prevention of Significant Deterioration Provisions
PWSA	Port and Waterways Safety Act
RHA	Rivers and Harbors Act
SAV	Submerged Aquatic Vegetation
SCR	Submerged Cultural Resources
SEA	Strategic Environmental Assessments Division (ORCA, NOAA)
SEFSC	Southeast Fisheries Science Center
SFRC	South Florida Research Center
SFWMD	South Florida Water Management District
SHPO	State Historic Preservation Officer
SLA	Submerged Land Act of 1953
SOC	Save Our Coasts
SOR	Save Our Rivers
SPAs	Sanctuary Preservation Areas
SPF	Standard Project Flood
SPL	Saltwater Products License
SRD	Sanctuaries and Reserves Division (OCRM, NOAA)
SRS	Shark River Slough
SWD	Solid Waste Disposal

Acronym	Meaning
SWIM	Surface Water Improvement and Management Act
SWM	Stormwater Management
TDC	Tourism Development Council
TNC	The Nature Conservancy
TSRP	Taylor Slough Rainfall Plan
UIC	Underground Injection Control
ULV	Ultra Low Volume
UNCW	University of North Carolina, Wilmington
USACE	United States Army Corps of Engineers
USCG	United States Coast Guard
USDOC	United States Department of Commerce
USDOI	United States Department of the Interior
USDOS	United States Department of State
USDOT	United States Department of Transportation
USGS	United States Geological Survey
VTSS	Vessel Traffic Separation Schemes
WCAs	Water Conservation Areas
WQBELs	Water Quality Based Effluent Limitations
WWTP	Wastewater Treatment Plant

Glossary of Technical Terms

accretion- growth or increase in size by gradual external addition

ad valorem- according to value; imposed at a rate percent of the value as stated in an invoice

ahermatypic- non reef-building corals

anaerobic- capable of living or growing in an environment lacking free oxygen

annelids- any of various worms with cylindrical segmented bodies

aquaculture- the cultivation of marine life for harvest and utilization by humans

arboreal- relating to, or like, a tree; in referring to species, those that inhabit or frequent trees

ascidians- “sack-like” tunicates; animals in which the larval stage resembles a tadpole but the adult is sedentary and sack-like (e.g. sea squirts)

backcountry- primarily referring to the Florida Bay area of the Keys' islands and waterways

bathymetry- water depth measurement information used to produce depth-contoured charts

benthic communities- bottom-dwelling flora and fauna

Bermuda/Azores high- the subtropical anticyclone positioned over the southern Atlantic Ocean in the Northern Hemisphere; it is most pronounced in spring and summer

bioherm- a mound, dome, or reef-like structure built up by, and composed almost exclusively of, the remains of sedentary organisms, such as corals, algae, or molluscs

biota- animal or plant life of a region considered as a total ecological entity

block-faulted- a type of normal faulting in which the Earth's crust is divided into structural or fault blocks of different elevations and orientations

calcareous- containing characteristics of calcium carbonate, calcium, or limestone

capital facilities- those buildings and structures required for the provision of public services

Carolinian- refers to organisms and physical characteristics of the southeastern U.S. coastline

Census Designated Place- closely settled communities without corporate limits or status

common property resources- resources that are not exclusively controlled by a single agent or source. Access to such resources is not restricted, and therefore the resources can be exploited on a first-come, first-served basis

convective storm- storm characterized by vertically rising air

corallimorphs- false corals

coralline- any animal related to or resembling corals

crenulated (corals)- corals having tiny notches or scallops

crinoids- “sea lilies”; echinoderms that are suspension feeders with jointed arms and appendages that give a feathery appearance resembling a plant

cyclonic storms/systems- a windstorm with a violent whirling movement; a system of rotating winds over a vast area, spinning inward to a low pressure center (counterclockwise in the northern hemisphere) generally causing stormy weather

defaunated- indigenous animals are removed from a particular area

desiccation- removal of moisture; drying out

detrital- the accumulation of disintegrated material

diurnal- pertaining to or occurring in a day or each day; daily

downzoning- the practice of rezoning a parcel or parcels in a “lower” or more restrictive zoning category (e.g., a rezoning from multifamily residential to single-family residential) is considered downzoning; downzonings are often part of a growth management program employed when communities find that they have overzoned for the population growth which is desired

downwelling- a reverse vertical flow of water, moving from the ocean's surface to great depths; occurs at oceanic convergences

echinoderms- radially symmetrical animals that are exclusively marine and possess a spiny skin and a system of water filled canals that aids in feeding and locomotion. (e.g., sea urchins, sand dollars, and sea cucumbers)

endangered species- a species in danger of becoming extinct that is protected by the Endangered Species Act

endemic- restricted to or native to a particular area or region

epibenthic- organisms that live on the surface of a substrate, including motile organisms such as gastropods, sea urchins, sea stars, sea cucumbers, sea biscuits, and a wide variety of crustacea

epifauna- animals that live on the ocean bottom, either attached or moving freely over it

epiphytic- any organisms that grow on the blades of seagrasses, including algae, diatoms, and other encrusting organisms

eutrophication- the process by which nutrient-rich waters bring about a high level of biological productivity that may ultimately lead to reduced dissolved oxygen levels

fauna- animal life of a particular region

flora- plant life of a particular region

Florida Current- the segment of current between the Gulf of Mexico Loop Current and the Gulf Stream from the Dry Tortugas to the Southeastern tip of Florida, and confined by the 250-meter and 500-meter isobaths

Florida reef tract- the third largest barrier reef in the world, running from the Miami area southwest to the Dry Tortugas

Floridan Aquifer- the rock mass of South Florida that contains groundwater

foraminifera- an order of planktonic and benthic protozoans having a calcareous shell; perforations through which numerous pseudopodia protrude

gastropods- "Stomach footed" class of molluscs that have only one shell and usually move about on a muscular "foot" (e.g., snail, slug, cowry, limpet)

gorgonian- a type of octocoral (soft coral) commonly found in southeast Florida reefs at depths less than 30 meters; they include sea fans, sea plumes, sea whips, and sea rods

Gulf of Mexico Loop Current- major surface current in the Gulf of Mexico; enters through Yucatan Straits, flows clockwise into the east central portion of the Gulf, and exits through the Straits of Florida becoming the Florida current and eventually the Gulf Stream

gyre- circular spiral form; used mainly in reference to the circular motion of water in major ocean basins centered in the subtropic high-pressure regions

halophytic- type of plant that can survive in saltwater environments

Holocene Era- designating the present epoch of geologic time

hookah- an underwater breathing apparatus that supplies air to one or more divers through hoses attached to a compressor located on the surface

hot spot- an area of actual or potential trouble

hydrography- the study, description, and mapping of oceans, lakes, and rivers with an emphasis on navigation

hydrology- the science dealing with the nature, distribution, and movement of water on and below the Earth's surface

hydroperiod- hydrologic conditions that contribute to seasonally elevated surficial and groundwater flow conditions

incorporated lands- land areas under the jurisdiction of a municipal government; in Monroe County there are three incorporated areas: the cities of Key West, Layton, and Key Colony Beach; all other areas in the Keys fall under Monroe County's jurisdiction

infaunal- organisms that live buried in sediments, including a variety of polychaetes, burrowing crustaceans, and molluscs

infrastructure- basic installations and facilities, such as roads, power plants, transportation, and communication systems

iron-pile lighthouse- a lighthouse built on iron pilings that are threaded like a screw; the piling legs are screwed into the surface; this design allows water to pass through during storms

isobath- line connecting points of equal depth

keystone species- a single species whose activities determine community structure; a species whose presence is critical to that community

lithology- the scientific study of rocks usually with the unaided eye or little magnification

live rock- rock to which living marine organisms are attached

Lower Keys- that part of incorporated Monroe County south and/or west of the Seven Mile Bridge (i.e., Little Duck, Missouri and Ohio Keys, Bahia Honda, West Summerland/Spanish Harbor, and south to Stock Island)

mailboxes- propeller-wash device treasure hunters use to blow sediment away from wrecks buried beneath the seabed

management alternative- a bundle of management strategies that, when employed together, represent the means for achieving a desired level of protection within the Sanctuary

management strategy- an action or physical measure taken to address a specific issue; a management strategy is combined with an implementation incentive or mechanism to induce behavior; an institutional arrangement with authority to act; and a financing scheme to support the costs of implementation

Middle Keys- that part of unincorporated segment of Monroe County between Seven Mile Bridge and Whale Harbor Bridge (i.e., Islamorada, Upper and Lower Matecumbe, Fiesta Key, Long Key, Conch Key, Walkers Island, Duck Key, Fat Deer Key, Marathon, and Pigeon Key)

military exclusion area- a region or tract reserved for military uses, where unauthorized persons may not enter

National Register of Historic Places- a congressionally authorized register of historically significant places, and or objects that receive protection from alteration or demolition under law; alterations are subject to Historic Preservation Council approval and must not significantly change the character or associations of the place or object in question

nektonic- highly motile organisms, such as fishes and squids that live in, or above, the seagrass canopy

nonpoint source pollutant discharges- those pollutant discharges not associated with a specific location (e.g., urban and agricultural pesticide runoff)

nutrients- any number of organic or inorganic compounds used by plants in primary production (typically nitrogen and phosphorous)

octocorals- coral type that includes sea plumes, sea whips, gorgonians, and soft corals

oolitic- made of a limestone composition consisting of many small grains of carbonate of lime cemented together

patch reef- small circular or irregular reefs that arise from the floor of lagoons, behind barrier reefs, or within an atoll

pathogens- any agent, most commonly a microorganism, capable of causing disease

personal watercraft- a shallow-draft, jet drive watercraft on which the operator sits, kneels, or stands; excludes those vehicles piloted from inside the craft

planktonic- organisms dependent on water movement and currents as their means of transportation, including phytoplankton, zooplankton, and ichthyoplankton

Planning Analysis Area/Enumeration District- aggregated subcounty areas used as a framework for compiling and analyzing census data; aggregated into three areas: Lower, Middle, and Upper Keys

Pleistocene epoch- the first epoch of the Quaternary Period of the Cenozoic Era, beginning approximately 10,000 years ago; characterized by major worldwide climatic fluctuations, the spreading and recession of continental ice sheets with concomitant rise and fall of sea levels, and the appearance of modern humans

point source pollutant discharges- the discharge of pollutants from a distinct and identifiable source, such as a sewer or industrial outfall pipe

polychaeta- class of annelid worms that includes bristle and feather duster worms

potable water- water that is safe to drink

puerulus- the transitional swimming stage of the spiny lobster

seasonal population- any group of organisms of the same species that occupy a given space at a particular time of year (defined as winter, spring, summer, fall, wet, or dry)

sessile- immobile organisms that are permanently fixed to the substrate

sheet flow- surface water runoff

slough- swamp bog or marsh; especially one that is part of an inlet or backwater

solution holes- depression in the Earth's surface caused by dissolving of substrate composed primarily of calcium carbonate

southwest continental shelf- the submerged shelf of land that slopes gradually from the exposed edge of the continent for a variable distance to the point where the steep descent to the ocean floor begins

spur and groove- coral formation endemic to fringing or bank reefs; spurs are usually composed of a framework or *Acropora palmata* that form ramparts protruding at right angles to the axis of the reef and projecting into the prevailing wind pattern; the spaces between the spurs are sand channels referred to as grooves

storm surge- water elevation change due especially to tropical or extratropical storms

threatened species- plant or animal species believed likely to move into the endangered category in the near future if causal factors at work continue to persist

tourism units- hotel/motel rooms, sites for camping and recreational vehicles, and vacation rentals

toxicant- a poisonous or toxic substance

turbid- the state of being clouded, opaqued, or obscured by suspended sediment

unincorporated lands- lands not under the jurisdiction of (and not receiving services from) a town or city

Upper Keys- that part of unincorporated portion of Monroe County north of Whale Harbor Bridge; geologically, the segment of the Keys comprised of exposed Miami Limestone substrate; includes the area from Marathon to Soldier Key

vascular- typically describes tubular structures involved in fluid transport

viviparous- bearing or bringing forth live young, as with most mammals

zoanthids- generally small anemone; may be colonial or solitary, and both symbiotic and free-living; the most common on the Florida reef tract is *Palythoa caribbea*, referred to as "golden sea mat"

zone- an area or region considered as separate and distinct from others because of its designated use, plant or animal life, etc.

zoning- the act of partitioning areas of land or water into sections dedicated to specific purposes and activities

Metric Conversion Table

Linear Measurement

1 foot
= 0.3048 meter

1 meter
= 3.28084 feet
= 0.001 kilometer

1 kilometer
= 1,000 meters
= 0.621371 statute mile

1 statute mile
= 5,280 feet
= 1.60934 kilometers
= 0.8689 nautical mile

1 nautical mile
= 6,076.12 feet
= 1.852 kilometers
= 1.15078 statute miles

Area Measurement

1 acre
= 43,560 square feet
= 4,046.86 square meters
= 0.404686 hectare
= 0.0015625 square statute mile

1 hectare
= 2.47105 acres
= 10,000 square meters
= 0.01 square kilometer
= 0.003861 square statute mile

1 square kilometer
= 247.105 acres
= 100 hectares
= 0.386102 square statute mile

1 square statute mile
= 640 acres
= 258.999 hectares
= 2.58999 square kilometers
= 0.755 square nautical mile

1 square nautical mile
= 847.5443 acres
= 3.43 square kilometers
= 1.324288 square statute miles

Mass Measurement

1 pound
= 0.002 ton
= 0.453592 kilogram

1 ton
= 2,000 pounds
= 0.907185 metric ton

1 kilogram
= 2.20462 pounds
= 0.001 metric ton

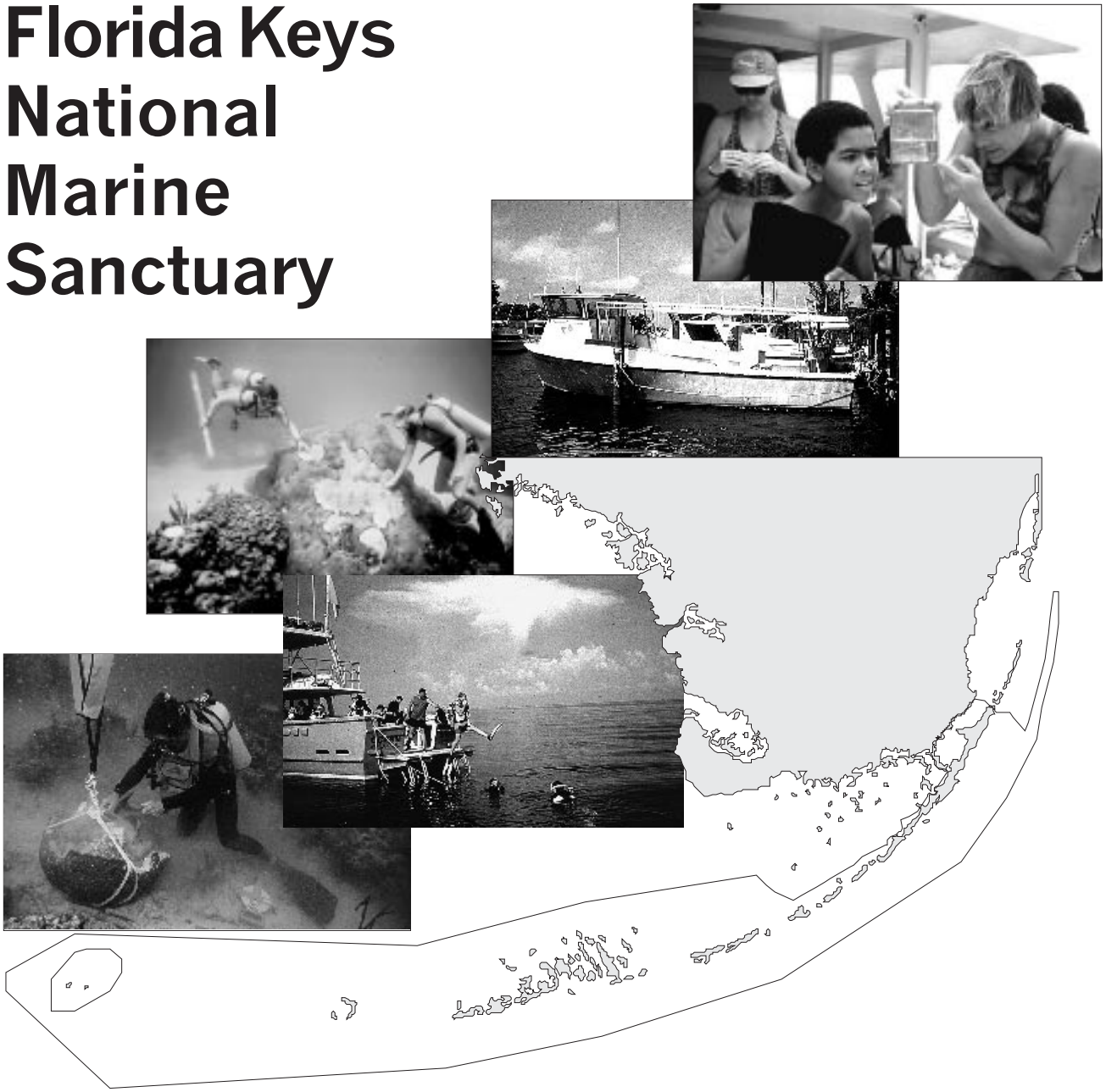
1 metric ton
= 2,240 pounds
= 1.10231 tons

Unit Abbreviations

foot	(ft)
hectare	(ha)
kilometer	(km)
meter	(m)
nautical mile	(nmi)
pound	(lb)
square kilometer	(km^2)
square meter	(m^2)
square nautical mile	(nmi^2)
square statute mile	(mi^2)
statute mile	(mi)

Strategy for Stewardship

Florida Keys National Marine Sanctuary



U.S. Department of Commerce

National Oceanic and Atmospheric Administration

National Ocean Service

Office of Ocean and Coastal Resource Management

Sanctuaries and Reserves Division

Final Management Plan/Environmental Impact Statement

Volume III of III
Appendices

This final management plan and environmental impact statement is dedicated to the memories of Secretary Ron Brown and George Barley. Their dedicated work furthered the goals of the National Marine Sanctuary Program and specifically the Florida Keys National Marine Sanctuary.

"We must continue to work together - inspired by the delight in a child's eye when a harbor seal or a gray whale is sighted, or the wrinkled grin of a fisherman when the catch is good. We must honor the tradition of this land's earliest caretakers who approached nature's gifts with appreciation and deep respect. And we must keep our promise to protect nature's legacy for future generations."

- Secretary Ron Brown
  Olympic Coast dedication ceremony, July 16, 1994

"The Everglades and Florida Bay will be our legacy to our children and to our Nation."

- George Barley
  Sanctuary Advisory Council Chairperson

Cover Photos: Marine Educator--Heather Dine, Upper Keys Regional Office; Lobster Boats--Billy Causey, Sanctuary Superintendent; Divers--Harold Hudson, Upper Keys Regional Office; Dive Charter--Paige Gill, Upper Keys Regional Office; Coral Restoration--Mike White, NOAA Corps.

Florida Keys National Marine Sanctuary

Final Management Plan/Environmental Impact Statement

Volume III
Appendices

1996

National Oceanic and Atmospheric Administration

Acknowledgments

In 1955, renowned naturalist and marine biologist Rachel Carson described the Florida Keys this way in her book *The Edge of the Sea:*

> "I doubt that anyone can travel the length of the Florida Keys without having communicated to his mind a sense of the uniqueness of this land of sky and water and scattered mangrove-covered islands. The atmosphere of the Keys is strongly and peculiarly their own. This world of the Keys has no counterpart elsewhere in the United States, and indeed few coasts of the Earth are like it."

This unique environment is the reason for the existence of the Florida Keys National Marine Sanctuary, and the reason why so many people have contributed so much of their time and energy to making the Management Plan as comprehensive and fair as possible.

Since 1989, numerous environmental organizations and individuals have worked long and hard to provide input into the legislation designating the Sanctuary and into developing the Final Management Plan/Environmental Impact Statement (FMP/EIS). They provided useful and objective comments at numerous workshops, Advisory Council meetings, and other public forums held during the planning process. The contributions of each of these individuals, and the organizations they represent, is appreciated.

The National Marine Sanctuary Program staff wish to thank everyone who has participated in the development of this plan, especially members of the public who gave of their time to offer objective and useful input during the many public comment periods offered during the planning process.

Special thanks go to the members of the Sanctuary Advisory Council for their major contribution to the planning process. Their diligent work and sacrifice of time and expenses will be remembered as the key to the success of developing a comprehensive management plan. With the leadership of their chairman and vice-chairman, they navigated waters never before charted for a National Marine Sanctuary or, for that matter, any marine protected area in the United States. Their role was crucial in this planning process, especially the leadership they exhibited in developing the Sanctuary's final plan. Never before has such a comprehensive plan been assembled by such a diverse interest group to solve complex problems in one of the Nation’s most ecologically diverse regions.

In addition, Program staff would like to thank our local, State, and Federal agency planning partners for their assistance during the development of this plan. Those individuals who worked diligently for over four years on the plan sacrificed an enormous amount of time and effort to assist in this project. Dozens of agency scientists, managers, and planners have devoted time to this planning process, especially during the various workshops and strategy assessment planning sessions, extended review sessions, and deliberations on the compact agreement. The National Marine Sanctuary Program staff is grateful to all of you.

Also, special thanks to all of those individuals who reviewed various portions of the document, especially sections of the Description of the Affected Environment. Your thorough review has served to make this section an important reference for future use.

We also extend our appreciation to the Sanctuary Volunteers and staff and students of Indiana University who have helped assess some shipwrecks identified in the management plan.

Particularly, the Program owes special recognition and thanks to the staff of NOAA’s Strategic Environmental Assessments Division for their enormous amount of time and sacrifice in assisting in the planning and development of this plan.

Abstract

This abstract describes the Final Management Plan and Environmental Impact Statement (FMP/EIS) for the Florida Keys National Marine Sanctuary. Congress, recognizing the degradation of this unique ecosystem due to direct physical impacts and indirect impacts, passed the Florida Keys National Marine Sanctuary and Protection Act of 1990 (Public Law 101-605) designating the Florida Keys National Marine Sanctuary. The Act requires the National Oceanic and Atmospheric Administration (NOAA) to develop a comprehensive management plan with implementing regulations to govern the overall management of the Sanctuary and to protect Sanctuary resources and qualities for the enjoyment of present and future generations. The Act also establishes the boundary of the Sanctuary, prohibits any oil drilling and exploration within the Sanctuary, prohibits the operation of tank ships or ships greater than 50 meters in the Area to Be Avoided, and requires the development and implementation of a water quality protection program by the U.S. Environmental Protection Agency and the State of Florida, in conjunction with NOAA.

The Sanctuary consists of approximately 2,800 nm^2 (9,500 km^2) of coastal and oceanic waters, and the submerged lands thereunder, surrounding the Florida Keys, and extending westward to encompass the Dry Tortugas, but excluding the Dry Tortugas National Park. The shoreward boundary of the Sanctuary is the mean high-water mark. Within these waters are spectacular, unique, and nationally significant marine environments, including seagrass meadows, mangrove islands, and extensive living coral reefs. These marine environments support rich biological communities possessing extensive conservation, recreational, commercial, ecological, historical, research, educational, and aesthetic values that give this area special national significance. These environments are the marine equivalent of tropical rain forests in that they support high levels of biological diversity, are fragile and easily susceptible to damage from human activities, and possess high value to human beings if properly conserved.

The economy of the Keys is dependent upon a healthy ecosystem. Approximately four million tourists visit the Keys annually, participating primarily in water-related sports such as fishing, diving, boating, and other ecotourism activities. In 1991, the gross earnings of the Florida Keys and Monroe County totaled $853 million, 36 percent of which came from services provided as part of the tourism industry. Another 18.7 percent of the gross earnings came from the retail trade, which is largely supported by tourists. In 1990, half of the Keys' population held jobs that directly or indirectly supported outdoor recreation. In addition, the commercial fishing industry accounted for $17 million of the Keys' economy, more than 20 percent of Florida's total gross earnings from commercial fishing. All of these activities depend on a healthy marine environment with good water quality.

The purpose of the proposed Management Plan is to ensure the sustainable use of the Keys' marine environment by achieving a balance between comprehensive resource protection and multiple, compatible uses of those resources. Sanctuary resources are threatened by a variety of direct and indirect impacts. Direct impacts include boat groundings, propeller dredging of seagrasses, and diver impacts on coral. For example, over 30,000 acres of seagrasses have been impacted by boat propellers. Indirect impacts include marine discharge of wastes, land-based pollution, and external sources of water quality degradation. These and other management issues are addressed by the comprehensive Management Plan.

Volume I contains the final comprehensive Management Plan and includes the discussion of the Preferred Alternative and socioeconomic analysis as well as 10 action plans composed of management strategies developed with substantial input from the public, local experts, and the Sanctuary Advisory Council to address management issues. The action plans provide an organized process for implementing management strategies, including a description of the activities required, institutions involved, staffing requirements, and an estimate of the implementation cost. A list of the action plans in alphabetical order is as follows: 1) Channel/ Reef Marking; 2) Education and Outreach; 3) Enforcement; 4) Mooring Buoy; 5) Regulatory; 6) Research and Monitoring; 7) Submerged Cultural Resources; 8) Volunteer; 9) Water Quality; and 10) Zoning. These action plans include several critical activities designed to manage and protect the natural and historic resources of the Sanctuary, including:

- Establishing water-use zones providing focused protection for 60 to 70 percent of the well-developed reef formations, prohibiting consumptive activities in a small portion of the Sanctuary, buffering important wildlife habitat from human disturbance, and protecting several large reserves for species diversity replenishment, breeding areas, and genetic protection.

- Establishing Sanctuary regulations to designate nonconsumptive zones, prohibit damage to natural resources, establish special-use permits, and restrict other activities that may negatively impact Sanctuary resources.

- Expanding and coordinating the Enforcement Program to enforce the regulations, particularly in the zoned areas.

- Implementing an Ecological Monitoring Plan to evaluate the effectiveness of the zoned areas and the health of the Sanctuary.

- Expanding the Mooring Buoy Program to include the new zones and protect important coral reef and seagrass habitat.

- Implementing a Channel and Reef Marking Program to protect seagrasses, coral reefs, and mangroves in shallow-water areas.

- Implementing a Submerged Cultural Resources Plan to protect the numerous historically important shipwrecks and other submerged cultural resources.

- Expanding the Education and Volunteer programs to reach more users and the millions of visitors coming to the Keys each year.

Volume II describes the process used to develop the draft management alternatives and includes environmental and socioeconomic impact analyses of the alternatives used in the draft management plan and environmental impact statement.

Volume III consists of the appendices, including the two acts that designate and implement the Sanctuary.

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Note to Readers:

Appendix I. *Strategy Development Tracking Table* was not reproduced from the Draft Management Plan/EIS since it was developed to assist reviewers of the draft document reconcile the strategies developed in 1992 with the draft plan. Any changes to the strategies in the draft plan were achieved in response to public comment received over the 9 month comment period and deliberation by the extended review team.

In the interest of space, **Appendix J.** *Marine and Terrestrial Species and Algae* in the Draft Management Plan/EIS has also not been reprinted in this final document. The species list provided in Volume III of the draft EIS continues to be valid, except for the erroneous reference to the California Sea Lion, *Zalophus californianus*, as a species endemic to the Florida Keys. Additional copies of the species list are available upon request to:

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General Introduction

This is the third of three volumes describing the Final Management Plan/Environmental Impact Statement (EIS) for the Florida Keys National Marine Sanctuary. Volume I contains the selection of the Final Preferred Alternative, which is the Final Management Plan, including 10 detailed action plans. The Final Preferred Alternative explains the modifications to the Draft Preferred Alternative (III) based on public comments, the FKNMSPA, the NMSA and other considerations. Volume II describes the Management Plan/EIS development process, including the process for selecting the Draft Preferred Alternative that underwent a nine month public review. Volume III contains the appendices referenced in Volumes I and II. The Final Plan is based on the EIS analysis in Volumes I and III.

Authority for Designation

National marine sanctuaries are routinely designated by the Secretary of Commerce through an administrative process established by the National Marine Sanctuaries Act (NMSA) of 1972, 16 U.S.C. 1431 et seq., as amended, including activation of candidate sites selected from the National Marine Sanctuary Program Site Evaluation List. Sanctuaries also have been designated by an Act of Congress. The Florida Keys National Marine Sanctuary was designated when the President signed the Florida Keys National Marine Sanctuary and Protection Act. Appendix A in Volume III contains a copy of this Act.

Terms of Statutory Designation

Section 304(a)(4) of the NMSA requires that the terms of designation set forth the geographic area included within the Sanctuary; the characteristics of the area that give it conservation, recreational, ecological, historical, research, educational, or aesthetic value; and the types of activities that will be subject to regulation by the Secretary of Commerce to protect those characteristics. This section also specifies that the terms of designation may be modified only through the same procedures by which the original designation was made. Thus, the terms of designation serve as a charter for the Sanctuary.

Mission and Goals of the National Marine Sanctuary Program

The purpose of a sanctuary is to protect resources and their conservation, recreational, ecological, historical, research, educational, or aesthetic values through comprehensive long-term management. National marine sanctuaries may be designated in coastal and ocean waters, the Great Lakes and their connecting waters, and submerged lands over which the United States exercises jurisdiction consistent with international law. They are built around distinctive natural and historical resources whose protection and beneficial use require comprehensive planning and management.

The National Oceanic and Atmospheric Administration (NOAA) administers the National Marine Sanctuary Program through the Sanctuaries and Reserves Division (SRD) of the Office of Ocean and Coastal Resource Management (OCRM).

In accordance with the NMSA, the mission of the National Marine Sanctuary Program is to identify, designate, and comprehensively manage marine areas of national significance. National marine sanctuaries are established for the public's long-term benefit, use, and enjoyment. To meet these objectives, the following National Marine Sanctuary Program goals have been established (15 CFR, Part 922.1(b)):

- Enhance resource protection through comprehensive and coordinated conservation and ecosystem management that complements existing regulatory authorities.
- Support, promote, and coordinate scientific research on, and monitoring of, the site-specific marine resources to improve management decisionmaking in national marine sanctuaries.
- Enhance public awareness, understanding, and the wise use of the marine environment through public interpretive, educational, and recreational programs.
- Facilitate, to the extent compatible with the primary objective of resource protection, multiple uses of national marine sanctuaries.

The Florida Keys National Marine Sanctuary is one of a system of national marine sanctuaries that has been established since the Program's inception in 1972. Sanctuaries are not new to the Florida Keys; there is a twenty year history of National Marine Sanctuaries in the Keys.

Background

Historical Perspective. The lure of the Florida Keys has attracted explorers and visitors for centuries. The clear tropical waters, bountiful resources, and appealing natural environment were among the many fine qualities that attracted visitors to the Keys. However, warning signs that the Keys' environment and natural resources were fragile, and not infinite, came early. In 1957, a group of conservationists and scientists held a conference at the Everglades National Park and discussed the demise of the coral reef resources in the Keys at the hands of those attracted there because of their beauty and uniqueness. This conference resulted in action that created the world's first underwater park, the John Pennekamp Coral Reef State Park in 1960. However, in just a little over a decade following the establishment of the park, a public outcry was sounded that cited pollution, overharvest, physical impacts, overuse, and use conflicts as continuing to occur in the Keys. These concerns continued to be voiced by environmentalists and scientists alike throughout the decade of the 1970's and indeed, into the 1990's.

Other management efforts were instituted to protect the coral reefs of the Florida Keys. The Key Largo National Marine Sanctuary was established in 1975 to protect 103 square nautical miles of coral reef habitat stretching along the reef tract from north of Carysfort Lighthouse to south of Molasses Reef, offshore of the Upper Keys. In 1981, the 5.32 square nautical mile Looe Key National Marine Sanctuary was established to protect the very popular Looe Key Reef located off Big Pine Key in the Lower Keys. Throughout the 80's mounting threats to the health and ecological future of the coral reef ecosystem in the Florida Keys prompted Congress to take action to protect this fragile natural resource. The threat of oil drilling in the mid-to-late 1980's off the Florida Keys, combined with reports of deteriorating water quality throughout the region, occurred at the same time scientists were assessing the adverse affects of coral bleaching, the die-off of the long-spined urchin, loss of living coral cover on reefs, a major seagrass die-off, declines in reef fish populations, and the spread of coral diseases. With the reauthorization of the National Marine Sanctuary Program in 1988, Congress directed the Sanctuary Program to conduct a feasibility study of possible expansion of Sanctuary sites in the Keys. Those study sites were in the vicinity of Alligator Reef, Sombrero Key, and westward from American Shoals. This endorsement for expansion of the Sanctuary program in the Keys was a Congressional signal that the health of the resources of the Florida Keys was of National concern. The feasibility study was overtaken by several natural events and ship groundings that precipitated the designation of the Florida Keys National Marine Sanctuary.

Three large ships ran aground on the coral reef tract within a brief 18 day period in the fall of 1989. Coincidental as it may seem, it was this final physical insult to the reef that prompted Congress to take action to protect the coral reef ecosystem of the Florida Keys. Although most remember the ship groundings as having triggered Congressional action, it was in fact the cumulative events of environmental degradation, in conjunction with the physical impacts that prompted Congressman Dante Fascell to introduce a bill into the House of Representatives in November of 1989. Congressman Fascell had long been an environmental supporter of South Florida and his action was very timely. The bill was sponsored in the Senate by Senator Bob Graham, also known for his support of environmental issues both in Washington, and as a Florida Governor. It was passed by Congress through bi-partisan support and signed. On November 16, 1990, President George Bush signed into law the Florida Keys National Marine Sanctuary and Protection Act (FKNMSPA) (Appendix A in Volume III).

Florida Keys Environmental Setting. The Florida Keys National Marine Sanctuary extends approximately 220 miles southwest from the southern tip of the Florida peninsula. Located adjacent to the Keys' land mass are spectacular, unique, and nationally significant marine environments, including seagrass meadows, mangrove islands, and extensive living coral reefs. These support rich biological communities possessing extensive conservation, recreational, commercial, ecological, historical, research, educational, and aesthetic values that give this area special national significance. They are the marine equivalent of tropical rain forests, in that they support high levels of biological diversity, are fragile and easily susceptible to damage from human activities, and possess high value to humans if properly conserved.

The marine environment of the Florida Keys supports over 6,000 species of plants, fishes, and invertebrates, including the Nation's only coral reef that lies adjacent to the continent, and one of the largest seagrass communities in this hemisphere. Attracted by this natural diversity and tropical climate, approximately four million tourists visit the Keys annually, where they participate primarily in water-related sports such as fishing, diving, boating, and other activities.

Sanctuary Boundary. The Act designated 2,800 square nautical miles of coastal waters off the Florida Keys as the Florida Keys National Marine Sanctuary. The Sanctuary boundary extends southward on the Atlantic Ocean side of the Keys from the north easternmost point of the Biscayne National Park along the approximate 300-foot isobath for over 200 nautical miles to the Dry Tortugas. From there it turns north and east, encompassing a large portion of the Gulf of Mexico and Florida Bay, where it adjoins the Everglades National Park. The landward boundary is the mean high water mark. The Key Largo and Looe Key National Marine Sanctuaries, the State Parks and Aquatic Preserves, and the Florida Keys Refuges of the U.S. Fish and Wildlife Service are overlapped by the Sanctuary; whereas the Everglades National Park, Biscayne National Park, and Dry Tortugas National Park are excluded from the boundary of the Sanctuary.

Threats to the Environment. The deterioration of the marine environment in the Keys is no longer a matter of debate. There is a decline of healthy corals, an invasion by algae into seagrass beds and reefs, a decline in certain fisheries, an increase of coral diseases and coral bleaching. In Florida Bay, reduced freshwater flow has resulted in an increase in plankton blooms, sponge and seagrass die-offs, and fish kills.

Over four million people visit the Keys annually, 70% of whom visit the Sanctuary. Over 80,000 people reside in the Keys full time. Since 1965, the number of registered private recreational vessels has increased over six times. There are significant direct and indirect effects from the high levels of use of Sanctuary resources resulting from residents and tourists. The damage done by people hinders the ability of marine life to recover from naturally occurring stresses. Human impacts can be separated into direct and indirect impacts.

Direct human impacts. The most visible and familiar physical damage results from the carelessness or, on occasion, the recklessness of ship captains, boaters, divers, fishermen, snorkelers and beachgoers. Over 30,000 acres of seagrasses have been damaged by boat propellers. Direct impacts to resources also result from careless divers and snorkelers standing on coral, improperly placed anchors, and destructive fishing methods. In the period between 1993 and 1994, approximately 500 vessels were reported aground in the Sanctuary. These groundings have a cumulative effect on the resources. Over 19 acres of coral reef habitat has been damaged or destroyed by large ship groundings.

Indirect human impacts. The overnutrification of nearshore waters is a documented problem in the Sanctuary. A major source of excess nutrients is sewage-25,000 septic tanks, 7,000 cesspools, 700 shallow injection wells, and 139 marinas harboring over 15,000 boats. These nutrients are carried through the region by more than 700 canals and channels. Removing nitrogen and phosphorous from wastewater requires a technology that, at present, is lacking from sewage treatment facilities in the Keys.

Management Plan Requirements

The FKNMSPA directs the Secretary of Commerce to develop a comprehensive management plan and implement regulations to protect Sanctuary resources. The Act requires that the plan:

- facilitate all public and private uses of the Sanctuary consistent with the primary objective of resource protection;
- consider temporal and geographic zoning to ensure protection of Sanctuary resources;
- incorporate the regulations necessary to enforce the comprehensive water quality protection program developed under Section 8 of the FKNMSPA;
- identify needs for research, and establish a long-term ecological monitoring program;
- identify alternative sources of funding needed to fully implement the Plan's provisions and supplement appropriations authorized under Section 10 (16 U.S.C., §1444) of the FKNMSPA and Section 313 of the NMSA;
- ensure coordination and cooperation between Sanctuary managers and other Federal, State,

and local authorities with jurisdiction within or adjacent to the Sanctuary;

- promote education among users of the Sanctuary about coral reef conservation and navigational safety; and

- incorporate the existing Looe Key and Key Largo national marine sanctuaries into the Florida Keys National Marine Sanctuary.

All of these requirements have been addressed in the Management Plan.

In addition to the above statutory objectives, the Sanctuary Advisory Council, early on in the planning process in 1992, developed a set of goals and objectives for the Sanctuary that NOAA later adopted. The goal is:

"To preserve and protect the physical and biological components of the South Florida estuarine and marine ecosystem to ensure its viability for the use and enjoyment of present and future generations."

The objectives include:

- Encouraging all agencies and institutions to adopt an ecosystem and cooperative approach to accomplish the following objectives, including the provision of mechanisms to address impacts affecting Sanctuary resources but originating outside the boundaries of the Sanctuary;

- Providing a management system which is in harmony with an environment whose long-term ecological, economic, and sociological principles are understood, and which will allow appropriate sustainable uses;

- Managing the Florida Keys National Marine Sanctuary for the natural diversity of healthy species, populations, and communities;

- Reaching every single user and visitor to the FKNMS with information appropriate to their activities; and

- Recognizing the importance of cultural and historical resources, and managing these resources for reasonable, appropriate use and enjoyment.

NOAA incorporated the Sanctuary Advisory Council's objectives into the Final Comprehensive Management Plan, and some progress has already been made toward accomplishing these objectives. For example, steps have been taken to meet the first objective of ecosystem management. Sanctuary Staff have been involved in the efforts of the South Florida Ecosystem Restoration Task Force and the Governor's Commission for a Sustainable South Florida. These two efforts have focused on the restoration of the South Florida ecosystem, of which the Sanctuary is the downstream component. These combined efforts recognize the importance of protecting and preserving the natural environment for the sustainable use of future generations. The natural and built environments have to be managed in harmony to sustain the healthy environment upon which the South Florida economy is dependent.

Overview of the Planning Process

The size of the Sanctuary and the diversity of its users required that NOAA adopt a holistic, ecosystem-based management approach to address the problems facing the Sanctuary. This meant using a problem-driven focus, relying on partnerships, and building consensus around the identification of issues and their short- and long-term solutions.

A Comprehensive Approach. The FKNMSPA requires NOAA to develop a comprehensive management plan. To meet this mandate, NOAA has addressed many problems and issues, such as water quality and land use, that are outside the "traditional" scope of Sanctuary management. The process involved unprecedented participation by the general public, user groups, and Federal, State, and local governments.

Because of the size of the Sanctuary and the variety of resources it contains, many problems never before encountered by Sanctuary management had to be addressed. For example, significant declines in water quality and habitat conditions in Florida Bay are threatening the health of Sanctuary resources. These conditions are thought to be the result of water quality and quantity management in the South Florida region. Such problems must be addressed by management to ensure adequate protection of Sanctuary resources. There is a need, therefore, to explicitly include the agencies with responsibilities in these areas in an ecosystem management approach.

Knowledge-based Consensus Building. A series of workshops followed a set of public scoping meetings, and laid the foundation for building this Plan. At these work sessions, NOAA used a systematic process for obtaining relevant information from experts with knowledge of Sanctuary problems.

NOAA recognized that a useful management plan could not be developed and implemented without forging working teams to help provide the vision and knowledge necessary to accomplish the goals set forth in the FKNMSPA. Four teams were formed to ensure that input was provided by major Federal, State, and local interests in the Sanctuary, and to see that a plan was produced that met the goals and objectives set forth by the FKNMSPA and NOAA. There was considerable interaction, and some overlap in membership and function, among these teams.

- In July 1991, the Interagency Core Group, composed of Federal, State, and local agencies with direct jurisdictional responsibility in the Sanctuary, was formed to develop policies, and direct and oversee the management plan development process (Appendix B in Volume III lists the members of this Core Group).

- Sanctuary Planners held a series of workshops, from July 1991 through January 1992, which focused on a range of topics. The workshop topics included mooring buoys, education, photobathymetry, research, submerged cultural resources, and zoning.

- A Strategy Identification Work Group, composed of 49 local scientists and management experts, generated the initial set of strategies and details on implementation requirements.

- The Sanctuary Advisory Council (SAC) was established by the FKNMSPA to ensure public input into the Plan, and to advise and assist NOAA in its development and implementation. The SAC first met in February 1992 and conducted over 30 meetings that were open to the public (Appendix B in Volume III contains a list of SAC members). The SAC became an integral part of the Sanctuary planning process by serving as a direct link to the Keys' user communities, such as the dive industry, environmental groups, and commercial and recreational fishermen. In addition, the SAC has been instrumental in helping NOAA to formulate policy, particularly with regard to: 1) the marine zoning plan, 2) activities needing regulation, and 3) recommending a preferred alternative for the Management Plan.

- A NOAA team composed of the Sanctuaries and Reserves Division, the Strategic Environmental Assessments Division, and the Office of the Assistant General Counsel for Ocean Services was responsible for developing and implementing the process to produce the Draft Plan. The Sanctuaries and Reserves Division is responsible for coordinating the review and producing the Final Management Plan and Environmental Impact Statement.

Focus on Management and Action. From the beginning of the Plan development process, it has been recognized that management is a continuous activity that must involve those responsible for implementing actions. The process has made maximum use of existing knowledge and experience to identify, characterize, and assess alternative management actions. Much of the planning process was devoted to identifying short- and long-term management actions or strategies, including their operational requirements. These management actions can be found in the detailed action plans contained in this volume. These plans address management issues ranging from channel marking, to volunteer programs, to regulations. They provide details on institutional needs, personnel, time requirements, and implementation costs. These details are necessary for the decisions that will have to be made upon Plan implementation by the managers in the region.

Toward Integrated, Continuous Management. A central purpose of the Management Plan is to take the disparate threads of protection and regulation that currently apply to the Florida Keys' ecosystem and weave them into a fabric of integrated coastal management (ICM). ICM is not a new idea or concept; what is new is the notion of applying it in a comprehensive and continuous manner. ICM is a process that begins with direct participation of managers, planners, analysts, scientists, and a concerned public. Developing an integrated management approach does not take place quickly; it evolves over time, based on incremental gains that build upon one another.

A major component of the Management Plan is the consideration of water quality issues and problems. The FKNMSPA called upon the U.S. Environmental Protection Agency and the State of Florida to develop

a comprehensive water quality protection program for the Sanctuary. NOAA has incorporated this protection program into the Management Plan as the Water Quality Action Plan found in this volume.

Overview of the Public Review Process

The Draft Management Plan and Environmental Impact Statement for the Florida Keys National Marine Sanctuary was released to the public at a Sanctuary Advisory Council meeting on April 4, 1995. This initiated a nine month public review of the draft plan that ended December 31, 1995. During this review period Sanctuary staff facilitated the public's review of the plan in a variety of ways that were designed to maximize the public's full understanding of the components and contents of the draft plan.

The nine month public review process included the following opportunities:

- *Sanctuary Advisory Council Preview*. On April 4, the draft plan was released in a public meeting. At this meeting, each of the authors of the Action Plans contained in the Preferred Alternative (Volume I) gave a verbal summary of the contents of the Action Plans. This day-long, detailed preview, initiated the public's review of the draft plan and served to introduce and familiarize the public with the plan.

- *Info-Expos*. The Sanctuary staff held two series of three-day-long Info-Expos in April and May of 1995 and October 1995. The Info-Expos were held in the Upper, Middle, and Lower Keys. They were set up like a trade show and individual tables served as information booths manned by Sanctuary staff, Sanctuary Advisory Council members, Core Group members, and a Spanish interpreter. The Info-Expo staff passed out materials and answered the public's questions about the draft plan. Each of the booths represented a specific theme such as water quality, fishing, boating, zoning, etc. Additionally, staff distributed copies of the draft plan to the public if they had not received one by mail.

- *Working Groups*. In June 1995, the Sanctuary Advisory Council established 10 Working Groups, one for each action plan, to assist in the public review of the draft plan. The SAC appointed a Chairperson for each of the Working Groups and other SAC members were encouraged to sign up to participate in the Working Groups that they were interested in monitoring.

  In August 1995, the Sanctuary Staff gave the Working Groups a briefing outlining the purpose, objectives, and ground rules for the Working Group's public review of the draft plan. The purpose of the Working Groups was to broaden the public's review of the draft plan in order to get the best and most comprehensive review possible. An objective of the process was to help the SAC formulate their comments on the draft plan. The ground rules were: that membership on the Working Groups was open and the public was encouraged to sign up and participate; no voting (strive for consensus, but record both sides when split); all suggestions were to be recorded; the Working Group meetings were to be held in different parts of the Keys; and Sanctuary staff were to serve in a support role.

  Each of the Working Groups held multiple meetings in various parts of the Keys. The public was given enormous opportunity to provide their input on the draft plan.

- *Public Hearings*. There were six public hearings held on the draft plan. The hearings were held in Miami, Key Largo, Marathon, Key West, St. Petersburg, and Silver Spring, Maryland. The Sanctuary Advisory Council was encouraged to attend as many of the meetings as possible in order to help the SAC further develop their comments on the draft plan. This made it possible for the SAC to take full advantage of the public's comments in their deliberations on the draft plan in November and December.

As a result of the public review process, NOAA received over 6,400 statements of public comment on the draft management plan and environmental impact statement. Clearly, the use of the Sanctuary Advisory Council Working Groups assisted the advisory council in the development of their comments on the draft plan. As a result of their review process, the input at public hearings, and written public comments, NOAA has been able to develop a Final Management Plan that reflects a broad range of public comments.

The Environmental Impact Statement Process

The National Environmental Policy Act of 1969 (NEPA) requires any Federal agency proposing a major action that significantly affects the quality of the human environment to develop an environmental impact statement that describes both the positive and negative impacts that may result from implementation. Accordingly, an EIS has been drafted to accompany the Management Plan, and both have gone through a public review and comment process prior to adoption in this Final Plan. The Draft EIS evaluated a range of reasonable alternative approaches to Sanctuary management. These alternatives are presented in Volume II to facilitate analysis of their effects. The Preferred Alternative for Sanctuary management is presented based on NOAA's analysis of its impacts and the public comments.

Contents of Volume III

This volume contains appendices referred to in Volume I and II. They are organized alphabetically, and the pages within each appendix are listed numerically.

- Appendix A includes the full texts of both the National Marine Sanctuary Act and the Florida Keys National Marine Sanctuary and Protection Act.
- Appendix B lists the members of the Interagency Core Group, Sanctuary Advisory Council, and Strategy Working Group.
- Appendix C lists the existing legislative authorities within the Keys.
- Appendix D provides additional information about Federal fishery management.
- Appendix E gives a sample strategy description sheet.
- Appendix F gives a sample strategy characterization sheet.
- Appendix G lists the strategies in each of the mid-range management alternatives.
- Appendix H lists the strategies in the Preferred Alternative.
- Appendix I provides a list of submerged cultural resources - known sites and losses.
- Appendix J is a draft compact and agreement package.
- Appendix K is the revised Sanctuary Designation Document, which details the effect of designation, describes the Sanctuary area, outlines the scope of applicable Sanctuary regulations, and specifically defines the Sanctuary's boundaries.
- Appendix L is a summary of the comments received on the Draft Management Plan/EIS and NOAA's responses.
- Appendix M is the assessment of the potential costs and benefits of the Final Management Plan regulations pursuant to Executive Order 12866.

The National Marine Sanctuaries Act

The National Marine Sanctuaries Act, as amended

Sec. 301. **FINDINGS, PURPOSES, AND POLICIES**.

(a) Findings.—The Congress finds that—

(1) this nation historically has recognized the importance of protecting special areas of its public domain, but these efforts have been directed almost exclusively to land areas above the high-water mark;

(2) certain areas of the marine environment possess conservation, recreational, ecological, historical, research, educational, or esthetic qualities which give them special national and, in some instances, international significance;

(3) while the need to control the effects of particular activities has led to enactment of resource-specific legislation, these laws cannot in all cases provide a coordinated and comprehensive approach to the conservation and management of special areas of the marine environment;

(4) a Federal program which identifies special areas of the marine environment will contribute positively to marine resources conservation, research, and management;

(5) such a Federal program will also serve to enhance public awareness, understanding, appreciation, and wise use of the marine environment; and

(6) protection of these special areas can contribute to maintaining a natural assemblage of living resources for future generations.

(b) Purposes and Policies.—The purposes and policies of this title are—

(1) to identify and designate as national marine sanctuaries areas of the marine environment which are of special national significance;

(2) to provide authority for comprehensive and coordinated conservation and management of these marine areas, and activities affecting them, in a manner which complements existing regulatory authorities;

(3) to support, promote, and coordinate scientific research on, and monitoring of, the resources of these marine areas, especially long-term monitoring and research of these areas;

(4) to enhance public awareness, understanding, appreciation, and wise use of the marine environment;

(5) to facilitate to the extent compatible with the primary objective of resource protection, all public and private uses of the resources of these marine areas not prohibited pursuant to other authorities;

(6) to develop and implement coordinated plans for the protection and management of these areas with appropriate Federal agencies, State and local governments, Native American tribes and organizations, international organizations, and other public and private interests concerned with the continuing health and resilience of these marine areas;

(7) to create models of, and incentives for, ways to conserve and manage these areas;

(8) to cooperate with global programs encouraging conservation of marine resources; and

(9) to maintain, restore, and enhance living resources by providing places for species that depend upon these marine areas to survive and propagate.

Sec. 302. Definitions.

As used in this title, the term—

(1) "draft management plan" means the plan described in section 304(a)(1) (C)(v);

(2) "Magnuson Act" means the Magnuson Fishery Conservation and Management Act (16 U.S.C. 1801 et seq.);

(3) "marine environment" means those areas of coastal and ocean waters, the Great Lakes and their connecting waters, and submerged lands over which the United States exercises jurisdiction, including the exclusive economic zone, consistent with international law;

(4) "Secretary" means the Secretary of Commerce;

(5) "State" means each of the several States, the District of Columbia, the Commonwealth of Puerto Rico, the Commonwealth of the Northern Mariana Islands, American Samoa, the Virgin Islands, Guam, and any other commonwealth, territory, or possession of the United States;

(6) "damages" includes—

(A) compensation for—

(i)(I) the cost of replacing, restoring, or acquiring the equivalent of a Sanctuary resource; and

(II) the value of the lost use of a sanctuary resource pending its restora-

tion or replacement or the acquisition of an equivalent sanctuary resource; or

(ii) the value of a sanctuary resource if the sanctuary resource cannot be restored or replaced or if the equivalent of such resource cannot be acquired;

(B) the cost of damage assessments under section 312(b)(2); and

(C) the reasonable cost of monitoring appropriate to the injured, restored, or replaced resources;

(7) "response costs" means the costs of actions taken or authorized by the Secretary to minimize destruction or loss of, or injury to, sanctuary resources, or to minimize the imminent risks of such destruction, loss, or injury**;**

(8) "sanctuary resource" means any living or nonliving resource of a national marine sanctuary that contributes to the conservation, recreational, ecological, historical, research, educational, or aesthetic value of the sanctuary; and

(9) "exclusive economic zone" means the exclusive economic zone as defined in the Magnuson Fishery and Conservation Act.

Sec. 303. Sanctuary Designation Standards

(a) Standards.—The Secretary may designate any discrete area of the marine environment as a national marine sanctuary and promulgate regulations implementing the designation if the Secretary—

(1) determines that the designation will fulfill the purposes and policies of this title; and

(2) finds that—

(A) the area is of special national significance due to its resource or human-use values;

(B) existing State and Federal authorities are inadequate or should be supplemented to ensure coordinated and comprehensive conservation and management of the area, including resource protection, scientific research, and public education;

(C) designation of the area as a national marine sanctuary will facilitate the objectives in subparagraph (B); and

(D) the area is of a size and nature that will permit comprehensive and coordinated conservation and management.

(b) Factors and Consultations Required in Making Determinations and Findings.—

(1) Factors.—For purposes of determining if an area of the marine environment meets the standards set forth in subsection (a), the Secretary shall consider—

(A) the area's natural resource and ecological qualities, including its contribution to biological productivity, maintenance of ecosystem structure, maintenance of ecologically or commercially important or threatened species or species assemblages, maintenance of critical habitat of endangered species, and the biogeographic representation of the site;

(B) the area's historical, cultural, archaeological, or paleontological significance;

(C) the present and potential uses of the area that depend on maintenance of the area's resources, including commercial and recreational fishing, subsistence uses, other commercial and recreational activities, and research and education;

(D) the present and potential activities that may adversely affect the factors identified in subparagraphs (A), (B), (C);

(E) the existing State and Federal regulatory and management authorities applicable to the area and the adequacy of those authorities to fulfill the purposes and policies of this title;

(F) the manageability of the area, including such factors as its size, its ability to be identified as a discrete ecological unit with definable boundaries, its accessibility, and its suitability for monitoring and enforcement activities;

(G) the public benefits to be derived from sanctuary status, with emphasis on the benefits of long-term protection of nationally significant resources, vital habitats, and resources which generate tourism;

(H) the negative impacts produced by management restrictions on income-generating activities such as living and nonliving resources development; and

(I) the socioeconomic effects of sanctuary designation.

(2) Consultation.—In making determinations and findings, the Secretary shall consult with—

(A) the Committee on Merchant Marine and Fisheries of the House of Representatives and the Committee on Commerce, Science, and Transportation of the Senate;

(B) the Secretaries of State, Defense, Transportation, and the Interior, the Administrator, and the heads of other interested Federal agencies;

(C) the responsible officials or relevant agency heads of the appropriate State and local

government entities, including coastal zone management agencies, that will, or are likely to be, affected by the establishment of the area as a national marine sanctuary;

(D) the appropriate officials of any Regional Fishery Management Council established by section 302 of the Magnuson Act (16 U.S.C. 1852) that may be affected by the proposed designation; and

(E) other interested persons.

(3) Resource Assessment Report.—In making determinations and findings, the Secretary shall draft, as part of the environmental impact statement referred to in section 304(a)(2), a resource assessment report documenting present and potential uses of the area, including commercial and recreational fishing, research and education, minerals and energy development, subsistence uses, and other commercial, governmental, or recreational uses. The Secretary, in consultation with the Secretary of the Interior, shall draft a resource assessment section for the report regarding any commercial, governmental or recreational resource uses in the area under consideration that are subject to the primary jurisdiction of the Department of the Interior. The Secretary, in consultation with the Secretary of Defense, the Secretary of Energy, and the Administrator, shall draft a resource assessment section for the report including information on any past, present, or proposed future disposal or discharge of materials in the vicinity of the proposed sanctuary. Public disclosure by the Secretary of such information shall be consistent with national security regulations.

Sec. 304. Procedures for Designation and Implementation.

(a) Sanctuary Proposal.—

(1) Notice.—In proposing to designate a national marine sanctuary, the Secretary shall—

(A) issue, in the Federal Register, a notice of the proposal, proposed regulations that may be necessary and reasonable to implement the proposal, and a summary of the draft management plan;

(B) provide notice of the proposal in newspapers of general circulation or electronic media in the communities that may be affected by the proposal; and

(C) on the same day the notice required by subparagraph (A) is issued, the Secretary shall submit to the Committee on Merchant Marine and Fisheries of the House of Representatives and the Committee on Commerce, Science, and Transportation of the Senate documents including an executive summary consisting of—

(i) the terms of the proposed designation;

(ii) the basis of the findings made under section 303(a) with respect to the area;

(iii) an assessment of the considerations under section 303(b)(1);

(iv) proposed mechanisms to coordinate existing regulatory and management authorities within the area;

(v) the draft management plan detailing the proposed goals and objectives, management responsibilities, resource studies, interpretive and educational programs, and enforcement, including surveillance activities for the area;

(vi) an estimate of the annual cost of the proposed designation, including costs of personnel, equipment and facilities, enforcement, research, and public education;

(vii) the draft environmental impact statement;

(viii) an evaluation of the advantages of cooperative State and Federal management if all or part of a proposed marine sanctuary is within the territorial limits of any state or is superjacent to the subsoil and seabed within the seaward boundary of a State, as that boundary is established under the Submerged Lands Act (43 U.S.C. 1301 et seq.); and

(ix) the proposed regulations referred to in subparagraph (A).

(2) Environmental Impact Statement.—The Secretary shall—

(A) prepare a draft environmental impact statement, as provided by the National Environmental Policy Act of 1969 (42 U.S.C. 4321 et seq.), on the proposal that includes the resource assessment report required under section 303(b)(3), maps depicting the boundaries of the proposed designated area, and the existing and potential uses and resources of the area; and

(B) make copies of the draft environmental impact statement available to the public.

(3) Public Hearing.—No sooner than thirty days after issuing a notice under this subsection, the Secretary shall hold at least one public hearing in the coastal area or areas that will be most affected by the proposed designation of the area as a national marine sanctuary for the purpose of receiving the views of interested parties.

(4) Terms of Designation.—The terms of designation of a sanctuary shall include the geographic area proposed to be included within the sanctuary, the characteristics of the area that give it conserva-

tion, recreational, ecological, historical, research, educational, or esthetic value, and the types of activities that will be subject to regulation by the Secretary to protect those characteristics. The terms of designation may be modified only by the same procedures by which the original designation is made.

(5) Fishing Regulations.—The Secretary shall provide the appropriate Regional Fishery Management Council with the opportunity to prepare draft regulations for fishing within the exclusive economic zone as the Council may deem necessary to implement the proposed designation. Draft regulations prepared by the Council, or a Council determination that regulations are not necessary pursuant to this paragraph, shall be accepted and issued as proposed regulations by the Secretary unless the Secretary finds that the Council's action fails to fulfill the purposes and policies of this title and the goals and objectives of the proposed designation. In preparing the draft regulations, a Regional Fishery Management Council shall use as guidance the national standards of section 301(a) of the Magnuson Act (16 U.S.C. 1851) to the extent that the standards are consistent and compatible with the goals and objectives of the proposed designation. The Secretary shall prepare the fishing regulations, if the Council declines to make a determination with respect to the need for regulations, makes a determination which is rejected by the Secretary, or fails to prepare the draft regulations in a timely manner. Any amendments to the fishing regulations shall be drafted, approved, and issued in the same manner as the original regulations. The Secretary shall also cooperate with other appropriate fishery management authorities with rights or responsibilities within a proposed sanctuary at the earliest practicable stage in drafting any sanctuary fishing regulations.

(6) Committee Action.—After receiving the documents under-subsection (a)(l)(C), the Committee on Merchant Marine and Fisheries of the House of Representatives and the Committee on Commerce, Science, and Transportation of the Senate may each hold hearings on the proposed designation and on the matters set forth in the documents. If within the forty-five day period of continuous session of Congress beginning on the date of submission of the documents either Committee issues a report concerning matters addressed in the documents, the Secretary shall consider this report before publishing a notice to designate the national marine sanctuary.

(b) Taking Effect of Designations.—

(1) Notice.—In designating a national marine sanctuary, the Secretary shall publish in the Federal Register notice of the designation together with final regulations to implement the designation and any other matters required by law, and submit such notice to the Congress. The Secretary shall advise the public of the availability of the final management plan and the final environmental impact statement with respect to such sanctuary. The Secretary shall issue a notice of designation with respect to a proposed national marine sanctuary site not later than 30 months after the date a notice declaring the site to be an active candidate for sanctuary designation is published in the Federal Register under regulations issued under this Act, or shall publish not later than such date in the Federal Register findings regarding why such notice has not been published. No notice of designation may occur until the expiration of the period for Committee action under subsection (a)(6). The designation (and any of its terms not disapproved under this subsection) and regulations shall take effect and become final after the close of a review period of forty-five days of continuous session of Congress beginning on the day on which such notice is published, unless in the case of a natural marine sanctuary that is located partially or entirely within the seaward boundary of any State, the Governor affected certifies to the Secretary that the designation or any of its terms is unacceptable, in which case the designation or the unacceptable term shall not take effect in the area of the sanctuary lying within the seaward boundary of the State.

(2) Withdrawal of Designation.— If the Secretary considers that actions taken under paragraph (1) will affect the designation of a national marine sanctuary in a manner that the goals and objectives of the sanctuary cannot be fulfilled, the Secretary may withdraw the entire designation. If the Secretary does not withdraw the designation, only those terms of the designation or not certified under paragraph (1) shall take effect.

(3) Procedures.—

(A) In computing the forty-five-day periods of continuous session of Congress pursuant to subsection (a)(6) and paragraph (1) of this subsection—

(i) continuity of session is broken only by an adjournment of Congress sine die; and

(ii) the days on which either House of Congress is not in session because of an adjournment of more than three days to a day certain are excluded.

(B) When the committee to which a joint resolution has been referred has reported such a resolution, it shall at any time thereafter be in order to move to proceed to the consideration of the resolution. The motion shall be privileged

and shall not be debatable. An amendment to the motion shall not be in order, and it shall not be in order to move to reconsider the vote by which the motion was agreed to or disagreed to.

(C) This subsection is enacted by Congress as an exercise of the rulemaking power of each House of Congress, respectively, and as such is deemed a part of the rules of each House, respectively, but applicable only with respect to the procedure to be followed in the case of resolutions described in this subsection. This subsection supersedes other rules only to the extent that they are inconsistent therewith, and is enacted with full recognition of the constitutional right of either House to change the rules (so far as those relate to the procedure of that House) at any time, in the same manner, and to the same extent as in the case of any other rule of such House.

(c) Access and Valid Rights.—

(1) Nothing in this title shall be construed as terminating or granting to the Secretary the right to terminate any valid lease, permit, license, or right of subsistence use or of access that is in existence on the date of designation of any national marine sanctuary.

(2) The exercise of a lease, permit, license, or right is subject to regulation by the Secretary consistent with the purposes for which the sanctuary is designated.

(d) INTERAGENCY COOPERATION.—

(1) REVIEW OF AGENCY ACTIONS.—

(A) IN GENERAL.—Federal agency actions internal or external to a national marine sanctuary, including private activities authorized by licenses, leases, or permits, that are likely to destroy, cause the loss of, or injure any sanctuary resource are subject to consultation with the Secretary.

(B) AGENCY STATEMENTS REQUIRED.— Subject to any regulations the Secretary may establish, each Federal agency proposing an action described in subparagraph (A) shall provide the Secretary with a written statement describing the action and its potential effects on sanctuary resources at the earliest practicable time, but in no case later than 45 days before the final approval of the action unless such Federal agency and the Secretary agree to a different schedule.

(2) SECRETARY'S RECOMMENDED ALTERNATIVES.—If the Secretary finds that a Federal agency action is likely to destroy, cause the loss of, or injure a sanctuary resource, the Secretary shall (within 45 days of receipt of complete information on the proposed agency action) recommend reasonable and prudent alternatives, which may include conduct of the action elsewhere, which can be taken by the Federal agency in implementing the agency action that will protect sanctuary resources.

(3) RESPONSE TO RECOMMENDATIONS.—The agency head who receives the Secretary's recommended alternatives under paragraph (2) shall promptly consult with the Secretary on the alternatives. If the agency head decides not to follow the alternatives, the agency head shall provide the Secretary with a written statement explaining the reasons for that decision.

(e) REVIEW OF MANAGEMENT PLANS.—Not more than five years after the date of designation of any national marine sanctuary, and thereafter at intervals not exceeding five years, the Secretary shall evaluate the substantive progress toward implementing the management plan and goals for the sanctuary, especially the effectiveness of site-specific management techniques, and shall revise the management plan and regulations as necessary to fulfill the purposes and policies of this title.

Sec. 305. Application of Regulations and International Negotiations.

(a) Regulations.—This title and the regulations issued under section 304 shall be applied in accordance with generally recognized principles of international law, and in accordance with the treaties, conventions, and other agreements to which the United States is a party. No regulation shall apply to or be enforced against a person who is not a citizen, national, or resident alien of the United States, unless in accordance with—

(1) generally recognized principles of international law;

(2) an agreement between the United States and the foreign state of which the person is a citizen; or

(3) an agreement between the United States and the flag state of a foreign vessel, if the person is a crewmember of the vessel.

(b) Negotiations.—The Secretary of State, in consultation with the Secretary, shall take appropriate action to enter into negotiations with other governments to make necessary arrangements for the protection of any national marine sanctuary and to promote the purposes for which the sanctuary is established.

(c) INTERNATIONAL COOPERATION.—The Secretary, in consultation with the Secretary of State and other appropriate Federal agencies, shall cooper-

ate with other governments and international organizations in the furtherance of the purposes and policies of this title and consistent with applicable regional and multilateral arrangements for the protection and management of special marine areas.

Sec. 306. Prohibited Activities.
It is unlawful to—
(1) destroy, cause the loss of, or injure any sanctuary resource managed under law or regulations for that sanctuary;
(2) possess, sell, deliver, carry, transport, or ship by any means any sanctuary resource taken in violation of this section;
(3) interfere with the enforcement of this title; or
(4) violate any provision of this title or any regulation or permit issued pursuant to this title.

Sec. 307. **Enforcement**.

(a) In General.—The Secretary shall conduct such enforcement activities as are necessary and reasonable to carry out this title.

(b) Powers of Authorized Officers.—Any person who is authorized to enforce this title may—

(1) board, search, inspect, and seize any vessel suspected of being used to violate this title or any regulation or permit issued under this title and any equipment, stores, and cargo of such vessel;

(2) seize, wherever found, any sanctuary resource taken or retained in violation of this title or any regulation or permit issued under this title;

(3) seize any evidence of a violation of this title or of any regulation or permit issued under this title;

(4) execute any warrant or other process issued by any court of competent jurisdiction; and

(5) exercise any other lawful authority.

(c) Civil Penalties.—

(1) Civil penalty.—Any person subject to the jurisdiction of the United States who violates this title or any regulation or permit issued under this title shall be liable to the United States for a civil penalty of not more than $100,000 for each such violation, to be assessed by the Secretary. Each day of a continuing violation shall constitute a separate violation.

(2) Notice.—No penalty shall be assessed under this subsection until after the person charged has been given notice and an opportunity for a hearing.

(3) In Rem Jurisdiction.—A vessel used in violating this title or any regulation or permit issued under this title shall be liable in rem for any civil penalty assessed for such violation. Such penalty shall constitute a maritime lien on the vessel and may be recovered in an action in rem in the district court of the United States having jurisdiction over the vessel.

(4) Review of Civil Penalty.—Any person against whom a civil penalty is assessed under this subsection may obtain review in the United States district court for the appropriate district by filing a complaint in such court not later than 30 days after the date of such order.

(5) Collection of Penalties.—If any person fails to pay an assessment of a civil penalty under this section after it has become a final and unappealable order, or after the appropriate court has entered final judgment in favor of the Secretary, the Secretary shall refer the matter to the Attorney General, who shall recover the amount assessed in any appropriate district court of the United States. In such action, the validity and appropriateness of the final order imposing the civil penalty shall not be subject to review.

(6) Compromise or Other Action by Secretary.—The Secretary may compromise, modify, or remit, with or without conditions, any civil penalty which is, or may be, imposed under this section.

(d) Forfeiture.—

(1) In General.—Any vessel (including the vessel's equipment, stores, and cargo) and other item used, and any sanctuary resource taken or retained, in any manner, in connection with, or as a result of, any violation of this title or of any regulation or permit issued under this title shall be subject to forfeiture to the United States pursuant to a civil proceeding under this subsection. The proceeds from forfeiture actions under this subsection shall constitute a separate recovery in addition to any amounts recovered as civil penalties under this section or as civil damages under section 312. None of those proceeds shall be subject to set-off.

(2) Application of the Customs Laws.—The Secretary may exercise the authority of any United States official granted by any relevant customs law relating to the seizure, forfeiture, condemnation, disposition, remission, and mitigation of property in enforcing this title.

(3) Disposal of Sanctuary Resources.—Any sanctuary resource seized pursuant to this title may be disposed of pursuant to an order of the appropriate court or, if perishable, in a manner prescribed by regulations promulgated by the Secretary. Any proceeds from the sale of such sanctuary resource shall for all purposes represent the sanctuary resource so disposed of in any subsequent legal proceedings.

(4) Presumption.—For the purposes of this section there is a rebuttable presumption that all sanctuary resources found onboard a vessel that is used or seized in connection with a violation of this title or of any regulation or permit issued under this title were taken or retained in violation of this title or of a regulation or permit issued under this title.

(e) Payment of Storage, Care, and Other Costs.—

(1) EXPENDITURES.—

(A) Notwithstanding any other law, amounts received by the United States as civil penalties, forfeitures of property, and costs imposed under paragraph (2) shall be retained by the Secretary in the manner provided for in section 107(f)(1) of the Comprehensive Environmental Response, Compensation, and Liability Act.

(B) Amounts received under this section for forfeitures and costs imposed under paragraph (2) shall be used to pay the reasonable and necessary costs incurred by the Secretary to provide temporary storage, care, maintenance, and disposal of any sanctuary resource or other property seized in connection with a violation of this title or any regulation or permit issued under this title.

(C) Amounts received under this section as civil penalties and any amounts remaining after the operation of subparagraph (B) shall be used, in order of priority, to—

(i) manage and improve the national marine sanctuary with respect to which the violation occurred that resulted in the penalty or forfeiture;

(ii) pay a reward to any person who furnishes information leading to an assessment of a civil penalty, or to a forfeiture of property, for a violation of this title or any regulation or permit issued under this title; and

(iii) manage and improve any other national marine sanctuary.

(2) Liability for Costs.—Any person assessed a civil penalty for a violation of this title or of any regulation or permit issued under this title, and any claimant in a forfeiture action brought for such a violation, shall be liable for the reasonable costs incurred by the Secretary in storage, care, and maintenance of any sanctuary resource or other property seized in connection with the violation.

(f) Subpoenas.—In the case of any hearing under this section which is determined on the record in accordance with the procedures provided for under section 554 of title 5, United States Code, the Secretary may issue subpoenas for the attendance and testimony of witnesses and the production of relevant papers, books, and documents, and may administer oaths.

(g) Use of Resources of State and Other Federal Agencies.—The Secretary shall, whenever appropriate, use by agreement the personnel, services, and facilities of State and other Federal departments, agencies, and instrumentalities, on a reimbursable or nonreimbursable basis, to carry out the Secretary's responsibilities under this section.

(h) Coast Guard Authority Not Limited.—Nothing in this section shall be considered to limit the authority of the Coast Guard to enforce this or any other Federal law under section 89 of title 14, United States Code.

(i) Injunctive Relief.—If the Secretary determines that there is an imminent risk of destruction or loss of or injury to a sanctuary resource, or that there has been actual destruction or loss of, or injury to, a sanctuary resource which may give rise to liability under section 312, the Attorney General, upon request of the Secretary, shall seek to obtain such relief as may be necessary to abate such risk or actual destruction, loss, or injury, or to restore or replace the sanctuary resource, or both. The district courts of the United States shall have jurisdiction in such a case to order such relief as the public interest and the equities of the case may require.

(J) Area of Application and Enforceability.—The area of application and enforceability of this title includes the territorial sea of the United States, as described in Presidential Proclamation 5928 of December 27, 1988, which is subject to the sovereignty of the United States, and the United States' exclusive economic zone, consistent with international law.

Sec. 308. Severability.

If any provision of this Act or the application thereof to any person or circumstances is held

invalid, the validity of the remainder of this Act and of the application of such provision to other persons and circumstances shall not be affected thereby.

SEC. 309. Research, Monitoring, and Education.

(a) IN GENERAL.—The Secretary shall conduct research, monitoring, evaluation, and education programs as are necessary and reasonable to carry out the purposes and policies of this title.

(b) PROMOTION AND COORDINATION OF SANCTUARY USE.—The Secretary shall take such action as is necessary and reasonable to promote and coordinate the use of national marine sanctuaries for research, monitoring, and education purposes. Such action may include consulting with Federal agencies, States, local governments, regional agencies, interstate agencies, or other persons to promote use of one or more sanctuaries for research, monitoring, and education, including coordination with the National Estuarine Research Reserve System.

Sec. 310. Special Use Permits.

(a) Issuance of Permits.—The Secretary may issue special use permits which authorize the conduct of specific activities in a national marine sanctuary if the Secretary determines such authorization is necessary—

(1) to establish conditions of access to and use of any sanctuary resource; or

(2) to promote public use and understanding of a sanctuary resource.

(b) Permit Terms.—A permit issued under this section—

(1) shall authorize the conduct of an activity only if that activity is compatible with the purposes for which the sanctuary is designated and with protection of sanctuary resources;

(2) shall not authorize the conduct of any activity for a period of more than five years unless renewed by the Secretary;

(3) shall require that activities carried out under the permit be conducted in a manner that does not destroy, cause the loss of, or injure sanctuary resources; and

(4) shall require the permittee to purchase and maintain comprehensive general liability insurance against claims arising out of activities conducted under the permit, and to agree to hold the United States harmless against such claims.

(c) Fees.—

(1) Assessment and Collection.—The Secretary may assess and collect fees for the conduct of any activity under a permit issued under this section.

(2) Amount.—The amount of a fee under this subsection shall be equal to the sum of—

(A) costs incurred, or expected to be incurred, by the Secretary in issuing the permit;

(B) costs incurred, or expected to be incurred, by the Secretary as a direct result of the conduct of the activity for which the permit is issued, including costs of monitoring the conduct of the activity; and

(C) an amount which represents the fair market value of the use of the sanctuary resource and a reasonable return to the United States government.

(3) Use of Fees.—Amounts collected by the Secretary in the form of fees under this section may be used by the Secretary—

(A) for issuing and administering permits under this section; and

(B) for expenses of designating and managing national marine sanctuaries.

(d) Violations.—Upon violation of a term or condition of a permit issued under this section, the Secretary may—

(1) suspend or revoke the permit without compensation to the permittee and without liability to the United States;

(2) assess a civil penalty in accordance with section 307; or

(3) both.

(e) Reports.—Each person issued a permit under this section shall submit an annual report to the Secretary not later than December 31 of each year which describes activities conducted under that permit and revenues derived from such activities during the year.

(f) Fishing.—Nothing in this section shall be considered to require a person to obtain a permit under this section for the conduct of any fishing activities in a national marine sanctuary.

SEC. 311. **Cooperative Agreements, Donations, And Acquisitions.**

(a) COOPERATIVE AGREEMENTS, GRANTS, AND OTHER AGREEMENTS.—The Secretary may enter into cooperative agreements, financial agreements, grants, contracts, or other agreements with States, local governments, regional agencies, interstate agencies, or other persons to carry out the purposes and policies of this title.

(b) AUTHORIZATION TO SOLICIT DONATIONS.—The Secretary may enter into such agreements with any nonprofit organization authorizing the organization to solicit private donations to carry out the purposes and policies of this title.

(c) DONATIONS.—The Secretary may accept donations of funds, property, and services for use in designating and administering national marine

sanctuaries under this title. Donations accepted under this section shall be considered as a gift or bequest to or for the use of the United States.

(d) ACQUISITIONS.—The Secretary may acquire by purchase, lease, or exchange, any land, facilities, or other property necessary and appropriate to carry out the purposes and policies of this title

SEC. 312. Destruction Or Loss Of, Or Injury To, Sanctuary Resources.

(a) Liability for Interest.—

(1) Liability to the United States.—

(A) IN GENERAL— Any person who destroys, causes the loss of, or injures any sanctuary resource is liable to the United States for an amount equal to the sum of—

(i) the amount of response costs and damages resulting from the destruction, loss, or injury; and

(ii) interests on that amount calculated in the manner described under section 1005 of the Oil Pollution Act of 1990.

(2) Liability In Rem.—Any vessel used to destroy, cause the loss of, or injure any sanctuary resource shall be liable in rem to the United States for response costs and damages resulting from such destruction, loss, or injury. The amount of that liability shall constitute a maritime lien on the vessel, and may be recovered in an action in rem in the district court of the United States having jurisdiction over the vessel.

(3) Defenses.—A person is not liable under this subsection if that person establishes that—

(A) the destruction or loss of, or injury to, the sanctuary resource was caused solely by an act of God, an act of war, or an act or omission of a third party, and the person acted with due care;

(B) the destruction, loss, or injury was caused by an activity authorized by Federal or State law; or

(C) the destruction, loss, or injury was negligible.

(4) Limits to Liability.— Nothing in sections 4281–4289 of the Revised Statutes of the United States or section 3 of the Act of February 13, 1893 shall limit the liability of any person under this title.

(b) Response Actions And Damage Assessment.—

(1) Response Actions.—The Secretary may undertake or authorize all necessary actions to prevent or minimize the destruction or loss of, or injury to, sanctuary resources, or to minimize the imminent risk of such destruction, loss, or injury.

(2) Damage Assessment.—The Secretary shall assess damages to sanctuary resources in accordance with section 302(6).

(c) Civil Actions For Response Costs And Damages.—The Attorney General, upon request of the Secretary, may commence a civil action in the United States district court for the appropriate district against any person or vessel who may be liable under subsection (a) for response costs and damages. The Secretary, acting as trustee for sanctuary resources for the United States, shall submit a request for such an action to the Attorney General whenever a person may be liable for such costs or damages.

(d) Use Of Recovered Amounts.—Response costs and damages recovered by the Secretary under this section shall be retained by the Secretary in the manner provided for in section 107(f)(1) of the Comprehensive Environmental Response, Compensation, and Liability Act (42 U.S.C. 9607(f)(1)), and used as follows:

(1) Response Costs And Damage Assessments.— Twenty percent of amounts recovered under this section, up to a maximum balance of $750,000, shall be used to finance response actions and damage assessments by the Secretary.

(2) Restoration, Replacement, Management, And Improvement.—Amounts remaining after the operation of paragraph (1) shall be used, in order of priority—

(A) to restore, replace, or acquire the equivalent of the sanctuary resources which were the subject of the action;

(B) to manage and improve the national marine sanctuary within which are located the sanctuary resources which were the subject of the action; and

(C) to manage and improve any other national marine sanctuary.

(3) Federal-State Coordination.—Amounts recovered under this section with respect to sanctuary resources lying within the jurisdiction of a State shall be used under paragraphs (2)(A) and (B) in accordance with the court decree or settlement agreement and an agreement entered into by the Secretary and the Governor of that State.

Sec. 313. Authorization Of Appropriations.

There are authorized to be appropriated to the Secretary to carry out this title the following:

(A) $8,000,000 for fiscal year 1993;

(B) $12,500,000 for fiscal year 1994;
(C) $15,000,000 for fiscal year 1995; and
(D) $20,000,000 for fiscal year 1996.

Sec. 314. U.S.S. Monitor Artifacts and Materials.

(a) Congressional Policy. — In recognition of the historical significance of the wreck of the United States ship Monitor to coastal North Carolina and to the area off the coast of North Carolina known as the Graveyard of the Atlantic, the Congress directs that a suitable display of artifacts and materials from the United States ship Monitor be maintained permanently at an appropriate site in coastal North Carolina. [P.L. 102–587 designated Hatteras Village, NC, as this site.]

(b) Interpretation And Display Of Artifacts.—

(1) Submission Of Plan. — The Secretary shall, within six months after the date of the enactment of this section, submit to the Committee on Merchant Marine and Fisheries of the House of Representatives a plan for a suitable display in coastal North Carolina of artifacts and materials of the United States ship Monitor.

(2) Contents Of Plan.—The plan submitted under subsection (a) shall, at a minimum, contain—

(A) an identification of appropriate sites in coastal North Carolina, either existing or proposed, for display of artifacts and materials of the United States ship Monitor;

(B) an identification of suitable artifacts and materials, including artifacts recovered or proposed for recovery, for display in coastal North Carolina;

(C) an interpretive plan for the artifacts and materials which focuses on the sinking, discovery, and subsequent management of the wreck of the United States ship Monitor; and

(D) a draft cooperative agreement with the State of North Carolina to implement the plan.

(c) Disclaimer. —This section shall not affect the following:

(1) Responsibilities Of Secretary.—The responsibilities of the Secretary to provide for the protection, conservation, and display of artifacts and materials from the United States ship Monitor.

(2) Authority Of Secretary.—The authority of the Secretary to designate the Mariner's Museum, located at Newport News, Virginia, as the principal museum for coordination of activities referred to in paragraph (1).

Sec. 315. Advisory Councils.

(a) ESTABLISHMENT.—The Secretary may establish one or more advisory councils (in this section referred to as an "Advisory Council") to provide assistance to the Secretary regarding the designation and management of national marine sanctuaries. The Advisory Councils shall be exempt from the Federal Advisory Committee Act.

(b) MEMBERSHIP.—Members of the Advisory Councils may be appointed from among—

(1) persons employed by Federal or State agencies with expertise in management of natural resources;

(2) members of relevant Regional Fishery Management Councils established under section 302 of the Magnuson Fishery Conservation and Management Act; and

(3) representatives of local user groups, conservation and other public interest organizations, scientific organizations, educational organizations, or others interested in the protection and multiple use management of sanctuary resources.

(c) LIMITS ON MEMBERSHIP.—For sanctuaries designated after the date of enactment of the National Marine Sanctuaries Program Amendments Act of 1992, the membership of Advisory Councils shall be limited to no more than 15 members.

(d) STAFFING AND ASSISTANCE.—The Secretary may make available to an Advisory Council any staff, information, administrative services, or assistance the Secretary determines are reasonably required to enable the Advisory Council to carry out its functions.

(e) PUBLIC PARTICIPATION AND PROCEDURAL MATTERS.—The following guidelines apply with respect to the conduct of business meetings of an Advisory Council:

(1) Each meeting shall be open to the public, and interested persons shall be permitted to present oral or written statements on items on the agenda.

(2) Emergency meetings may be held at the call of the chairman or presiding officer.

(3) Timely notice of each meeting, including the time, place, and agenda of the meeting, shall be published locally and in the Federal Register.

(4) Minutes of each meeting shall be kept and contain a summary of the attendees and matters discussed.

The Florida Keys National Marine Sanctuary and Protection Act

Public Law 101–605 (H.R. 5909)

SECTION 1. SHORT TITLE. This Act may be cited as the "Florida Keys National Marine Sanctuary and Protection Act."

SEC. 2. FINDINGS. The Congress finds and declares the following:

(l) The Florida Keys extend approximately 220 miles southwest from the southern tip of the Florida peninsula.

(2) Adjacent to the Florida Keys land mass are located spectacular, unique, and nationally significant marine environments, including seagrass meadows, mangrove islands, and extensive living coral reefs.

(3) These marine environments support rich biological communities possessing extensive conservation, recreational, commercial, ecological, historical, research, educational, and esthetic values which give this area special national significance.

(4) These environments are the marine equivalent of tropical rain forests in that they support high levels of biological diversity, are fragile and easily susceptible to damage from human activities, and possess high value to human beings if properly conserved.

(5) These marine environments are subject to damage and loss of their ecological integrity from a variety of sources of disturbance.

(6) Vessel groundings along the reefs of the Florida Keys represent one of many serious threats to the continued vitality of the marine environments of the Florida Keys which must be addressed in order to protect their values.

(7) Action is necessary to provide comprehensive protection for these marine environments by establishing a Florida Keys National Marine Sanctuary, by restricting vessel traffic within such Sanctuary, and by requiring promulgation of a management plan and regulations to protect sanctuary resources.

(8) The agencies of the United States must cooperate fully to achieve the necessary protection of sanctuary resources.

(9) The Federal Government and the State of Florida should jointly develop and implement a comprehensive program to reduce pollution in the waters offshore the Florida Keys to protect and restore the water quality, coral reefs, and other living marine resources of the Florida Keys environment.

POLICY AND PURPOSE

SEC. 3.(a) POLICY.—It is the policy of the United States to protect and preserve living and other resources of the Florida Keys marine environment.

(b) PURPOSE.—The purpose of this Act is to protect the resources of the area described in section 5(b), to educate and interpret for the public regarding the Florida Keys marine environment, and to manage such human uses of the Sanctuary consistent with this Act. Nothing in this Act is intended to restrict activities that do not cause an adverse effect to the resources or property of the Sanctuary or that do not pose harm to users of the Sanctuary.

DEFINITION

SEC. 4. As used in this Act, the term "adverse effect" means any factor, force, or action that would independently or cumulatively damage, diminish, degrade, impair, destroy, or otherwise harm—

(l) any sanctuary resource, as defined in section 302(8) of the Marine Protection, Research, and Sanctuaries Act of 1972 (16 U.S.C. 1432(8)); or

(2) any of those qualities, values, or purposes for which the Sanctuary is designated.

SANCTUARY DESIGNATION

SEC. 5.(a) DESIGNATION.—The area described in subsection (b) is designated as the Florida Keys National Marine Sanctuary (in this Act referred to as the "Sanctuary") under title III of the Marine Protection, Research, and Sanctuaries Act of 1972 (16 U.S.C. 1431 et seq.). The Sanctuary shall be managed and regulations enforced under all applicable provisions of such title III as if the Sanctuary had been designated under such title.

(b) AREA INCLUDED.—(1) Subject to subsections (c) and (d), the area referred to in subsection (a) consists of all submerged lands and waters, including living marine and other resources within and on those lands and waters, from the mean high water mark to the boundary described under paragraph (2), with the exception of areas within the Fort Jefferson National Monument. The Sanctuary shall be generally identified and depicted on National Oceanic and Atmospheric Administration charts FKNMS 1 and 2, which shall be maintained on file and kept available for public examination during regular business hours at the Office of Ocean and Coastal Resource Management of the National Oceanic and Atmospheric Administration and which shall be updated to reflect boundary modifications under this section.

(2) The boundary referred to in paragraph (1)—

(A) begins at the northeasternmost point of Biscayne National Park located at approximately 25 degrees 39 minutes north latitude, 80 degrees 5 minutes west longitude, then runs eastward to the 300-foot isobath located at approximately 25 degrees 39 minutes north latitude, 80 degrees 4 minutes west longitude;

(B) then runs southward and connects in succession the points at the following coordinates:

(i) 25 degrees 34 minutes north latitude, 80 degrees 4 minutes west longitude,

(ii) 25 degrees 28 minutes north latitude, 80 degrees 5 minutes west longitude, and

(iii) 25 degrees 21 minutes north latitude, 80 degrees 7 minutes west longitude;

(C) then runs southward to the northeastern corner of the existing Key Largo National Marine Sanctuary located at 25 degrees 16 minutes north latitude, 80 degrees 8 minutes west longitude;

(D) then runs southwesterly approximating the 300-foot isobath and connects in succession the points at the following coordinates:

(i) 25 degrees 7 minutes north latitude, 80 degrees 13 minutes west longitude,

(ii) 24 degrees 57 minutes north latitude, 80 degrees 21 minutes west longitude,

(iii) 24 degrees 39 minutes north latitude, 80 degrees 52 minutes west longitude,

(iv) 24 degrees 30 minutes north latitude, 81 degrees 23 minutes west longitude,

(v) 24 degrees 25 minutes north latitude, 81 degrees 50 minutes west longitude,

(vi) 24 degrees 22 minutes north latitude, 82 degrees 48 minutes west longitude,

(vii) 24 degrees 37 minutes north latitude, 83 degrees 6 minutes west longitude,

(viii) 24 degrees 40 minutes north latitude, 83 degrees 6 minutes west longitude,

(ix) 24 degrees 46 minutes north latitude, 82 degrees 54 minutes west longitude,

(x) 24 degrees 44 minutes north latitude, 81 degrees 55 minutes west longitude,

(xi) 24 degrees 51 minutes north latitude, 81 degrees 26 minutes west longitude, and

(xii) 24 degrees 55 minutes north latitude, 80 degrees 56 minutes west longitude;

(E) then follows the boundary of Everglades National Park in a southerly then northeasterly direction through Florida Bay, Buttonwood Sound, Tarpon Basin, and Blackwater Sound;

(F) after Division Point, then departs from the boundary of Everglades National Park and follows the western shoreline of Manatee Bay, Barnes Sound, and Card Sound;

(G) then follows the southern boundary of Biscayne National Park and the northern boundary of Key Largo National Marine Sanctuary to the southeasternmost point of Biscayne National Park; and

(H) then follows the eastern boundary of the Biscayne National Park to the beginning point specified in subparagraph (A).

(c) AREAS WITHIN STATE OF FLORIDA.—The designation under subsection (a) shall not take effect for any area located within the waters of the State of Florida if, not later than 45 days after the date of enactment of this Act, the Governor of the State of Florida objects in writing to the Secretary of Commerce.

(d) BOUNDARY MODIFICATIONS.—No later than the issuance of the draft environmental impact statement for the Sanctuary under section 304(a) (1) (C) (vii) of the Marine Protection, Research, and Sanctuaries Act of 1972 (16 U.S.C. 1434(a) (1) (C) (vii)), in consultation with the Governor of the State of Florida, if appropriate, the Secretary of Commerce may make minor modifications to the boundaries of the Sanctuary as necessary to properly protect sanctuary resources. The Secretary of Commerce shall submit to the Committee on Commerce, Science, and Transportation of the Senate and the Committee on Merchant Marine and Fisheries of the House of Representatives a written notification of such modifications. Any boundary modification made under this subsection shall be reflected on the charts referred to in subsection (b) (l).

PROHIBITION OF CERTAIN USES

SEC. 6.(a) VESSEL TRAFFIC.—(1) Consistent with generally recognized principles of international law, a person may not operate a tank vessel (as that term is defined in section 2101 of title 46, United States Code) or a vessel greater than 50 meters in length in the Area to Be Avoided described in the Federal Register notice of May 9, 1990 (55 Fed. Reg. 19418-19419).

(2) The prohibition in paragraph (l) shall not apply to necessary operations of public vessels. For the purposes of this paragraph, necessary operations of public vessels shall include operations essential for national defense, law enforcement, and responses to emergencies that threaten life, property, or the environment.

(3) The provisions of paragraphs (l) and (2), including the area in which vessel operations are prohibited under paragraph (1), may be modified by regulations issued jointly by the Secretary of the department in which the Coast guard is operating and the Secretary of Commerce.

(4) This subsection shall be effective on the earliest of the following:

(A) the date that is six months after the date of enactment of this Act,

(B) the date of publication of a notice to mariners consistent with this section, or

(C) the date of publication of new nautical charts consistent with this section.

(b) MINERAL AND HYDROCARBON LEASING, EXPLORATION, DEVELOPMENT, AND PRODUCTION.—No leasing, exploration, development, or production or minerals or hydrocarbons shall be permitted within the Sanctuary.

COMPREHENSIVE MANAGEMENT PLAN

SEC. 7.(a) PREPARATION OF PLAN.—The Secretary of Commerce, in consultation with appropriate Federal, State, and local government authorities and with the Advisory Council established under section 208, shall develop a comprehensive management plan and implementing regulations to achieve the policy and purpose of this Act. The Secretary of Commerce shall complete such comprehensive management plan and final regulations for the Sanctuary not later than 30 months after the date of enactment of this Act. In developing the plan and regulations, the Secretary of Commerce shall follow the procedures specified in sections 303 and 304 of the Marine Protection, Research, and Sanctuaries Act of 1972 (16 U.S.C. 1433 and 1434), except those procedures requiring the delineation of Sanctuary boundaries and development of a resource assessment report. Such comprehensive management plan shall—

(l) facilitate all public and private uses of the Sanctuary consistent with the primary objective of Sanctuary resource protection;

(2) consider temporal and geographical zoning, to ensure protection of sanctuary resources;

(3) incorporate regulations necessary to enforce the elements of the comprehensive water quality protection program developed under section 8 unless the Secretary of Commerce determines that such program does not meet the purpose for which the Sanctuary is designated or is otherwise inconsistent or incompatible with the comprehensive management plan developed under this section;

(4) identify priority needs for research and amounts needed to—

(A) improve management of the Sanctuary, and in particular, the coral reef ecosystem within the Sanctuary; and

(B) identify clearly the cause and effect relationships between factors threatening the health of the coral reef ecosystem in the Sanctuary;

(5) establish a long-term ecological monitoring program and database, including methods to disseminate information on the management of the coral reef ecosystem.

(6) identify alternative sources of funding needed to fully implement the plan's provisions and supplement appropriations under section 9 of this Act and section 313 of the Marine Protection, Research, and Sanctuaries Act of 1972 (16 U.S.C. 1444).

(7) ensure coordination and cooperation between Sanctuary managers and other Federal, State, and local authorities with jurisdiction within or adjacent to the Sanctuary;

(8) promote education, among users of the Sanctuary, about coral reef conservation and navigational safety; and

(9) incorporate the existing Looe Key and Key Largo National Marine Sanctuaries into the Florida Keys National Marine Sanctuary except that Looe Key and Key Largo Sanctuaries shall continue to be operated until completion of the comprehensive management plan for the Florida Keys Sanctuary.

(b) PUBLIC PARTICIPATION.—The Secretary of Commerce shall provide for participation by the general public in development of the comprehensive management plan.

(c) TERMINATION OF STUDIES.—On the date of enactment of this Act, all congressionally mandated studies of existing areas in the Florida Keys for designation as National Marine Sanctuaries shall be terminated.

FLORIDA KEYS WATER QUALITY

SEC. 8.(a) WATER QUALITY PROTECTION PROGRAM.—(1) Not later than 18 months after the date of enactment of this Act, the Administrator of the Environmental Protection Agency and the Governor of the State of Florida, in consultation with the Secretary of Commerce, shall develop a comprehensive water quality protection program for the Sanctuary. If the Secretary of Commerce determines that such comprehensive water quality protection program does not meet the purpose for which the Sanctuary is designated or is otherwise inconsistent or incompatible with the comprehensive management plan prepared under section 7, such water quality program shall not be included in the comprehensive management plan. The purposes of such water quality program shall be to—

(A) recommend priority corrective actions and compliance schedules addressing point and nonpoint sources of pollution to restore and maintain the chemical, physical, and biological integrity of the Sanctuary, including restoration and maintenance of a balanced, indigenous population of corals, shellfish, fish and wildlife, and recreational activities in and on the water; and

(B) assign responsibilities for the implementation of the program among the Governor, the Secretary of Commerce, and the Administrator in accordance with applicable Federal and State laws.

(2) The program required by paragraph (l) shall, under applicable Federal and State laws, provide for measures to achieve the purposes described under paragraph (1), including—

(A) adoption or revision, under applicable Federal and State laws, by the State and the Administrator of applicable water quality standards for the Sanctuary, based on water quality criteria which may utilize biological monitoring or assessment methods, to assure protection and restoration of the water quality, coral reefs, and other living marine resources of the Sanctuary;

(B) adoption under applicable Federal and State laws of enforceable pollution control measures (including water quality-based effluent limitations and best management practices) and methods to eliminate or reduce pollution from point and nonpoint sources;

(C) establishment of a comprehensive water quality monitoring program to (i) determine the sources of pollution causing or contributing to existing or anticipated pollution problems in the Sanctuary, (ii)

evaluate the effectiveness of efforts to reduce or eliminate those sources of pollution, and (iii) evaluate progress toward achieving and maintaining water quality standards and toward protecting and restoring the coral reefs and other living marine resources of the Sanctuary;

(D) provision of adequate opportunity for public participation in all aspects of developing and implementing the program; and

(E) identification of funding for implementation of the program, including appropriate Federal and State cost sharing arrangements.

(b) COMPLIANCE AND ENFORCEMENT.—The Administrator of the Environmental Protection Agency, the Secretary of Commerce, and the Governor of the State of Florida shall ensure compliance with the program required by this section, consistent with applicable Federal and State laws.

(c) CONSULTATION.—In the development and implementation of the program required by paragraph (1), appropriate State and local government officials shall be consulted.

(d) IMPLEMENTATION.—

(1) The Administrator of the Environmental Protection Agency and the Governor of the State of Florida shall implement the program required by this section, in cooperation with the Secretary of Commerce.

(2)(A) The Regional Administrator of the Environmental Protection Agency shall with the Governor of the State of Florida establish a Steering Committee to set guidance and policy for the development and implementation of such program. Membership shall include representatives of the Environmental Protection Agency, the National Park Service, the United States Fish and Wildlife Service, the Army Corps of Engineers, the National Oceanic and Atmospheric Administration, the Florida Department of Community Affairs, the Florida Department of Environmental Regulation, the South Florida Water Management District, and the Florida Keys Aqueduct Authority; three individuals in local government in the Florida Keys; and three citizens knowledgeable about such program.

(B) The Steering Committee shall, on a biennial basis, issue a report to Congress that—

(i) summarizes the progress of the program;

(ii) summarizes any modifications to the program and its recommended actions and plans; and

(iii) incorporates specific recommendations concerning the implementation of the program.

(C) The Administrator of the Environmental Protection Agency and the Administrator of the National Oceanic and Atmospheric Administration shall cooperate with the Florida Department of Environmental Regulation to establish a Technical Advisory Committee to advise the Steering Committee and to assist in the design and prioritization of programs for scientific research and monitoring. The Technical Advisory Committee shall be composed of scientists from federal agencies, State agencies, academic institutions, private non-profit organizations, and knowledgeable citizens.

(3)(A) The Regional Administrator of the Environmental Protection Agency shall appoint a Florida Keys Liaison Officer. The Liaison Officer, who shall be located within the State of Florida, shall have the authority and staff to—

(i) assist and support the implementation of the program required by this section, including administrative and technical support for the Steering Committee and Technical Advisory Committee;

(ii) assist and support local, State, and Federal agencies in developing and implementing specific action plans designed to carry out such program;

(iii) coordinate the actions of the Environmental Protection Agency with other Federal agencies, including the National Oceanic and Atmospheric Administration and the National Park Service, and State and local authorities, in developing strategies to maintain, protect, and improve water quality in the Florida Keys;

(iv) collect and make available to the public publications, and other forms of information that the Steering Committee determines to be appropriate, related to the water quality in the vicinity of the Florida Keys; and

(v) provide for public review and comment on the program and implementing actions.

(4)(A) There are authorized to be appropriated to the Administrator of the Environmental Protection Agency $2,000,000 for fiscal year 1993, $3,000,000 for fiscal year 1994, and $4,000,000 for fiscal year 1995, for the purpose of carrying out this section.

(B) There are authorized to be appropriated to the Secretary of Commerce $300,000 for fiscal year 1993, $400,000 for fiscal year 1994, and $500,000 for fiscal year 1995, for the purpose of enabling the

National Oceanic and Atmospheric Administration to carry out this section.

(C) Amounts appropriated under this paragraph shall remain available until expended.

(D) No more than 15 percent of the amount authorized to be appropriated under subparagraph (A) for any fiscal year may be expended in that fiscal year on administrative expense.

ADVISORY COUNCIL

SEC. 9.(a) ESTABLISHMENT.—The Secretary of Commerce, in consultation with the Governor of the State of Florida and the Board of County Commissioners of Monroe County, Florida, shall establish an Advisory Council to assist the Secretary in the development and implementation of the comprehensive management plan for the Sanctuary.

(b) MEMBERSHIP.—Members of the Advisory Council may be appointed from among (l) Sanctuary managers, (2) members of other government agencies with overlapping management responsibilities for the Florida Keys marine environment, and (3) representatives of local industries, commercial users, conservation groups, the marine scientific and educational community, recreational user groups, or the general public.

(c) EXPENSES.—Members of the Advisory Council shall not be paid compensation for their service as members and shall not be reimbursed for actual and necessary traveling and subsistence expenses incurred by them in the performance of their duties as such members.

(d) ADMINISTRATION.—The Advisory Council shall elect a chairperson and may establish subcommittees, and adopt bylaws, rules, and such other administrative requirements and procedures as are necessary for the administration of its functions.

(e) STAFFING AND OTHER ASSISTANCE.—The Secretary of Commerce shall make available to the Advisory Council such staff, information, and administrative services and assistance as the Secretary of Commerce determines are reasonably required to enable the Advisory Council to carry out its functions.

AUTHORIZATION OF APPROPRIATIONS

SEC. 10.(a) AUTHORIZATION FOR SECRETARY OF COMMERCE.—Section 313(2) (C) of the Marine Protection, Research, and Sanctuaries Act of 1972 (16 U.S.C. 1444(2) (C)) is amended by striking "$3,000,000" and inserting in lieu thereof "$4,000,000."

(b) AUTHORIZATION FOR EPA ADMINISTRATOR.—There are authorized to be appropriated to the Administrator of the Environmental Protection Agency $750,000 for each of the fiscal years 1991 and 1992.

(c) REPORT.—The Secretary of Commerce shall, not later than March 1, 1991, submit to the Committee on Commerce, Science, and Transportation of the Senate and the Committee on Merchant Marine and Fisheries of the House of Representatives a report on the future requirements for funding the Sanctuary through fiscal year 1999 under title III of the Marine Protection, Research, and Sanctuaries Act of 1972 (16 U.S.C. 14321 et seq.).

Approved November 16, 1990.

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Existing Legislative Authorities

This appendix describes the statutory or legal framework currently in place in the Florida Keys.

Federal Authorities

The number of Federal agencies and statutes and regulations affecting water and resources in the Florida Keys is extensive, and authorities often overlap.

Coastal and Sanctuary Resource Management.

Abandoned Shipwreck Act of 1987 (ASA), 43 U.S.C. §§ 2101 et seq.

Under the ASA, the United States asserts title to shipwrecks that are: 1) embedded in the submerged lands of a state; 2) embedded in coralline formations protected by a state on its submerged lands; and 3) on the submerged lands of a state and included in or determined to be eligible for inclusion in the National Register. The ASA directs the Federal government to transfer title to the state whose submerged lands contain the shipwreck, except when shipwrecks are located on public or Indian lands or when the wrecks are United States warships that have not been affirmatively abandoned. The public is given notice of the location of any shipwreck when title is asserted under the ASA.

In accordance with the ASA, states manage a broad range of living and nonliving resources in State waters and submerged lands, including abandoned shipwrecks. Shipwrecks offer recreational and educational opportunities for divers, tourists, users of biological sanctuaries, and historical researchers. States are encouraged to provide public access to these shipwrecks through the adoption of guidelines for the creation of underwater parks.

The Secretary of the Interior is responsible for publishing guidelines that seek to maximize the enhancement of shipwrecks as cultural resources; foster a partnership among sport divers, salvors, and other interests to manage shipwreck resources; facilitate access and utilization of the shipwrecks; and recognize the interests of groups engaged in shipwreck discovery and salvage. This responsibility was delegated to the National Park Service.

Significantly, the admiralty principles of salvage and finds do not apply to abandoned shipwrecks under the ASA. Moreover, the ASA does not affect NOAA's authority under the National Marine Sanctuaries Act to designate and manage abandoned shipwrecks within national marine sanctuaries in State waters.

Coastal Barrier Resources Act of 1982, as amended (CBRA), 16 U.S.C. § 3501 et seq.

The purpose of the CBRA is to promote more appropriate use and conservation of coastal barriers along the Atlantic, Gulf, and Great Lakes coastlines. "Coastal barriers" are defined as bay barriers, barrier islands, and other geological features composed of sediment that protect landward aquatic habitats from direct wind and waves. They provide essential habitats for wildlife and marine life; natural storm buffer zones; and areas of scientific, recreational, historic, and archeological significance. The CBRA seeks to minimize the loss of human life, wasteful Federal expenditures on shoreline development, and damage to wildlife, marine life, and other natural resources by restricting future Federal financial assistance, establishing the Coastal Barrier Resources System (CBRS), and considering the means of achieving long-term conservation of barrier resources. The Secretary of the Interior is responsible for maintaining and reviewing the CBRS.

Under this Act, Federal financial assistance for development activities within the CBRS is generally unavailable, except for necessary oil and gas exploration and development; the maintenance of channel improvements, jetties, and roads; essential military activities; the construction and maintenance of Coast Guard facilities; the establishment and maintenance of air and water navigational devices; scientific studies; and nonstructural shoreline stabilization systems.

Coastal Zone Management Act of 1972, as amended (CZMA), 16 U.S.C. §§ 1451 et seq.

The CZMA provides incentives for coastal states to effectively manage, protect, and develop their coastal zones consistent with Federal standards and goals. A state's coastal zone includes coastal waters, and extends inland from the shoreline to the extent necessary to control activities having a significant impact on coastal waters. For Federal approval, a coastal zone management plan must:
1) identify the coastal zone boundaries; 2) define the permissible land and water uses within the coastal zone that have a direct and significant impact and identify the State's legal authority to regulate these uses; 3) inventory and designate areas of particular concern; 4) provide a planning process for energy

facilities; 5) provide a planning process to control and decrease shoreline erosion; and 6) provide for an effective coordination and consultation mechanism between regional, State, and local agencies.

NOAA has the authority to grant Federal approval for proposed coastal zone management plans. NOAA has approved Florida's coastal management program. Therefore, Florida is eligible for financial assistance and gains a legal mechanism to control Federal permits and activities that affect the State's coastal zone. Section 307 of the CZMA requires that all Federal agency activities within the coastal zone must be consistent, to the maximum extent practicable, with the enforceable policies of the State coastal zone management plan. The Secretary of Commerce, however, can override a state's determination of inconsistency if the Secretary finds that the activity is consistent with the CZMA or in the interests of national security.

Section 315 of the CZMA establishes the National Estuarine Research Reserve System (NERRS). States may seek Federal approval and designation of certain areas as national estuarine research reserves (NERR) if the areas qualify as biogeographic and typological representations of estuarine ecosystems and are suitable for long-term research and conservation. Federal financial assistance is available for approved acquisition, management, research, and education.

In the recent Coastal Zone Reauthorization Amendments of 1990, Congress added a Federal requirement that coastal states with federally approved coastal zone management plans prepare, and submit for Federal approval, coastal nonpoint source pollution control programs. CZMA § 6217, 16 U.S.C. § 1455b. The coastal nonpoint source pollution programs expand the nonpoint source pollution programs developed under section 319 of the Clean Water Act (CWA) by including land and water uses affecting coastal waters. States must submit the final versions of their coastal nonpoint source pollution, or section 6217, programs to NOAA by June 1995.

Endangered Species Act (ESA), 16 U.S.C. §§ 1531-1543.

The ESA protects species of marine mammals, birds, and fish listed as "threatened" or "endangered." The U.S. Fish and Wildlife Service (FWS) and NMFS determine which species need protection and maintain a list of endangered and threatened species. The ESA prohibits a "taking" of any member of a listed species. "Take" is defined broadly to mean "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct." 16 U.S.C. §1532(19).

The ESA also requires that Federal agencies engage in a consultation process designed to ensure that projects authorized, funded, or carried out by Federal agencies do not jeopardize the continued existence of endangered or threatened species or result in destruction or modification of their critical habitat. 16 U.S.C. §1536. Critical habitat areas are designated either by the FWS or NMFS, depending on the species. No critical habitats have been designated in the Sanctuary. However, the Right Whale Recovery Team has recently petitioned the National Marine Fisheries Service (NMFS) to establish critical habitat for the northern right whale in waters incorporating part of the Sanctuary. 55 Fed. Reg. 28,670 (1990).

Magnuson Fishery Conservation and Management Act (MFCMA), 16 U.S.C. § 1801 et seq.

The MFCMA provides for the conservation and management of all fishery resources between three and 200 nautical miles (5.6 and 370 km) offshore. The NMFS is charged with establishing guidelines for and approving fishery management plans (FMPs) prepared by regional fishery management councils for selected fisheries. These plans determine the levels of commercial and sport fishing consistent with achieving and maintaining the optimum yield of each fishery. Benthic continental shelf fishery resources located outside State waters, such as abalone, lobster, crabs, sea urchins, and corals, are subject to management under the MFCMA. The waters of the Florida Keys Marine Sanctuary are within the jurisdiction of both the South Atlantic and Gulf of Mexico fisheries management councils.

In July 1983 the Gulf of Mexico Fisheries Management Council approved an FMP to protect the coral and coral reefs of the Gulf of Mexico and the South Atlantic. The final rules implementing the FMP were published on July 23, 1984, at 49 Fed. Reg. 29,607 (1984) and codified at 50 C.F.R. Part 638. These regulations establish management measures to be applied in coral habitat areas of particular concern (HAPC). Within the HAPC, the following restrictions apply: 1) fishing for coral is prohibited except as authorized by permit; 2) fishing with bottom longlines, traps, pots, and bottom trawls is prohibited in areas less than 50 fathoms in depth; and 3) the use of toxic chemicals to take fish or other marine organisms in or on coral reef areas is prohibited except as authorized by permit.

The FMP for the protection of the reef fish resources of the Gulf of Mexico may also apply. This FMP sets bag and size limits, places restrictions on the use of certain types of fishing gear, and establishes reporting and permit systems. It also establishes a stressed area in the Gulf where reef fish are protected by special management measures.

Within Federal waters, the MFCMA is enforced by the U.S. Coast Guard (USCG) and the NMFS. The Secretary of Commerce can enter into agreements with any State agency for enforcement purposes in State waters.

Marine Mammal Protection Act (MMPA), 16 U.S.C. §§ 1361 et seq.

The MMPA applies to U.S. citizens in State, contiguous zone, and international waters and to foreign nationals subject to U.S. jurisdiction. It is designed to protect all species of marine mammals. The MMPA is implemented by the NMFS, which is the agency responsible for whales, porpoises, dolphins, and pinnipeds (seals), and the FWS, which is primarily responsible for sea lions and walruses. The Act provides for: 1) a general moratorium on the "taking" of marine mammals, with a few limited exceptions; 2) the development of a management approach designed to achieve an "optimum sustainable population" (OSP) for all species or population stocks of marine mammals; and 3) the protection of depleted populations of marine mammals.

The MMPA has been amended to include requirements that observers be carried aboard commercial fishing vessels to determine levels of incidental take of marine mammals. Commercial fishing activities are divided into categories on the basis of gear type and associated levels of potential incidental take of marine mammals.

Migratory Bird Treaty Act (MBTA), 16 U.S.C. §§ 703 et seq.

It is unlawful "to pursue, hunt, take, capture, kill . . . any migratory bird, any part, nest or egg" or any product of any such bird protected by the Migratory Bird Convention, except as permitted by regulations. The Secretary of the Interior is charged with determining when, to what extent, and how to permit these activities. Game bird cannot be hunted during a closed season. Nongame birds cannot be hunted at all.

National Historic Preservation Act (NHPA), 16 U.S.C. § 470 et seq.

The NHPA authorizes the Secretary of the Interior to maintain a National Register of "districts, sites, buildings, structures, and objects significant in American history, architecture, archaeology, and culture." Sites have been listed on the National Register that include or are composed entirely of ocean waters and submerged lands within State waters or on the Outer Continental Shelf (OCS), such as the USS MONITOR.

Federal agencies conducting, licensing, or assisting an undertaking that may affect a listed site or a site that is eligible for listing must provide the Advisory Council on Historic Preservation a reasonable opportunity to comment on the proposed action before any action is taken. 16 U.S.C. 470f. The Council determines whether the undertaking will change the quality of the site's historic, architectural, archaeological, or cultural character. 36 C.F.R. Part 800.

Pollution Control.

Clean Water Act (CWA), 33 U.S.C. § 1251 et seq.

The CWA establishes the basic scheme for restoring and maintaining the chemical, physical, and biological integrity of the nation's waters. To varying degrees, the waters of the United States are subject to requirements of the CWA. The CWA regulates discharges from known sources and discharges of harmful quantities of oil and hazardous substance discharges. The Act also regulates the disposal of vessel sewage and dredged material.

The EPA administers the National Pollutant Discharge Elimination System (NPDES). Under the NPDES program, a permit is required for the discharge of any pollutant from a point source into the navigable waters of the United States. NPDES permits are required for discharges associated with oil and gas development on Federal leases beyond State waters. The EPA can establish specific conditions for permits.

The CWA was amended in 1987 to include the nonpoint source (NPS) program. States must develop management programs to address NPS runoff. Under Florida's program, which has been approved by the EPA, the State will identify water bodies that require NPS controls. Water management districts have NPS control authority to permit agricultural

water management systems. The State implements an area-wide water quality management planning program that includes NPS controls.

The CWA prohibits discharges of harmful quantities of oil and hazardous substances into the contiguous zone, except where permitted under the Protocol of 1978 relating to the International Convention for the Prevention of Pollution from Ships. The USCG investigates and responds to discharges of oil and hazardous substances in accordance with the National Contingency Plan (NCP). The USCG, with the cooperation of the EPA, administers the NCP. Regional plans are submitted to implement the NCP. EPA's Region IV, which contains the Sanctuary, has a regional contingency plan that the EPA follows for both oil and hazardous substance spills occurring inland. The USCG is the lead agency for coastal and ocean spills, and follows the regional contingency plan for spills of hazardous substances. However, the USCG develops its own area plans for oil spills.

The CWA requires recreational vessels with toilet facilities to contain operable marine sanitation devices. The CWA also requires noncommercial craft to comply with marine sanitation device regulations issued by the EPA and enforced by the USCG. The statute also establishes “no-discharge zones” where greater environmental controls prohibit discharge of sewage from all vessels. Publicly owned sewage treatment facilities must meet effluent reductions by secondary treatment.

The Army Corps of Engineers (ACOE) implements a permitting program for the discharge of dredged or fill materials into the navigable waters of the United States that lie inside of the baseline for the territorial seas and fill materials into the territorial seas within three miles of shore. Although the ACOE has primary responsibility for the program, the EPA is authorized to review and comment on the impact of proposed dredge and fill activities on municipal water supplies, shellfish beds and fishery areas, wildlife, and recreational areas.

Clean Air Act (CAA), 42 U.S.C. §§ 7401 et seq.

The CAA establishes national guidelines and minimal air quality standards to protect and enhance the quality of the nation’s air resources. Beyond State waters, Prevention of Significant Deterioration (PSD) provisions of the CAA apply to new sources on the Outer Continental Shelf (OCS) adversely affecting air quality; these regulations would supplement air quality regulations administered by the DOI in its activities related to the OCS.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. §§ 9601 et seq.

The CERCLA addressed the cleanup of hazardous waste sites. Under CERCLA, Federal and State agencies categorize hazardous waste sites and prioritize responses. CERCLA provides the Federal government with the authority to respond to releases of hazardous substances, remediate sites, and seek reimbursement from the potentially responsible parties (PRPs). Response actions are carried out in accordance with the National Contingency Plan (NCP). CERCLA also created a Hazardous Substance Trust Fund, called the Superfund, to fund removal and remedial actions undertaken by the government. Finally, CERCLA makes PRPs liable for costs of removal or remediation incurred by the State or Federal government; other necessary costs of response; damages for injury, destruction, or loss of natural resources; and health assessment costs.

Ocean Dumping Act (ODA), Title I of the Marine Protection, Research, and Sanctuaries Act of 1972, 33 U.S.C. §§1401 et seq.

The ODA prohibits the transportation of any materials from or under the authority of the United States for the purpose of dumping them into ocean waters without a permit from the EPA. This Act also prohibits any person from dumping any material that may affect the territorial seas, regardless of the origin of the materials. The EPA regulates ocean dumping of all materials, except the dumping of dredged materials, which is regulated by the ACOE.

Oil Pollution Act of 1990 (OPA), 33 U.S.C. §§ 2701 et seq.

The OPA creates a comprehensive prevention, response, liability, and compensation regime for dealing with oil pollution from vessels and shore facilities. A person who causes an oil spill covered by OPA may be liable for certain costs and penalties. Any party responsible for a discharge, or a substantial threat of a discharge, of oil into navigable waters, adjoining shorelines, or the exclusive economic zone is liable for: 1) the removal costs and damages, including assessment costs; 2) injury to, destruction or loss of, or loss of use of natural resources; 3) injury to, or economic losses as a result of the destruction of real or personal property; 4) subsistence use of natural resources, net lost government revenues, or lost profits; and 5) net costs of providing additional public services during or after the removal activities.

It establishes enhanced vessel construction standards, crew licensing, contingency planning, Federal response capabilities, enforcement authority, penalties, and research and development with the goal of increasing environmental safeguards during oil transportation.

The USCG has the responsibility for merchant marine personnel, including the authority to review criminal records and alcohol and drug abuse histories. OPA establishes the double-hull requirement for oil tankers. Under OPA, the USCG is required to ensure that vessels comply with the improved, expanded vessel traffic service schemes.

OPA also amends section 311(c) of the CWA to ensure immediate and effective removal of a discharge and mitigation or prevention of a substantial threat of a discharge. OPA mandated a comprehensive national response system to quickly contain a spill of oil or hazardous waste into the waters of the United States and to minimize damage to the environment. OPA increases the penalties available under the CWA for oil and hazardous waste spills.

Ports and Waterways Safety Act (PWSA), 33 U.S.C. § 1221 et seq.

The PWSA, as amended by the Port and Tanker Safety Act of 1978 and the Oil Pollution Act of 1990, is designed to promote navigation and vessel safety and protect the marine environment. The PWSA applies both in State and Federal waters out to 200 miles. The PWSA authorizes the USCG to establish vessel traffic separation schemes (VTSSs) for ports, harbors, and other waters subject to congested vessel traffic. VTSSs are applicable to commercial ships, other than fishing vessels, weighing 300 gross tons (270 gross metric tons) or more. OPA amended the PWSA to mandate that appropriate vessels must comply with VTSSs.

In addition to vessel traffic control, the USCG regulates other navigational and shipping activities and promulgates numerous regulations relating to vessel design, construction, and operation designed to minimize the likelihood of accidents and to reduce vessel source pollution. Finally, the USCG is vested with the primary responsibility of maintaining boater safety, including the conduct of routine vessel inspections and coordination of rescue operations.

River and Harbors Act (RHA), 33 U.S.C. § 401 et seq.

Section 10 of the RHA prohibits the unauthorized obstruction of the navigable waters of the United States. The construction of any structure or the excavation or fill in the navigable waters of the United States is prohibited without a permit from the ACOE. Section 13 prohibits the discharge of refuse and other substances into navigable waters, but has been largely superseded by the CWA.

Shore Protection Act of 1988, 33 U.S.C. § 2601 et seq.

Under the Shore Protection Act of 1988, municipal and commercial waste cannot be transported by a vessel in coastal waters without a permit from the Department of Transportation. The procedures for loading, securing, and off-loading of these wastes must ensure that any deposition of waste into coastal waters is minimized.

Offshore Resources.

Submerged Lands Act of 1953, as amended (SLA), 43 U.S.C. §§ 1301 et seq.

The SLA delineates State authority over submerged lands and their resources. The Act recognizes State authority over submerged lands extending out to three geographical miles into the Atlantic or Pacific oceans, or three marine leagues into the Gulf of Mexico from the coastline.

Outer Continental Shelf Lands Act (OCSLA), 43 U.S.C.§ 1331 et seq.

The OCSLA, as amended, establishes Federal control over the natural resources of the OCS beyond three nautical miles (off Texas's and Florida's west coast, this authority extends to three marine leagues or 10.35 nm.). The authority to manage OCS mineral exploration and development activities has been delegated to the Minerals Management Service (MMS) by the Secretary of the Interior. The MMS has overall responsibility for leasing OCS lands. In unique or special areas, the MMS may impose special lease stipulations designed to protect specific geological and biological phenomena.

The MMS is also charged with supervising OCS operations, including the approval of both exploration and development/production plans and applications for pipeline rights-of-way on the OCS. Lessees are

required to include specific information concerning emissions and their potential impacts on coastal areas in exploration and development/production plans. The MMS enforces OCSLA regulations, 30 C.F.R. Part 250, and stipulations in particular leases.

In addition to the DOI, both the ACOE and USCG have responsibility over OCS mineral development under the PWSA to the extent that such development affects navigation. The ACOE is responsible for ensuring, through a permit system, that OCS structures including pipelines, platforms, drill ships, and semi-submersibles, do not obstruct navigation. The USCG ensures that structures on the OCS are properly marked and safe working conditions are maintained onboard.

General Nautical Authorities.

Act to Prevent Pollution from Ships (APPS), 33 U.S.C. § 1901 et seq.

The APPS is the Federal legislation implementing the International Convention for the Prevention of Pollution from Ships, as modified by a 1978 Protocol (MARPOL 73/78). The APPS regulates discharges of oil, oily mixtures, and noxious liquid substances from large seagoing vessels except tankers less than 150 gross tons and other vessels less than 500 gross tons. The USCG enforces the APPS.

Except for discharges from machinery space bilges, tankers subject to the Act may not discharge oil or oily mixtures unless they are 50 nautical miles from the nearest land; the total quantity of oil discharged cannot exceed one part in 15,000 of the total cargo capacity. Discharges from other vessels regulated by the Act, and discharges from the machinery bilges of tankers must be made as far as practicable from land and may not have an oil content of more than 100 parts per million. Besides these requirements, discharges by a vessel regulated by the Act must be made while the vessel is en route and the instantaneous discharge rate must not exceed 60 liters per mile. No discharges can be made in specially designated areas; the Gulf of Mexico is a special area for the purposes of the APPS and MARPOL.

Marine Plastic Pollution Research and Control Act of 1987 (MPPRCA), 33 U.S.C. §§ 1901-1903, 1905, 1907-1909, 1912.

This Act amends the APPS to implement Annex V of MARPOL in the United States by prohibiting the dumping of plastics at sea and severely restricting dumping other types of ship-generated garbage, both at sea and in the navigable waters of the United States. Its provisions apply to all U.S. watercraft, including recreational vessels, and to all other ships subject to MARPOL when in U.S. waters.

Miscellaneous.

Federal Aviation Act of 1958 (FAA), 49 U.S.C. §§ 1301 et seq.

The FAA establishes the Federal Aviation Administration and gives it broad powers to promote air commerce and regulate the use of navigable airspace to ensure aircraft safety and the efficient use of navigable airspace. To accomplish this mandate, the Administration publishes aeronautical charts that provide a variety of information to pilots, including the location of sensitive areas that should be avoided.

State Authorities

This section describes the State statutory or legal framework currently in place in the Florida Keys.

Coastal or Resource Management Authorities.

Florida Environmental Land and Water Management Act of 1972, Title 28, Natural Resources; Conservation, Reclamation, and Use, Chapter 380, Land and Water Management, sections 380.012-380.12.

In accordance with this Act, the Department of Community Affairs (DCA) is responsible for the statewide planning and development of land and water management policies to ensure a water management system that both improves water quality in the State and promotes growth. The Act establishes regional planning for developments that will have a substantial effect on the health, safety, or welfare of citizens in more than one country. This Act authorizes DCA to recommend Areas of Critical State Concern (ACSC) that should be considered “environmentally endangered lands and outdoors recreation lands” under the Land Conservation Act of 1972. The DCA establishes general guidelines for development activities in ACSC. Local land-development regulations and plans must conform to these guidelines and subsequent development in an ACSC must be conducted in accordance with this Act. The Florida Keys has been designated as an ACSC. The guiding principles for development of the Keys are set out in Section 380.0552 F.S.

The Florida ACSC Restoration Trust Fund Act, sections 380.0558 et seq., creates a trust fund for reimbursement of the State's actual costs in obtaining payment of damages for injury to, or destruction of, the coral reefs and other natural resources of the State. The fund also can be used for research, protection, and restoration of coral reefs and other injured national resources. Damages recovered by Florida for injury to its coral reefs or national resources are deposited in this fund.

Beach and Shore Preservation Act, Title 11, County Organization and Intergovernmental Relations, Chapter 161, Beach and Shore Preservation, sections 161.011 et seq.

Before any coastal construction, reconstruction, or physical activity is undertaken for shore protection purposes on State lands below the mean high-water line of any tidal water of the State, a coastal construction permit must be obtained from the State. Coastal construction cannot interfere with public use of the beach seaward of the mean high-water line unless the State determines that this interference is unavoidable for purposes of protecting the beach or an endangered upland sanctuary.

The Act creates beach and shore preservation districts at the county level. The State sets coastal construction control lines on a county basis along beaches to provide for a 100-year storm surge and ensure protection of the beach-dune system, as well as public access. Construction of buildings or other structures is generally prohibited seaward of the coastal construction control line, which is set at 50 feet of the mean high-water line, or the erosion control line if one is established (whichever line is more landward). The Act allows the State to authorize a waiver of this setback in certain situations.

Construction in violation of the Act is considered a public nuisance and must be removed. Violations of this Act can be considered criminal misdemeanors. The State can also assess administrative penalties of $10,000 per day for willful violation. The Act provides for joint and severe liability when damages are caused by gross negligence or willful conduct. The State can impose liens on both real and personal property.

The Act sets up a "Beach Management Trust Fund" to carry out State responsibilities in comprehensive, statewide beach protection activities.

Coastal Zone Protection Act of 1985, Title 11, County Organization and Intergovernmental Relations, Chapter 161, Beach and Shore Preservation, sections 161.52-161.58.

This Act mandates strict construction standards in order to minimize damage along the coast.

Florida Coastal Management Act of 1978, Title 28, Natural Resources; Conservation, Reclamation, and Use, Chapter 380, Coastal Planning, sections 380.19-380.25.

Although the Florida Coastal Coordinating Council (FCCC) is created within the State, the State administers the FCMA as the State's lead agency. The FCCC, however, reviews all of the plans and activities relating to the coastal zone and develops a comprehensive State plan for the coastal zone. The State coastal zone management plan is considered part of the State comprehensive plan. The FCMA provides for Federal consistency review as part of the permit or license issuance or denial process. Federal consistency review is limited to specific situations explicitly delineated in the FCMA.

Florida Wetlands Protection Act, Title 29, Public Health, Chapter 403, Environmental Control, sections 403.91 - 403.929 (known as the Warren S. Henderson Wetlands Protection Act of 1984).

In Florida, the State is responsible for permitting certain activities in wetlands. For example, no person can dredge or fill in, on, or over surface waters without a permit. A permit applicant must show that the water quality criteria for the wetlands will not be violated and that the project will not adversely affect human health and safety, fish and wildlife conservation, navigation, fishing, recreation, and significant historical archaeological resources, among others. The Act creates a wetlands monitoring system to determine the location of wetlands and to identify impacts to and losses of wetlands. The Act provides protection for mangroves located in waters where dredge and fill activities are permitted.

(1) Florida Wetlands Regulations, FAC 17-312.

Part IV of Rule 17-312, entitled "Additional Criteria for Dredging and Filling Within Outstanding Florida Water in Monroe County," provides the most stringent protection to the waters of the Florida Keys that is allowed by law. Part IV explicitly requires additional protection for coral, algae, sponge, and seagrass communities; specifies siting and design criteria for

piers and boat mooring facilities; and denotes permitting requirements for marinas and shoreline stabilization.

Land Conservation Act of 1972, Title 18, Public Lands, Chapter 259, Land Acquisition for Conservation or Recreation.

This Act requires the State to develop comprehensive plans to conserve environmentally endangered lands, and provides a mechanism for the State to purchase land in designated ACSC.

Outdoor Recreation and Conservation Act of 1963, Title 28, Natural Resources; Conservation, Reclamation, and Use, Chapter 375, Outdoor Recreation, sections 375.001 et seq.

In accordance with this statute, the State develops a comprehensive multipurpose outdoor recreation and conservation plan for the State, and is authorized to acquire property to achieve conservation and recreation purposes.

Florida Communities Trust Act, Title 28, Natural Resources; Conservation, Reclamation, and Use, sections 380.501 et seq.

This statute created a nonregulatory State agency in DCA and a revolving trust fund to coordinate, undertake, or fund projects implementing the conservation, recreation, or coastal elements of the local comprehensive plans. The trust fund is authorized to acquire and dispose of property to protect the environment or provide public access or recreational facilities.

Title 28, Natural Resources; Conservation, Reclamation, and Use, Chapter 370, Saltwater Fisheries.

This chapter provides statutory authority for the State to preserve, manage, and protect the marine, crustacean, shellfish, and anadromous fishery resources in State waters and regulate fishing operations in the State.

Title 28, Natural Resources; Conservation, Reclamation, and Use, Chapter 372, Wildlife.

This chapter generally authorizes the Game and Fresh Water Fish Commission to regulate the use of freshwater organisms and everglades.

Florida Endangered and Threatened Species Act of 1977, Title 28, Natural Resources; Conservation, Reclamation, and Use, sections 372.072 et seq.

The Game and Fresh Water Fish Commission is responsible for researching and managing freshwater and upland species. The State has the regulatory authority for marine species. Killing or wounding endangered or threatened species is a third degree felony.

(1) Endangered and Threatened Species Regulations, FAC 39.

Florida Historical Resources Act, Title 18, Public Lands and Property, Chapter 267, Historical Resources, sections 267.011 et seq.

The Division of Historical Resources manages the State's historical resources, including resources on State-owned submerged lands. All treasure trove, artifacts, and objects with historical and archaeological value that have been abandoned on State-owned or State-owned sovereignty submerged lands belong to the State, and title to these resources is vested in the Division of Historical Resources for administration and protection. By virtue of its ownership, this agency has primary the responsibility for submerged cultural resources, including historic shipwreck sites and other abandoned objects with intrinsic, historical, or archaeological value.

(1) Procedures for conducting exploration and salvage of historic shipwreck sites, FAC 1A – 31.001 et seq.

(2) Research permits for archeological sites of significance, FAC 1A – 32.01 et seq.

Title 18, Public Lands and Property, Chapter 253, State Lands. Section 253.12 provides State ownership of all sovereignty tidal and submerged bottom lands, all coastal and intracoastal waters of the State and all submerged lands owned by the State in navigable freshwater.

Water and Air Quality Authorities.

Florida Clean Vessel Act, Vessel Registration and Safety, Chapter 327, Marine Sanitation, section 327.53

(1) Every vessel 26 feet or more in length which has an enclosed cabin with berthing facilities shall, while on the waters of the state, be equipped

with a toilet. On a vessel other than a houseboat, the toilet may be portable or permanently installed. Every permanently installed toilet shall be properly attached to the appropriate United States Coast Guard certified or labeled marine sanitation device.

(2)(a) Every houseboat shall be equipped with at least one permanently installed toilet which shall be properly connected to a United States Coast Guard certified of labeled Type III marine sanitation device. If the toilet is simultaneously connected to both Type III marine sanitation and to another approved marine sanitation device, the value or other mechanism selecting between the two marine sanitation devices shall be set to direct all sewage to the Type III marine sanitation device and, while the vessel is on the waters of the state, shall be locked or otherwise secured by the operator, so as to prevent resetting.

(b) A houseboat on which a Type I marine sanitation device was installed before January 30, 1980, need not install a Type II device until October 1, 1996. A houseboat on which a Type III marine sanitation device was installed before July 1, 1994, need not install a Type III device until October 1, 1996.

(3) Every floating structure that has an enclosed living space with berthing facilities, or working space with public access, must be equipped with a permanently installed toilet properly connected to a Type III marine sanitation device or permanently attached via plumbing to shoreside sewage disposal. No structure shall be plumbed so as to permit the discharge of sewage into the waters of the state.

(4)(a) Raw sewage shall not be discharged from any vessel, including houseboats, or any floating structure in Florida waters. The operator of any vessel which is plumbed so that a toilet may be flushed directly into the water or so that a holding tank may be emptied into the water shall, while the vessel is on the waters of the state, set the valve or other mechanism directing the sewage so as to prevent direct discharge and lock or otherwise secure the valve so as to prevent resetting.

(b) All waste from Type III marine sanitation devices shall be disposed in an approved sewage pumpout facility.

(c) All waste from portable toilets shall be disposed in an approved waste reception facility.

(5) Every vessel owner, operator, and occupant shall comply with United States Coast Guard regulations pertaining to marine sanitation devices and with United States Environmental Protection Agency regulations pertaining to areas in which the discharge of sewage, treated or untreated, is prohibited.

(6)(a) A violation of this section is a noncriminal infraction as provided in s.327.73. Each violation shall be a separate offense. The owner and operator of any vessel shall be jointly and severally liable for the civil penalty imposed pursuant to this section.

(b) All civil penalties imposed and collected pursuant to this section shall be deposited in the Motorboat Revolving Trust Fund and shall be used: to implement, administer, and enforce this act; to construct, renovate, or operate pumpout stations and waste reception facilities; and to conduct a program to educate vessel operators about the problem of human body waste discharges from vessels and inform them of the location of pumpout stations and waste reception facilities.

(7) Any vessel or floating structure operated or occupied on the waters of the state in violation of this section is declared a nuisance and a hazard to public safety and health. The owner or operator of any vessel or floating structure cited for violating this section shall, within 30 days following the issuance of the citation, correct the violation for which the citation was issued or remove the vessel or floating structure from the waters of the state. If the violation is not corrected within the 30 days and the vessel or floating structure remains on the waters of the state in violation of this section, law enforcement officers charged with the enforcement of this chapter under s.327.70 shall apply to the appropriate court in the county in which the vessel or floating structure is located, to order or otherwise cause the removal of such vessel or floating structure from the waters of the State at the owner's expense. If the owner cannot be found or otherwise fails to pay the removal costs, the provisions of s.328.17 shall apply. If the proceeds under s.328.17 are not sufficient to pay all removal costs, funds appropriated from the Motorboat Revolving Trust Fund pursuant to paragraph (6)(b) or s.327.25(12) may be used.

(8) Any not-for-profit corporation that is organized and existing under the laws of the state and that possesses a valid exemption from federal income taxation under s.501(c)(3) of the United States Internal Revenue Code received prior to

January 1, 1994 shall have until October 1, 1998, to comply with the provisions of this section.

Florida Air and Water Pollution Control Act, Title 29, Public Health, Chapter 403, Environmental Control, sections 403.011 et seq.

The State is responsible for regulating the pollution of air and water under this Act by administering and enforcing the State standards for air and water quality. A permit is required for the operation, construction, or expansion of any installation that may be a source of air or water pollution. This Act authorizes the State to establish restoration programs for water bodies within State and rules for waters categorized as Outstanding Florida Waters. The State approves current and long-range plans for air and water quality control and pollution abatement. The State stormwater program is also authorized in accordance with this Act.

The State enforces this Act by instituting civil actions for damages to the "air, waters, or property, including animal, plant, and aquatic life" caused by any violation and civil penalties of up to $10,000 per offense. Each day of a continuing violation constitutes a separate offense. The State can also pursue civil penalties for damages, administrative relief, injunctive relief, and criminal penalties.

(1) Air Pollution Rules, FAC 17-2.100.

(2) Antidegredation for Surface Water Quality, Outstanding Florida Waters, FAC 17-3.041.

No degradation of water quality is allowed in Outstanding Florida Waters and Outstanding Natural Resource Waters except as provided in FAC 17-4.242 (2) and (3).

(3) Ambient Air Quality Standards, FAC 17-2.300.

(4) Rules on Permits, FAC 17-4.001.

(5) Special Protection for Outstanding Florida Waters, FAC 17-4.242.

(6) Stormwater Discharge Regulations, FAC 17-25.001.

(7) Water Quality Standards. FAC 17-3.011.

(8) Wetlands Application Regulations, FAC 17-611.100.

Environmental Protection Act of 1971, Title 29, Public Health, Chapter 403, Environmental Control, sections 403.412 et seq.

Injunctive relief is available to Florida's Department of Legal Affairs, any political subdivision or municipality of the State, or any private citizen in order: 1) to compel a government agency to enforce its rules or the law protecting air, water, or other natural resources; or 2) to stop any person or government entity from violating a law or regulation protecting the air, water, or other natural resources.

Florida Litter Law of 1971, Title 29, Public Health, Chapter 403, Environmental Control, sections 403.413-403.4135.

This law makes it illegal to dump litter of any kind, in any manner or amount, on roads or public lands, or in lakes, rivers, canals, streams, tidal waters, or coastal waters unless authorized by law or permit. The penalties for violating this Act range from civil fines to criminal prosecution. The Litter Law is enforced by all law enforcement officers in Florida.

Florida Pollutant Spill Prevention and Control Act, Title 28, Natural Resources; Conservation, Reclamation, and Use, Chapter 376, Pollutant Discharge Prevention, sections 376.011-376.319.

This Act provides the State with the authority to regulate the transfer, storage, or transportation of products that contain pollutants between vessels, onshore facilities and vessels, and terminal facilities within State jurisdiction. For the purposes of this Act, pollutants are defined as oil of any kind, gasoline, pesticides, ammonia, chlorine, and derivatives, excluding liquefied petroleum gas. The discharge of any of these substances into or on any coastal waters, estuaries, tidal flats, beaches, or lands adjoining the sea coast of the State is generally prohibited. When a prohibited discharge occurs, this Act provides for proper removal and establishes liability limits for the terminal facility or vessel and reimbursement of persons who have been damaged. Furthermore, the State is authorized to contain and remove any pollution caused by these activities. A trust fund has been established to pay for inspections, supervision over activities, and reasonable damage claims. The State possesses strong enforcement powers, including civil penalties that can reach $50,000 per violation per day.

Surface Water Improvement and Management Act, Title 28, Natural Resources, Chapter 373, Surface Waters, sections 373.451-373.4596.

Each water management district prepares and maintains a list of prioritized water bodies of regional or statewide significance. Based on criteria developed by the State for these water bodies, the water management districts develop surface water improvement and management plans to restore and maintain the water quality. The Surface Water Improvement and Management Trust Fund is available for planning and implementation.

Water Resources Restoration and Preservation Act, Title 29, Public Health, Chapter 403, Environmental Control, sections 403.0615 et seq.

The State samples the water quality of State waters and establishes restoration programs when needed.

Water Resources Act of 1972, Title 28, Natural Resources; Conservation, Reclamation, and Use, Chapter 373, Water Resource Plan, sections 373.026 et seq.

Under this Act, the State supervises regional water management districts. The South Florida Water Management District (SFWMD) manages the Florida Keys. Pursuant to the permitting authorization in this Act, the SFWMD regulates development impacting freshwater wetlands and estuarine systems. The SFWMD's authority to permit activities extends to all "waters in the State," including coastal waters.

Waste Management Authorities.

Florida Solid and Hazardous Waste Management Act (FSHWMA), Title 29, Public Health, Chapter 403, Environmental Control, sections 403.702-403.7721.

This statute regulates the storage, collection, transport, separation, processing, recycling, and disposal of solid waste, including hazardous waste. The Act was passed to protect public health and enhance the environment, while at the same time recovering resources that still have use. Pursuant to this authority, the State coordinates solid waste planning, reviews and issues permits for the construction, operation and closure of solid waste management facilities, creates and enforces standards for the generation, treatment, storage, and disposal of waste, and promotes recycling. The Act requires certain storage, treatment, and disposal activities for all types of solid waste, including residential waste and used oil.

(1) Biohazardous Waste Management Regulations, FAC 17-712.100 et seq.

(2) Hazardous Substance Release Notification Rules, FAC 17 150.200 et seq.

When a reportable quantity of a hazardous substance is released, the owner/operator of a facility that allows the release must notify the State.

(3) Hazardous Waste Rules, FAC 17-730.001 et seq.

The State's regulations implementing the FSHWMA.

(4) Inland Protection Trust Fund.

Provides payment for cleanup and closure of leaking UST with petroleum or petroleum products.

(5) Resource Recovery and Management Regulations, FAC 17-7.200 et seq.

The State's regulations, which implement the Florida Resource Recovery and Management Act, set the criteria and standards for recycling and recovery of materials from wastes.

(6) Solid Waste Disposal Facilities Regulations, FAC 17-701.001 et seq.

The State's regulations implementing the FSHWMA.

(7) Underground Storage Tanks Regulation, FAC 17-61.001 et seq.

The State's regulations prescribing standards for underground storage tanks; providing for registration and notification requirements; mandating construction, operation, repair, and closure standards; establishing an inspection program; creating a petroleum-contaminated cleanup reimbursement funds, criteria, and site ranking.

(8) Used Oil Management Regulations, FAC 17-710.100 et seq.

Florida Statewide Multipurpose Hazardous Waste Facility Siting Act, Title 29, Public Health, Chapter 403, Environmental Control, sections 403.78-403.7893.

This Act establishes a centralized and coordinated permitting process for the location, construction, operation, and maintenance of hazardous waste management facilities.

Florida Industrial Siting Act.

(1) Industrial Siting Regulations, FAC 17-23.001 to 23.200.

These regulations implement the Industrial Siting Act by providing a centrally coordinated permit review for industrial, commercial, wholesale, or retail projects to ensure that these projects will protect national resources.

Development and Planning.

Local Government Comprehensive Planning and Land Development Regulation Act, Title 11, County Organization and Intergovernmental Relations, Chapter 163, Intergovernmental Programs, sections 163.3161 et seq.

This Act confers on local officials the responsibility of planning and regulating the use of land by adopting local government comprehensive plans and land development regulations in conformity with the Environmental Land and Water Management act of 1972. Section 163.3178 deals specifically with coastal management.

(1) Local Planning Regulations, FAC 9J-5 [9J-ll, 9J-12, 9J-24, 9J-26, and 9J-29].

These regulations implement the Local Government Planning and Land Development Act by providing that planning activities are integrated on a State, regional, and local level.

State Comprehensive Planning Act of 1972, Title 13, Planning and Development, Chapter 186, State and Regional Planning, sections 186.001 et seq., and Chapter 187, State Comprehensive Plan.

This Act creates an integrated planning process to guide State policies in many areas, specifically including land use and water resources. The State comprehensive plan has become the authoritative expression of State policy and is a long-range planning tool to aid in orderly social, economic, and physical growth. It provides goals for water resources, coastal and marine resources, air quality, natural systems and recreational lands, waste, land use, and cultural historical resources. [The State Water Use Development Plan for the State's water resources does not provide any additional regulatory authority, but is used as a functional part of the State Comprehensive Plan and provides policy guidance for the State's activities related to water use.]

Florida Regional Planning Council Act, Sections 186.501-.513.

This statute establishes a formal mechanism, in the form of regional planning councils and regional plans, to link local concerns, regional policies, and State plans.

Miscellaneous.

Pesticides. The State is represented by the Florida Coordinating Council on Mosquito Control, a body established by the statute (Chapter 388, F.S.) that gives the Department general authority to accomplish its mission.

Wastewater Facilities Regulation. Domestic Wastewater treatment plants are permitted in accordance with Chapter 17-600, F.A.C., Chapters 17-610, F.A.C., and 17-640, F.A.C., are used to permit the re-use of reclaimed water and land application of wastewater residuals aspects of wastewater treatment plant permitting. Chapter 17-40, F.A.C., contains provisions for mandatory re-use within designated critical water supply areas by the Water Management Districts. Also, any new or expanded surface water discharges must meet the anti-degradation requirements in Chapters 17-4 and 17-302, F.A.C.

Underground Injection Well Control. The Underground Injection Control (UIC) system was delegated to the Department in April 1982 under Chapter 17-28 F.A.C. The UIC rule regulates injection wells.

Septic tanks, or on-site sewage disposal systems (OSDS), are permitted by the County Public Health Units in accordance with Chapter lOD-6, F.A.C.

The Department of Health and Rehabilitative Services is created under Section 20.19, Florida Statutes (F.S.). The specific authority to conduct the OSDS program is granted under sections 381. 0064-66, F.S. Specific regulations promulgated under these sections are contained in Chapter lOD-6 of the Florida Administrative Code (FAC). Section 381.0064, F.S., requires the department to provide continuing education courses for "septic tank contractors, pump-out operators, environmental health specialists, and master plumbers who install septic tanks or service septic tanks." Section 381.0065, F.S., provides for installation conditions for OSDSs. Section 381.0066,

F.S., provides the authority for the implementation of a fee schedule designed to recover the cost of carrying out the on-site sewage disposal program. Chapter lOD-6, F.A.C., contains the regulations promulgated by the Department to oversee the installation and operation of individual OSDSs.

The general purpose of the Division of Tourism under Section 218.121, F.S. is to guide, stimulate, and promote the coordinated, efficient, and beneficial travel and leisure development of the state of its region. The 1991 Legislature created the Florida Tourism Commission (Chapter 91-31, Laws of Florida). The Division will operate under the oversight of this commission, whose authority includes funding, planning, promoting and coordinating the State's activities relating to tourism.

The Florida Transportation Code of the Florida Statutes includes Chapters 334-339, 341, 347, 348, and 349 and sections 332.003-322.007, 351.35, 351.36, 351.37, and 861.011. The following sections and chapters supplement the Code and provide additional authority to the Department: section 20.23 and Chapters 206, 212, 316, 320, 427, and 479.

Federal Fishery Management

Fishery Management Plans

Regional fishery management councils have been established by the Magnuson Fishery Conservation and Management Act to manage fishery resources in the U.S. exclusive economic zone. This is accomplished through the preparation of Fishery Management Plans (FMP) that encompass domestic and foreign fishing efforts for species within their areas of authority. The Councils initially identify a need for fishery management, then determine the objectives that the FMP would accomplish within a defined time period. An FMP is then prepared that includes a list of management alternatives that can be used to achieve these objectives. After the FMP is approved by the Council, it is taken to public hearings. Following these hearings and the expiration of the required review period, the FMP is submitted to the Secretary of Commerce for approval and implementation. The Department of Commerce, through National Marine Fisheries Service agents, the U.S. Coast Guard, and cooperative agreements with State agencies, is responsible for enforcing the FMP laws and regulations.

The Councils are charged with developing FMPs to define certain fisheries within their jurisdictions and establish management measures to prevent overfishing. Highly migratory species, including billfish, swordfish, tunas, and sharks, are managed directly by the National Marine Fisheries Service on behalf of the Secretary (of Commerce).

FMPs Affecting the Sanctuary

FMPs governing fisheries within the FKNMS and their implementing regulations are as follows:

Gulf of Mexico Fishery Management Council

Red Drum	50 CFR 653
Reef Fish	50 CFR 641
Shrimp	50 CFR 658
Stone Crab	50 CFR 654

South Atlantic Fishery Management Council

Atlantic Red Drum	50 CFR 647
Shrimp	50 CFR 658
Snapper-Grouper	50 CFR 646

Joint Gulf and South Atlantic Council

Coastal Migratory Pelagic Resources	50 CFR 642
Coral and Coral Reefs	50 CFR 638
Spiny Lobster	50 CFR 640

Secretarial FMPs

Atlantic Billfish	50 CFR 644
Atlantic Swordfish	50 CFR 630
Shark of the Atlantic Coast	50 CFR 678
Atlantic Tuna Fisheries-Atlantic Tunas Convention Act of 1975	50 CFR 285

National Standards

The national standards are statutory principles that must be followed in any FMP. In developing FMPs, the Councils have the initial authority to ascertain facts, establish management objectives, and to propose management measures that will achieve the objectives. The Secretary (of Commerce) determines whether the proposed management objectives and measures are consistent with the national standards, other provisions of the Magnuson Act, and other applicable law. The NMSA authorizes the Councils to prepare draft fishing regulations for the sanctuaries, pursuant to 16 U.S.C. 1434 (a)(5), using the following national standards as guidance.

National Standard 1 - Optimum Yield

Conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery for the United States fishing industry.

National Standard 2 - Scientific Information

Conservation and management measures shall be based upon the best scientific information available.

National Standard 3 - Management Units

To the extent practicable, an individual stock of fish shall be managed as a unit throughout its range, and interrelated stocks of fish shall be managed as a unit or in close coordination.

National Standard 4 - Allocation

Conservation and management measures shall not discriminate between residents of different states. If it becomes necessary to allocate or assign fishing

privileges among various United States fishermen, such allocation shall be: (1) Fair and equitable to all such fishermen; (2) Reasonably calculated to promote conservation; and (3) Carried out in such a manner that no particular individual, corporation, or other entity acquires an excessive share of such privileges.

National Standard 5 - Efficiency

Conservation and management measures shall, where practicable, promote efficiency in the utilization of fishery resources; except that no such measure shall have economic allocation as its sole purpose.

National Standard 6 - Variations and Contingencies

Conservation and management measures shall take into account and allow for variations among, and contingencies in, fisheries, fishery resources, and catches.

National Standard 7 - Costs and Benefits

Conservation and management measures shall, where practicable, minimize costs and avoid unnecessary duplication.

Stock Assessment And Fishery Evaluation (SAFE) Reports

The SAFE Report is a document that provides the Councils with a summary of the most recent biological status of the species in the fisheries and the social and economic condition of the recreational and commercial fishing interests. It summarizes, on a periodic basis, the best available scientific information concerning past, present, and possible future condition of the stocks and fisheries being managed under Federal regulations. SAFE reports have been developed for all Council FMPs listed above. SAFE reports are available from NMFS, Office of Fishery Management, Silver Spring, MD, 20910.

Sample Strategy Description Sheet

Florida Keys National Marine Sanctuary

Strategy Identification Session

Strategy Description Sheet

Strategy Number BD-1

Strategy Name Develop standardized channel marker system for the Sanctuary (HIGH).

Strategy Type

- ☒ Educational
- ☐ Regulatory
- ☒ Administrative
- ☐ Economic
- ☐ Research

Description
Design channel/obstruction markers and place them throughout the Sanctuary to define obstructions, shallow areas, and environmentally sensitive areas. The areas to be marked should be mapped using GIS and aerial photography.

Desired Effect
To alert boaters to natural and manmade water obstructions, such as seagrass, coral, wrecks, and spoil banks. The markers will also divert boaters from environmentally sensitive areas.

Geographic Extent of Strategy
FKNMS

Targeted Use(r) & Cost to User
Private and commercial boaters may be affected indirectly through licensefees and taxes.

How Administered
DNR, NOAA, USCG, State, Federal, and Local Governments.

Administrative Costs and Financing
USCG markers cost $500-$1000 per structure. Alternative financing should be considered for defining shallow areas throughout the Sanctuary.

Implementation Schedule
As soon as possible.

Prerequisites for Implementation
Permission of the USCG, the development of a workable plan with confirmed funding, and the cooperation of the Int'l Assoc. of Lighthouse Adm., USACOE, Florida DER, and DNR.

Sample Strategy Characterization Sheet

Preliminary Characterization Worksheet
Theme: Habitats

Strategy	+/–	Relative Impacts: In a Given Area H	In a Given Area M	In a Given Area L	Throughout Sanctuary H	Throughout Sanctuary M	Throughout Sanctuary L	Notes/Assumptions	
BD-1 Standardize Channel Marker System in FKNMS								Present (H M L)	Future (H M L)
1. Corals	+		X				X	H	H
2. Hardbottoms	+		X				X	H	H
3. Seagrasses	+	X				X		H	H
4. Algal Communities	+		X				X	H	H
5. Mangroves									
6. Sediments	+			X			X	H	H
7. Submerged Cultural Resources									
BD-2 Restricted zoning for all habitat in the FKNMS								Present (H M L)	Future (H M L)
1. Corals	+	X			X			L	H
2. Hardbottoms	+	X			X			L	H
3. Seagrasses	+	X			X			L	H
4. Algal Communities	+	X			X			L	H
5. Mangroves	+	X			X			L	H
6. Sediments	+	X			X			L	H
7. Submerged Cultural Resources	+	X			X			L	H
BD-3 Signs at Boat Ramps								Present (H M L)	Future (H M L)
1. Corals	+	X				X		H	M
2. Hardbottoms	+		X				X	H	M
3. Seagrasses	+	X				X		H	M
4. Algal Communities	+		X				X	H	M
5. Mangroves	+		X				X	H	M
6. Sediments	+		X				X	H	M
7. Submerged Cultural Resources	+		X				X	H	M

Mid-range Alternative Strategies

This appendix presents the three mid-range management alternatives being considered for inclusion in the comprehensive Draft Florida Keys National Marine Sanctuary Management Plan and describes the strategies (proposed management actions) that comprise them. It also details the differences between the strategies across each mid-range alternative.

The strategies described in this appendix are the result of a two-year effort to gather and distill information relevant to meeting the requirements of the National Environmental Policy Act (NEPA). Each alternative represents a different approach to managing the Sanctuary, and this appendix is designed to present the most complete view of the current strategies by issue.

Boating

B.1.a Conduct a survey to assess public and private boat access throughout the Sanctuary to develop a low-impact access plan. Implement low-cost administrative changes for public access (e.g., signage, timing restrictions, closures, etc.). (Alt. IV)

This strategy is designed to reduce resource impacts from all boating activities throughout the Sanctuary. An inventory will first be conducted of the existing locations of public and private boat access ramps and their levels of use. Based on this inventory, a boating access plan will be developed to direct new public and private access points, including marinas and mooring areas, to low-impact areas.

Impacts will also be reduced through the use of low-cost administrative techniques such as signs posted at boat ramps, restricted access during certain times of the day, and the closure of access points for a specified amount of time. Prerequisites include developing benthic habitat and bathymetry maps and assessing the distribution of access points.

B.1.b Conduct a survey to assess public and private boat access throughout the Sanctuary to develop a low-impact access plan; direct new public access to low-impact areas; and modify as appropriate any access affecting sensitive areas throughout the Sanctuary. (Alt. III)

This strategy is designed to reduce resource impacts from all boating activities throughout the Sanctuary. An inventory will first be conducted of the existing locations of public and private boat access ramps and their levels of use. Based on this inventory, a boating access plan will be developed that: 1) directs new public access points, including marinas and mooring areas, to low-impact areas; and *2) requires modification of access ramps directly affecting sensitive areas (i.e., seagrasses, mangroves, hardbottom, etc.) throughout the Sanctuary.*

Impacts will also be reduced through the use of low-cost administrative techniques such as signs posted at boat ramps, restricted access during certain times of the day, and the closure of access points for a specified amount of time. Prerequisites include developing benthic habitat and bathymetry maps and assessing the distribution of access points.

B.1.c Conduct a survey to assess public and private boat access throughout the Sanctuary to develop a low-impact access plan; implement restrictions on new public access; and require modification of public and private access to reduce impacts to resources and user conflicts throughout the Sanctuary. (Alt. II)

This strategy is designed to reduce resource impacts from all boating activities throughout the Sanctuary. An inventory will first be conducted of the existing locations of public and private boat access ramps and their levels of use. Based on this inventory, a boating access plan will be developed that: 1) restricts new public access points, including marinas and mooring areas, to low-impact areas; *2) requires modifications to both public and private access to reduce impacts to resources and user conflicts; and 3) implements restrictions on new public access areas.*

Impacts will also be reduced through the use of low-cost administrative techniques such as signs posted at boat ramps, restricted access during certain times of the day, and the closure of access points for a specified amount of time. Prerequisites include developing benthic habitat and bathymetry maps and assessing the distribution of access points.

B.2.a Continue ongoing habitat restoration activities and monitor recovery processes. (Alt. IV)

This strategy supports current efforts to restore and enhance coral, seagrass, and mangrove habitats at severely impacted sites through the help of various organizations, including volunteer groups and NGOs. Restoring these habitats will enhance fishery stocks. Seagrass and coral transplanting are examples of restoration activities, but other techniques must also be developed. Recovery processes (e.g., recruitment and survivability) will be monitored at these sites. An extensive demonstration project will be developed for mitigation and restoration techniques following physical disturbances or chronic pollutant inputs. Emergency or long-term restoration zones may be established to allow for sufficient resource recovery.

B.2.b Conduct a program of restoration research at representative habitat sites within the Sanctuary; develop a restoration plan and implement restoration in severely impacted areas. Monitor recovery processes. (Alt. III)

This strategy is designed to promote research and the development of new technologies to restore and enhance coral, seagrass, and mangrove habitats throughout the Sanctuary. Restoring these habitats will enhance fishery stocks. Seagrass and coral transplanting are examples of restoration activities, but other techniques must also be developed. *A restoration plan will be developed and implemented for severely impacted areas.* Recovery processes (e.g., recruitment and survivability) will be monitored at these sites. An extensive demonstration project will be developed for mitigation and restoration techniques following physical disturbances or chronic pollutant inputs. Emergency or long-term restoration zones may be established to allow for sufficient resource recovery.

B.2.c Conduct a program of restoration research at representative habitat sites within the Sanctuary; develop a restoration plan and implement restoration in all impacted areas. Monitor recovery processes. (Alt. II)

This strategy is designed to promote research and the development of new technologies to restore and enhance coral, seagrass, and mangrove habitats throughout the Sanctuary. Restoring these habitats will enhance fishery stocks. Seagrass and coral transplanting are examples of restoration activities, but other techniques must also be developed. *A restoration plan will be developed and implemented for all impacted areas.* Recovery processes (e.g., recruitment and survivability) will be monitored at these sites. An extensive demonstration project will be developed for mitigation and restoration techniques following physical disturbances or chronic pollutant inputs. Emergency or long-term restoration zones may be established to allow for sufficient resource recovery.

B.3.a Develop a removal and disposal plan for derelict and abandoned vessels throughout the Sanctuary and streamline the existing permitting process for the removal of derelict and abandoned vessels from high-use and sensitive areas. (Alt. IV)

This strategy will reduce direct and indirect impacts to natural resources from derelict and abandoned vessels. A removal and disposal plan will include: 1) assessing the location and extent of derelict and abandoned vessels; 2) streamlining the existing permitting process for removing derelict and abandoned vessels from high-use and sensitive areas; and 3) requiring the use of environmentally sound removal practices and techniques.

Screening criteria will also be developed to determine whether or not to move a vessel. Criteria will include possible damage to the environment and the establishment of a policy where the owner of the vessel, if known, would pay for its removal.

B.3.b Develop and implement a removal and disposal plan for derelict and abandoned vessels, streamline the permitting process, and require the removal of all derelict and abandoned vessels throughout the Sanctuary. (Alts. III and II)

This strategy will reduce direct and indirect impacts to natural resources from derelict and abandoned vessels. A removal and disposal plan will include: 1) assessing the location and extent of derelict and abandoned vessels; 2) streamlining the existing permitting process for removing derelict and abandoned vessels from high-use and sensitive areas; and 3) requiring the use of environmentally sound removal practices and techniques. *It will also require the removal of derelict and abandoned vessels throughout the Sanctuary.*

Screening criteria will also be developed to determine whether or not to move a vessel. Criteria will include possible damage to the environment and the establishment of a policy where the owner of the vessel, if known, would pay for its removal.

B.4.a Establish a channel and "significant features" marking system and associated regulations regarding boat speeds and wakes to reduce natural resource damages, and implement in sensitive areas (e.g., corals, hardbottoms, some mangrove creeks, submerged aquatic vegetation). (Alt. IV)

This strategy will reduce damage to natural resources from boating activities by: 1) placing regulatory and informational floating buoys or fixed markers at major shallow-water reefs, shoals, or other significant features; 2) marking frequently used and preferred channels; and 3) reducing boat wakes in sensitive habitats, areas vulnerable to erosion, and high-density areas such as marinas. The strategy will be implemented in sensitive areas (corals, hardbottoms, some mangrove creeks, submerged aquatic vegetation). A survey to identify and map areas of frequent groundings, channels, sites of shallow-water reefs, shoals and other significant features is a prerequisite. This strategy will affect all watercraft, including personal watercrafts (PWC).

B.4.b Establish a channel/waterway marking system throughout the Sanctuary. (Alts. III and II)

This strategy will reduce damage to natural resources from boating activities by: 1) placing regulatory and informational floating buoys or fixed markers at major shallow-water reefs, shoals, or other significant features; 2) marking

frequently used and preferred channels; and 3) reducing boat wakes in sensitive habitats, areas vulnerable to erosion, and high-density areas such as marinas. *The strategy will be implemented throughout the Sanctuary.* A survey to identify and map areas of frequent groundings, channels, sites of shallow-water reefs, shoals, and other significant features is a prerequisite. This strategy will affect all watercraft, including personal watercraft (PWC).

B.5.a Develop a response plan for boat groundings throughout the Sanctuary. (Alts. IV, III, and II)

This strategy will develop a standard response plan to address boat groundings throughout the Sanctuary. The plan should reduce response time, a critical factor in limiting the potential for extensive resource damage. A prerequisite is to identify the available response resources and the affected agencies, and to develop a protocol for responsibility, assessment standards, methods, and training.

B.6.a Add 10 Sanctuary enforcement officers to deploy in high-use and sensitive areas. (Alt. IV)

This strategy will increase the presence of law enforcement officers (LEOs) on the water to protect resources and reduce user conflicts. This will be accomplished by hiring 10 more LEOs and deploying them in high-use and sensitive areas. Remote observation techniques may be used to aid enforcement efforts. High-use and sensitive areas will be identified.

B.6.b Add 30 Sanctuary enforcement officers to deploy in high-use and sensitive areas. (Alt. III)

This strategy will increase the presence of law enforcement officers (LEOs) on the water to protect resources and reduce user conflicts. This will be accomplished by hiring *30* more LEOs and deploying them in high-use and sensitive areas. Remote observation techniques may be used to aid enforcement efforts. High-use and sensitive areas will be identified.

B.6.c Add 50 Sanctuary enforcement officers to deploy throughout the Sanctuary. (Alt. II)

This strategy will increase the presence of law enforcement officers (LEOs) on the water to protect resources and reduce user conflicts. This will be accomplished by hiring *50* more LEOs and deploying them throughout the Sanctuary. Remote observation techniques may be used to aid enforcement efforts.

B.7.a Reduce pollution discharges (e.g., sanitary wastes, debris, and hydrocarbons) from vessels by enforcing existing regulations, assessing the need for additional regulations, and implementing and enforcing new regulations (i.e., upcoming regulation restricting discharge in State waters). Change the environmental crimes category associated with discharges from felony to civil offense, thereby removing the need to prove criminal intent. (Alts. IV, III, and II)

This strategy will help avoid further water quality degradation by boaters and live-aboards by: 1) requiring boaters and live-aboards to use holding tanks; 2) restricting the discharge of substances (other than fish waste and exhaust) into nearshore waters; and 3) establishing trash-collection stations. This strategy requires an assessment of where pump-out and trash-collection stations are most needed and where they should be located (e.g., in marinas or elsewhere). The strategy includes a review of the adequacy of existing regulations that address pollution discharges from vessels and the need for additional regulations. This strategy could also reduce pollution by providing civil penalties (e.g., fines) for environmental crimes such as discharging fuel or pumping out a shipboard holding tank. These are currently felonies, and obtaining a conviction requires proving criminal intent, which is often difficult. Reclassifying these actions as civil offenses would make it easier to discourage the pollution of Sanctuary waters.

B.8.a Conduct a boating fee assessment study to evaluate and reallocate Sanctuary-related fees. (Alt. IV)

This strategy will examine mechanisms for generating funds for use in Sanctuary management and related research. Boating activity levels will be assessed, and existing fees related to resource utilization in the Sanctuary evaluated. Based on this information, an impact fee plan will be considered for different users in proportion to their use levels. The fee could be implemented through the purchase of a sticker or stamp to be displayed on the boat or fishing license. A process will be developed to properly funnel and utilize existing fees.

B.8.b Conduct a boating fee assessment study to evaluate and reallocate Sanctuary-related fees; implement appropriate impact fees. (Alts. III and II)

This strategy will examine mechanisms to generate funds for use in Sanctuary management and related research. Boating activity levels will be assessed and existing fees related to resource utilization in the Sanctuary evaluated. *Based on this information, appropriate impact fees will be implemented, contingent upon the current study to establish user fees for NOAA's national marine sanctuaries, for users in proportion to their use levels.* The fee could be implemented through the purchase of a sticker or stamp to be displayed on the boat or fishing license. A process will be developed to properly funnel and utilize existing fees.

B.9.a Establish a voluntary visitor registration program to assess user activity in the Sanctuary. (Alts. IV, III, and II)

This strategy will help better understand overall Sanctuary use patterns by determining the areas of the Sanctuary visited most frequently and the types of visitor activities. Visitors can fill out registration forms at all Sanctuary offices, Federal- and State-administered areas and visitor centers and, at the same time, can obtain information on the Sanctuary.

B.10.a Establish damage assessment standards for vessel groundings in the Sanctuary. (Alts. IV, III, and II)

This strategy will establish a standard damage assessment methodology for vessel groundings on coral reefs and other vulnerable or sensitive habitats. Establishing a standard damage assessment methodology includes improving response times, assessment procedures, and litigation practices. Prerequisites include: 1) developing an assessment procedure manual; 2) assembling assessment response teams; 3) identifying assessment techniques for all habitat types; and 4) determining resource values.

B.11.a Establish permits (e.g., for researchers, educators, emergency response personnel, salvors, salvage operators, animal rescue operations) to conduct activities otherwise prohibited within the Sanctuary; facilitate simplified permitting. (Alts. IV, III, and II)

This strategy will allow access by special groups (e.g., researchers, educators, emergency response personnel, salvage operators, and animal rescue operations) to restricted areas (e.g., nesting sites, spawning areas, etc.). Permits will be monitored and permit provisions enforced.

B.12.a Expand Federal/State/local cooperative law enforcement and cross-deputization programs and prioritize enforcement areas. (Alts. IV, III, and II)

This strategy will increase the efficiency and effectiveness of enforcement efforts. It will establish coordination and cooperation among agencies and increase interagency communication by: 1) developing cooperative administrative agreements that establish Federal, State, and local enforcement authority among all officers; 2) scheduling efficient equipment and staff use among all agencies; 3) standardizing training; 4) developing a process for handling violations; 5) standardizing radio communications (i.e., use of a common radio frequency); 6) promoting cooperation with the military in detecting violations; and 7) determining priority enforcement areas. Establishing cooperative agreements and identifying priority areas are prerequisites.

B.13.a Establish regulations and procedural guidelines for commercial salvaging and towing of vessels in need of assistance. (Alt. IV)

This strategy will reduce damage to natural resources resulting from improper vessel salvage methods by developing standard vessel salvage procedures including: 1) obtaining a permit; 2) notifying authorities; 3) having an authorized observer at the site or receiving permission to proceed; 4) providing operator training; and 5) promoting the use of environmentally sound salvaging and towing practices and techniques. Prerequisites include establishing a Memorandum of Understanding (MOU) with the Coast Guard and the construction of a bond/insurance program.

B.13.b Establish regulations and procedural guidelines for commercial salvaging and towing of vessels in need of assistance. Implement permitting for salvaging and towing throughout the Sanctuary and establish an operator training program. (Alt. III)

This strategy will reduce damage to natural resources resulting from improper vessel salvage methods by developing standard vessel salvage procedures including: 1) obtaining a permit; 2) notifying authorities; 3) having an authorized observer at the site or receiving permission to proceed; 4) providing operator training; and 5) promoting the use of environmentally sound salvaging and towing practices and techniques. *Permitting for salvaging and towing operations will be implemented throughout the Sanctuary. A program to train operators in environmentally sound methods of towing and salvaging will also be established and promoted.* Prerequisites include establishing an MOU with the Coast Guard and the construction of a bond/insurance program.

B.13.c Establish regulations and procedural guidelines for commercial salvaging and towing of vessels in need of assistance. Implement permitting for salvaging and towing throughout the Sanctuary and require operator training . (Alt. II)

This strategy will reduce damage to natural resources resulting from improper vessel salvage methods by establishing standard vessel salvage procedures including: 1) obtaining a permit; 2) notifying authorities; 3) having an authorized observer at the site or receiving permission to proceed; 4) requiring operator training; and 5) promoting the use of environmentally sound salvaging and towing practices and techniques. *Permitting for salvaging and towing operations and operator training will be required throughout the Sanctuary.* Prerequisites include establishing an MOU with the Coast Guard and the construction of a bond/insurance program.

B.15.a Conduct an assessment of current mooring buoy technology to determine impacts to resources and to evaluate which are the most environmentally sound, cost-effective, and functional for use in Sanctuary waters. Develop a comprehensive mooring buoy plan providing for the maintenance of buoys, the placement of buoys as needed, and the implementation of vessel size limits at mooring buoys in sensitive areas. (Alt. IV)

This strategy decreases user conflicts, prolongs mooring buoy life, and reduces the risk of vessel groundings by: 1) assessing vessel impacts on mooring buoys and natural resources; 2) determining the impacts of mooring buoy technologies on resources; and 3) determining which mooring buoy designs are the most environmentally sound, cost-effective, and functional. A comprehensive mooring buoy plan will be developed providing for the maintenance of buoys, the placement of buoys as needed, and the implementation of vessel size limits at mooring buoys in sensitive areas. The assessment will define vessel size limits.

B.15.b Conduct an assessment of current mooring buoy technology to determine impacts to resources and to evaluate which are the most environmentally sound, cost-effective, and functional for use in Sanctuary waters. Develop a comprehensive mooring buoy plan providing for the maintenance of buoys, the placement of buoys as needed, and the implementation of vessel size limits at mooring buoys throughout the Sanctuary. (Alts. III and II)

This strategy decreases user conflicts, prolongs mooring buoy life and reduces the risk of vessel groundings by: 1) assessing vessel impacts on mooring buoys and natural resources; 2) determining the impacts of mooring buoy technologies on resources; and 3) determining which mooring buoy designs are the most environmentally sound, cost-effective and functional. A comprehensive mooring buoy plan will be developed providing for the maintenance of buoys, the placement of buoys as needed, and the implementation of vessel size limits at mooring buoys *throughout the Sanctuary.* The assessment will define vessel size limits.

B.16.a Identify subdivisions and coastal areas where dock construction should be prohibited due to inadequate surrounding water depths and the presence of important marine resources. Coordinate the Federal, State, and local permitting process for dock construction. (Alts IV, III, and II)

Conduct a study to determine areas within the Sanctuary where dock construction should be prohibited because of the lack of channels providing access to navigable waters. This can be done in conjunction with strategy B.4. (Channel Marking). Monroe County is currently permitting dock construction in areas with inadequate surrounding water depth. The intent of this strategy is to develop a protocol between the ACOE, FL DCA, and Monroe County for only permitting docks in areas where there are accessible channels of adequate depth, and where they will not adversely impact important marine resources.

B.17.a Develop and implement regulations for the operation of PWC and other motorized vessels within 100 yards of sensitive or critical areas, other boats, and people in the water. Develop and implement regulations and procedural guidelines for commercial PWC rental operations. (Alt. IV)

This strategy will reduce damage to natural resources resulting from the improper operation of PWCs and other motorized vessels, and will address user-conflict issues. Special-use Areas (strategy Z.5) will be used to establish 100-yard idle-only buffer zones around sensitive areas (e.g., residential shorelines, edges of flats, and areas being used by wading or nesting birds). Riders will be required to operate at idle speeds within 100 yards of other vessels, bridges, persons in the water, persons fishing, and within residential canals. Rental operations will also be required to establish their own zones, subject to permit requirements, where riders can be observed at all times. Areas to be avoided will be marked according to the channel-marking strategy (B.4).

To further protect the resources and reduce user conflicts, rental operations will be required to screen and train their employees on safe and environmentally sound methods of PWC operation. Employees will be given a training manual that they must sign certifying that they understand its contents. In addition, information about the Sanctuary must be made available to clients.

To enhance safe riding, rental operations must be able to effect emergency communications, have rescue and chase vessels available, and have personnel available who are trained in first-aid and CPR.

Users of PWCs must comply with existing laws, including minimum age and equipment requirements and regulations governing vehicle operation (e.g., surfing the wakes of other vessels).

B.17.b Develop and implement regulations for the operation of PWC and other motorized vessels within 200 yards of sensitive or critical areas, other boats, and people in the water. Develop and implement regulations and procedural guidelines for commercial PWC rental operations. (Alt. III)

This strategy will reduce damage to natural resources resulting from the improper operation of PWCs and other motorized vessels, and will address user-conflict issues. Special-use Areas (strategy Z.5) will be used to establish *200-yard* idle-only buffer zones around sensitive areas (e.g., residential shorelines, edges of flats, and areas being

used by wading or nesting birds). Riders will be required to operate at idle speeds within *200 yards* of other vessels, bridges, persons in the water, persons fishing, and within residential canals. Rental operations will also be required to establish their own zones, subject to permit requirements, where riders can be observed at all times. Areas to be avoided will be marked according to the channel-marking strategy (B.4).

To further protect the resources and reduce user conflicts, rental operations will be required to screen and train their employees on safe and environmentally sound methods of PWC operation. Employees will be given a training manual that they must sign certifying that they understand its contents. In addition, information about the Sanctuary must be made available to clients.

To enhance safe riding, rental operations must be able to effect emergency communications, have rescue and chase vessels available, and have personnel available who are trained in first-aid and CPR.

Users of PWCs must comply with existing laws, including minimum age and equipment requirements and regulations governing vehicle operation (e.g., surfing the wakes of other vessels).

B.17.c Develop and implement regulations for the operation of PWC and other motorized vessels within 300 yards of sensitive or critical areas, other boats, and people in the water. Develop and implement regulations and procedural guidelines for commercial PWC rental operations. (Alt. II)

This strategy will reduce damage to natural resources resulting from the improper operation of PWCs and other motorized vessels, and will address user-conflict issues. Special-use Areas (strategy Z.5) will be used to establish *300-yard* idle-only buffer zones around sensitive areas (e.g., residential shorelines, edges of flats, and areas being used by wading or nesting birds). Riders will be required to operate at idle speeds within *300 yards* of other vessels, bridges, persons in the water, persons fishing, and within residential canals. Rental operations will also be required to establish their own zones, subject to permit requirements, where riders can be observed at all times. Areas to be avoided will be marked according to the channel-marking strategy (B.4).

To further protect the resources and reduce user conflicts, rental operations will be required to screen and train their employees on safe and environmentally sound methods of PWC operation. Employees will be given a training manual that they must sign certifying that they understand its contents. In addition, information about the Sanctuary must be made available to clients.

To enhance safe riding, rental operations must be able to effect emergency communications, have rescue and chase vessels available, and have personnel available who are trained in first-aid and CPR.

Users of PWCs must comply with existing laws, including minimum age and equipment requirements and regulations governing vehicle operation (e.g., surfing the wakes of other vessels).

Fishing

F.1.a Establish a protocol for developing and revising a consistent set of fisheries regulations, and implement throughout the Sanctuary. (Alts. IV, III, and II)

This strategy will ensure administrative and regulatory coordination between fisheries regulatory agencies operating within Sanctuary waters, and will develop a process for combining and revising existing regulations and developing new regulations. All fisheries and harvesting methods will be included. The Florida Marine Fisheries Commission (FMFC) and Gulf of Mexico and South Atlantic fisheries management councils are currently working on protocols for developing and revising regulations within the Sanctuary, and are deciding on a lead agency to coordinate and facilitate regulatory functions. Identifying and assessing existing regulations are prerequisites, and should also form the basis for identifying additional regulatory needs. Regulations developed under this strategy will ensure that the goals of long-term maintenance of the ecosystem and optimum sustainable yields are met. Any fisheries regulations implemented within the Sanctuary (e.g., gear and fishing method restrictions, fishing area restrictions, and size limits) will be developed through the established protocol.

F.3.a Develop and conduct a research program to assess the impacts of stocking programs on the genetic integrity of native stocks within the Sanctuary. The program will also be used to develop and implement appropriate regulations on the stocking of native and non-native species to protect the genetic integrity of native stocks. (Alt. IV)

The research will build on native stock genetic integrity research conducted elsewhere to determine the effect of fish stocking on the genetic integrity of native species within the Sanctuary. This research will determine the extent to which changes in the genetic integrity of native stocks have occurred, or are likely to occur, and the effects of these changes on their abundance, distribution, and life histories. Research results will assist in the development and implementation of regulations governing stocking activities.

F.3.b Implement a moratorium on stocking activities. Assess existing research on the impacts of stocking on the genetic integrity of native stocks. Conduct research on natural stock recovery and its role in maintaining genetic integrity. Conduct a re-

evaluation of stocking options. The length of the moratorium will depend on the length and results of the assessment. (Alts. III and II)

The research will build on native stock genetic integrity research conducted elsewhere to determine the effect of fish stocking on the genetic integrity of native species within the Sanctuary. This research will determine the extent to which changes in the genetic integrity of native stocks have occurred, or are likely to occur, and the effects of these changes on their abundance, distribution, and life histories. *A moratorium and re-evaluation of stocking options will allow for the development and implementation of regulations governing stocking activities. The length of the moratorium will depend on the length and results of the assessment.*

F.4.b Assess, develop, and promote mariculture alternatives for all commercially harvested marine species. Support efforts to eliminate the harvest and landing of live rock. (Alt. III)

This strategy will reduce fishing pressures on commercially harvested marine species and help satisfy commercial demand for these species. This is a long-term effort designed to identify and develop mariculture techniques and promote the development of environmentally sound mariculture operations. This strategy also complements a provision by the FMFC, which began a three-year phase out of live rock harvesting in July 1992. The Sanctuary will support efforts to eliminate the harvest and landing of live rock in accordance with the FMFC and the protocols established for consistent regulations in strategy F.1.a.

F.4.c Develop and implement mariculture alternatives for all commercially harvested marine species. Support efforts to eliminate the harvest and landing of live rock. (Alt. II)

This strategy will reduce fishing pressures on commercially harvested marine species and help satisfy commercial demand for these species. This is a long-term effort designed to identify and develop mariculture techniques and promote the development of environmentally sound mariculture operations. *Once effective mariculture techniques are developed for a given species, regulations will be developed to reduce or eliminate the harvest of that species in the wild.* This strategy also complements a provision by the FMFC, which began a three-year phase out of live rock harvesting in July 1992. The Sanctuary will support efforts to eliminate the harvest and landing of live rock in accordance with the FMFC and the protocols established for consistent regulations in strategy F.1.a.

F.5.a Assess limited-entry fisheries options for specific Sanctuary fisheries. Develop appropriate regulations that ensure the long-term sustainability of Sanctuary fisheries. (Alt. IV)

This strategy will involve the assessment of existing fishery regulatory programs that limit the number of persons, vessels, or units of fishing gear utilizing specific fisheries within the Sanctuary, within Florida, and elsewhere. The objective is to determine the extent to which limited-entry management regimes can be used to: 1) protect specific marine life species; 2) increase stock abundance; 3) reduce habitat damage; and 4) reduce user conflicts within the Sanctuary.

F.5.b Assess limited-entry fisheries options for specific Sanctuary fisheries. Develop appropriate regulations that ensure the long-term sustainability of Sanctuary fisheries. Implement appropriate regulations on a fishery-by-fishery basis. (Alt. III)

This strategy will involve the assessment of existing fishery regulatory programs that limit the number of persons, vessels, or units of fishing gear utilizing specific fisheries within the Sanctuary, within Florida, and elsewhere. The objective is to determine the extent to which limited-entry management regimes can be used to: 1) protect specific marine life species; 2) increase stock abundance; 3) reduce habitat damage; and 4) reduce user conflicts within the Sanctuary. *This strategy will require the implementation of regulations limiting entry to fisheries that: 1) involve marine life species in need of protection; 2) have low stock abundance; 3) are associated with areas exhibiting severe habitat damage; or 4) have a high degree of user conflicts. Regulations will be developed and implemented in accordance with the FMFC and the protocols established for consistent regulations in strategy F.1.a.*

F.5.c Assess limited-entry fisheries options for specific Sanctuary fisheries. Develop appropriate regulations that ensure the long-term sustainability of Sanctuary fisheries. Implement regulations for all Sanctuary fisheries. (Alt. II)

This strategy will involve the assessment of existing fishery regulatory programs that limit the number of persons, vessels, or units of fishing gear utilizing specific fisheries within the Sanctuary, within Florida and elsewhere. The objective is to determine the extent to which limited-entry management regimes can be used to: 1) protect specific marine life species; 2) increase stock abundance; 3) reduce habitat damage; and 4) reduce user conflicts within the Sanctuary. *The strategy requires the implementation of regulations that limit entry to all Sanctuary fisheries.* Regulations will be developed and implemented in accordance with the FMFC and the protocols established for consistent regulations in strategy F.1.a.

F.6.a Enhance the resolution of existing commercial and recreational fisheries-dependent sampling programs to provide statistics on catch and effort at the Sanctuary level. Initiate a fisheries-independent sampling program to measure Sanctuary-level prerecruitment of economically important species. Conduct a fisheries inventory of species, sizes, ages, harvest, bycatch, timing, distribution, users, socioeconomics, and gear. (Alt. IV)

This strategy is designed to evaluate and modify existing commercial landing and recreational creel census programs for providing Sanctuary-level, statistically based management information for regulating take. This includes an assessment and modification of information types and mandatory versus voluntary information. A fishery prerecruitment monitoring effort will also be initiated for the long-term prediction of fishery stocks for Sanctuary-level management. This effort is independent of commercial and recreational industry monitoring, and Florida's DEP has begun implementation for other areas in the state. Regulations will be developed and implemented in accordance with the FMFC and the protocols established for consistent regulations in strategy F.1.a.

F.6.b Enhance the resolution of existing commercial and recreational fisheries-dependent and independent sampling programs to provide statistics on catch and effort. This will be accomplished by establishing statistical areas based on "completeness criteria" including scientific need. Initiate fisheries-independent sampling programs to measure the prerecruitment of economically important species within the statistical areas. (Alts. III and II)

This strategy is designed to evaluate and modify existing commercial landing and recreational creel census programs for providing statistically based management information for regulating take. *To increase the resolution of the programs, statistical areas will be established to provide information on catch and effort. The number of areas will be based on "completeness criteria" including scientific need.* This includes an assessment and modification of information types and mandatory versus voluntary information. A fishery prerecruitment monitoring effort will also be initiated for the long-term prediction of fishery stocks for Sanctuary-level management. This effort is independent of commercial and recreational industry monitoring, and Florida's DEP has begun implementation for other areas in the state. Regulations will be developed and implemented in accordance with Florida's Marine Fisheries Commission and the protocols established for consistent regulations in strategy F.1.a.

F.7.a Conduct research on the impacts of artificial reefs on fish and invertebrate populations for long-term management including location, size, materials, etc. Monitor and evaluate habitat modifications caused by the installation of marine structures. Assess and develop regulations for artificial reef construction and evaluate habitat suitability for artificial reefs. (Alts. IV and III)

This strategy will: 1) determine the impacts of artificial reefs on fish abundance and community composition; 2) develop design criteria including construction materials and appropriate sites; and 3) examine existing regulations/ policies that would affect the placement of artificial reefs within the Sanctuary. Regulations can be developed based on research and in accordance with the protocols established in strategy F.1.a. This strategy also will allow for the implementation of existing regulations.

F.7.c Implement a three-year moratorium on artificial reef development. Conduct research on the impacts of artificial reefs on fish and invertebrate populations for long-term management, including locations, size, materials, etc. Monitor and evaluate habitat modifications caused by the installation of marine structures. Assess and develop regulations for artificial reef construction and evaluate habitat suitability for artificial reefs. (Alt. II)

This strategy will: 1) determine the impacts of artificial reefs on fish abundance and community composition; 2) develop design criteria including construction materials and appropriate sites; and 3) examine existing regulations/ policies which would affect the placement of artificial reefs within the Sanctuary. Regulations can be developed based on research and in accordance with the protocols established in strategy F.1.a. This strategy will also allow for the implementation of existing regulations *and prohibit artificial reef placement/construction within the Sanctuary for three years. This will allow for the development of new Sanctuary-specific regulations and the establishment of implementation methods.*

F.8.a Implement regulations to prevent the release of exotic species into the Sanctuary. (Alts. IV, III, and II)

This strategy will prevent the introduction of exotic species into the natural environment of the Sanctuary to ensure that local and ecosystem-level impacts do not occur. The main focus of this strategy involves the control of aquaculture operations. In some cases, prohibitions on the culture of certain species will be considered.

F.9.a Develop a program for the removal of lost or out-of-season fishing gear, and implement in all areas of the Sanctuary. (Alts. IV, III, and II)

This strategy will reduce habitat, wildlife, and fish population impacts resulting from fishing gear that has been lost or abandoned including traps, fishing lines, and hooks. Gear removal will be achieved through incentives, volunteer efforts, an extension of the trap removal grace period,

and education and enforcement programs. Implementation will occur throughout the Sanctuary.

F.10.a Conduct an assessment of methods used to harvest commercial and recreational marine species including corals, fish, and invertebrates. Develop and implement regulations to reduce the effects of current fishing practices on nontargeted species. (Alts. IV, III, and II)

This strategy will determine the impacts of harvesting methods on species composition and abundance, and the indirect impacts on other species and the environment. The extent of the problem will be assessed, and research will be conducted on the impacts of existing fishing methods and gear. Regulations will be developed and implemented based on research results to reduce the by-catch of incidental species and undersized targeted species. These may include requirements for the use of specific net/trap designs and temporal/spatial restrictions (e.g., spawning areas). Regulations will focus on protecting marine species, increasing species composition and abundance, and reducing adverse impacts on the environment.

F.11.a Conduct research on alternative fishing gear and methods that minimize impacts on habitat. Implement a voluntary program to encourage the use of low-impact gear and methods. Characterize harvesting stresses affecting outer and inshore reefs and hardbottom ecosystems. (Alt. IV)

This strategy will facilitate research to develop gear designs and types that minimize impacts to corals, hardbottoms, seagrasses, and other habitats. Biodegradable fishing line, traps, and buoy lines are examples of gear that should be researched. Modified trap designs should also be considered. Fishing methods, including resource handling and gear placement, should be researched to develop methods and gear that minimize impacts to resources, while maintaining gear efficiency. The Sanctuary will implement an effort to encourage the voluntary use of low-impact gear types and fishing methods.

F.11.b Conduct research on alternative fishing gear and methods that minimize impacts on habitat. Implement a voluntary program to encourage the use of low-impact gear and methods. Implement regulations to require the use of low-impact gear and methods in priority areas. Characterize harvesting stresses affecting outer and inshore reefs and hardbottom ecosystems. (Alt. III)

This strategy will facilitate research to develop gear designs and types that minimize impacts to corals, hardbottoms, seagrasses and other habitats. Biodegradable fishing line, traps and buoy lines are examples of gear that should be researched. Modified trap designs should also be considered. Fishing methods, including resource handling and gear placement, should also be researched to develop methods and gear that minimize impacts to resources, while maintaining gear efficiency. The Sanctuary will implement an effort to encourage the voluntary use of low-impact gear types and fishing methods throughout the Sanctuary. *Regulations will be developed requiring the use of low-impact gear and methods in priority areas. Regulatory implementation will be in accordance with strategy F.1.a.*

F.11.c Conduct research on alternative fishing gear and methods that minimizes impacts on habitat. Implement regulations to require the use of low-impact gear and methods Sanctuary-wide. Characterize harvesting stresses affecting outer and inshore reefs and hardbottom ecosystems. (Alt. II)

This strategy will facilitate research to develop gear designs and types that minimize impacts to corals, hardbottoms, seagrasses, and other habitats. Biodegradable fishing line, traps, and buoy lines are examples of gear that should be researched. Modified trap designs should also be considered. Fishing methods, including resource handling and gear placement, should also be researched to develop methods and gear that minimize impacts to resources while maintaining gear efficiency. The Sanctuary will implement an effort to educate fisheries users about the benefits of low-impact gear types and fishing methods to encourage voluntary compliance with regulations. *Regulations mandating the use of low-impact gear and methods will be required throughout the Sanctuary to provide maximum resource protection.* Regulatory implementation will be conducted in accordance with strategy F.1.a.

F.12.a Eliminate all finfish traps within the Sanctuary, excluding those set for bait fish. (Alts. IV, III, and II)

This strategy will increase species diversity, composition, and abundance and will eliminate the harvest of nontargeted species, reducing adverse environmental impacts resulting from placement and recovery activities. This strategy complements existing Florida and South Atlantic fisheries management council regulations.

F.14.a Conduct an assessment of spearfishing practices and impacts to develop and implement regulations in high-priority areas. (Alt. IV and III)

This strategy will: 1) determine the impacts of spearfishing on species composition and abundance; 2) reduce incidental habitat damage; and 3) reduce user conflicts. Regulations will be developed and implemented in high-priority areas (i.e., those areas exhibiting a low stock abundance, a high degree of habitat damage, or a high degree of user conflicts). Restrictions may include bag limits, gear prohibitions, or the closure of selected areas

(e.g., around residential areas). This strategy will also support any existing spearfishing closures in Sanctuary waters.

F.14.c Conduct an assessment of spearfishing practices and impacts to develop and implement regulations throughout the Sanctuary. (Alt. II)

This strategy is designed to: 1) determine the impacts of spearfishing on species composition and abundance; 2) reduce incidental habitat damage; and 3) reduce user conflicts. *Regulations will be developed and implemented throughout the Sanctuary.* Restrictions may include bag limits, gear prohibitions, or the closure of selected areas (e.g., around residential areas). This strategy will also support any existing spearfishing closures in Sanctuary waters.

F.15.a Develop and conduct a research program to assess the impacts of current sponge harvest methods on the resource and the habitats in which they occur. Develop and implement regulations for high-priority areas. (Alt. IV)

This strategy will include research and assessment activities to determine which methods have a low adverse impact on both species and habitats and to identify areas that exhibit low abundance, low recovery rates, and habitat damage. Species specific regulations will be developed and implemented in these areas in accordance with the FMFC and the protocols established in strategy F.1.a. Regulations may include bag limits, an increase in minimum size, and/or designating areas closed to harvest. This strategy is specific to nonornamental sponge species, which are currently regulated by the FMFC.

F.15.b Develop and conduct a research program to assess the impacts of current sponge harvest methods on the resource and the habitats in which they occur. Develop and implement regulations throughout the Sanctuary. (Alt. III)

This strategy will include research and assessment activities to determine which methods have a low adverse impact on both species and habitats and to identify areas that exhibit low abundance, low recovery rates, and habitat damage. *This strategy requires the development and implementation of species specific regulations governing sponge harvest in all habitats in which they occur throughout the Sanctuary* in accordance with the FMFC and the protocols established in strategy F.1.a. Regulations may include bag limits, an increase in minimum size and/or designating areas closed to harvest. This strategy is specific to nonornamental sponge species, which are currently regulated by the FMFC.

F.15.c Establish a three-year moratorium on the harvest of sponges. Develop and conduct a research program to assess the impacts of current sponge harvest methods on the resource and the habitats in which they occur. Develop regulations for implementation after the moratorium. (Alt. II)

This strategy will include research and assessment activities to determine which methods have a low adverse impact on both species and habitats and to identify areas that exhibit low abundance, low recovery rates, and habitat damage. *The imposed three-year moratorium will be species specific and allow for the full development of regulations governing sponge harvest throughout the Sanctuary* in accordance with the FMFC and the protocols established in strategy F.1.a. Regulations may include bag limits, an increase in minimum size, and/or designating areas closed to harvest. This strategy is specific to nonornamental sponge species, which are currently regulated by the FMFC.

Land Use

L.1.a Require marinas that have pump-out requirements to install pump-out facilities. (Alts. IV, III, and II)

This strategy will eliminate marina live-aboard vessels as a source of pollution in the Sanctuary. Although live-aboards within marinas may be a minor contributor to the total pollutant load, marinas are normally located in confined waters that are more susceptible to the impacts of such loading. By requiring marinas to provide pump-out facilities, two problems may be resolved: 1) boats in marinas that don't currently pump-out will be provided with the means to do so; and 2) boats that moor outside of marinas can take advantage of the increased number of pump-out facilities.

L.2.a Conduct an assessment of marina (10 slips or more) compliance with current regulations and standards, including OSHA standards for marina operations. Evaluate interagency cooperation in the marina permit review process and initiate action to eliminate conflicts in agency jurisdictions. Improve marina siting criteria to ensure that only appropriate deep-water access will be permitted and to provide for the proper handling of noxious materials. (Alts. IV, III, and II)

This strategy will reduce sources of pollution loading associated with marina activities. It will also reduce the pollution of nearshore waters through the implementation of OSHA regulations regarding marina operations. A program will be developed to target activities that have potential impacts on ground and nearshore waters (e.g., bottom paint removal; use of fiberglass, resins, and solvents; fuel transfer; etc.). All marinas will be subject to this program. This strategy will also improve marina operations, the cooperation and coordination of agencies

involved in the marina permitting process, and will develop criteria for selecting sites for developing new or expanding existing marinas.

L.3.a Evaluate procedures to avoid or reduce fuel spillage during refueling operations. Initiate remedial solutions to any problems identified. (Alt. IV)

This strategy will require an evaluation of refueling operations through a detailed inventory of fueling facilities and an assessment of typical fuel-handling techniques and technology. Based on the inventory and assessment, short-term, low-cost remedial actions should be initiated in compliance with existing State laws.

L.3.b Evaluate procedures to avoid or reduce fuel spillage during refueling operations. Initiate remedial solutions to any problems identified. Require the establishment of paved and curbed containment areas for boat maintenance activities such as hull scraping and repainting, mechanical repairs, and lubrication. Require the creation of secondary containment, generally in the form of curbing or synthetic liners, for areas where significant quantities of hazardous or toxic materials are stored. (Alts. III and II)

This strategy requires an evaluation of refueling operations through a detailed inventory of fueling facilities and an assessment of typical fuel handling techniques and technology. Based on the inventory and assessment, short-term, low-cost remedial actions should be initiated in compliance with existing State laws. *In addition, little effort is now directed at containing and collecting wastes associated with boat maintenance activities such as bottom scraping or mechanical repairs. This strategy will help reduce pollution by establishing containment areas to prevent paint chips or dust and other wastes from entering surface waters. Secondary containment for hazardous or toxic material storage areas will minimize the potential for these substances to enter ground or surface waters.*

L.4.a Revise regulations to require public and private RV parks to provide pump-out facilities, and implement requirements within three years. (Alts. IV, III, and II)

This strategy will reduce pollution caused by the inappropriate disposal of wastewater from RVs, campers, and other mobile units, including live-aboards not docked at marinas. It is a regulatory strategy that could be implemented through Monroe County's comprehensive plan and land development regulations. All RV parks (public and private) will be required to have adequate and efficient pump-out facilities. Other pump-out facilities could be identified for use by the transient public. Some facilities could be holding tanks with a scheduled pick up, while others could include a type of on-site waste treatment.

L.5.a Expand enforcement activities to reduce illegal waste disposal from RVs. (Alts. IV, III, and II)

This strategy will reduce pollution caused by the illegal dumping of waste by RVs. Monroe County regulations currently prohibit the disposal of waste from RVs. This enforcement strategy will allow all law enforcement branches to enforce cooperatively any illegal disposal of waste by RVs.

L.6.b Establish a mobile pump-out service through the local government or a franchise with a private contractor which would serve to pump-out live-aboard vessels moored outside of marina facilities. Encourage the use of existing, and the construction of additional, shore-side facilities such as dingy docks, parking areas, showers, and laundries for use by live-aboards. (Alts. III and II)

This strategy will minimize the pollution impacts of live-aboard vessels located outside marinas within the Sanctuary. Although such live-aboards may be only a minor contributor to the total pollutant load, their mooring areas are normally located in confined waters that are more susceptible to the impacts of such loading. The establishment of this system will provide the incentive for live-aboard vessels to have their bilges and holding tanks pumped out regularly. The provision of shore-side facilities should reduce the potential for pollutants associated with other live-aboard activities to enter surface waters.

L.7.a Conduct an assessment to identify solid waste disposal sites that pose threats to water quality and/or sensitive areas, based on the results of EPA's Water Quality Plan. Intensify existing monitoring programs around landfills to ensure that no leaching is occurring into marine waters. If problems are discovered, evaluate and implement appropriate remedial actions such as boring or mining, upgrading closure, collecting and treating leachate, constructing slurry walls, or excavating and hauling landfill contents. (Alt. IV, III, and II)

This strategy will identify potential groundwater contamination problems from existing landfills and other solid waste disposal operations. The assessment will include the locations of disposal areas, the types of materials present at each site, and the movement of leachate off the site. The assessment will also establish a program to cap, mine, or relocate existing solid waste where the volume of leachate has been identified as a problem. In addition, this strategy will provide for the monitoring of old landfills not currently being monitored.

L.8.a Initiate a study to investigate the feasibility of various solid waste containment/relocation options. (Alt. IV)

The strategy will involve researching methods of solid waste disposal, other than the creation of new landfills. The study would determine what regulations are necessary to meet State and regional recycling goals, implement retail packaging standards, and require source separation. The study could also address incineration by identifying its impacts, the best available technology, and the need to eventually discontinue its use. Cooperative agreements with other local governments to accept Monroe County's solid waste also should be explored. The South Florida Regional Planning Commission can provide support for a regional discussion of the alternatives for the disposal of solid waste generated in Monroe County.

L.8.b Initiate a study to investigate the feasibility of various solid waste containment/relocation options. Implement containment/relocation options where appropriate within five years. (Alts. III and II)

The strategy will involve researching methods of solid waste disposal, other than the creation of new landfills. The study would determine what regulations are necessary to meet State and regional recycling goals, implement retail packaging standards, and require source separation. The study could also address incineration by identifying its impacts, the best available technology, and the need to eventually discontinue its use. Cooperative agreements with other local governments to accept Monroe County's solid waste also should be explored. The South Florida Regional Planning Commission can provide support for a regional discussion of the alternatives for the disposal of solid waste generated in Monroe County. *Containment/ relocation options will be implemented where appropriate within five years.*

L.9.a Comply with Monroe County policies on solid waste disposal. (Alts. IV, III, and II)

The fragile natural resources and limited amount of upland sites in the Keys can be protected by expanding the enforcement of current policies and regulations for solid waste disposal. In addition, Monroe County could adopt land development regulations that prohibit new solid waste disposal sites and negotiate a cooperative agreement with other local governments to accept its solid waste.

L.10.a Conduct an assessment and inventory of hazardous materials handling and use in the Florida Keys including facilities, types and quantities of materials, and transport/movement. Add information to the FDEP/EPA/Monroe County GIS database. (Alts. IV, III, and II)

This strategy will involve cataloging the use of all hazardous materials as defined by the FDEP and the EPA. The resulting inventory would include: 1) the types of hazardous materials used in Monroe and Dade counties; 2) the types of facilities utilizing identified hazardous materials; 3) the specific location of some users; 4) how these material are typically transported; 5) the toxic/noxious/volatile nature of identified hazardous materials; and 6) how these materials impact water quality and resources. This assessment and inventory will be used to develop a hazardous materials management plan for normal use and emergency response and containment. This information will be added to the FDEP/EPA/Monroe County GIS database.

L.11.a Establish licensing requirements for commercial handlers of hazardous materials and biohazardous waste within three years to reduce mishandling and illegal disposal. (Alts. IV, III, and II)

This strategy will develop a program for the responsible commercial handling of hazardous materials and biohazardous waste. Local licensing will be required as a mechanism to educate commercial handlers and to ensure that hazardous materials are utilized with standards prescribed by the State and Federal governments to protect human and environmental health. The program will focus on the types of uses and activities that could lead to marine resource degradation and/or destruction. The result will be a reduction in all kinds of hazardous material spills and leaks. The illegal dumping of such materials could also be better assessed.

L.12.b Establish a program to increase the availability of hazardous materials collection and transfer stations for nonlicensed users (e.g., households, etc.) within three years. (Alts. III and II)

This strategy will provide for the safe disposal of hazardous materials from residential and other nonlicensed sources. Since nonlicensed hazardous materials handlers are not regulated, adequate mechanisms for handling such materials are limited. Hazardous materials are frequently flushed down toilets, sinks, etc. The creation of collection and transfer sites will allow for the safe, simple, and efficient disposal of household materials.

L.14.a Prohibit new dredge and fill permits unless public interest is demonstrated. (Alt. IV)

This strategy will eliminate the possibility of new dredge and fill activities within the Sanctuary unless public interest can be demonstrated through the ACOE system. Such activities may lead to the direct degradation and/or destruction of sensitive Sanctuary resources. Any areas to be considered to satisfy public interest should focus on the expansion of existing marinas and water-dependent facilities. This prohibition will also apply to upland excavation, where the goal will be to lengthen an existing canal system to expand land/water use or create greater canal flushing.

L.14.b Prohibit new dredge and fill permits unless public interest is demonstrated and there will be little or no environmental degradation. (Alt. III)

This strategy will eliminate the possibility of new dredge and fill activities within the Sanctuary unless public interest can be demonstrated through the ACOE system *and if there will be little or no environmental degradation*. Such activities may lead to the direct degradation and/or destruction of sensitive Sanctuary resources. Any areas to be considered to satisfy public interest should focus on the expansion of existing marinas and water-dependent facilities. This prohibition will also apply to upland excavation, where the goal will be to lengthen an existing canal system to expand land/water use or create greater canal flushing.

L.14.c Prohibit new dredge and fill permits. (Alt. II)

This strategy will eliminate the possibility of new dredge and fill activities within the Sanctuary. Such activities lead to the direct degradation and/or destruction of sensitive Sanctuary resources. This prohibition will also apply to upland excavation, where the goal will be to lengthen an existing canal system to expand land/water use or create greater canal flushing.

L.15.a Conduct an inventory and assessment of current or recent maintenance dredging activities throughout the Sanctuary. (Alt. IV)

This strategy is designed to record the locations, sizes, and independent and cumulative impacts of maintenance dredging within the Sanctuary. Information will be aggregated in a database and/or a GIS to allow managers to evaluate maintenance dredging impacts as related to new permit requests.

L.15.b Conduct an inventory and assessment of maintenance dredging activities throughout the Sanctuary. Implement low-impact dredging methods for all maintenance dredging. Avoid maintenance dredging whenever possible. (Alts. III and II)

This strategy is designed to record the locations, sizes and independent and cumulative impacts of maintenance dredging within the Sanctuary. Information will be aggregated in a database and/or a GIS to allow managers to evaluate maintenance dredging impacts as related to new permit requests. *New policies and regulations will be developed that will require low-impact technologies for maintenance dredging and will prohibit such dredging in areas where significant re-establishment of sensitive benthic communities has occurred (i.e., seagrass and coral habitats).*

L.16.a Initiate a study to investigate the feasibility of water-use reduction and re-use options and thresholds. (Alt. IV)

This strategy is designed to reduce the amount of water being used in the Keys and to encourage better wastewater treatment by developing standards and practices for water re-use. A plan will be developed containing re-use options, thresholds, water-use reduction incentives, etc.

L.16.b Initiate a study to investigate the feasibility of water-use reduction and re-use options and thresholds. Implement a plan for water-use reduction and re-use for major users within five years. (Alt. III)

This strategy is designed to reduce the amount of water being used in the Keys and to encourage better wastewater treatment by developing standards and practices for water re-use. A plan will be developed containing re-use options, threshold levels, water-use reduction incentives, etc.

The FDEP currently will not permit the re-use of treated wastewater for plants with a capacity of less than 100,000 gallons per day (gpd). This is a disincentive to higher treatment and water conservation, both of which reduce pollution. The FDEP should develop appropriate human health and environmental standards to permit re-use for smaller users. Research and standards should focus on how water from households can be reused in other domestic applications. A water-use reduction and re-use plan will be implemented for major users within five years.

L.16.c Initiate a study to investigate the feasibility of water-use reduction and re-use options and thresholds. Implement a plan for water-use reduction and re-use for all users within five years. (Alt. II)

This strategy is designed to reduce the amount of domestic, commercial and industrial water being used in the Keys

and to encourage better wastewater treatment by developing standards and practices for water re-use. A plan will be developed containing re-use options, threshold levels, water-use reduction incentives, etc.

The FDEP currently will not permit re-use of treated wastewater for plants with a capacity of less than 100,000 gpd. This is a disincentive to higher treatment and water conservation, both of which reduce pollution. The FDEP should develop appropriate human health and environmental standards to permit re-use for smaller users. Research and standards should focus on how water from households can be reused in other domestic applications. *A water-use reduction and re-use plan will be implemented for all users within five years.*

L.17.a Establish consistent interagency regulatory authority addressing all dredge and fill activities. (Alts. IV, III, and II)

This strategy will establish further levels of interagency coordination and regulatory consistency with respect to the authorities of the FDEP, FDNR, ACOE, and local government. All agencies require permits for development activities within the Sanctuary, and coordination and consistency is essential. Some consolidation of such authority may be helpful through delegation, MOUs, etc.

L.18.a Restrict wetland dredge and fill permitting. (Alt. IV)

This strategy will further restrict the degree of wetland destruction currently occurring within Sanctuary boundaries. Monroe County has recently initiated policies to eliminate any dredge and fill activities within undisturbed wetland areas. This strategy will support this effort and develop consistent approaches with the agencies involved. The result will be reduced wetland destruction, protection of the natural wetland/stormwater filtration processes, and the protection of the habitat of numerous endangered species.

Mitigation banking for permitted development will be considered. Monies will be provided in an amount deemed necessary to re-establish wetlands on adjacent or nearby public lands. Absolute replacement of all permitted wetlands lost will be required, and dollar assessments are expected to be high.

L.18.b Restrict wetland dredge and fill permitting. (Alts. III and II)

This strategy will further restrict the degree of wetland destruction currently occurring within Sanctuary boundaries. Monroe County has recently initiated policies to eliminate any dredge and fill activities within undisturbed wetland areas. This strategy will support this effort and develop consistent approaches with the agencies involved. The result will be reduced wetland destruction, protection of the natural wetland/stormwater filtration processes, and the protection of the habitat of numerous endangered species. *New dredge and fill projects in functional disturbed wetlands will be required to pass a public interest test. This will reduce the loss of viable wetlands, which serve as buffers to runoff and as habitat for numerous endangered and protected species.*

Mitigation banking will be considered for permits issued in functional disturbed wetlands. Immediate replacement to functional status will be required in all mitigative efforts. Money will be received to a trust for restoration of public lands only. Where the agency has discretion, permits will not be renewed.

L.19.a Conduct an evaluation of the Monroe County Growth Plan for ecological impacts on the Sanctuary. Identify and recommend additional options to minimize short- and long-term impacts. (Alts. IV, III, and II)

This strategy will protect the natural resources of the Sanctuary by limiting growth and the associated impacts on resources. EPA's Water Quality Management Plan will begin to establish some standards related to volumes and quantities. Monroe County has recently tied its growth rate to hurricane evacuation standards and determined a 20-year growth cap. These issues will be evaluated comprehensively to establish a population "build-out" that will reduce residential-based impacts.

An intergovernmental acquisition program will be established to help purchase any remaining "unbuildable" lots in Monroe County. The remaining development should be directed at high-density, disturbed subdivisions, especially those serviced by centralized facilities.

L.20.a Conduct an assessment of existing public access to shoreline areas. Develop standards and guidelines for improvements to, and construction of, public access areas. (Alt. IV)

This strategy will provide information on problems associated with existing public access areas, including habitat damage and user conflicts. Existing public access areas will be inventoried, and nondestructive recreational uses identified. Standards and guidelines for improvements to, and the construction of, public access areas will be developed and could include: 1) improvements to supporting infrastructure; 2) restrictions on activities that damage habitats; 3) promotion of nondestructive recreational uses; and 4) the establishment of low-impact construction standards.

L.20.b Conduct an assessment of existing public access to shoreline areas. Develop standards and guidelines for improvements to, and construction of, public access areas. Acquire shoreline areas for developing and/or regulating public access. (Alts. III and II)

This strategy will provide information on problems associated with existing public access areas, including habitat damage and user conflicts. Existing public access areas will be inventoried, and nondestructive recreational uses identified. Standards and guidelines for improvements to, and the construction of, public access areas will be developed and could include: 1) improvements to supporting infrastructure; 2) restrictions on activities that damage habitats; 3) promotion of nondestructive recreational uses; and 4) the establishment of low-impact construction standards. *The acquisition of shoreline areas that will help improve and regulate public access while protecting the habitat will be pursued by supporting the existing land acquisition programs (such as the Conservation and Recreational Lands Program) and those implemented by the Monroe County Land Authority and The Nature Conservancy.*

Recreation

R.1.a Develop and implement a program to manage submerged cultural resources (SCRs). Conduct an inventory of SCRs and assess survey and extraction techniques within the Sanctuary. Require permitting throughout the Sanctuary. (Alt. IV)

This strategy is designed to protect SCRs from undesired disturbances and maintain them as intact as possible for research, education, science, and recreational activities by preparing an SCR Management Plan which will include the following elements:

1) Inventory - Compile existing literature into a bibliography and survey and identify location and specific site characteristics including name, age, integrity, and historical and cultural significance.

2) Management - Develop a set of management practices, guidelines and regulations addressing the exploration, removal, research, and dispensation of artifacts. Management of SCRs would prohibit unauthorized removal. The division of objects recovered from SCRs would be split 80 percent for the discoverer-recoverer, and 20 percent for the government.

3) Permitting - Develop and implement a permitting system for the research, exploration, removal, and dispensation of cultural artifacts, with a provision for exemptions for nondestructive exploration. Require permitting throughout the Sanctuary. Permit privatization of public resources would be consistent with past practices in Florida and Admiralty Court.

4) Enforcement - Ensure compliance with statutes, rules, regulations, and permits such as the Abandoned Shipwreck Act (ASA), Sanctuary regulations, State administration rules, and Federal and State permits through intensive on-site patrols by certified law enforcement officers.

5) Coordination - Ensure comprehensive coordination among all appropriate Federal, State, and local agencies involved in, and responsible for, the management of SCRs through the development and implementation of MOUs.

R.1.b Develop and implement a program to manage SCRs. Conduct an inventory of SCRs and assess survey and extraction techniques within the Sanctuary. Require permitting throughout the Sanctuary. (Alt. III)

This strategy is designed to protect SCRs from undesired disturbances and maintain them as intact as possible for research, education, science, and recreational activities by preparing an SCR Management Plan which will include the following elements:

1) Inventory - Compile existing literature into a bibliography and survey and identify location and specific site characteristics including name, age, integrity, and historical and cultural significance.

2) Management - Develop a set of management practices, guidelines and regulations addressing the exploration, removal, research, and dispensation of artifacts. Management of SCRs would prohibit unauthorized removal. *Disposition of artifacts from approved recovery operations will be consistent with ASA guidelines, 50 percent for the discoverer-recoverer, and 50 percent for the government. However, where the recoverer has arranged for private conservation, long-term public display, guaranteed public access, and public interpretation of artifacts and data, the disposition of objects may be adjusted accordingly.*

3) Permitting - Develop and implement a permitting system for the research, exploration, removal, and dispensation of cultural artifacts, with a provision for exemptions for nondestructive exploration. Require permitting throughout the Sanctuary. *The granting of permits will be based upon archaeological and historical value, potential environmental impact, proposed archaeological methods, and proposed public benefit. Permit applications that provide for conservation in museums or similar structures of public access for research, education, or public viewing enjoyment will be given priority over applications where some of the objects are dispersed into private markets.*

4) Enforcement - Ensure compliance with statutes, rules, regulations, and permits such as the ASA, Sanctuary regulations, State administration rules, and Federal and State permits through intensive on-site patrols by certified law enforcement officers.

5) Coordination - Ensure comprehensive coordination among all appropriate Federal, State, and local agencies

involved in, and responsible for, the management of SCRs through the development and implementation of MOUs.

R.1.c Develop and implement a program to manage SCRs. Conduct an inventory of SCRs and assess survey and extraction techniques within the Sanctuary. Require permitting throughout the Sanctuary. (Alt. II)

This strategy is designed to protect SCRs from undesired disturbances and maintain them as intact as possible for research, education, science, and recreational activities by preparing an SCR Management Plan which will include the following elements:

1) Inventory - Compile existing literature into a bibliography and survey and identify location and specific site characteristics including name, age, integrity, and historical and cultural significance.

2) Management - *Develop a set of management practices, guidelines and regulations addressing the exploration and research of SCR sites, and the removal of artifacts.* Management of SCRs would prohibit unauthorized removal. *Any artifacts recovered would be conserved in museums or similar structures of public access for research, education, or public viewing enjoyment.*

3) Permitting - Develop and implement a permitting system for the research, exploration, removal, and dispensation of cultural artifacts, with a provision for exemptions for nondestructive exploration. Require permitting throughout the Sanctuary. *Permits would require that all artifacts recovered be conserved in museums or similar structures of public access for research, education, or public viewing enjoyment.*

4) Enforcement - Ensure compliance with statutes, rules, regulations, and permits such as the ASA, Sanctuary regulations, State administration rules, and Federal and State permits through intensive on-site patrols by certified law enforcement officers.

5) Coordination - Ensure comprehensive coordination among all appropriate Federal, State, and local agencies involved in, and responsible for, the management of SCRs through the development and implementation of MOUs.

R.2.a Establish a routine survey of recreational activities and use levels within the Sanctuary through a survey of charter and recreational-for-hire vessels, intercept surveys at access points and launch sites, and periodic field surveys. (Alts. IV and III)

This strategy will provide data on the types, levels, users, and locations of recreational activities within the Sanctuary to better plan for management concerns such as access to sensitive or heavily used areas, user conflicts, and adverse impacts to resources. The survey, to be conducted by non-law-enforcement personnel, will request information on operator and safety equipment and visitor behaviors such as the use of gloves and buoyancy vests, etc. Data on the number of operators, users, and uses will help shape management decisions on costs (associated with permits, regulations, and other requirements) that may be imposed on users. This survey will be compatible with the current survey to establish user fees for NOAA's national marine sanctuaries.

R.2.c Establish a routine survey of recreational activities and use levels within the Sanctuary through a survey of charter and recreational-for-hire vessels, intercept surveys at access points and launch sites, and periodic field surveys. Establish a permitting and enforcement system to regulate use levels (e.g., number of boats, divers, etc.) for charter and recreational-for-hire vessels. (Alt. II)

This strategy *will protect resources from further damage by requiring commercial charter and rental boat operations to obtain permits that restrict the number of boats and passengers. It will provide data on the types, levels, users and locations of recreational activities in the Sanctuary* to better plan for management concerns such as access to sensitive or heavily used areas, user conflicts and adverse impacts to resources. The survey, to be conducted by non-law-enforcement personnel, will request information on operator and safety equipment and visitor behaviors such as the use of gloves and buoyancy vests, etc. Data on the number of operators, users, and uses will help shape management decisions on costs (associated with permits, regulations, and other requirements) that may be imposed on users. This survey will be compatible with the current survey to establish user fees for NOAA's national marine sanctuaries.

R.5.a Conduct a program to study and implement carrying-capacity limits for recreation activities by: 1) assessing the effects of recreation and boating activities on Sanctuary resources; 2) establishing recreational user carrying capacities that minimize wildlife disturbances and other adverse impacts on natural resources; and 3) enforcing carrying-capacity limits in highly sensitive areas. (Alt. IV)

This strategy will reduce impacts to Sanctuary resources from recreational activities by better understanding the level of use that different habitats can tolerate without degradation. The capacity levels for each activity identified by the research component of this strategy will be enforced in highly sensitive areas such as reefs. The causes of coral mortality (e.g., disease, temperature stress, bleaching, algal overgrowth, and physical damage) will be characterized, as well as physical stresses, especially those affecting outer and inshore reefs.

This research will assess the impacts that recreation activities have on Sanctuary resources and provide a basis for the continued anticipation of problems associated with specific activities and the development of management actions to eliminate/reduce impacts. Impacts such as

wildlife disturbance (especially of commercial and threatened and endangered species), changes in ecosystem balance, degradation of habitat, and other impacts associated with activities such as boating, fishing, diving, etc. will be included.

R.5.b Conduct a program to study and implement carrying-capacity limits for recreation activities by: 1) assessing the effects of recreation and boating activities on Sanctuary resources; 2) establishing recreational user carrying capacities that minimize wildlife disturbances and other adverse impacts on natural resources; and 3) enforcing carrying-capacity limits in high-use areas and for highly sensitive habitats throughout the Sanctuary. (Alt. III)

This strategy will reduce impacts to Sanctuary resources from recreational activities by better understanding the level of use that different habitats can tolerate without degradation. The capacity levels for each activity identified by the research component of this strategy *will be enforced in high-use areas and for highly sensitive habitats (i.e., coral, seagrass, hardbottom) throughout the Sanctuary.* The causes of coral mortality (e.g., disease, temperature stress, bleaching, algal overgrowth, and physical damage) will be characterized, as well as physical stresses, especially those affecting outer and inshore reefs.

This research will assess the impacts that recreation activities have on Sanctuary resources and provide a basis for the continued anticipation of problems associated with specific activities and the development of management actions to eliminate/reduce impacts. Impacts such as wildlife disturbance (especially of commercial and threatened and endangered species), changes in ecosystem balance, degradation of habitat, and other impacts associated with activities such as boating, fishing, diving, etc. will be included.

R.5.c Conduct a program to study and implement carrying-capacity limits for recreation activities by: 1) assessing the effects of recreation and boating activities on Sanctuary resources; 2) establishing recreational user carrying capacities that minimize wildlife disturbances and other adverse impacts on natural resources; and 3) enforcing carrying-capacity limits throughout the Sanctuary. (Alt. II)

This strategy will reduce the impacts to Sanctuary resources from recreational activities by better understanding the level of use that different habitats can tolerate without degradation. The capacity levels for each activity identified by the research component of this strategy *will be enforced throughout the Sanctuary.* The causes of coral mortality (e.g., disease, temperature stress, bleaching, algal overgrowth, and physical damage) will be characterized as will physical stresses, especially those affecting outer and inshore reefs.

This research will assess the impacts that recreation activities have on Sanctuary resources and provide a basis for the continued anticipation of problems associated with specific activities and the development of management actions to eliminate/reduce impacts. Impacts such as wildlife disturbance (especially commercial and threatened and endangered species), changes in ecosystem balance, degradation of habitat, and other impacts associated with activities such as boating, fishing, diving, etc. will be included.

R.7.a Prohibit contact with corals in high-use, sensitive, and vulnerable areas. (Alts. IV, III, and II)

This strategy will reduce the damage to hard coral communities caused primarily by boat anchoring/grounding and divers and snorkelers, by prohibiting contact with coral in high-use, sensitive, and vulnerable areas.

Water Quality

W.1.a Conduct a demonstration project to evaluate alternate, nutrient-removing OSDSs. (Alts. IV, III, and II)

This strategy will provide information to help determine the appropriate role, if any, of alternate OSDSs in wastewater management in the Keys. Although some alternate OSDS designs appear promising, it is not appropriate to proceed with broad-scale installation of these systems until an independent evaluation has been conducted. Alternate OSDSs designed for nutrient removal would be installed and maintained in a manner consistent with actual residential use. Influent, effluent, and groundwater quality (both background and "down-gradient") would be monitored at regular intervals for at least one year. In addition to nutrient removal efficiency, the study would evaluate maintenance and inspection requirements to keep units operating properly.

W.2.a Conduct a demonstration project to evaluate the installation of a small expandable AWT plant to serve an area of heavy OSDS use with associated water quality problems. (Alts. IV, III, and II)

This strategy will provide information to help determine whether the elimination of OSDSs would improve water quality in areas believed to be degraded by OSDS-related nutrients. The project would also provide information on the long-term performance of small AWT systems and septic tank effluent pumps or other collection systems. A small, expandable AWT package plant would be installed to serve an area where there is high-density OSDS use in close proximity to confined waters. Preferably, the test area would be one where water-quality problems believed to be related to OSDS nutrients have already been identified. Initial background groundwater and surface-water monitoring would be conducted, and plant influent and effluent

would be monitored for a minimum of one year after the plant is in operation. Groundwater and surface-water monitoring would continue for three to five years. Most facilities constructed for the demonstration project could be incorporated into a larger system if results are favorable.

W.3.a Establish authority for and implement inspection/enforcement programs to eliminate all cesspits and enforce existing standards for all OSDS and package plants. (Alt. IV)

This strategy will reduce the amount of pollutants entering groundwater by enforcing existing standards. On-site inspection programs would be implemented to identify and eliminate all cesspits and ensure that OSDSs and package plants are in compliance with existing standards. Penalties would be imposed for noncomplying systems.

Cesspits are illegal and provide no sewage treatment. OSDSs provide adequate sanitary treatment and limited nutrient reduction; however, there is no routine inspection and enforcement program to ensure that these systems are operating properly. Package plants provide secondary treatment and are inspected routinely (although not frequently). The elimination of cesspits and replacement with approved OSDSs would reduce nutrient loading to groundwater and eliminate health hazards from untreated sewage. Aggressive inspection/enforcement programs for OSDSs and package plants could be expected to further reduce nutrient loadings to groundwater.

W.3.b Establish authority for and implement inspection/enforcement programs to eliminate all cesspits and enforce existing standards for all OSDSs and package plants. Develop targets for reductions in wastewater nutrient loadings necessary to restore and maintain water quality and Sanctuary resources. Develop and implement a Sanitary Wastewater Master Plan that evaluates options for upgrading existing systems beyond current standards or constructing community sewage treatment plants based on nutrient reduction targets, cost and cost effectiveness, reliability/compliance considerations, and environmental and socioeconomic impacts. (Alts. III and II)

This strategy will reduce the amount of pollutants entering groundwater by enforcing existing standards. On-site inspection programs would be implemented to identify and eliminate all cesspits and ensure that OSDSs and package plants are in compliance with existing standards. Penalties would be imposed for noncomplying systems.

Cesspits are illegal and provide no sewage treatment. OSDSs provide adequate sanitary treatment and limited nutrient reduction; however, there is no routine inspection and enforcement program to ensure that these systems are operating properly. Package plants provide secondary treatment and are inspected routinely (although not frequently). The elimination of cesspits and replacement with approved OSDSs would reduce nutrient loading to groundwater and eliminate health hazards from untreated sewage. Aggressive inspection/enforcement programs for OSDSs and package plants could be expected to further reduce nutrient loadings to groundwater.

In addition, this strategy would involve research to estimate the level of reduction in wastewater nutrient loading necessary to restore and maintain water quality and Sanctuary resources. Based on these nutrient reduction targets and the results of the wastewater demonstration projects (Strategies W.1 and W.2), a Sanitary Wastewater Master Plan would be developed that would evaluate options for further treatment (e.g., construction of community wastewater plants, upgrading package plants to AWT, or the use of alternate, nutrient-removing OSDSs. The Sanitary Wastewater Master Plan would also specify details of costs, schedules, service areas, etc. for implementation.

W.4.a Upgrade effluent disposal for the City of Key West's wastewater treatment plant. Evaluate deep-well injection, including the possibility of effluent migration through the boulder zone into Sanctuary waters. Evaluate options for the re-use of effluent, including irrigation and potable re-use. Discontinue the use of ocean outfall and implement deep-well injection, aquifer storage, and/or re-use. Implement nutrient reduction technologies for effluent prior to disposal or re-use. (Alts. IV, III, and II)

This strategy will reduce direct nutrient loadings to surface waters from the Key West wastewater treatment plant. Use of the ocean outfall would be discontinued (except in emergencies), and effluents would be treated to reduce nutrients and disposed through deep-well injection, aquifer storage, and/or re-use.

Before the use of ocean outfalls is discontinued, both the environmental aspects of deep-well injection and the economics of effluent re-use must be evaluated thoroughly. Studies of deep-well injection need to investigate the possibility of effluent migrating through the boulder zone into Sanctuary waters. Re-use options to be evaluated include irrigation and further treatment to produce potable water. Re-use for local irrigation may be limited due to the small number of application sites. Re-use for irrigation in areas outside the Keys would be considered only if it were proposed for unincorporated Monroe County. Potable re-use, although requiring costly treatment, might be cost-effective in the long-term, considering the current cost of treating and pumping in drinking water from Florida City.

W.5.a Develop and implement water quality standards, including biocriteria, appropriate to Sanctuary resources. (Alts. IV, III, and II)

This strategy will reduce impacts of pollution on Sanctuary resources by determining water quality conditions to

ensure resource protection. The intent is to implement water quality standards as guidance in determining permitted discharge limitations. OFW standards will be used until research indicates that new, more-stringent regulations are necessary.

W.6.a Delegate administration of the NPDES program for Florida Keys dischargers to the State of Florida. (Alts. IV, III, and II)

This strategy will streamline and eliminate unnecessary duplication in the NPDES permitting process. Currently, all surface-water dischargers must receive permits from both the EPA and the FDEP. Although the two agencies coordinate their permitting activities, it would be simpler for both the agencies and permit applicants if the EPA delegated NPDES permitting authority to the State, as has been done in many other states.

W.7.b Require all NPDES-permitted surface dischargers to develop resource monitoring programs. (Alts. III and II)

This strategy will help to evaluate environmental impacts of point-source discharges by requiring all NPDES-permitted surface dischargers to develop resource monitoring programs. This could be accomplished in one of two ways: 1) EPA could eliminate the baseline exemption for resource monitoring under the Ocean Discharge Program as it applies to the Keys. All surface dischargers except the City of Key West sewage treatment plant are currently exempted from developing resource monitoring programs because the end of their discharge pipe does not extend beyond the baseline (the mean low-tide line); or 2) FDEP, through the State of Florida's permitting authority, could require resource monitoring when individual NPDES permits come up for renewal. This approach would probably be easier because it can be accomplished under existing rules, whereas eliminating EPA's baseline exemption would require a Federal rule change.

W.8.a Improve interagency coordination for industrial wastewater discharge permitting. Combine OSDS permitting responsibilities in one agency for commercial establishments, institutions, and multi-family residential establishments utilizing injection wells. (Alts. IV, III, and II)

This strategy will improve coordination between the EPA, FDEP, and local government agencies relative to industrial wastewater discharge permitting and tracking (HRS is included for special cases such as seafood processing plants). Much of the interagency coordination and tracking is currently handled through a series of Memorandums of Agreement (MOAs) and MOUs. These agreements will be reviewed, evaluated, and revised specifically for the Keys. This could also indirectly reduce wastewater pollution by refining and simplifying the OSDS permitting process and increasing funds for compliance monitoring and enforcement.

W.9.a Establish an interagency laboratory capable of processing monitoring and compliance samples. (Alt. IV, III, and II)

This strategy could indirectly help reduce pollution by creating an interagency laboratory facility for processing compliance monitoring samples, thus reducing the cost of analysis currently conducted outside the Keys. Neither the FDEP nor the FDHRS has FDHRS-certified (or equivalent) laboratory facilities in the Keys. Because of quality control considerations (holding times), it is difficult or impossible to ship compliance/enforcement samples to Tallahassee for analysis, and the use of contracted private laboratory facilities is expensive. This laboratory would not process toxics or status and trends samples from the water quality monitoring program.

W.10.a Inventory and characterize dead-end canals/basins and investigate alternative management strategies to improve their water quality. (Alt. IV)

This strategy will examine water quality in nearshore confined areas, with an emphasis on dead-end canals and basins where reduced circulation increases the risk of reduced dissolved oxygen, retention of both dissolved and particulate pollutants, and the potential impacts on benthic and pelagic environments. A comprehensive management plan will be developed for improving water quality in nearshore and confined basins and canals.

W.10.b Inventory and characterize dead-end canals/basins and investigate alternative management strategies to improve their water quality. Implement improvements (consistent with the strategies developed for wastewater and stormwater) in known hot spots throughout the Sanctuary. (Alt. III)

This strategy will *improve* water quality in nearshore confined areas, with emphasis on dead-end canals and basins where reduced circulation increases the risk of reduced dissolved oxygen, retention of both dissolved and particulate pollutants, and potential impacts on benthic and pelagic environments. A comprehensive management plan will be developed for improving water quality in nearshore confined basins and canals. *Improvement strategies will be implemented in all canals and basins identified as hot spots throughout the Sanctuary.*

W.10.c Inventory and characterize dead-end canals/ basins and investigate alternative management strategies to improve their water quality. Implement improvements (consistent with the strategies developed for wastewater and stormwater) throughout the Sanctuary. (Alt. II)

This strategy will improve water quality in nearshore confined areas, with emphasis on dead-end canals and basins where reduced circulation increases the risk of reduced dissolved oxygen, retention of both dissolved and particulate pollutants, and potential impacts on benthic and pelagic environments. A comprehensive management plan will be developed for improving water quality in nearshore confined basins and canals. *Improvement strategies will be implemented in canals and basins throughout the Sanctuary.*

W.11.b Identify and retrofit stormwater hot spots using "Best Management Practices," such as grass parking, swales, pollution control structures, and detention/ retention facilities. Control stormwater runoff in areas handling toxic and hazardous materials. Install swales and detention facilities along limited sections of US 1. (Alt. III)

This strategy will reduce loadings of sediment, toxics, and nutrients to Sanctuary waters through engineering methods applied to stormwater hot spots (e.g., commercial and industrial facilities) and limited sections of US 1.

W.11.c Identify and retrofit stormwater hot spots and degraded areas using "Best Management Practices," such as grass parking, swales, pollution control structures, and detention/retention facilities. Control stormwater runoff in areas handling toxic and hazardous materials. Install swales and detention facilities along numerous sections of US 1. (Alt. II)

This strategy would reduce loadings of sediment, toxics, and nutrients to Sanctuary waters through engineering methods applied to stormwater hot spots (e.g., commercial and industrial facilities), *degraded areas*, *and numerous sections of US 1.*

W.12.a Require that no development in the Florida Keys be exempted from the stormwater permitting process. (Alts. IV, III, and II)

The SFWMD, which currently has the primary responsibility for stormwater permitting in the Keys, exempts developments of less than 10 acres in size or two acres of impervious surface from having to obtain a stormwater permit. Most development in the Keys falls below this threshold. Local governments are in the process of developing stormwater management ordinances and/or stormwater management master plans. This strategy would require that local government ordinances and master plans cover all development, with no minimum size threshold for requiring that it go through the stormwater permitting process.

W.13.a Require local governments to enact and implement stormwater management ordinances and comprehensive stormwater management master plans. Petition the EPA to include the Florida Keys in the stormwater NPDES program if adequate stormwater management ordinances and administrative capabilities to manage such ordinances are not in place by a certain date. (Alts. IV, III, and II)

This strategy will help reduce stormwater pollutant loadings (e.g., sediment, toxics, and nutrients) by requiring local governments to develop stormwater management ordinances and master plans. There is currently little regulation of stormwater runoff in the Keys. Many developments were constructed before SFWMD stormwater permitting requirements were in place or, if constructed more recently, fell below the acreage thresholds for those regulations. Monroe County recently passed a stormwater ordinance, and other local governments are either developing ordinances and/or have stated in their comprehensive plans that stormwater management master plans will be developed. This strategy would set deadlines for local governments to enact the stormwater ordinances and master plans. As a backup in the event that these ordinances and master plans are not developed in a timely manner, the FDEP would petition the EPA to include the Florida Keys in the stormwater NPDES permitting program for municipal separate storm sewer systems.

W.14.a Institute a series of "Best Management Practices" and a public education program to prevent pollutants from entering stormwater runoff. (Alts. IV, III, and II)

This strategy will reduce pollution from stormwater runoff through a variety of programs, including: 1) street sweeping; 2) ordinances aimed at controlling fertilizer application on public and private landscaping; 3) collection locations and a public education program for the proper use and disposal of fertilizers, pesticides, motor oil, and other hazardous chemicals; and 4) strenuous litter-control programs.

W.15.a Improve and expand oil and hazardous materials response programs throughout the Sanctuary. (Alts. IV, III, and II)

This strategy will reduce the chance that an oil or hazardous materials spill will have a significant negative impact on Sanctuary resources. This will be accomplished by improving coordination and cooperation between the Federal, State, and local agencies responding to spills; encouraging improvements in response and containment technologies appropriate to the Keys; and creating a spill

contingency plan for the Sanctuary that includes crew and equipment staged in the Keys (possibly including skimmers). As this strategy recognizes that hazardous material spills on land are handled independent of marine spills, improvement measures will be developed for both programs.

W.16.a Establish a reporting system to ensure that all spills in and near the Sanctuary are reported to Sanctuary managers and managers of impacted areas within the Sanctuary. Establish a geo-referenced Sanctuary spills database. (Alts. IV, III, and II)

This strategy will ensure that Sanctuary managers are informed of all spills (e.g., of petroleum products) in and near the Sanctuary. Small spills, in particular, are underreported, although they occur frequently and may have a significant effect on the Sanctuary's water quality. This strategy will establish a reporting system to ensure that all spills documented by various agencies (e.g., the USCG and FDEP) are reported to Sanctuary managers and managers of impacted areas within the Sanctuary. In addition, it would establish a geo-referenced database for the Sanctuary that could be used to keep track of information on spills (e.g., locations, quantities, types of material spilled, and environmental impacts).

W.17.a Refine the aerial spraying program to further reduce aerial spraying over marine areas. (Alts. IV and III)

This strategy will reduce the amounts of pesticides entering Sanctuary waters through the refinement of the existing aerial spraying program. Ground spraying by truck is the current method of choice for controlling the adult mosquito population; however, aerial spraying is initiated when the mosquito population reaches a certain threshold, as determined by mosquito landing counts at test sites. Although the Monroe County Mosquito Control District attempts to avoid marine areas when aerially spraying, the potential for pesticides to reach marine waters may be reduced through program refinements. The threshold for initiating aerial spraying would be reviewed to determine whether it could be raised. Also, the program would be reviewed to determine whether the amount of spray released over water could be reduced through the development of a more refined plan for flight lines and the use of improved equipment. Ground spraying of larvicides in currently restricted areas would be reconsidered to reduce the need for aerial spraying of adult mosquito populations. The possibility of eliminating thermal fogs (which contain diesel oil) and implementing ultra-low-volume spraying techniques will be evaluated.

W.17.c Eliminate all aerial pesticide spraying within five years. (Alt. II)

This strategy will reduce the potential impacts that aerial pesticide spraying (including that of hormones and other biological agents) may be having on Sanctuary resources by requiring that all spraying conform to existing regulations regarding applications to open-water areas. *Over a five-year period, a program of land-based spraying will be implemented and all aerial pesticide application will be eliminated.*

W.18.a Develop and implement an independent research program to assess and investigate the impacts of, and alternatives to, current pesticide practices. Modify the Mosquito Control Program as necessary on the basis of research findings. (Alts. IV, III, and II)

This strategy will establish a research program to identify the impacts of current spraying practices on Sanctuary resources and will identify alternative means of mosquito control. Since pesticides used in mosquito control are nonspecific to the larval stages of crustaceans, fish, and natural mosquito-control predators, the effects of the chemicals used (and all application methods employed) need to be examined. In addition, the effect of housing patterns, design, and landscaping as they affect the demand for mosquito control, need to be investigated. The results of this research may be used to modify the Mosquito Control Program.

W.19.a The Steering Committee for the Water Quality Protection Program shall take a leading role in restoring the historical freshwater flow to Florida Bay. In addition, Sanctuary representatives should work with the appropriate Federal, State, and local agencies to ensure that restoration plans and surface water management and improvement plans for South Florida and the Everglades are compatible with efforts to maintain water quality within the Sanctuary. (Alts. IV, III, and II)

The Steering Committee for the Water Quality Protection Program includes high-level representatives of all relevant agencies and can, therefore, take a leading role in water management issues affecting Florida Bay, including restoring historical freshwater flow. Both short- and long-term solutions must be pursued at high levels of management in both State and Federal agencies.

In addition, Sanctuary representatives should participate in the review and revision of restoration plans and water management plans for Florida Bay and adjacent areas to ensure that these proposals and/or actions will enhance and complement water quality improvement efforts undertaken in the Sanctuary. These plans include, but are not limited to, the Shark River Slough GDM, C-111 basin, Taylor Slough Restoration, West Dade Wellfield, US 1

widening, National Park Service Everglades Restoration Plan, Lower East Coast Water Supply Plan, and Everglades Surface Water Management and Improvement Plan.

W.20.a Conduct a long-term, comprehensive water quality monitoring program as described in the EPA Water Quality Protection Program. (Alts. IV, III, and II)

This strategy will provide long-term, comprehensive information about the status and trends of water quality parameters and biological resources in the Sanctuary. It will allow managers to identify or confirm problem areas and determine whether conditions are improving or degrading. In addition, remedial actions taken to reduce pollution would be monitored to evaluate their effectiveness. Water-column parameters to be monitored include temperature, salinity, dissolved oxygen, pH, photosynthetically active radiation, turbidity, nutrients, Chlorophyll-a, and alkaline phosphatase activity. Sediment parameters to be monitored include grain size, mineralogy, organic content, nutrients, metals, pesticides, PCBs, petroleum hydrocarbons, and sewage tracers. In addition to the water and sediment sampling, biological monitoring of seagrass, hardbottom, and mangrove communities would be conducted. Seagrass and hardbottom communities (including coral reefs and nearshore hardbottom areas) would be monitored by in situ sampling and remote sensing. Changes in the areal coverage of mangrove communities would be monitored by remote sensing.

W.21.a Develop phased hydrodynamic/water quality models and coupled, landscape-level ecological models to predict and evaluate the outcome of in-place and proposed water quality management strategies. (Alts. IV, III, and II)

This strategy will develop predictive models that, used with appropriate scientific guidance, would allow resource managers to predict and evaluate the outcome of various management strategies (e.g., engineering actions to reduce wastewater nutrient loadings). Initial conceptual models would be developed, information needs identified, environmental data gathered, and quantitative models developed and refined over the long-term and on a continuous basis to aid in management decisions.

W.22.a Develop a segmentation framework to identify surface water areas sharing common hydrographic properties affecting water quality. Determine the susceptibility of each segment to pollutants based upon all loadings (i.e., land- and water-based) and segment specific hydrographic properties affecting their retention. (Alts. IV, III, and II)

This strategy will establish a management framework that recognizes the extent to which both regional and local circulation affect temperature, salinity, and the transport of pollutants and marine life into and within segments of the Sanctuary. To better understand these processes, physical simulation models (e.g., coastal ocean hydrodynamical, circulation, transport, mesoscale meteorological, and hydrographical and hydrological models) will be developed.

This strategy also includes documenting the locations and magnitudes of pollution sources entering the Sanctuary to better understand what areas are at high risk. Sources will include those that are point, nonpoint, and external to the Sanctuary (e.g., permitted discharges, OSDSs, stormwater runoff, groundwater leachates, marinas, C-111, Biscayne Bay, Florida Bay, southwest Florida and oceanic fluxes, and gyre-induced upwelling). Pollutants are to be inclusive of nutrients, hydrocarbons, heavy metals, and pesticides. Load estimates will be based on the best available information, and will include engineering estimates where applicable.

W.23.a Conduct a hydrologic/geologic assessment of leachate transport (e.g., from injection wells, land fills, storage tanks, etc.) into nearshore waters. Determine whether, and in what quantities, groundwater nutrients are reaching Sanctuary waters including the Florida Reef Tract. (Alts. IV, III, and II)

This strategy will better define the influences of various geologic formations (e.g., Miami Oolite, Key Largo Limestone, and Holocene sediment) on groundwater hydrology as they affect the volume, composition, and transport of leachates to nearshore/confined waters as a contributing factor to ambient water quality. The research will also examine the possible effects of groundwater nutrients on the Florida Reef Tract.

W.24.a Conduct research to understand the effect of water transport from Florida Bay on water quality and resources in the Sanctuary. (Alts. IV, III, and II)

This strategy will research the influence of Florida Bay on the Sanctuary's water quality. Research will include an historical assessment of Everglades/Florida Bay/Florida Keys hydrology, as well as an estimation of present-day, long-term net transport and episodic transport from Florida Bay to the Sanctuary. This strategy will also clarify the role of freshwater inflow and water quality from the Everglades and other freshwater discharges to the southwest shoreline of Florida, Florida Bay, and the Sanctuary. The objective is to provide a scientific basis for efforts to re-establish salinity, temperature, and nutrient regimes to ensure the biological integrity of Florida Bay. The strategy will examine the effects of structural modifications and changes in the timing and volume of freshwater releases from existing structures, as well as land practices affecting the water quality of runoff.

This strategy will also involve studies to document any ecological impacts of Florida Bay waters on Sanctuary communities including seagrasses, coral reefs, nearshore

hardbottom communities, and potentially endangered or threatened species. Documentation of hypothesized impacts could provide a stronger basis for action to restore the historical freshwater flow to Florida Bay.

W.25.a Conduct research to identify and document causal linkages between water quality (e.g., levels of pollutants, nutrients, salinity, temperature, etc.) and ecological problems in each major ecosystem. (Alts. IV, III, and II)

This strategy will help understand the cause/effect relationships between pollutants and biological resources. Numerous problems have been identified in Sanctuary biological communities, but the causes in most cases are not understood well enough to: 1) determine whether anthropogenic pollutants are having adverse ecological effects; and 2) predict confidently the ecological benefits of actions to reduce pollution. Research is needed to identify and understand causal linkages between pollutants and specific ecological problems. Studies would identify limiting nutrients, estimate nutrient thresholds, and evaluate interactive effects of nutrients, toxics, and other water quality parameters. Nutrient budgets will be constructed to determine limiting nutrients for each habitat, including seasonal effects and thresholds. The strategy will also establish a framework for investigating the impacts of catastrophic events (such as hurricanes) on water quality and Sanctuary resources. The effects of turbidity, the direction and flow of nearshore currents, nutrient enrichment, and suspended sediment on seagrasses, benthic algae, and coral symbionts will be examined, as will the effects of oil spills on coral reefs. The interactive effects of salinity, temperature, and nutrients on seagrasses and corals will be determined, and water-quality stresses (including changes in nutrients, suspended sediments and circulation patterns) will be characterized. Research could include experimental studies (laboratory, mesocosm, in situ), historical studies (sclerochronology, geological reconstruction), and geographic comparisons.

W.26.a Develop diagnostic indicators of water quality problems (e.g., tissue C:N:P ratios, alkaline phosphate activity, and shifts in community structure by habitat). Conduct research to identify and evaluate indicators (biochemical and ecological measures to provide early warning of widespread ecological problems) in each type of ecosystem. (Alts. IV, III, and II)

This strategy will make ecological monitoring simpler, less expensive, and more sensitive to changes in water quality. It would identify and evaluate indicators (biochemical and ecological measures to provide early warning of widespread ecological problems) in each type of ecosystem. These measures could be incorporated into the Water Quality Monitoring Program to provide the basis for resource-oriented water quality standards for the Sanctuary (see strategy W.5).

W.27.a Conduct research to identify and evaluate innovative monitoring tools and methodologies to detect pollutants and identify cause/effect relationships involving water quality and biological resources. (Alts. IV, III, and II)

This strategy would identify and evaluate innovative monitoring tools and methodologies to detect pollutants and identify cause/effect relationships involving water quality and biological resources. New or modified monitoring tools and methodologies may be needed because of the unique biota and environmental conditions in the Sanctuary.

W.28.a Establish a regional database and data management system for recording research results and biological, physical, and chemical parameters associated with Sanctuary monitoring programs. (AIts IV, III, and II)

This strategy will develop a regional database including biological, physical, and chemical parameters and instrument records, etc.

W.29.a Develop a program to disseminate scientific research results including an information exchange network, conferences, and support for the publication of research findings in peer-reviewed scientific journals. (Alts IV, III, and II)

This strategy will help disseminate research findings among scientists and resource managers, helping to stimulate discussion and critical thinking and to avoid duplication of effort in preparing research proposals.

W.31.a Examine the effects of global climate change on the organisms and ecosystems of the Keys. (Alts. IV, III, and II)

This strategy will examine the effects of stresses associated with global change on the ecosystem. Examples include temperature, salinity, frequency and intensity of storms, turbidity, sea-level change, ultraviolet and visible radiation, etc.

W.32.a Establish a technical advisory committee for coordinating and guiding research and monitoring activities. (Alts IV, III, and II)

This strategy will create an advisory committee to guide the process of setting priorities for research and monitoring. The committee shall be composed of scientists from Federal agencies, State agencies, academic institutions, private nonprofit organizations, and knowledgeable citizens.

W.33.a. Develop and implement a Sanctuary-wide, intensive ecosystem monitoring program. The objective of the program will be to monitor the status of various biological and ecological indicators of system components throughout the Sanctuary and adjacent areas in order to discern the local and system-wide effects of human and natural disturbances and assess the overall health of the Sanctuary. (Alts. IV, III, and II)

This strategy will establish an extensive, long-term monitoring program throughout the Sanctuary and adjacent areas. The monitoring program will have three purposes: 1) to supply resource managers with information on the status of the health of living resources and the ecosystem; 2) to determine causal relationships impacting management decisions; and 3) to evaluate the effectiveness of management actions such as zoning. The Ecological Monitoring Program will be fully integrated into the Water Quality Monitoring Program. The elements of the monitoring program will include: 1) a temporal and spatial ecological framework based on current knowledge from which to establish the sampling protocol; 2) status and trends assessments of corals, fishes, seagrasses, benthic organisms, plankton, and mangroves; 3) a fisheries ecology monitoring and research component to examine community composition and function within the habitats of the Sanctuary; 4) a Science Advisory Board to develop and oversee the monitoring program; 5) a sampling protocol; 6) a data analysis, management, and dissemination protocol; 7) a quality assurance/quality control protocol; 8) development of an index of health for the Sanctuary; and 9) a volunteer monitoring program. The development of a spatial, ecological framework for the Sanctuary and the establishment of a Science Advisory Board are prerequisites.

Zoning

Z.1.a Establish Wildlife Management Areas that restrict access to especially sensitive wildlife populations and habitats. Such areas would include bird nesting, resting, or feeding areas and turtle nesting beaches. Restrictions could prohibit use, modify the way areas are used or accessed, and specify time periods when use is prohibited. (Alt. IV)

Wildlife Management Areas are designed to minimize disturbance to wildlife populations and their habitats. Regulations governing access will be designed to protect wildlife populations and habitat, while providing opportunities for public use. Regulations will include various restrictions on access including no-access zones, no-motor-use zones, and idle-speed zones. Zones would be placed in areas considered especially sensitive wildlife habitats. Regulations could also have seasonal components, e.g., nesting season closures. Special-use permits, as specified in strategy B.11.a, will allow for access and activities otherwise prohibited. This zoning includes measures contained in proposed management plans for the Great White Heron, Key West, and National Key Deer wildlife refuges developed by the U.S. Fish and Wildlife Service and the State of Florida Department of Natural Resources.

Z.1.b Establish Wildlife Management Areas that restrict access to especially sensitive wildlife populations and habitats. Such areas would include bird nesting, resting, or feeding areas and turtle nesting beaches. Restrictions could prohibit use, modify the way areas are used or accessed, and specify time periods when use is prohibited. (Alt. III)

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Z.1.c Establish Wildlife Management Areas that restrict access to especially sensitive wildlife populations and habitats. Such areas would include bird nesting, resting, or feeding areas and turtle nesting beaches. Restrictions could prohibit use, modify the way areas are used or accessed, and specify time periods when use is prohibited. (Alt. II)

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Z.2.a Replenishment Reserves are designed to encompass large, contiguous diverse habitats. They are intended to provide natural spawning, nursery, and permanent residence areas for the replenishment and genetic protection of marine life and to protect and preserve all habitats and species. These reserves are intended to protect areas that represent the full range and diversity of resources and habitats found throughout the Sanctuary. The intent is to meet these objectives by minimizing human influences within these areas. (Alt. IV)

Replenishment Reserves are zones that will be established in accordance with Section 7 (a) (2) of the Florida Keys National Marine Sanctuary and Protection Act for the purpose of ensuring the protection of Sanctuary resources. They are designed to protect habitats and species by limiting consumptive activities, while continuing to allow recreational activities that are compatible with resource protection. This will provide the opportunity for these areas to evolve in a natural state, with a minimum of anthropogenic influence. These zones will protect a limited number of areas that represent the diverse habitats within the Sanctuary and that provide important habitat for sustaining natural resources such as fish and invertebrates. These areas have been selected to protect and enhance biodiversity and provide natural spawning, nursery, or permanent residence areas that will serve to replenish stocks of all species.

There already is scientific evidence that nonconsumptive areas lead to increases in both harvested and nonharvested species. However, questions remain about the usefulness of these areas in the Sanctuary, as well as the best sites, configurations, and locations. In addition, there is uncertainty about the relative impacts of regional water quality, nearby pollution sources, and human uses that already exist in the Sanctuary. Unbiased scientific studies, therefore, will be initiated in the Replenishment Reserves for two purposes: 1) to determine whether the reserves actually protect biological diversity and increase the productivity of important marine life species; and 2) to utilize the reserves as control areas to better understand the impacts of water quality, pollution, and various human uses. Based on the results of these studies, the five-year update of the Management Plan will consider expanding, modifying, or eliminating these zones.

Z.2.b Replenishment Reserves are designed to encompass large, contiguous diverse habitats. They are intended to provide natural spawning, nursery, and permanent residence areas for the replenishment and genetic protection of marine life and to protect and preserve all habitats and species. These reserves are intended to protect areas that represent the full range of diversity of resources and habitats found throughout the Sanctuary. The intent is to meet these objectives by minimizing human influences within these areas. (Alt. III)

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Z.3.a Establish nonconsumptive Sanctuary Preservation Areas in a select number of areas that are experiencing a high degree of conflict between consumptive and nonconsumptive uses and in discrete areas that are currently experiencing significant population or habitat declines. These areas will provide for the protection and sustenance of resources, particularly select marine species in high-use and biologically important areas. (Alt. IV)

These zones will focus on the protection of shallow, heavily used reefs where conflicts occur between user groups, and where concentrated visitor activity leads to resource degradation. They are designed to enhance the reproductive capabilities of renewable resources, protect areas that are critical for sustaining and protecting important marine species, and reduce user conflicts in high-use areas. This will be accomplished through a prohibition of consumptive activities within these areas. These areas have been chosen based on the status of important habitat, the ability of a particular area to sustain and protect the habitat, and the degree of conflict between consumptive and nonconsumptive users.

Research conducted in these areas can provide important information for comparing the effects of natural processes and consumptive activities on species and habitat. Important prerequisites for conducting monitoring and research in these areas are to continue the ongoing, large-scale remote sensing project to locate and map the resources and habitats within the Sanctuary and to assess the status of important marine species and their habitat. The actual size and location of these zones have been determined by examination of user patterns, aerial photography, and ground-truthing of specific habitats.

Z.3.b Establish nonconsumptive Sanctuary Preservation Areas in a number of areas that are experiencing a high degree of conflict between consumptive and nonconsumptive uses, and in discrete areas that are currently experiencing significant population or habitat declines. These areas will provide for the protection and sustenance of resources, particularly select marine species in high-use and biologically important areas. (Alt. III)

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Z.4.a Establish an Existing Management Area that recognizes areas that are managed by other agencies where restrictions already exist. Management of these areas within the Sanctuary may require additional regulations or restrictions to adequately protect resources. Any additional management measures will be developed and implemented in coordination with the agency having jurisdictional authority. (Alts. IV, III, and II)

These zones delineate the existing jurisdictional authority of other agencies (i.e., State parks, aquatic preserves, sanctuaries, and other restricted areas). Their function is to recognize established management areas and to, at a minimum, complement the existing management programs that have been established in those areas. This zone type will serve as a vehicle to accomplish Section 7 (a) (6) of the Florida Keys National Marine Sanctuary and Protection Act by ensuring cooperation and coordination with other agencies.

Z.5.a Establish zones to address special-use activities and concerns within the Sanctuary. These zones can be used to set aside areas for educational and scientific purposes, restorative, monitoring, or research activities or to establish areas that confine or restrict activities such as power boat racing and personal watercraft use in order to minimize impacts on sensitive habitats and to reduce user conflicts. This zone type will also establish live-aboard areas and mooring fields in areas where adverse environmental impacts will be minimal. (Alts. IV and III)

This strategy is designed to delineate areas of special concern where specific issues can be addressed through the use of zoning. Using these zones, areas can be set aside for specific uses to reduce user conflicts and minimize adverse environmental effects from high-impact activities. This will be accomplished by designating selected areas where activities can be conducted with a minimum of disturbance to other users and the environment. Special-use Areas may include areas set aside for research, artificial reef construction, archaeological sites, etc. They will also delineate areas where high-impact activities, such as powerboat racing and personal watercraft use will be allowed. Live-aboard areas and mooring fields will also be confined to specific areas in order to reduce adverse environmental impacts. This is the broadest zoning classification and encompasses the greatest range of management issues. The boundaries of these areas will be selected to address management issues and needs, and may include seasonal or emergency closures of areas.

Z.5.c Establish zones to address special-use activities and concerns within the Sanctuary. These zones can be used to set aside areas for educational and scientific purposes, restorative, monitoring, or research activities or to establish areas - limited in size and number - that confine or restrict activities, such as powerboat racing and personal watercraft use, in order to minimize impacts on sensitive habitats and to reduce user conflicts. This zone type will also establish a limited number of live-aboard areas and mooring fields in areas where adverse environmental impacts will be minimal. (Alt. II)

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Education

E.1.a Develop printed materials to promote public awareness, specifically targeting boaters and divers/ snorkelers, of the impacts of their activities on the Sanctuary's resources and environmental quality. Promote the proper use of equipment used for these activities in order to minimize adverse impacts to natural resources. Materials will include brochures, posters, newsletters and contributions to periodicals. Distribute materials in bulk to high-interception locations (e.g., marinas, boat ramps, dive shops, etc.). (Alt. IV)

Printed materials will be developed to promote public awareness (e.g., visitors, business owners and operators, etc.) and, in particular, boaters' and divers'/snorkelers' awareness of the impacts of their activities on Sanctuary resources and environmental quality. Information will be printed in brochures, posters, newspapers, newsletters, and periodicals.

Materials for boaters and divers will include specific information on the proper use of equipment, Sanctuary regulations related to boating and diving, safe boating and diving/snorkeling practices, Sanctuary habitats and species guides for divers/snorkelers, and direct and indirect impacts of boating and diving on Sanctuary resources.

Printed materials will be distributed in bulk to locations accessible to boaters and divers in particular. These locations will include marinas, boat ramps, and dive shops. Other locations more accessible to the general public include schools, libraries, and Federal, State, and local agencies.

E.1.b. Develop printed materials to promote public awareness of the impact of their activities, both land- and water-related, on the Sanctuary's resources and environmental quality. Promote the proper use of equipment used for these activities in order to minimize adverse impacts to natural resources. Materials will include brochures, posters, newsletters, contributions to periodicals, environmental nautical charts, color environmental atlases, and a color periodical. Distribute materials in bulk to high-interception locations (e.g., marinas, boat ramps, dive shops, other businesses etc.) and include bulk mailings as a means of distribution. (Alts. III and II)

Printed materials will be developed to promote public awareness (e.g., visitors, business owners and operators, etc.) and, in particular, boaters', divers'/snorkelers', *fishermens', and homeowners'* awareness of the impacts of their activities on Sanctuary resources and environmental quality. Information will be printed in brochures, posters, newspapers, newsletters, and periodicals. *Some brochures will be produced in color on glossy paper stock. Nautical charts will also be printed with relevant environmental information. A color environmental atlas for the Sanctuary will be produced, as will a monthly color periodical.*

Materials for boaters, divers, *and fishermen* will include specific information on the proper use of equipment, Sanctuary regulations related to *water activities, safe practices for each*, Sanctuary habitats and species guides for *users,* and direct and indirect impacts of boating, diving, *fishing and other water-based activities* on Sanctuary resources. *In addition, materials with information directed towards activities on land, such as sewage and solid waste disposal, and stormwater runoff and household activities (e.g., home improvement, yard waste disposal, etc.) that impact the Sanctuary will be produced.*

Printed materials will be distributed in bulk to locations accessible to boaters, divers, *and fishermen* in particular. These locations will include marinas, boat ramps, dive shops, *aquarium shops, and where fishing licenses are sold.* Other locations more accessible to the general public include schools, libraries, and Federal, State, and local agency offices. *A Sanctuary newsletter will be mailed out in bulk. Other materials will be mailed out with vehicle licenses and registrations and utility bills.*

E.2.a Inventory and use existing videos, films, and audio materials portraying activities in the Florida Keys and their impacts on Sanctuary resources. Materials will be available from Sanctuary offices. (Alt. IV)

This strategy is designed to assemble available audio/ visual environmental education materials and create a library for use by public and private organizations as well as Sanctuary staff. No new videos or audio tapes will be produced. A slide/photo library will be developed and contributions of materials will be solicited from amateur and professional photographers.

A check-out system will be used to lend out these materials. A video system will be installed in the Sanctuary office to allow visitors to view tapes.

E.2.b Inventory and use existing videos, films, and audio/visual environmental education materials portraying activities in the Florida Keys and their impacts on Sanctuary resources. Produce a limited number of audios/videos to address gaps in available materials and to address major activities including boating, fishing, diving, etc. Materials will be available at Sanctuary offices and will be distributed to key locations (e.g., dive shops, etc.) throughout South Florida. (Alts. III and II)

This strategy is designed to assemble all available audio/ visual environmental education materials and create a library for use by public and private organizations, as well as Sanctuary staff. *A limited number of new audio and*

visual materials will be developed to address gaps in available materials. A number of videos and other materials will be produced to address major activity/issue areas (e.g., boating impacts, fishing, diving, etc.). A slide/photo library will be developed and contributions of materials will be solicited from amateur and professional photographers.

A check-out system will be used to lend out these materials. *The distribution scheme will include libraries at all Sanctuary facilities, as well as at-cost distribution to dive shops and other high-interception locations in the Keys and throughout South Florida.*

E.3.a Develop signs/displays at high-use areas and public and private boat ramps to inform participants in water-based activities of regulations and environmentally sound practices, provide navigation information, and promote awareness of sensitive areas. Produce portable displays with information on Sanctuary resources, regulations, environmental quality, etc. A limited number of signs will be multi-lingual. (Alt. IV)

Permanent displays/signs will be developed with text limited to Sanctuary resource information and regulations. A portable display will be produced with similar information. Permanent displays/signs will be placed at a limited number of high-use public and private boat ramps. A limited number of multi-lingual signs will also be produced.

E.3.b Develop signs/displays at high-use areas, all public and some private boat ramps, and some public beach access areas to inform participants in water-based activities of regulations and environmentally sound practices, provide navigation information, and promote awareness of nearby sensitive areas. Portable displays will also be produced with information on Sanctuary resources, regulations, environmental quality, etc. Most of the signs will be multi-lingual. Targeted multi-media displays will be developed with information and impacts on the Sanctuary relevant to the activity targeted. A number of wayside exhibits will be installed.

Develop a user-friendly computer system containing information on regulations, access, recreational sites, environmental etiquette, etc. for visitor use at selected sites throughout the Sanctuary within five years. (Alts. III and II)

Permanent displays/signs will be developed with *Sanctuary resource information, regulations, navigation safety and environmental etiquette.* A portable display will be produced with similar information. *Also multi-media targeted displays (e.g., boating, fishing, diving, etc.) will be produced with information on sound boating practices, nearby sensitive areas, catch-and-release fishing, handling techniques and impacts of hook-and-line fishing on Sanctuary resources. Most of the signs produced will be multi-lingual.*

Permanent displays/signs will be placed at all public and some private boat ramps. Signs will also be displayed at some public shoreline access areas. A number of displays will be placed along the roadside throughout the Keys (e.g., Key Largo, Islamorada, Marathon, Big Pine, and Key West).

A network of computer-driven display systems will be set up to provide information to Sanctuary visitors on resources, activities, and the environment. This system must be user-friendly (e.g., touch-screen menus) and will be available for sale to commercial establishments. Updates would take place every six months. The system will be in place in five years.

E.4.a Develop oportunities for instruction and training. This will include programs conducted by teachers, Sanctuary staff, and volunteers. Training programs (e.g., Coral Reef Classroom, submerged cultural resources, etc.) will also be provided for teachers, environmental professionals, business owners and operators, and law enforcement officials. (Alt. IV)

This strategy will improve the understanding of Sanctuary programs and purposes and the ecology of the Keys through development of training modules to be used as follows:

1) Volunteer training opportunities involving basic education/orientation for new volunteers concerning the marine sanctuary program and specific, task-oriented training designed to assist paid staff in accomplishing monitoring, safety, or public outreach.

2) Development of specific packaged presentations on the Sanctuary, its resources, goals, etiquette, and environmental quality targeted at either the primary or secondary education level.

3) The Florida Marine Patrol has an environmental awareness program that has produced significant results in the past. This strategy would provide additional funding, allowing the Patrol to improve and increase the range of its existing program.

E.4.b Develop oportunities for instruction and training. This will include programs (both on the primary and secondary level) conducted by teachers, Sanctuary staff, and volunteers. Participation in existing environmental education programs would also be established, and some programs would be expanded. Training programs (e.g., Coral Reef Classroom, submerged cultural resources, etc.) will also be provided for teachers, environmental professionals, business owners and operators, and law enforcement officials. (Alts. III and II)

This strategy will improve the understanding of Sanctuary programs and purposes and the ecology of the Keys through development of training modules to be used as follows:

1) Volunteer training opportunities will involve *sophisticated technical* education/orientation for volunteers concerning the marine sanctuary program and specific, task-oriented education designed to assist paid staff in accomplishing *habitat restoration, SCR research and interpretation*, etc.

2) Development of specific packaged presentations on the Sanctuary, its resources, goals, etiquette, and environmental quality targeted at *both primary and secondary education levels. The programs will include on-site training opportunities for studying a limited number of Sanctuary habitats and SCRs.*

3) *Sanctuary interpretive staff will coordinate activities on a limited basis with State, county, and private environmental education programs targeted at specific activities (e.g., boating, fishing, diving, business owners and operators, households, etc.). New environmental education programs for targeted activities will be developed to fill in gaps.*

4) The Florida Marine Patrol has an environmental awareness program that has produced significant results in the past. This strategy would provide additional funding allowing the Patrol to improve and increase the range of its existing program.

E.5.a Establish a program to promote Sanctuary goals and activities through public service announcements (PSAs) in Monroe County that presents an overview of the Sanctuary, its resources, and their ecological significance for limited "no-cost" distribution to radio, cable television stations, and newspapers. Develop limited editorial/contributions for other printed media. PSAs will focus on participants in water-related activities (boaters, divers, etc.). These materials will also be organized into a press packet. (Alt. IV)

This strategy is designed to develop a program of public service announcements and other media-related materials to educate the public about how their activities impact Sanctuary resources. The media contacted in this strategy will include those based in Monroe County only. The materials are primarily aimed at boaters and divers. The exposure will be limited to a small number of "no-cost" PSAs on radio and TV. A limited number of editorial responses/contributions will be developed for local papers. A "no-cost" program for printing PSAs on manufacturers product packaging will also be established. A basic press package will be produced for distribution to media representatives on request.

E.5.b Establish a program to promote Sanctuary goals and activities through public service announcements (PSAs) in South Florida, with some national and international public exposure, that presents an overview of the Sanctuary, its resources and their ecological significance for routine distribution to radio, cable television stations, and newspapers. Develop editorial/ contributions for other printed media. Funds will be spent on routine media exposure. PSAs would focus on participants in water-related and other activities that affect the Sanctuary (e.g., boaters, divers, household etc.). These materials will also be organized into a press packet. (Alts. III and II)

This strategy is designed to develop a program of public service announcements and other media-related materials to educate the public about how their activities impact Sanctuary resources. *The PSAs will focus on boating, diving, household activities and other activities that impact the Sanctuary. The areal extent of media exposure will extend to all of South Florida. Some PSAs will be shown to state, national, and international markets. A number of broadcasts will be in languages other than English (primarily Spanish).*

The exposure will be routine "no-cost" PSAs on radio and TV. Funds will be spent on column space and air time to increase the frequency of broadcast. Routine editorial responses/contributions will be developed for local papers and other printed materials. A "no-cost" program for printing PSAs on manufacturers product packaging will also be established. A basic press package will be produced for distribution to media representatives on request.

E.6.b Establish an education advisory council to advise educators on education goals, priorities and funding sources for the Sanctuary. A full-time staff person will be provided. (Alts. III and II)

This strategy is designed to establish an education advisory council to assist education staff in establishing education priorities, securing funds, and coordinating educational efforts to prevent duplication with other education organizations. The council will be able to rely on a *full-time staff person* provided by the Sanctuary Program.

E.7.a Promote educational materials and other information about the Sanctuary and its resources at existing Sanctuary offices. (Alt. IV)

This strategy will establish visitor booths/displays to provide educational materials on Sanctuary resources, etiquette, and environmental quality. Existing Sanctuary offices will provide limited space for distribution on a walk-in basis. No other building space will be dedicated to this function.

E.7.b Promote educational materials, including bilingual materials and other information about the Sanctuary and its resources, at existing Sanctuary offices and Chambers of Commerce. Establish an interagency visitor center with the U.S. DOI and the Florida DEP. (Alt. III)

This strategy will establish visitor booths/displays to provide educational materials on Sanctuary resources, etiquette, and environmental quality *with materials printed in languages other than English (primarily Spanish). Existing Sanctuary offices will provide limited space for distribution on a walk-in basis. In addition, an interagency visitor center will be established in cooperation with the U.S. DOI (FWS, NPS) and the FDEP to provide visitors and residents with orientation information on various protected and managed areas. Cooperative efforts will allow agencies to pool resources and provide lowest cost options for a special center.*

The Sanctuary will also use no-cost/low-cost space in locations where tourist-related information is already distributed (e.g., Chambers of Commerce) for promotional purposes.

E.7.c Promote educational materials, including bilingual materials and other information about the Sanctuary and its resources, in a visitor center established by and dedicated solely to the Sanctuary. Other smaller centers will be established at major resort locations. Booths/displays will be established in remote locations. (Alt. II)

This strategy will establish visitor booths/displays to provide educational materials on Sanctuary resources, etiquette, and environmental quality with materials printed in languages other than English (primarily Spanish). *Existing Sanctuary offices will provide space for distribution on a walk-in basis. In addition, an interagency visitor center will be established by the Sanctuary Program that will focus only on issues related to the Sanctuary. Mini visitor centers will be established at major resort areas in the Keys (e.g., Key Largo, Marathon, or Key West, depending on the location of the main visitor center).*

The Sanctuary will also use no-cost/low-cost space in locations where tourist-related information is already distributed (e.g., Chambers of Commerce, car rental agencies, airports, etc.) to establish booths/displays promoting the Sanctuary.

E.9.c Establish an ecotourism coordinator/promoter position for the Sanctuary within three years. (Alt. II)

This strategy will establish an "ecotourism coordinator" to work in conjunction with the Monroe County Tourism Board to promote, assist and coordinate the development of resource-sensitive tourism activities that would have a minimum impact on Sanctuary resources. They will also assist in development of "ecotourism" companies that promote Sanctuary goals and purposes.

E.10.a Establish a program to ensure public involvement throughout South Florida in Sanctuary activities by holding public meetings and promoting Sanctuary awareness to extracurricular groups. (Alt. IV)

This strategy will establish a program to ensure public involvement by holding periodic public meetings throughout South Florida to which commercial and recreational users of Sanctuary resources and the general public will be invited. Sanctuary staff and/or guest speakers will make presentations, and dialogue and feedback from the public will be encouraged.

Limited printed materials will be developed to support presentations to organizations such as 4-H clubs, scouts, and nongovernmental agencies who are making an effort to learn about and support the Sanctuary.

E.10.b Establish a program to ensure public involvement throughout South Florida in Sanctuary activities by holding public meetings and promoting Sanctuary awareness to extracurricular groups. A Sanctuary "hot line" will be established for the public to report information concerning the Sanctuary. A program will also be established to provide Sanctuary sponsorship of contests/awards. (Alts. III and II)

This strategy will establish a program to ensure public involvement by having periodic public meetings throughout South Florida to which commercial and recreational users of Sanctuary resources and the general public will be invited. Sanctuary staff and/or guest speakers will make presentations, and dialogue and feedback from the public will be encouraged.

Limited printed materials will be developed to support presentations to organizations such as 4-H clubs, scouts, and nongovernmental agencies who are making an effort to learn about and support the Sanctuary.

Sanctuary-sponsored contests will be established that include logo contests, photo contests, and volunteer of the year contests. An annual award to recognize contributions by individuals and organizations will also be part of the program. "Adopt-a-Reef" will be another valuable Sanctuary-sponsored program.

E.11.a Organize, support, and/or participate in special events (e.g., trade shows, expositions, grand openings, etc.) that allow for the exchange of Sanctuary information. The Sanctuary will co-sponsor a limited number of conferences and workshops. **(Alt. IV)**

This strategy proposes that the Sanctuary Program be involved in special events where Sanctuary information can be distributed.

The Sanctuary Program will also co-sponsor a limited number of conferences and workshops dealing with Sanctuary issues and environmental quality.

E.11.b Organize, support, and/or participate in special events (e.g., trade shows, expositions, grand openings, etc.) that allow for the exchange of Sanctuary information. The Sanctuary will co-sponsor a limited number of conferences and workshops.The Sanctuary will co-sponsor a number of conferences and workshops, with selected sole sponsorship of some events. This would include a "Sanctuary Awareness Week" and a "grand opening" to the Sanctuary. The Sanctuary Program would co-sponsor other "awareness" events/weeks (e.g., National Fishing Week, etc.). (Alts. III and II)

This strategy proposes that the Sanctuary Program be involved in special events where Sanctuary information can be distributed.

The Sanctuary Program will also co-sponsor conferences and workshops dealing with Sanctuary issues and environmental quality. Sole sponsorship of a limited number of events of particular interest/benefit to the Sanctuary will be established. This will include "Sanctuary Awareness Week" and a "grand opening" to further promote public awareness of Sanctuary goals. The Sanctuary Program will co-sponsor other "awareness" events/weeks (e.g., National Fishing Week, etc.) with special-interest groups by providing information on specific activities and their impacts.

Strategies in the Preferred Alternative

This appendix presents and describes the strategies that were in the Preferred Alternative for the Draft Florida Keys National Marine Sanctuary Management Plan/Environmental Impact Statement. See Volume I for the Description of the Preferred Alternative for the Final Environmental Impact Statement/ Management Plan.

Boating

B.1 Conduct a survey to assess public and private boat access throughout the Sanctuary to develop a low-impact access plan; direct new public access to low-impact areas; and modify as appropriate any access affecting sensitive areas throughout the Sanctuary.

This strategy is designed to reduce resource impacts from all boating activities throughout the Sanctuary. An inventory will first be conducted of the existing locations of public and private boat access ramps and their levels of use. Based on this inventory, a boating access plan will be developed that: 1) directs new public access points, including marinas and mooring areas, to low-impact areas; and 2) requires modification of access ramps directly affecting sensitive areas (i.e., seagrasses, mangroves, hardbottoms, etc.) throughout the Sanctuary.

Impacts will also be reduced through the use of low-cost administrative techniques such as signs posted at boat ramps, restricted access during certain times of the day, and the closure of access points for a specified amount of time. Prerequisites include developing benthic habitat and bathymetry maps and assessing the distribution of access points.

B.2 Conduct a program of restoration research at representative habitat sites within the Sanctuary; develop a restoration plan and implement restoration in severely impacted areas. Monitor recovery processes.

This strategy is designed to promote research and the development of new technologies to restore and enhance coral, seagrass, and mangrove habitats throughout the Sanctuary. Restoring these habitats will enhance fishery stocks. Seagrass and coral transplanting are examples of restoration activities, but other techniques must also be developed. A restoration plan will be developed and implemented for severely impacted areas. Recovery processes (e.g., recruitment and survivability) will be monitored at these sites. An extensive demonstration project will be developed for mitigation and restoration techniques following physical disturbances or chronic pollutant inputs. Emergency or long-term restoration zones may be established to allow for sufficient resource recovery.

B.3 Develop and implement a removal and disposal plan for derelict and abandoned vessels, streamline the permitting process, and require the removal of all derelict and abandoned vessels throughout the Sanctuary.

This strategy will reduce direct and indirect impacts to natural resources from derelict and abandoned vessels. A removal and disposal plan will include: 1) assessing the location and extent of derelict and abandoned vessels; 2) streamlining the existing permitting process for removing derelict and abandoned vessels from high-use and sensitive areas; and 3) requiring the use of environmentally sound removal practices and techniques. It will also require the removal of derelict and abandoned vessels throughout the Sanctuary.

Screening criteria will also be developed to determine whether or not to move a vessel. Criteria will include possible damage to the environment and the establishment of a policy where the owner of the vessel, if known, would pay for its removal.

B.4 Establish a channel/waterway marking system throughout the Sanctuary.

This strategy will reduce damage to natural resources from boating activities by: 1) placing regulatory and informational floating buoys or fixed markers at major shallow-water reefs, shoals, or other significant features; 2) marking frequently used and preferred channels; and 3) reducing boat wakes in sensitive habitats, areas vulnerable to erosion, and high-density areas such as marinas. The strategy will be implemented throughout the Sanctuary. A survey to identify and map areas of frequent groundings, channels, sites of shallow-water reefs, shoals, and other significant features is a prerequisite. This strategy will affect all watercraft, including personal watercraft (PWC).

B.5 Develop a response plan for boat groundings throughout the Sanctuary.

This strategy will develop a standard response plan to address boat groundings throughout the Sanctuary. The plan should reduce response time, a critical factor in limiting the potential for extensive resource damage. A prerequisite is to identify the available response resources and the affected agencies, and to develop a protocol for responsibility, assessment standards, methods, and training.

B.6 Add 30 Sanctuary enforcement officers to deploy in high-use and sensitive areas.

This strategy will increase the presence of law enforcement officers (LEOs) on the water to protect resources and reduce user conflicts. This will be accomplished by hiring 30 more LEOs and deploying them in high-use and sensitive areas. Remote observation techniques may be

used to aid enforcement efforts. High-use and sensitive areas will be identified.

B.7 Reduce pollution discharges (e.g., sanitary wastes, debris, and hydrocarbons) from vessels by enforcing existing regulations, assessing the need for additional regulations, and implementing and enforcing new regulations (i.e., upcoming regulation restricting discharge in State waters). Change the environmental crimes category associated with discharges from felony to civil offense, thereby removing the need to prove criminal intent.

This strategy will help avoid further water quality degradation by boaters and live-aboards by: 1) requiring boaters and live-aboards to use holding tanks; 2) restricting the discharge of substances (other than fish waste and exhaust) into nearshore waters; and 3) establishing trash-collection stations. This strategy requires an assessment of where pump-out and trash-collection stations are most needed and where they should be located (e.g., in marinas or elsewhere). The strategy includes a review of the adequacy of existing regulations that address pollution discharges from vessels and the need for additional regulations. This strategy could also reduce pollution by providing civil penalties (e.g., fines) for environmental crimes such as discharging fuel or pumping out a shipboard holding tank. These are currently felonies, and obtaining a conviction requires proving criminal intent, which is often difficult. Reclassifying these actions as civil offenses would make it easier to discourage the pollution of Sanctuary waters.

B.8 Conduct a boating fee assessment study to evaluate and reallocate Sanctuary-related fees; implement appropriate impact fees.

This strategy will examine mechanisms to generate funds for use in Sanctuary management and related research. Boating activity levels will be assessed and existing fees related to resource utilization in the Sanctuary evaluated. Based on this information, appropriate impact fees will be implemented, contingent upon the current study to establish user fees for NOAA's national marine sanctuaries, for users in proportion to their use levels. The fee could be implemented through the purchase of a sticker or stamp to be displayed on the boat or fishing license. A process will be developed to properly funnel and utilize existing fees.

B.9 Establish a voluntary visitor registration program to assess user activity in the Sanctuary.

This strategy will help better understand overall Sanctuary use patterns by determining the areas of the Sanctuary visited most frequently and the types of visitor activities. Visitors can fill out registration forms at all Sanctuary offices, Federal- and State-administered areas and visitor centers and, at the same time, can obtain information on the Sanctuary.

B.10 Establish damage assessment standards for vessel groundings in the Sanctuary.

This strategy will establish a standard damage assessment methodology for vessel groundings on coral reefs and other vulnerable or sensitive habitats. Establishing a standard damage assessment methodology includes improving response times, assessment procedures, and litigation practices. Prerequisites include: 1) developing an assessment procedure manual; 2) assembling assessment response teams; 3) identifying assessment techniques for all habitat types; and 4) determining resource values.

B.11 Establish permits (e.g., for researchers, educators, emergency response personnel, salvors, salvage operators, animal rescue operations) to conduct activities otherwise prohibited within the Sanctuary; facilitate simplified permitting.

This strategy will allow access by special groups (e.g., researchers, educators, emergency response personnel, salvage operators, and animal rescue operations) to restricted areas (e.g., nesting sites, spawning areas, etc.). Permits will be monitored and permit provisions enforced.

B.12 Expand Federal/State/local cooperative law enforcement and cross-deputization programs and prioritize enforcement areas.

This strategy will increase the efficiency and effectiveness of enforcement efforts. It will establish coordination and cooperation among agencies and increase interagency communication by: 1) developing cooperative administrative agreements that establish Federal, State, and local enforcement authority among all officers; 2) scheduling efficient equipment and staff use among all agencies; 3) standardizing training; 4) developing a process for handling violations; 5) standardizing radio communications (i.e., use of a common radio frequency); 6) promoting cooperation with the military in detecting violations; and 7) determining priority enforcement areas. Establishing cooperative agreements and identifying priority areas are prerequisites.

B.13 Establish regulations and procedural guidelines for commercial salvaging and towing of vessels in need of assistance. Implement permitting for salvaging and towing throughout the Sanctuary and establish an operator training program.

This strategy will reduce damage to natural resources resulting from improper vessel salvage methods by developing standard vessel salvage procedures including: 1) obtaining a permit; 2) notifying authorities; 3) having an authorized observer at the site or receiving permission to proceed; 4) providing operator training; and 5) promoting the use of environmentally sound salvaging and towing practices and techniques. Permitting for salvaging and towing operations will be implemented throughout the

Sanctuary. A program to train operators in environmentally sound methods of towing and salvaging will also be established and promoted. Prerequisites include establishing a memorandum of understanding (MOU) with the Coast Guard and the construction of a bond/insurance program.

B.15 Conduct an assessment of current mooring buoy technology to determine impacts to resources and to evaluate which are the most environmentally sound, cost-effective, and functional for use in Sanctuary waters. Develop a comprehensive mooring buoy plan providing for the maintenance of buoys, the placement of buoys as needed, and the implementation of vessel size limits at mooring buoys throughout the Sanctuary.

This strategy decreases user conflicts, prolongs mooring buoy life and reduces the risk of vessel groundings by: 1) assessing vessel impacts on mooring buoys and natural resources; 2) determining the impacts of mooring buoy technologies on resources; and 3) determining which mooring buoy designs are the most environmentally sound, cost-effective and functional. A comprehensive mooring buoy plan will be developed providing for the maintenance of buoys, the placement of buoys as needed, and the implementation of vessel size limits at mooring buoys throughout the Sanctuary. The assessment will define vessel size limits.

B.16 Identify subdivisions and coastal areas where dock construction should be prohibited due to inadequate surrounding water depths and the presence of important marine resources. Coordinate the Federal, State, and local permitting process for dock construction.

Conduct a study to determine areas within the Sanctuary where dock construction should be prohibited because of the lack of channels providing access to navigable waters. This can be done in conjunction with strategy B.4. (Channel Marking). Monroe County is currently permitting dock construction in areas with inadequate surrounding water depth. The intent of this strategy is to develop a protocol between the ACOE, Florida DCA, and Monroe County for only permitting docks in areas where there are accessible channels of adequate depth, and where they will not adversely impact important marine resources.

B.17 Develop and implement regulations for the operation of PWCs and other motorized vessels within 200 yards of sensitive or critical areas, other boats, and people in the water. Develop and implement regulations and procedural guidelines for commercial PWC rental operations.

This strategy will reduce damage to natural resources resulting from the improper operation of PWCs and other motorized vessels, and will address user-conflict issues. Special-use Areas (strategy Z.5) will be used to establish 200-yard idle-only buffer zones around sensitive areas (e.g., residential shorelines, edges of flats, and areas being used by wading or nesting birds). Riders will be required to operate at idle speeds within 200 yards of other vessels, bridges, persons in the water, persons fishing, and within residential canals. Rental operations will also be required to establish their own zones, subject to permit requirements, where riders can be observed at all times. Areas to be avoided will be marked according to the channel-marking strategy (B.4).

To further protect the resources and reduce user conflicts, rental operations will be required to screen and train their employees on safe and environmentally sound methods of PWC operation. Employees will be given a training manual that they must sign certifying that they understand its contents. In addition, all information about the Sanctuary must be made available to clients.

To enhance safe riding, rental operations must be able to effect emergency communications, have rescue and chase vessels available, and have personnel available who are trained in first-aid and CPR.

Users of PWCs must comply with existing laws, including minimum age and equipment requirements and regulations governing vehicle operation (e.g., surfing the wakes of other vessels).

Fishing

F.1 Establish a protocol for developing and revising a consistent set of fisheries regulations, and implement throughout the Sanctuary.

This strategy will ensure administrative and regulatory coordination between fisheries regulatory agencies operating within Sanctuary waters, and will develop a process for combining and revising existing regulations and developing new regulations. All fisheries and harvesting methods will be included. The Florida Marine Fisheries Commission (FMFC) and Gulf of Mexico and South Atlantic fisheries management councils are currently working on protocols for developing and revising regulations within the Sanctuary, and are deciding on a lead agency to coordinate and facilitate regulatory functions. Identifying and assessing existing regulations are prerequisites, and should also form the basis for identifying additional regulatory needs. Regulations developed under this strategy will ensure that the goals of long-term maintenance of the ecosystem and optimum sustainable yields are met. Any fisheries regulations implemented within the Sanctuary (e.g., gear and fishing method restrictions, fishing area restrictions, and size limits) will be developed through the established protocol.

F.3 Implement a moratorium on stocking activities. Assess existing research on the impacts of stocking on the genetic integrity of native stocks. Conduct research on natural stock recovery and its role in maintaining genetic integrity. Conduct a reevaluation of stocking options. The length of the moratorium will depend on the length and results of the assessment.

The research will build on native stock genetic integrity research conducted elsewhere to determine the effect of fish stocking on the genetic integrity of native species within the Sanctuary. This research will determine the extent to which changes in the genetic integrity of native stocks have occurred, or are likely to occur, and the effects of these changes on their abundance, distribution, and life histories. A moratorium and reevaluation of stocking options will allow for the development and implementation of regulations governing stocking activities. The length of the moratorium will depend on the length and results of the assessment.

F.4 Assess, develop, and promote mariculture alternatives for all commercially harvested marine species. Support efforts to eliminate the harvest and landing of live rock.

This strategy will reduce fishing pressures on commercially harvested marine species and help satisfy the commercial demand for these species. This is a long-term effort designed to identify and develop mariculture techniques and promote the development of environmentally sound mariculture operations. This strategy also complements a provision made by the FMFC, which began a three-year phase out of live rock harvesting in July 1992. The Sanctuary will support efforts to eliminate the harvest and landing of live rock in accordance with the FMFC and the protocols established for consistent regulations in strategy F.1.

F.5 Assess limited-entry fisheries options for specific Sanctuary fisheries. Develop appropriate regulations that ensure the long-term sustainability of Sanctuary fisheries. Implement appropriate regulations on a fishery-by-fishery basis.

This strategy will involve the assessment of existing fishery regulatory programs that limit the number of persons, vessels, or units of fishing gear utilizing specific fisheries within the Sanctuary, within Florida, and elsewhere. The objective is to determine the extent to which limited-entry management regimes can be used to: 1) protect specific marine life species; 2) increase stock abundance; 3) reduce habitat damage; and 4) reduce user conflicts within the Sanctuary. This strategy will require the implementation of regulations limiting entry to fisheries that: 1) involve marine life species in need of protection; 2) have low stock abundance; 3) are associated with areas exhibiting severe habitat damage; or 4) have a high degree of user conflicts. Regulations will be developed and implemented in accordance with the FMFC and the protocols established for consistent regulations in strategy F.1.

F.6 Enhance the resolution of existing commercial and recreational fisheries-dependent and independent sampling programs to provide statistics on catch and effort. This will be accomplished by establishing statistical areas based on "completeness criteria" including scientific need. Initiate fisheries-independent sampling programs to measure the prerecruitment of economically important species within the statistical areas.

This strategy is designed to evaluate and modify existing commercial landing and recreational creel census programs for providing statistically based management information for regulating take. To increase the resolution of the programs, statistical areas will be established to provide information on catch and effort. The number of areas will be based on "completeness criteria" including scientific need. This includes an assessment and modification of information types and mandatory versus voluntary information. A fishery prerecruitment monitoring effort will also be initiated for the long-term prediction of fishery stocks for Sanctuary-level management. This effort is independent of commercial and recreational industry monitoring, and Florida's DEP has begun implementation for other areas in the state. Regulations will be developed and implemented in accordance with FMFC and the protocols established for consistent regulations in strategy F.1.

F.7 Conduct research on the impacts of artificial reefs on fish and invertebrate populations for long-term management including location, size, materials, etc. Monitor and evaluate habitat modifications caused by the installation of marine structures. Assess and develop regulations for artificial reef construction and evaluate habitat suitability for artificial reefs.

This strategy will: 1) determine the impacts of artificial reefs on fish abundance and community composition; 2) develop design criteria including construction materials and appropriate sites; and 3) examine existing regulations/ policies that would affect the placement of artificial reefs within the Sanctuary. Regulations can be developed based on research and in accordance with the protocols established in strategy F.1. This strategy also will allow for the implementation of existing regulations.

F.8 Implement regulations to prevent the release of exotic species into the Sanctuary.

This strategy will prevent the introduction of exotic species into the natural environment of the Sanctuary to ensure that local and ecosystem-level impacts do not occur. The main focus of this strategy involves the control of aquaculture operations. In some cases, prohibitions on the culture of certain species will be considered.

F.9 Develop a program for the removal of lost or out-of-season fishing gear, and implement in all areas of the Sanctuary.

This strategy will reduce habitat, wildlife, and fish population impacts resulting from fishing gear that has been lost or abandoned including traps, fishing lines, and hooks. Gear removal will be achieved through incentives, volunteer efforts, an extension of the trap removal grace period, and education and enforcement programs. Implementation will occur throughout the Sanctuary.

F.10 Conduct an assessment of methods used to harvest commercial and recreational marine species including corals, fish, and invertebrates. Develop and implement regulations to reduce the effects of current fishing practices on nontargeted species.

This strategy will determine the impacts of harvesting methods on species composition and abundance, and the indirect impacts on other species and the environment. The extent of the problem will be assessed, and research will be conducted on the impacts of existing fishing methods and gear. Regulations will be developed and implemented based on research results to reduce the bycatch of incidental species and undersized targeted species. These may include requirements for the use of specific net/trap designs and temporal/spatial restrictions (e.g., spawning areas). Regulations will focus on protecting marine species, increasing species composition and abundance, and reducing adverse impacts on the environment.

F.11 Conduct research on alternative fishing gear and methods that minimize impacts on habitat. Implement a voluntary program to encourage the use of low-impact gear and methods. Implement regulations to require the use of low-impact gear and methods in priority areas. Characterize harvesting stresses affecting outer and inshore reefs and hardbottom ecosystems.

This strategy will facilitate research to develop gear designs and types that minimize impacts to corals, hardbottoms, seagrasses, and other habitats. Biodegradable fishing line, traps and buoy lines are examples of gear that should be researched. Modified trap designs should also be considered. Fishing methods, including resource handling and gear placement, should also be researched to develop methods and gear that minimize impacts to resources, while maintaining gear efficiency. The Sanctuary will implement an effort to encourage the voluntary use of low-impact gear types and fishing methods throughout the Sanctuary. Regulations will be developed requiring the use of low-impact gear and methods in priority areas. Regulatory implementation will be in accordance with strategy F.1.

F.12 Eliminate all finfish traps within the Sanctuary, excluding those set for bait fish.

This strategy will increase species diversity, composition, and abundance and will eliminate the harvest of nontargeted species, reducing adverse environmental impacts resulting from placement and recovery activities. This strategy complements existing Florida and South Atlantic fisheries management council regulations.

F.14 Conduct an assessment of spearfishing practices and impacts to develop and implement regulations in high-priority areas.

This strategy will: 1) determine the impacts of spearfishing on species composition and abundance; 2) reduce incidental habitat damage; and 3) reduce user conflicts. Regulations will be developed and implemented in high-priority areas (i.e., those areas exhibiting a low stock abundance, a high degree of habitat damage, or a high degree of user conflicts). Restrictions may include bag limits, gear prohibitions, or the closure of selected areas (e.g., around residential areas). This strategy will also support any existing spearfishing closures in Sanctuary waters.

F.15 Develop and conduct a research program to assess the impacts of current sponge harvest methods on the resource and the habitats in which they occur. Develop and implement regulations throughout the Sanctuary.

This strategy will include research and assessment activities to determine which methods have a low adverse impact on both species and habitats and to identify areas that exhibit low abundance, low recovery rates, and habitat damage. This strategy requires the development and implementation of species specific regulations governing sponge harvest in all habitats in which they occur throughout the Sanctuary in accordance with the FMFC and the protocols established in strategy F.1. Regulations may include bag limits, an increase in minimum size and/or designating areas closed to harvest. This strategy is specific to nonornamental sponge species, which are currently regulated by the FMFC.

Land Use

L.1 Require marinas that have pump-out requirements to install pump-out facilities.

This strategy will eliminate marina live-aboard vessels as a source of pollution in the Sanctuary. Although live-aboards within marinas may be a minor contributor to the total pollutant load, marinas are normally located in confined waters that are more susceptible to the impacts of such loading. By requiring marinas to provide pump-out facilities, two problems may be resolved: 1) boats in marinas that

don't currently pump-out will be provided with the means to do so; and 2) boats that moor outside of marinas can take advantage of the increased number of pump-out facilities.

L.2 Conduct an assessment of marina (10 slips or more) compliance with current regulations and standards, including OSHA standards for marina operations. Evaluate interagency cooperation in the marina permit review process and initiate action to eliminate conflicts in agency jurisdictions. Improve marina siting criteria to ensure that only appropriate deep-water access will be permitted and to provide for the proper handling of noxious materials.

This strategy will reduce sources of pollution loading associated with marina activities. It will also reduce the pollution of nearshore waters through the implementation of OSHA regulations regarding marina operations. A program will be developed to target activities that have potential impacts on ground and nearshore waters (e.g., bottom paint removal; the use of fiberglass, resins, and solvents; fuel transfer; etc.). All marinas will be subject to this program. This strategy will also improve marina operations, the cooperation and coordination of agencies involved in the marina permitting process, and will develop criteria for selecting sites for developing new or expanding existing marinas.

L.3 Evaluate procedures to avoid or reduce fuel spillage during refueling operations. Initiate remedial solutions to any problems identified. Require the establishment of paved and curbed containment areas for boat maintenance activities such as hull scraping and repainting, mechanical repairs, and lubrication. Require the creation of secondary containment, generally in the form of curbing or synthetic liners, for areas where significant quantities of hazardous or toxic materials are stored.

This strategy requires an evaluation of refueling operations through a detailed inventory of fueling facilities and an assessment of typical fuel handling techniques and technology. Based on the inventory and assessment, short-term, low-cost remedial actions should be initiated in compliance with existing State laws. In addition, little effort is now directed at containing and collecting wastes associated with boat maintenance activities such as bottom scraping or mechanical repairs. This strategy will help reduce pollution by establishing containment areas to prevent paint chips or dust and other wastes from entering surface waters. Secondary containment for hazardous or toxic material storage areas will minimize the potential for these substances to enter ground or surface waters.

L.4 Revise regulations to require public and private RV parks to provide pump-out facilities, and implement requirements within three years.

This strategy will reduce pollution caused by the inappropriate disposal of wastewater from RVs, campers, and other mobile units, including live-aboards not docked at marinas. It is a regulatory strategy that could be implemented through Monroe County's comprehensive plan and land development regulations. All RV parks (public and private) will be required to have adequate and efficient pump-out facilities. Other pump-out facilities could be identified for use by the transient public. Some facilities could be holding tanks with a scheduled pick up, while others could include a type of on-site waste treatment.

L.5 Expand enforcement activities to reduce illegal waste disposal from RVs.

This strategy will reduce pollution caused by the illegal dumping of waste by RVs. Monroe County regulations currently prohibit the disposal of waste from RVs. This enforcement strategy will allow all law enforcement branches to enforce cooperatively any illegal disposal of waste by RVs.

L.6 Establish a mobile pump-out service through the local government or a franchise with a private contractor which would serve to pump-out live-aboard vessels moored outside of marina facilities. Encourage the use of existing, and the construction of additional, shore-side facilities such as dingy docks, parking areas, showers, and laundries for use by live-aboards.

This strategy will minimize the pollution impacts of live-aboard vessels located outside marinas within the Sanctuary. Although such live-aboards may be only a minor contributor to the total pollutant load, their mooring areas are normally located in confined waters that are more susceptible to the impacts of such loading. The establishment of this system will provide the incentive for live-aboard vessels to have their bilges and holding tanks pumped out regularly. The provision of shore-side facilities should reduce the potential for pollutants associated with other live-aboard activities to enter surface waters.

L.7 Conduct an assessment to identify solid waste disposal sites that pose threats to water quality and/or sensitive areas, based on the results of EPA's Water Quality Plan. Intensify existing monitoring programs around landfills to ensure that no leaching is occurring into marine waters. If problems are discovered, evaluate and implement appropriate remedial actions such as boring or mining, upgrading closure, collecting and treating leachate, constructing slurry walls, or excavating and hauling landfill contents.

This strategy will identify potential groundwater contamination problems from existing landfills and other solid waste disposal operations. The assessment will include the locations of disposal areas, the types of materials present at each site, and the movement of leachate off the site. The assessment will also establish a program to cap, mine, or relocate existing solid waste where the volume of leachate has been identified as a problem. In addition, this strategy

will provide for the monitoring of old landfills not currently being monitored.

L.8 Initiate a study to investigate the feasibility of various solid waste containment/relocation options. Implement containment/relocation options where appropriate within five years.

The strategy will involve researching methods of solid waste disposal, other than the creation of new landfills. The study would determine what regulations are necessary to meet State and regional recycling goals, implement retail packaging standards, and require source separation. The study could also address incineration by identifying its impacts, the best available technology, and the need to eventually discontinue its use. Cooperative agreements with other local governments to accept Monroe County's solid waste also should be explored. The South Florida Regional Planning Commission can provide support for a regional discussion of the alternatives for the disposal of solid waste generated in Monroe County. Containment/ relocation options will be implemented where appropriate within five years.

L.9 Comply with Monroe County policies on solid waste disposal.

The fragile natural resources and limited amount of upland sites in the Keys can be protected by expanding the enforcement of current policies and regulations for solid waste disposal. In addition, Monroe County could adopt land development regulations that prohibit new solid waste disposal sites and negotiate a cooperative agreement with other local governments to accept its solid waste.

L.10 Conduct an assessment and inventory of hazardous materials handling and use in the Florida Keys including facilities, types and quantities of materials, and transport/movement. Add information to the FDEP/EPA/Monroe County GIS database.

This strategy will involve cataloging the use of all hazardous materials as defined by the FDEP and the EPA. The resulting inventory would include: 1) the types of hazardous materials used in Monroe and Dade counties; 2) the types of facilities utilizing identified hazardous materials; 3) the specific location of some users; 4) how these material are typically transported; 5) the toxic/noxious/volatile nature of identified hazardous materials; and 6) how these materials impact water quality and resources. This assessment and inventory will be used to develop a hazardous materials management plan for normal use and emergency response and containment. This information will be added to the FDEP/EPA/Monroe County GIS database.

L.11 Establish licensing requirements for commercial handlers of hazardous materials and biohazardous waste within three years to reduce mishandling and illegal disposal.

This strategy will develop a program for the responsible commercial handling of hazardous materials and biohazardous waste. Local licensing will be required as a mechanism to educate commercial handlers and to ensure that hazardous materials are utilized with standards prescribed by the State and Federal governments to protect human and environmental health. The program will focus on the types of uses and activities that could lead to marine resource degradation and/or destruction. The result will be a reduction in all kinds of hazardous material spills and leaks. The illegal dumping of such materials could also be better assessed.

L.12 Establish a program to increase the availability of hazardous materials collection and transfer stations for nonlicensed users (e.g., households, etc.) within three years.

This strategy will provide for the safe disposal of hazardous materials from residential and other nonlicensed sources. Since nonlicensed hazardous materials handlers are not regulated, adequate mechanisms for handling such materials are limited. Hazardous materials are frequently flushed down toilets, sinks, etc. The creation of collection and transfer sites will allow for the safe, simple, and efficient disposal of household materials.

L.14 Prohibit new dredge and fill permits unless public interest is demonstrated and there will be little or no environmental degradation.

This strategy will eliminate the possibility of new dredge and fill activities within the Sanctuary unless public interest can be demonstrated through the ACOE system and if there will be little or no environmental degradation. Such activities may lead to the direct degradation and/or destruction of sensitive Sanctuary resources. Any areas to be considered to satisfy public interest should focus on the expansion of existing marinas and water-dependent facilities. This prohibition will also apply to upland excavation, where the goal will be to lengthen an existing canal system to expand land/water use or create greater canal flushing.

L.15 Conduct an inventory and assessment of maintenance dredging activities throughout the Sanctuary. Implement low-impact dredging methods for all maintenance dredging. Avoid maintenance dredging whenever possible.

This strategy is designed to record the locations, sizes and independent and cumulative impacts of maintenance dredging within the Sanctuary. Information will be aggre-

gated in a database and/or a GIS to allow managers to evaluate maintenance dredging impacts as related to new permit requests. New policies and regulations will be developed that will require low-impact technologies for maintenance dredging and will prohibit such dredging in areas where significant reestablishment of sensitive benthic communities has occurred (i.e., seagrass and coral habitats).

L.16 Initiate a study to investigate the feasibility of water-use reduction and re-use options and thresholds. Implement a plan for water-use reduction and re-use for major users within five years.

This strategy is designed to reduce the amount of water being used in the Keys and to encourage better wastewater treatment by developing standards and practices for water re-use. A plan will be developed containing re-use options, threshold levels, water-use reduction incentives, etc.

The FDEP currently will not permit the re-use of treated wastewater for plants with a capacity of less than 100,000 gallons per day (gpd). This is a disincentive to higher treatment and water conservation, both of which reduce pollution. The FDEP should develop appropriate human health and environmental standards to permit re-use for smaller users. Research and standards should focus on how water from households can be reused in other domestic applications. A water-use reduction and re-use plan will be implemented for major users within five years.

L.17 Establish consistent interagency regulatory authority addressing all dredge and fill activities.

This strategy will establish further levels of interagency coordination and regulatory consistency with respect to the authorities of the FDEP, ACOE, and local government. All agencies require permits for development activities within the Sanctuary, and coordination and consistency is essential. Some consolidation of such authority may be helpful through delegation, MOUs, etc.

L.18 Restrict wetland dredge and fill permitting.

This strategy will further restrict the degree of wetland destruction currently occurring within Sanctuary boundaries. Monroe County has recently initiated policies to eliminate any dredge and fill activities within undisturbed wetland areas. This strategy will support this effort and develop consistent approaches with the agencies involved. The result will be reduced wetland destruction, protection of the natural wetland/stormwater filtration processes, and the protection of the habitat of numerous endangered species. New dredge and fill projects in functional disturbed wetlands will be required to pass a public interest test. This will reduce the loss of viable wetlands, which serve as buffers to runoff and as habitat for numerous endangered and protected species.

Mitigation banking will be considered for permits issued in functional disturbed wetlands. Immediate replacement to functional status will be required in all mitigative efforts. Money will be received to a trust for restoration of public lands only. Where the agency has discretion, permits will not be renewed.

L.19 Conduct an evaluation of the Monroe County Growth Plan for ecological impacts on the Sanctuary. Identify and recommend additional options to minimize short- and long-term impacts.

This strategy will protect the natural resources of the Sanctuary by limiting growth and the associated impacts on resources. EPA's Water Quality Management Plan will begin to establish some standards related to volumes and quantities. Monroe County has recently tied its growth rate to hurricane evacuation standards and determined a 20-year growth cap. These issues will be evaluated comprehensively to establish a population "build-out" that will reduce residential-based impacts.

An intergovernmental acquisition program will be established to help purchase any remaining "unbuildable" lots in Monroe County. The remaining development should be directed at high-density, disturbed subdivisions, especially those serviced by centralized facilities.

L.20 Conduct an assessment of existing public access to shoreline areas. Develop standards and guidelines for improvements to, and construction of, public access areas. Acquire shoreline areas for developing and/or regulating public access.

This strategy will provide information on problems associated with existing public access areas, including habitat damage and user conflicts. Existing public access areas will be inventoried and nondestructive recreational uses identified. Standards and guidelines for improvements to, and the construction of, public access areas will be developed and could include: 1) improvements to supporting infrastructure; 2) restrictions on activities that damage habitats; 3) promotion of nondestructive recreational uses; and 4) the establishment of low-impact construction standards. The acquisition of shoreline areas that will help improve and regulate public access while protecting the habitat will be pursued by supporting the existing land acquisition programs (such as the Conservation and Recreational Lands Program) and those implemented by the Monroe County Land Authority and The Nature Conservancy.

Recreation

R.1 Develop and implement a program to manage submerged cultural resources. Conduct an inventory of submerged cultural resources (SCRs) and assess survey and extraction techniques within the Sanctuary. Require permitting throughout the Sanctuary.

This strategy is designed to protect submerged cultural resources from undesired disturbances and maintain them as intact as possible for research, education, science, and recreational activities by preparing an SCR Management Plan which will include the following elements:

1) Inventory - Compile existing literature into a bibliography and survey and identify location and specific site characteristics including name, age, integrity, and historical and cultural significance.

2) Management - Develop a set of management practices, guidelines and regulations addressing the exploration, removal, research, and dispensation of artifacts. Management of SCRs would prohibit unauthorized removal. Disposition of artifacts from approved recovery operations will be consistent with the Abandoned Shipwreck Act (ASA), 50 percent for the discoverer-recoverer, and 50 percent for the government. However, where the recoverer has arranged for private conservation, long-term public display, guaranteed public access, and public interpretation of artifacts and data, the disposition of objects may be adjusted accordingly.

3) Permitting - Develop and implement a permitting system for the research, exploration, removal, and dispensation of cultural artifacts, with a provision for exemptions for nondestructive exploration. Require permitting throughout the Sanctuary. The granting of permits will be based upon archaeological and historical value, potential environmental impact, proposed archaeological methods, and proposed public benefit. Permit applications that provide for conservation in museums or similar structures of public access for research, education, or public viewing enjoyment will be given priority over applications where some of the objects are dispersed into private markets.

4) Enforcement - Ensure compliance with statutes, rules, regulations, and permits such as the ASA, Sanctuary regulations, State administration rules, and Federal and State permits through intensive on-site patrols by certified law enforcement officers.

5) Coordination - Ensure comprehensive coordination among all appropriate Federal, State, and local agencies involved in, and responsible for, the management of SCRs through the development and implementation of MOUs.

R.2 Establish a routine survey of recreational activities and use levels within the Sanctuary through a survey of charter and recreational-for-hire vessels, intercept surveys at access points and launch sites, and periodic field surveys.

This strategy will provide data on the types, levels, users, and locations of recreational activities within the Sanctuary to better plan for management concerns such as access to sensitive or heavily used areas, user conflicts, and adverse impacts to resources. The survey, to be conducted by non-law-enforcement personnel, will request information on operator and safety equipment and visitor behaviors such as the use of gloves and buoyancy vests, etc. Data on the number of operators, users, and uses will help shape management decisions on costs (associated with permits, regulations, and other requirements) that may be imposed on users. This survey will be compatible with the current survey to establish user fees for NOAA's national marine sanctuaries.

R.5 Conduct a program to study and implement carrying-capacity limits for recreation activities by: 1) assessing the effects of recreation and boating activities on Sanctuary resources; 2) establishing recreational user carrying capacities that minimize wildlife disturbances and other adverse impacts on natural resources; and 3) enforcing carrying-capacity limits in high-use areas and for highly sensitive habitats throughout the Sanctuary.

This strategy will reduce impacts to Sanctuary resources from recreational activities by better understanding the level of use that different habitats can tolerate without degradation. The capacity levels for each activity identified by the research component of this strategy will be enforced in high-use areas and for highly sensitive habitats (i.e., coral, seagrass, hardbottoms) throughout the Sanctuary. The causes of coral mortality (e.g., disease, temperature stress, bleaching, algal overgrowth, and physical damage) will be characterized, as well as physical stresses, especially those affecting outer and inshore reefs.

This research will assess the impacts that recreation activities have on Sanctuary resources and provide a basis for the continued anticipation of problems associated with specific activities and the development of management actions to eliminate/reduce impacts. Impacts such as wildlife disturbance (especially of commercial and threatened and endangered species), changes in ecosystem balance, degradation of habitat, and other impacts associated with activities such as boating, fishing, diving, etc. will be included.

R.7 Prohibit contact with corals in high-use, sensitive, and vulnerable areas.

This strategy will reduce the damage to hard coral communities caused primarily by boat anchoring/grounding and divers and snorkelers, by prohibiting contact with coral in high-use, sensitive, and vulnerable areas.

Water Quality

W.1 Conduct a demonstration project to evaluate alternate, nutrient-removing on site disposal systems (OSDS).

This strategy will provide information to help determine the appropriate role, if any, of alternate OSDSs in wastewater management in the Keys. Although some alternate OSDS designs appear promising, it is not appropriate to proceed with broad-scale installation of these systems until an independent evaluation has been conducted. Alternate OSDSs designed for nutrient removal would be installed and maintained in a manner consistent with actual residential use. Influent, effluent, and groundwater quality (both background and "down-gradient") would be monitored at regular intervals for at least one year. In addition to nutrient removal efficiency, the study would evaluate maintenance and inspection requirements to keep units operating properly.

W.2 Conduct a demonstration project to evaluate the installation of a small expandable AWT plant to serve an area of heavy OSDS use with associated water quality problems.

This strategy will provide information to help determine whether the elimination of OSDSs would improve water quality in areas believed to be degraded by OSDS-related nutrients. The project would also provide information on the long-term performance of small AWT systems and septic tank effluent pumps or other collection systems. A small, expandable AWT package plant would be installed to serve an area where there is high-density OSDS use in close proximity to confined waters. Preferably, the test area would be one where water-quality problems believed to be related to OSDS nutrients have already been identified. Initial background groundwater and surface-water monitoring would be conducted, and plant influent and effluent would be monitored for a minimum of one year after the plant is in operation. Groundwater and surface-water monitoring would continue for three to five years. Most facilities constructed for the demonstration project could be incorporated into a larger system if results are favorable.

W.3 Establish authority for and implement inspection/enforcement programs to eliminate all cesspits and enforce existing standards for all OSDSs and package plants. Develop targets for reductions in wastewater nutrient loadings necessary to restore and maintain water quality and Sanctuary resources. Develop and implement a Sanitary Wastewater Master Plan that evaluates options for upgrading existing systems beyond current standards or constructing community sewage treatment plants based on nutrient reduction targets, cost and cost effectiveness, reliability/compliance considerations, and environmental and socioeconomic impacts.

This strategy will reduce the amount of pollutants entering groundwater by enforcing existing standards. On-site inspection programs would be implemented to identify and eliminate all cesspits and ensure that OSDSs and package plants are in compliance with existing standards. Penalties would be imposed for noncomplying systems.

Cesspits are illegal and provide no sewage treatment. OSDSs provide adequate sanitary treatment and limited nutrient reduction; however, there is no routine inspection and enforcement program to ensure that these systems are operating properly. Package plants provide secondary treatment and are inspected routinely (although not frequently). The elimination of cesspits and replacement with approved OSDSs would reduce nutrient loading to groundwater and eliminate health hazards from untreated sewage. Aggressive inspection/enforcement programs for OSDSs and package plants could be expected to further reduce nutrient loadings to groundwater.

In addition, this strategy would involve research to estimate the level of reduction in wastewater nutrient loading necessary to restore and maintain water quality and Sanctuary resources. Based on these nutrient reduction targets and the results of the wastewater demonstration projects (strategies W.1 and W.2), a Sanitary Wastewater Master Plan would be developed that would evaluate options for further treatment (e.g., construction of community wastewater plants, upgrading package plants to AWT, or the use of alternate, nutrient-removing OSDSs. The Sanitary Wastewater Master Plan would also specify details of costs, schedules, service areas, etc. for implementation.

W.4 Upgrade effluent disposal for the City of Key West's wastewater treatment plant. Evaluate deep-well injection, including the possibility of effluent migration through the boulder zone into Sanctuary waters. Evaluate options for the re-use of effluent, including irrigation and potable re-use. Discontinue the use of ocean outfall and implement deep-well injection, aquifer storage, and/or re-use. Implement nutrient reduction technologies for effluent prior to disposal or re-use.

This strategy will reduce direct nutrient loadings to surface waters from the Key West wastewater treatment plant. Use of the ocean outfall would be discontinued (except in emergencies), and effluents would be treated to reduce nutrients and disposed through deep-well injection, aquifer storage, and/or re-use.

Before the use of ocean outfalls is discontinued, both the environmental aspects of deep-well injection and the economics of effluent re-use must be evaluated thoroughly. Studies of deep-well injection need to investigate the possibility of effluent migrating through the boulder zone into Sanctuary waters. Re-use options to be evaluated include irrigation and further treatment to produce potable water. Re-use for local irrigation may be limited due to the small number of application sites. Re-use for irrigation in areas outside the Keys would be considered only if it were proposed for unincorporated Monroe County. Potable re-use, although requiring costly treatment, might be cost-effective in the long-term, considering the current cost of treating and pumping in drinking water from Florida City.

W.5 Develop and implement water quality standards, including biocriteria, appropriate to Sanctuary resources.

This strategy will reduce the impacts of pollution on Sanctuary resources by determining water quality conditions to ensure resource protection. The intent is to implement water quality standards as guidance in determining permitted discharge limitations. OFW standards will be used until research indicates that new, more-stringent regulations are necessary.

W.6 Delegate administration of the NPDES program for Florida Keys dischargers to the State of Florida.

This strategy will streamline and eliminate unnecessary duplication in the NPDES permitting process. Currently, all surface-water dischargers must receive permits from both the EPA and the FDEP. Although the two agencies coordinate their permitting activities, it would be simpler for both the agencies and permit applicants if the EPA delegated NPDES permitting authority to the State, as has been done in many other states.

W.7 Require all NPDES-permitted surface dischargers to develop resource monitoring programs.

This strategy will help to evaluate environmental impacts of point-source discharges by requiring all NPDES-permitted surface dischargers to develop resource monitoring programs. This could be accomplished in one of two ways: 1) EPA could eliminate the baseline exemption for resource monitoring under the Ocean Discharge Program as it applies to the Keys. All surface dischargers except the City of Key West sewage treatment plant are currently exempted from developing resource monitoring programs because the end of their discharge pipe does not extend beyond the baseline (the mean low-tide line); or 2) FDEP, through the State of Florida's permitting authority, could require resource monitoring when individual NPDES permits come up for renewal. This approach would probably be easier because it can be accomplished under existing rules, whereas eliminating EPA's baseline exemption would require a Federal rule change.

W.8 Improve interagency coordination for industrial wastewater discharge permitting. Combine OSDS permitting responsibilities in one agency for commercial establishments, institutions, and multifamily residential establishments utilizing injection wells.

This strategy will improve coordination between the EPA, FDEP, and local government agencies relative to industrial wastewater discharge permitting and tracking (HRS is included for special cases such as seafood processing plants). Much of the interagency coordination and tracking is currently handled through a series of MOAs and MOUs. These agreements will be reviewed, evaluated, and revised specifically for the Keys. This could also indirectly reduce wastewater pollution by refining and simplifying the OSDS permitting process and increasing funds for compliance monitoring and enforcement.

W.9 Establish an interagency laboratory capable of processing monitoring and compliance samples.

This strategy could indirectly help reduce pollution by creating an interagency laboratory facility for processing compliance monitoring samples, thus reducing the cost of analysis currently conducted outside the Keys. Neither the FDEP nor the FDHRS has FDHRS-certified (or equivalent) laboratory facilities in the Keys. Because of quality control considerations (holding times), it is difficult or impossible to ship compliance/enforcement samples to Tallahassee for analysis, and the use of contracted private laboratory facilities is expensive. This laboratory would not process toxics or status and trends samples from the water quality monitoring program.

W.10 Inventory and characterize dead-end canals/basins and investigate alternative management strategies to improve their water quality. Implement improvements (consistent with the strategies developed for wastewater and stormwater) in known hot spots throughout the Sanctuary.

This strategy will improve water quality in nearshore confined areas, with emphasis on dead-end canals and basins where reduced circulation increases the risk of reduced dissolved oxygen, retention of both dissolved and particulate pollutants, and potential impacts on benthic and pelagic environments. A comprehensive management plan will be developed for improving water quality in nearshore confined basins and canals. Improvement strategies will be implemented in all canals and basins identified as hot spots throughout the Sanctuary.

W.11 Identify and retrofit stormwater hot spots using "Best Management Practices," such as grass parking, swales, pollution control structures, and detention/retention facilities. Control stormwater runoff in areas handling toxic and hazardous materials. Install swales and detention facilities along limited sections of US 1.

This strategy will reduce loadings of sediment, toxics, and nutrients to Sanctuary waters through engineering methods applied to stormwater hot spots (e.g., commercial and industrial facilities) and limited sections of US 1.

W.12 Require that no development in the Florida Keys be exempted from the stormwater permitting process.

The South Florida Water Management District, which currently has the primary responsibility for stormwater permitting in the Keys, exempts developments of less than 10 acres in size or two acres of impervious surface from having to obtain a stormwater permit. Most development in the Keys falls below this threshold. Local governments are in the process of developing stormwater management ordinances and/or stormwater management master plans. This strategy would require that local government ordinances and master plans cover all development, with no minimum size threshold for requiring that it go through the stormwater permitting process.

W.13 Require local governments to enact and implement stormwater management ordinances and comprehensive stormwater management master plans. Petition the EPA to include the Florida Keys in the stormwater NPDES program if adequate stormwater management ordinances and administrative capabilities to manage such ordinances are not in place by a certain date.

This strategy will help reduce stormwater pollutant loadings (e.g., sediment, toxics, and nutrients) by requiring local governments to develop stormwater management ordinances and master plans. There is currently little regulation of stormwater runoff in the Keys. Many developments were constructed before SFWMD stormwater permitting requirements were in place or, if constructed more recently, fell below the acreage thresholds for those regulations. Monroe County recently passed a stormwater ordinance, and other local governments are either developing ordinances and/or have stated in their comprehensive plans that stormwater management master plans will be developed. This strategy would set deadlines for local governments to enact the stormwater ordinances and master plans. As a backup in the event that these ordinances and master plans are not developed in a timely manner, the FDEP would petition the EPA to include the Florida Keys in the stormwater NPDES permitting program for municipal separate storm sewer systems.

W.14 Institute a series of "Best Management Practices" and a public education program to prevent pollutants from entering stormwater runoff.

This strategy will reduce pollution from stormwater runoff through a variety of programs, including: 1) street sweeping; 2) ordinances aimed at controlling fertilizer application on public and private landscaping; 3) collection locations and a public education program for the proper use and disposal of fertilizers, pesticides, motor oil, and other hazardous chemicals; and 4) strenuous litter-control programs.

W.15 Improve and expand oil and hazardous materials response programs throughout the Sanctuary.

This strategy will reduce the chance that an oil or hazardous materials spill will have a significant negative impact on Sanctuary resources. This will be accomplished by improving coordination and cooperation between the Federal, State, and local agencies responding to spills; encouraging improvements in response and containment technologies appropriate to the Keys; and creating a spill contingency plan for the Sanctuary that includes crew and equipment staged in the Keys (possibly including skimmers). As this strategy recognizes that hazardous material spills on land are handled independent of marine spills, improvement measures will be developed for both programs.

W.16 Establish a reporting system to ensure that all spills in and near the Sanctuary are reported to Sanctuary managers and managers of impacted areas within the Sanctuary. Establish a geo-referenced Sanctuary spills database.

This strategy will ensure that Sanctuary managers are informed of all spills (e.g., of petroleum products) in and near the Sanctuary. Small spills, in particular, are underreported, although they occur frequently and may have a significant effect on the Sanctuary's water quality. This strategy will establish a reporting system to ensure that all spills documented by various agencies (e.g., the USCG and FDEP) are reported to Sanctuary managers and managers of impacted areas within the Sanctuary. In addition, it would establish a geo-referenced database for the Sanctuary that could be used to keep track of information on spills (e.g., locations, quantities, types of material spilled, environmental impacts).

W.17 Refine the aerial spraying program to further reduce aerial spraying over marine areas.

This strategy will reduce the amounts of pesticides entering Sanctuary waters through the refinement of the existing aerial spraying program. Ground spraying by truck is the current method of choice for controlling the adult mosquito

population; however, aerial spraying is initiated when the mosquito population reaches a certain threshold, as determined by mosquito landing counts at test sites. Although the Monroe County Mosquito Control District attempts to avoid marine areas when aerially spraying, the potential for pesticides to reach marine waters may be reduced through program refinements. The threshold for initiating aerial spraying would be reviewed to determine whether it could be raised. Also, the program would be reviewed to determine whether the amount of spray released over water could be reduced through the development of a more refined plan for flight lines and the use of improved equipment. Ground spraying of larvicides in currently restricted areas would be reconsidered to reduce the need for aerial spraying of adult mosquito populations. The possibility of eliminating thermal fogs (which contain diesel oil) and implementing ultra-low-volume spraying techniques will be evaluated.

W.18 Develop and implement an independent research program to assess and investigate the impacts of, and alternatives to, current pesticide practices. Modify the Mosquito Control Program as necessary on the basis of research findings.

This strategy will establish a research program to identify the impacts of current spraying practices on Sanctuary resources and will identify alternative means of mosquito control. Since pesticides used in mosquito control are nonspecific to the larval stages of crustaceans, fish, and natural mosquito-control predators, the effects of the chemicals used (and all application methods employed) need to be examined. In addition, the effect of housing patterns, design, and landscaping as they affect the demand for mosquito control, need to be investigated. The results of this research may be used to modify the Mosquito Control Program.

W.19 The Steering Committee for the Water Quality Protection Program shall take a leading role in restoring the historical freshwater flow to Florida Bay. In addition, Sanctuary representatives should work with the appropriate Federal, State, and local agencies to ensure that restoration plans and surface water management and improvement plans for South Florida and the Everglades are compatible with efforts to maintain water quality within the Sanctuary.

The Steering Committee for the Water Quality Protection Program includes high-level representatives of all relevant agencies and can, therefore, take a leading role in water management issues affecting Florida Bay, including restoring historical freshwater flow. Both short- and long-term solutions must be pursued at high levels of management in both State and Federal agencies.

In addition, Sanctuary representatives should participate in the review and revision of restoration plans and water management plans for Florida Bay and adjacent areas to ensure that these proposals and/or actions will enhance and complement water quality improvement efforts undertaken in the Sanctuary. These plans include, but are not limited to, the Shark River Slough GDM, C-111 basin, Taylor Slough Restoration, West Dade Wellfield, US 1 widening, National Park Service Everglades Restoration Plan, Lower East Coast Water Supply Plan, and Everglades Surface Water Management and Improvement Plan.

W.20 Conduct a long-term, comprehensive water quality monitoring program as described in the EPA Water Quality Protection Program.

This strategy will provide long-term, comprehensive information about the status and trends of water quality parameters and biological resources in the Sanctuary. It will allow managers to identify or confirm problem areas and determine whether conditions are improving or degrading. In addition, remedial actions taken to reduce pollution would be monitored to evaluate their effectiveness. Water-column parameters to be monitored include temperature, salinity, dissolved oxygen, pH, photosynthetically active radiation, turbidity, nutrients, Chlorophyll-a, and alkaline phosphatase activity. Sediment parameters to be monitored include grain size, mineralogy, organic content, nutrients, metals, pesticides, PCBs, petroleum hydrocarbons, and sewage tracers. In addition to the water and sediment sampling, biological monitoring of seagrass, hardbottom, and mangrove communities would be conducted. Seagrass and hardbottom communities (including coral reefs and nearshore hardbottom areas) would be monitored by in situ sampling and remote sensing. Changes in the areal coverage of mangrove communities would be monitored by remote sensing.

W.21 Develop phased hydrodynamic/water quality models and coupled, landscape-level ecological models to predict and evaluate the outcome of in-place and proposed water quality management strategies.

This strategy will develop predictive models that, used with appropriate scientific guidance, would allow resource managers to predict and evaluate the outcome of various management strategies (e.g., engineering actions to reduce wastewater nutrient loadings). Initial conceptual models would be developed, information needs identified, environmental data gathered, and quantitative models developed and refined over the long-term and on a continuous basis to aid in management decisions.

W.22 Develop a segmentation framework to identify surface water areas sharing common hydrographic properties affecting water quality. Determine the susceptibility of each segment to pollutants based upon all loadings (i.e., land- and water-based) and segment specific hydrographic properties affecting their retention.

This strategy will establish a management framework that recognizes the extent to which both regional and local circulation affect temperature, salinity, and the transport of pollutants and marine life into and within segments of the Sanctuary. To better understand these processes, physical simulation models (e.g., coastal ocean hydrodynamical, circulation, transport, mesoscale meteorological, and hydrographical and hydrological models) will be developed.

This strategy also includes documenting the locations and magnitudes of pollution sources entering the Sanctuary to better understand what areas are at higher risk. Sources will include those that are point, nonpoint, and external to the Sanctuary (e.g., permitted discharges, OSDSs, stormwater runoff, groundwater leachates, marinas, C-111, Biscayne Bay, Florida Bay, southwest Florida and oceanic fluxes, and gyre-induced upwelling). Pollutants are to be inclusive of nutrients, hydrocarbons, heavy metals, and pesticides. Load estimates will be based on the best available information and will include engineering estimates where applicable.

W.23 Conduct a hydrologic/geologic assessment of leachate transport (e.g., from injection wells, land fills, storage tanks, etc.) into nearshore waters. Determine whether, and in what quantities, groundwater nutrients are reaching Sanctuary waters including the Florida Reef Tract.

This strategy will better define the influences of various geologic formations (e.g., Miami Oolite, Key Largo Limestone, and Holocene sediment) on groundwater hydrology as they affect the volume, composition, and transport of leachates to nearshore/confined waters as a contributing factor to ambient water quality. The research will also examine the possible effects of groundwater nutrients on the Florida Reef Tract.

W.24 Conduct research to understand the effect of water transport from Florida Bay on water quality and resources in the Sanctuary.

This strategy will research the influence of Florida Bay on the Sanctuary's water quality. Research will include an historical assessment of Everglades/Florida Bay/Florida Keys hydrology, as well as an estimation of present-day, long-term net transport and episodic transport from Florida Bay to the Sanctuary. This strategy will also clarify the role of freshwater inflow and water quality from the Everglades and other freshwater discharges to the southwest shoreline of Florida, Florida Bay, and the Sanctuary. The objective is to provide a scientific basis for efforts to reestablish salinity, temperature, and nutrient regimes to ensure the biological integrity of Florida Bay. The strategy will examine the effects of structural modifications and changes in the timing and volume of freshwater releases from existing structures, as well as land practices affecting the water quality of runoff.

This strategy will also involve studies to document any ecological impacts of Florida Bay waters on Sanctuary communities including seagrasses, coral reefs, nearshore hardbottom communities, and potentially endangered or threatened species. Documentation of hypothesized impacts could provide a stronger basis for action to restore the historical freshwater flow to Florida Bay.

W.25 Conduct research to identify and document causal linkages between water quality (e.g., levels of pollutants, nutrients, salinity, temperature, etc.) and ecological problems in each major ecosystem.

This strategy will help understand the cause/effect relationships between pollutants and biological resources. Numerous problems have been identified in Sanctuary biological communities, but the causes in most cases are not understood well enough to: 1) determine whether anthropogenic pollutants are having adverse ecological effects; and 2) predict confidently the ecological benefits of actions to reduce pollution. Research is needed to identify and understand causal linkages between pollutants and specific ecological problems. Studies would identify limiting nutrients, estimate nutrient thresholds, and evaluate interactive effects of nutrients, toxics, and other water quality parameters. Nutrient budgets will be constructed to determine limiting nutrients for each habitat, including seasonal effects and thresholds. The strategy will also establish a framework for investigating the impacts of catastrophic events (such as hurricanes) on water quality and Sanctuary resources. The effects of turbidity, the direction and flow of nearshore currents, nutrient enrichment, and suspended sediment on seagrasses, benthic algae, and coral symbionts will be examined, as will the effects of oil spills on coral reefs. The interactive effects of salinity, temperature, and nutrients on seagrasses and corals will be determined, and water-quality stresses (including changes in nutrients, suspended sediments and circulation patterns) will be characterized. Research could include experimental studies (laboratory, mesocosm, in situ), historical studies (sclerochronology, geological reconstruction), and geographic comparisons.

W.26 Develop diagnostic indicators of water quality problems (e.g., tissue C:N:P ratios, alkaline phosphate activity, and shifts in community structure by habitat). Conduct research to identify and evaluate indicators (biochemical and ecological measures to provide early warning of widespread ecological problems) in each type of ecosystem.

This strategy will make ecological monitoring simpler, less expensive, and more sensitive to changes in water quality.

It would identify and evaluate indicators (biochemical and ecological measures to provide early warning of widespread ecological problems) in each type of ecosystem. These measures could be incorporated into the Water Quality Monitoring Program to provide the basis for resource-oriented water quality standards for the Sanctuary (see strategy W.5).

W.27 Conduct research to identify and evaluate innovative monitoring tools and methodologies to detect pollutants and identify cause/effect relationships involving water quality and biological resources.

This strategy would identify and evaluate innovative monitoring tools and methodologies to detect pollutants and identify cause/effect relationships involving water quality and biological resources. New or modified monitoring tools and methodologies may be needed because of the unique biota and environmental conditions in the Sanctuary.

W.28 Establish a regional database and data management system for recording research results and biological, physical, and chemical parameters associated with Sanctuary monitoring programs.

This strategy will develop a regional database including biological, physical, and chemical parameters and instrument records, etc.

W.29 Develop a program to disseminate scientific research results including an information exchange network, conferences, and support for the publication of research findings in peer-reviewed scientific journals.

This strategy will help disseminate research findings among scientists and resource managers, helping to stimulate discussion and critical thinking and to avoid duplication of effort in preparing research proposals.

W.31 Examine the effects of global climate change on the organisms and ecosystems of the Keys.

This strategy will examine the effects of stresses associated with global change on the ecosystem. Examples include temperature, salinity, frequency and intensity of storms, turbidity, sea-level change, ultraviolet and visible radiation, etc.

W.32 Establish a technical advisory committee for coordinating and guiding research and monitoring activities.

This strategy will create an advisory committee to guide the process of setting priorities for research and monitoring. The committee shall be composed of scientists from Federal agencies, State agencies, academic institutions, private nonprofit organizations, and knowledgeable citizens.

W.33 Develop and implement a Sanctuary-wide, intensive ecosystem monitoring program. The objective of the program will be to monitor the status of various biological and ecological indicators of system components throughout the Sanctuary and adjacent areas in order to discern the local and system-wide effects of human and natural disturbances and assess the overall health of the Sanctuary.

This strategy will establish an extensive, long-term monitoring program throughout the Sanctuary and adjacent areas. The monitoring program will have three purposes: 1) to supply resource managers with information on the status of the health of living resources and the ecosystem; 2) to determine causal relationships impacting management decisions; and 3) to evaluate the effectiveness of management actions such as zoning. The Ecological Monitoring Program will be fully integrated into the Water Quality Monitoring Program. The elements of the monitoring program will include: 1) a temporal and spatial ecological framework based on current knowledge from which to establish the sampling protocol; 2) status and trends assessments of corals, fishes, seagrasses, benthic organisms, plankton, and mangroves; 3) a fisheries ecology monitoring and research component to examine community composition and function within the habitats of the Sanctuary; 4) a Science Advisory Board to develop and oversee the monitoring program; 5) a sampling protocol; 6) a data analysis, management, and dissemination protocol; 7) a quality assurance/quality control protocol; 8) development of an index of health for the Sanctuary; and 9) a volunteer monitoring program. The development of a spatial, ecological framework for the Sanctuary and the establishment of a Science Advisory Board are prerequisites.

Zoning

Z.1 Establish Wildlife Management Areas that restrict access to especially sensitive wildlife populations and habitats. Such areas would include bird nesting, resting, or feeding areas and turtle nesting beaches. Restrictions could prohibit use, modify the way areas are used or accessed, and specify time periods when use is prohibited.

Wildlife Management Areas are designed to minimize disturbance to wildlife populations and their habitats. Regulations governing access will be designed to protect wildlife populations and habitat, while providing opportunities for public use. Regulations will include various restrictions on access including no-access zones, no-motor-use zones, and idle-speed zones. Zones would be placed in areas considered especially sensitive wildlife habitats. Regulations could also have seasonal components, e.g.,

nesting season closures. Special-use permits, as specified in strategy B.11, will allow for access and activities otherwise prohibited. This zoning includes measures contained in proposed management plans for the Great White Heron, Key West, and National Key Deer wildlife refuges developed by the U.S. Fish and Wildlife Service and the State of Florida Department of Natural Resources. The areas selected for this alternative will be more numerous than those established in Alternative IV.

Z.2 Replenishment Reserves are designed to encompass large, contiguous diverse habitats. They are intended to provide natural spawning, nursery, and permanent residence areas for the replenishment and genetic protection of marine life and to protect and preserve all habitats and species. These reserves are intended to protect areas that represent the full range of diversity of resources and habitats found throughout the Sanctuary. The intent is to meet these objectives by minimizing human influences within these areas.

Replenishment Reserves are zones that will be established in accordance with Section 7 (a) (2) of the Florida Keys National Marine Sanctuary and Protection Act for the purpose of ensuring the protection of Sanctuary resources. They are designed to protect habitats and species by limiting consumptive activities, while continuing to allow recreational activities that are compatible with resource protection. This will provide the opportunity for these areas to evolve in a natural state, with a minimum of anthropogenic influence. These zones will protect a limited number of areas that represent the diverse habitats within the Sanctuary, and that provide important habitat for sustaining natural resources such as fish and invertebrates. These areas have been selected to protect and enhance biodiversity and provide natural spawning, nursery, or permanent residence areas that will serve to replenish stocks of all species. The areas selected for this alternative will be slightly larger and/or more numerous than those established in Alternative IV.

There already is scientific evidence that nonconsumptive areas lead to increases in both harvested and nonharvested species. However, questions remain about the usefulness of these areas in the Sanctuary, as well as the best sites, configurations, and locations. In addition, there is uncertainty about the relative impacts of regional water quality, nearby pollution sources, and human uses that already exist in the Sanctuary. Unbiased scientific studies, therefore, will be initiated in the Replenishment Reserves for two purposes: 1) to determine whether the reserves actually protect biological diversity and increase the productivity of important marine life species; and 2) to utilize the reserves as control areas to better understand the impacts of water quality, pollution, and various human uses. Based on the results of these studies, the five-year update of the Management Plan will consider expanding, modifying, or eliminating these zones.

Z.3 Establish nonconsumptive Sanctuary Preservation Areas in a number of areas that are experiencing a high degree of conflict between consumptive and nonconsumptive uses, and in discrete areas that are currently experiencing significant population or habitat declines. These areas will provide for the protection and sustenance of resources, particularly select marine species in high-use and biologically important areas.

These zones will focus on the protection of shallow, heavily used reefs where conflicts occur between user groups, and where concentrated visitor activity leads to resource degradation. They are designed to enhance the reproductive capabilities of renewable resources, protect areas that are critical for sustaining and protecting important marine species, and reduce user conflicts in high-use areas. This will be accomplished through a prohibition of consumptive activities within these areas. These areas have been chosen based on the status of important habitat, the ability of a particular area to sustain and protect the habitat, and the degree of conflict between consumptive and nonconsumptive users.

Research conducted in these areas can provide important information for comparing the effects of natural processes and consumptive activities on species and habitat. Important prerequisites for conducting monitoring and research in these areas are to continue the ongoing, large-scale remote sensing project to locate and map the resources and habitats within the Sanctuary and to assess the status of important marine species and their habitat. The actual size and location of these zones have been determined by examination of user patterns, aerial photography, and ground-truthing of specific habitats. The areas selected will be slightly larger and/or more numerous than those established in Alternative IV.

Z.4 Establish an Existing Management Area that recognizes areas that are managed by other agencies where restrictions already exist. Management of these areas within the Sanctuary may require additional regulations or restrictions to adequately protect resources. Any additional management measures will be developed and implemented in coordination with the agency having jurisdictional authority.

These zones delineate the existing jurisdictional authority of other agencies (i.e., State parks, aquatic preserves, sanctuaries, and other restricted areas). Their function is to recognize established management areas and to, at a minimum, complement the existing management programs.

Z.5 Establish zones to address special-use activities and concerns within the Sanctuary. These zones can be used to set aside areas for educational and scientific purposes, restorative, monitoring, or research activities or to establish areas that confine or restrict activities such as power boat racing and personal watercraft use in order to minimize impacts

on sensitive habitats and to reduce user conflicts. This zone type will also establish live-aboard areas and mooring fields in areas where adverse environmental impacts will be minimal.

This strategy is designed to delineate areas of special concern where specific issues can be addressed through the use of zoning. Using these zones, areas can be set aside for specific uses to reduce user conflicts and minimize adverse environmental effects from high-impact activities. This will be accomplished by designating selected areas where activities can be conducted with a minimum of disturbance to other users and the environment. Special-use Areas may include areas set aside for research, artificial reef construction, archaeological sites, etc. They will also delineate areas where high-impact activities, such as powerboat racing and personal watercraft use will be allowed. Live-aboard areas and mooring fields will also be confined to specific areas in order to reduce adverse environmental impacts. This is the broadest zoning classification and encompasses the greatest range of management issues. The boundaries of these areas will be selected to address management issues and needs, and may include seasonal or emergency closures of areas.

Education

E.1 Develop printed materials to promote public awareness of the impact of their activities, both land- and water-related, on the Sanctuary's resources and environmental quality. Promote the proper use of equipment used for these activities in order to minimize adverse impacts to natural resources. Materials will include brochures, posters, newsletters, contributions to periodicals, environmental nautical charts, color environmental atlases, and a color periodical. Distribute materials in bulk to high-interception locations (e.g., marinas, boat ramps, dive shops, other businesses etc.) and include bulk mailings as a means of distribution.

Printed materials will be developed to promote public awareness (e.g., visitors, business owners and operators, etc.) and, in particular, boaters', divers'/snorkelers', fishermen's, and homeowners' awareness of the impacts of their activities on Sanctuary resources and environmental quality. Information will be printed in brochures, posters, newspapers, newsletters, and periodicals. Some brochures will be produced in color on glossy paper stock. Nautical charts will also be printed with relevant environmental information. A color environmental atlas for the Sanctuary will be produced, as will a monthly color periodical.

Materials for boaters, divers, and fishermen will include specific information on the proper use of equipment, Sanctuary regulations related to water activities, safe practices for each, Sanctuary habitats and species guides for users, and direct and indirect impacts of boating, diving, fishing and other water-based activities on Sanctuary resources. In addition, materials with information directed toward activities on land, such as sewage and solid waste disposal, and stormwater runoff and household activities (e.g., home improvement, yard waste disposal, etc.) that impact the Sanctuary will be produced.

Printed materials will be distributed in bulk to locations accessible to boaters, divers, and fishermen in particular. These locations will include marinas, boat ramps, dive shops, aquarium shops, and where fishing licenses are sold. Other locations more accessible to the general public include schools, libraries, and Federal, State, and local agencies. A Sanctuary newsletter will be mailed out in bulk. Other materials will be mailed out with vehicle licenses and registrations and utility bills.

E.2 Inventory and use existing videos, films, and audio/visual environmental education materials portraying activities in the Florida Keys and their impacts on Sanctuary resources. Produce a limited number of audios/videos to address gaps in available materials and to address major activities including boating, fishing, diving, etc. Materials will be available at Sanctuary offices and will be distributed to key locations (e.g., dive shops, etc.) throughout South Florida.

This strategy is designed to assemble all available audio/visual environmental education materials and create a library for use by public and private organizations, as well as Sanctuary staff. A limited number of new audio and visual materials will be developed to address gaps in available materials. A number of videos and other materials will be produced to address major activity/issue areas (e.g., boating impacts, fishing, diving, etc.). A slide/photo library will be developed and contributions of materials will be solicited from amateur and professional photographers.

A checkout system will be used to lend out these materials. The distribution scheme will include libraries at all Sanctuary facilities, as well as at-cost distribution to dive shops and other high-interception locations in the Keys and throughout South Florida.

E.3 Develop signs/displays at high-use areas, all public and some private boat ramps, and some public beach access areas to inform participants in water-based activities of regulations and environmentally sound practices, provide navigation information, and promote awareness of nearby sensitive areas. Portable displays will also be produced with information on Sanctuary resources, regulations, environmental quality, etc. Most of the signs will be multilingual. Targeted multimedia displays will be developed with information and impacts on the Sanctuary relevant to the activity targeted. A number of wayside exhibits will be installed.

A user-friendly computer system containing information on regulations, access, recreational sites, environmental etiquette, etc. will be developed for visitor use at selected sites throughout the Sanctuary within five years.

Permanent displays/signs with Sanctuary resource information, regulations, navigation safety and environmental etiquette will be developed. A portable display with similar information will be developed . Multimedia targeted displays (e.g., boating, fishing, diving, etc.) with information on sound boating practices, nearby sensitive areas, catch-and-release fishing, handling techniques and impacts of hook-and-line fishing on Sanctuary resources will also be developed. Most of the signs produced will be multilingual.

Permanent displays/signs will be placed at all public and some private boat ramps. Signs will also be displayed at some public shoreline access areas. A number of displays will be located along the roadside throughout the Keys (e.g., Key Largo, Islamorada, Marathon, Big Pine, and Key West).

A network of computer-driven display systems will be set up to provide information to Sanctuary visitors on resources, activities, and the environment. This system must be user-friendly (e.g., touch-screen menus) and will be available for sale to commercial establishments. Updates would take place every six months. The system will be in place in five years.

E.4 Develop opportunities for instruction and training. This will include programs (both on the primary and secondary level) conducted by teachers, Sanctuary staff, and volunteers. Participation in existing environmental education programs would also be established, and some programs would be expanded. Training programs (e.g., Coral Reef Classroom, submerged cultural resources, etc.) will also be provided for teachers, environmental professionals, business owners and operators, and law enforcement officials.

This strategy will improve the understanding of Sanctuary programs and purposes and the ecology of the Keys through development of training modules to be used as follows:

1) Volunteer training opportunities will involve *sophisticated technical* education/orientation for volunteers concerning the marine sanctuary program and specific, task-oriented education designed to assist paid staff in accomplishing *habitat restoration, SCR research and interpretation*, etc.

2) Development of specific packaged presentations on the Sanctuary, its resources, goals, etiquette, and environmental quality targeted at *both primary and secondary education levels. The programs will include on-site training opportunities for studying a limited number of Sanctuary habitats and SCRs.*

3) *Sanctuary interpretive staff will coordinate activities on a limited basis with State, county, and private environmental education programs targeted at specific activities (e.g., boating, fishing, diving, business owners and operators, households, etc.). New environmental education programs for targeted activities will be developed to fill in gaps.*

4) The Florida Marine Patrol has an environmental awareness program that has produced significant results in the past. This strategy would provide additional funding allowing the Patrol to improve and increase the range of its existing program.

E.5 Establish a program to promote Sanctuary goals and activities through public service announcements (PSAs) in South Florida, with some national and international public exposure, that presents an overview of the Sanctuary, its resources and their ecological significance for routine distribution to radio, cable television stations, and newspapers. Develop editorial/ contributions for other printed media. Funds will be spent on routine media exposure. PSAs would focus on participants in water-related and other activities that affect the Sanctuary (boaters, divers, household etc.). These materials will also be organized into a press packet.

This strategy is designed to develop a program of public service announcements and other media-related materials to educate the public about how their activities impact Sanctuary resources. The PSAs will focus on boating, diving, household activities and other activities that impact the Sanctuary. The areal extent of media exposure will extend to all of South Florida. Some PSAs will be shown to state, national, and international markets. A number of broadcasts will be in languages other than English (primarily Spanish).

The exposure will be routine "no-cost" PSAs on radio and TV. Funds will be spent on column space and air time to increase the frequency of broadcast. Routine editorial responses/contributions will be developed for local papers and other printed materials. A "no-cost" program for printing PSAs on manufacturers product packaging will also be established. A basic press package will be produced for distribution to media representatives on request.

E.6 Establish an education advisory council to advise educators on education goals, priorities and funding sources for the Sanctuary. A full-time staff person will be provided.

This strategy is designed to establish an education advisory council to assist education staff in establishing education priorities, securing funds, and coordinating educational efforts to prevent duplication with other education organizations. The council will be able to rely on a full-time staff person provided by the Sanctuary Program.

E.7 Promote educational materials, including bilingual materials and other information about the Sanctuary and its resources, at existing Sanctuary offices and Chambers of Commerce. Establish interagency visitor centers with the U.S. DOI and the Florida DEP.

This strategy will establish visitor booths/displays to provide educational materials on Sanctuary resources, etiquette, and environmental quality with materials printed in languages other than English (primarily Spanish). Existing Sanctuary offices will provide limited space for distribution on a walk-in basis. In addition, interagency visitor centers will be established in cooperation with the U.S. DOI (FWS, NPS) and the FDEP to provide visitors and residents with orientation information on various protected and managed areas. Cooperative efforts will allow agencies to pool resources and provide lowest cost options for a special center.

The Sanctuary will also use no-cost/low-cost space in locations where tourist-related information is already distributed (e.g., Chambers of Commerce) for promotional purposes.

E.10 Establish a program to ensure public involvement throughout South Florida in Sanctuary activities by holding public meetings and promoting Sanctuary awareness to extracurricular groups. A Sanctuary "hot line" will be established for the public to report information concerning the Sanctuary. A program will also be established to provide Sanctuary sponsorship of contests/awards.

This strategy will establish a program to ensure public involvement by having periodic public meetings throughout South Florida to which commercial and recreational users of Sanctuary resources and the general public will be invited. Sanctuary staff and/or guest speakers will make presentations, and dialogue and feedback from the public will be encouraged.

Limited printed materials will be developed to support presentations to organizations such as 4-H clubs, scouts, and nongovernmental agencies who are making an effort to learn about and support the Sanctuary.

Sanctuary-sponsored contests will be established that include logo contests, photo contests, and volunteer of the year contests. An annual award to recognize contributions by individuals and organizations will also be part of the program. "Adopt-a-Reef" will be another valuable Sanctuary-sponsored program.

E.11 Organize, support, and/or participate in special events (e.g., trade shows, expositions, grand openings, etc.) that allow for the exchange of Sanctuary information. The Sanctuary will cosponsor a limited number of conferences and workshops. The Sanctuary will cosponsor a number of conferences and workshops, with selected sole sponsorship of some events. This would include a "Sanctuary Awareness Week" and a "grand opening" to the Sanctuary. The Sanctuary Program would cosponsor other "awareness" events/weeks (e.g., National Fishing Week, etc.).

This strategy proposes that the Sanctuary Program be involved in special events where Sanctuary information can be distributed.

The Sanctuary Program will also cosponsor conferences and workshops dealing with Sanctuary issues and environmental quality. Sole sponsorship of a limited number of events of particular interest/benefit to the Sanctuary will be established. This will include "Sanctuary Awareness Week" and a "grand opening" to further promote public awareness of Sanctuary goals. The Sanctuary Program will cosponsor other "awareness" events/weeks (e.g., National Fishing Week, etc.) with special-interest groups by providing information on specific activities and their impacts.

Appendix J is not available electronically. For a paper copy of Appendix J, please contact:

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Historically Recorded and Documented Submerged Cultural Resources of Monroe Couhty, Forida

NAME	GENERAL LOCATION	YEAR LOST
9 CANNON WRECK	Dry Tortugas	Unknown
A. HAYFORD	Dry Tortugas	1905
A51		Unknown
A53		Unknown
A54		Unknown
A55		Unknown
A56		Unknown
ABBIE CARSON	Off Key West	1876
ACASTA	Dry Tortugas	1818
ADAM W. SPIES	40 miles West of Stirrup Key	1906
ADAM W. SPIES	40 miles West of Stirrup Key	1909
ADELAIDE	On Pickles Reef	1894
ADELAIDE BAKER	Coffins Patch	1889
ADELAYDA	Elbow Reef	1863
AGAMEMNON	Grecian Shoal	1858
AGENORA	Carysfort Reef	1836
AITAHA	Carysfort Reef	1844
AJAX	Carysfort Reef	1836
ALASCO	Conch Reef	1842
ALBERT MEYER	Florida Keys	1927
ALEXANDER	Keys Gulf of Florida	1752
ALLIGATOR LIGHT WRECK		Unknown
ALLIGATOR REEF WRECK		Unknown
ALMIRANTA OR SAN FRANCISCO DE ASIS	Off Long Key	1733
ALUIDA	Carysfort Reef	1844
AMAZON	Dry Rocks	1872
AMELIA	Three miles from Key West	1914
AMERICA	Dry Tortugas	1836
AMERICA	American Shoal	1885
AMERICANO	Florida Keys	1814
AMOS WATCHILT	Key West	1830
AMULET	Florida Keys	1831
ANDREW JACKSON	Key West	1942
ANDROMACHE	Florida Keys	1805
ANDROMACHE	Florida Keys	1823
ANGELA	Agamemnon Reef, Southeast of Key West	1866
ANN & ELIZABETH	Florida Keys	1774
ANN HARLEY	Loggerhead Shoal	1858
ANN OF LONDON	Florida Keys	1822
ANNA M. STAMMER	Duck Key	1906
ANNA THERESA	Florida Keys	1768
ANNIE OF SCARBOROUGH	Florida Keys	1819
ANSON	Key Vacas	1843
APPHIA & AMELIA	American Shoals	1897
AQUILLO	French Reef	1871
ARAGO	East Sambo Key	1928
ARAGO	Sambo Key	1928
ARCADIA	Dry Tortugas	1893
ARIETAS	Dry Tortugas	1886
ARTHUR	Dry Tortugas	1887
ATHALIA	Carysfort Reef	1844
ATHALIA	On Western Dry Rocks	1854
ATHENAISE	Southwest point of the Quicksands	1876
ATHENE		1943
ATLANTA	Dry Tortugas	1865

NAME	GENERAL LOCATION	YEAR LOST
ATLANTICA	Florida Straits off Marquesas and closer to Cuban Shore	1944
ATLAS	Gulf of Florida, Florida Keys	1816
AURORA	Southwest Reef of Tortugas	1879
BAGDAD	Key West	1921
BAHAMA	Carysfort Reef	1835
BAJA CALIFORNIA		1942
BARGE WRECK		Unknown
BARILLA	Florida Keys	1819
BAYRONTO	Off Key West	1919
BEATRICE	Dry Tortugas	1895
BELL HOOPER	Southwest Reef Tortugas	1890
BELLE	Sugarloaf Key	1836
BEN CUSHING	French Reef	1862
BENJAMIN HALE	On Bird Key Shoals	1893
BENJAMIN LITCHFIELD	Near the Lightship at Sand Key	1848
BENWOOD		1942
BETSEY	Florida Keys	1818
BIG PINE KEY WRECK	Big Pine Key	Unknown
BILLANDER BETTY	Looe Key	1744
BILLOW	Dry Tortugas	1837
BIRGINIA 3	Boca Chica	1910
BLAKELY	Carysford Light	1835
BOSILJKA	Several miles North-Northwest of Key West and North-Northeast of Marquesas	1942
BRAGANZA	Near Key West	1909
BRANDT	Carysford Reef	1817
BRAZOS	Dry Tortugas	1917
BRICK WRECK	Dry Tortugas	Unknown
BRIDESMAID	Tennessee Reef	1890
BRIG	Florida Keys	1819
BRITANNIA	Florida Keys	1803
BRONZE CANNON WRECK	American Shoal	Unknown
BRONZE WRECK	Turtle Shoal	Unknown
C. W. WELLS	35 Miles South-Southwest of Dry Tortugas	1921
C. WHITING	Carysfort Reef	1865
C.C. FOWLER	Washerwoman Shoal	1859
CABINET	Florida Keys	1811
CALDWELL H. COLT	Dry Tortugas	1922
CALLIOPE	Florida Keys	1804
CANTON	Dry Tortugas	1848
CAPITANA	Florida Keys	1623
CAPITANA EL RUBI SEGUNDO	Off Key Largo, near Davis Reef	1733
CARAQUENA	Sandbornes or West Sambos, near Key West.	1858
CARMALITA COMPOSITE	Dry Tortugas	1893
CAROLINE	Key West	1842
CAROLINE NESMITH	Carysfort Reef	1865
CARRIE S. ALLEN	Key West	1923
CATHERINE GREEN	Florida Keys	1794
CAV. IVANISSIVECK	Quicksands	1889
CAY	Near Matabumbe Key	1775
CERES	Dry Tortugas	1824
CERRO GORDO	Loggerhead Reef	1860
CETEWAJO	Bird Key, Tortugas	1885
CHARLES R. CAMPBELL	Dry Tortugas	1886
CHARLES THE FIFTH	Carysfort Reef	1842
CHAVEZ, N.S. DEL CARMEN, S. ANTONIO DE PADUA	Cayo De Matecumbe El Viejo, Upper Matecumbe Key, near Tavernier Key	1733
CIMBRUS	Dry Rocks	1853
CITY OF HOUSTON	Approximately 12 Miles From Key West, on the Shoals near Saddle Bunches	1876
CITY OF WASHINGTON	Elbow Reef	1917
CLIFFORD N. CARVER	Tennessee Reef	1913

NAME	GENERAL LOCATION	YEAR LOST
CLYDE	Key West	1897
COL. T SHEPPARD	Key West	1843
COLONY	Culbins Patches during heavy gale	1853
COLUMBIA	At Crayfish Key, Key West	1841
COMMISSARY	Key West	1846
CONCORD	Tortugas Reef	1831
CONCORIDIA	At Key Vaca	1855
CONSERVATIVE	Long Key Reef	1844
COOT		1942
CORDELIS	Loo Choo Key	1860
COSMOPOLITE	Florida Keys	1821
COSSACK	Florida Keys	1816
COURIER	Knights Key	1836
CRAIG WRECK OR SAN FRANCISCO	Off Long And Craig Keys	1733
CURLER	Southwest Key in the Marquesas	1894
CURREO	Carysfort Reef	1829
CUTTER MORRIS	Key West	1846
CYNTHIANA	Key West	1927
DAHLIA	Pickels Reef	1865
DELTA SHOALS STEEL WRECK	Southwest Delta Shoals	Unknown
DEODUEUS	Molasses Reef	1876
DESPATCH	Carysfort Reef	1817
DIRECTOR	Elbow Reef	1862
DOLCOUTH	North Key Spit, Tortugas	1883
DOLPHIN	Gulf of Florida	1752
DORIS	Carysfort Reef	1831
DOROTHY FOSTER	Pickles Reef	1836
DUMFRIES	Dry Tortugas	1831
DWIGHT	Eastern Dry Rocks	1865
E. G. WILLARD	At Long Key	1853
E. J. BULLOCK	Southwest of Dry Tortugas	1938
E. K. BROWN	Riding Rocks	1871
E.J. WATTE	Little Pelican Shoals	1886
EAGLE	Maranzie Reef	1801
EARL KING	Long Reef	1891
EAST KEY WRECK	Dry Tortugas	1850
EAST KEY WRECK 2	Dry Tortugas	Unknown
EBEN PREBLE	Probably in the Lower Keys	1846
EDITH	West of Key West	1877
EDNA LOUISE	30 miles from Key West	1914
EDWARD S. LUCKENBACH	30 miles North of Key West	1942
EDWARD T. STOTESBURY	Knight's Key	1910
EL AVISO CONSULADO	Pacific Reef	1733
EL GRAND PODER DE DIOS Y SANTA ANA	Matecumbe Key	1733
EL INFANTE, ALIAS NUESTRA SENORA DE BALVANEDA	Cayo De Vivoras, Little Conch Reef	1733
EL LERRI	Lower Matecumbe Key	1733
EL NUEVA VICTORIOSA	Off Key Largo	1771
ELEANOR	On the Tortugas	1836
ELENORA	Southwest Reef, Tortugas	1885
ELIZA	Carysfort Reef	1818
ELIZA	Rodriquez Key	1853
ELIZA PLUMMER	Probably the Lower Keys	1832
ELIZA W. DALTON	Struck Bird Key but taken to Long Cay	1855
ELIZABETH	Near Light Ship	1847
ELIZABETH BRUCE	Elbow Reef	1854
ELLA HAND	Stirrup Key	1838
EMIGRANT	Alligator Reef	1856
EMILIE	8 Miles South-Southwest of the Northwest Light	1877
EMMA ELIZA	Cudjoe Key	1909
ENERGIA	Molasses Reef	1877
ENGLISH COUNTY	Florida Keys	1782

NAME	GENERAL LOCATION	YEAR LOST
ENGLISH MERCHANT SHIP	American Shoals	Unknown
ENGLISH SHIP	Florida Keys	1782
ERICKSON	Key West area	
ERICKSON		Unknown
EUROPA	Florida Keys	1817
EVANDALE	French Reef	1875
EVELINE	Near Key West	1874
EVENLY	Florida Keys	1943
EXCELSIOR	Grecian Shoal, North of Carysfort Light	1879
EXCELSIOR	Grecian Shoals or Carysfort Light	1880
EXCHANGE	Off Key West on Reef	1846
EXERTON	Dry Tortugas	1831
F.A. KILBURN	American Shoal Light	1918
FANNIE AND FAY	Dry Tortugas	1925
FANNY A. EVERETT	American Shoals	1853
FERNANDIA	Elbow Key	1860
FERNONIA	Carysfort Reef	1845
FISCHER,ROBINS,CLAUSE	Dry Tortugas	Unknown
FISHING SCHOONER WRECK		Unknown
FLAGLER SHIPPING DOCKS	Marathon End of 7 Mile Bridge	1906
FLORA	Florida Keys	1789
FLORA	Dry Tortugas	1836
FLORA	Dry Rocks	1848
FLORENCE	Tortugas	1831
FLORENCE ROGERS	West of Alligator Reef Light Station near Indian Key	1875
FLORIDA	Florida Reef	1831
FLORIDA	Key West	1909
FLORIDA	Dry Tortugas	1910
FLORIDANA	Cayo De Vivoras	1777
FLY	Florida Keys	1789
FOLOMER	Southwest Reef, Tortugas	1881
FORREST	A Reef located one days sailing out of Key West	1838
FRANCES	Alligator Reef	1846
FRANCES & LUCY	Florida Keys	1822
FRANCIS	Dry Rocks	1856
FRANCIS ASHBY	At Loggerhead Key (American Shoals)	1843
FRANKLIN	Florida Keys	1823
FREDDIE L. PORTER	Dry Tortugas	1887
FREDDIE W. ALTON	The Dock at Key West	1909
FUERTE	Florida Keys	1742
FURTE	Florida Keys	1742
GALAXY	Dry Tortugas	1831
GALLO INDIANA	Long Key	1733
GALVESTON	Duck Key	1876
GANYMEDE	Matecumbe Bar	1850
GARDEN PIKE	Sugar Loaf Key	
GENERAL CLARK	Florida Keys	1793
GENERAL WILSON	Key West	1846
GEORGE III	Carysfort Reef	1824
GEORGE PEABODY	American Shoals	1878
GEROGES	Molasses Reef	1876
GLAMO	Marquesas Reef	1905
GOLCONDA	30 miles East of Key West	1869
GOLOENK		Unknown
GRACE CLARK	At Grand Key during a Norther	1852
GRANITE WRECK	Conch Reef	Unknown
GRECIAN	Carysfort Reef	1836
GREENVILLE PACKET	Dry Tortugas	1765
GUERRERO	Carysfort Reef	1827
GULFSTATE		1943
GUNDOR		1942
GUTENBERG	Bird Key, Tortugas	1884

NAME	GENERAL LOCATION	YEAR LOST
GUTENBERG	Dry Tortugas	1885
H. H. CONWAY		1944
H. W. STAFFORD	Key West	1846
HAMILTON	Ajax Reef	1780
HANNIBAL	Elbow Reef	1890
HAROLDINE	Off Bear's Cut	1906
HARRIET AND MARTHA	Dry Tortugas	1854
HARRY B. RITTER	Southwest Reef, Tortugas	1895
HEBRUS	Pickles Reef	1838
HECTOR	Florida Keys	1800
HELEN E. BOOKER	Elbow Key, or according to one source, Carysfort Reef	1857
HENRIETTA MARIE	New Ground Reef near the Marquesas Keys	1700
HENRIETTA MARIE	New Ground Reef	1796
HENRY	Key West	1831
HENRY	Marquesas	1848
HENRY J. MAY	Southwest Reef in Dry Tortugas	1875
HENRY J. MAY	Southwest end of Loggerhead Reef	1877
HENRY MEANER	Far out to sea West of the Dry Tortugas	1878
HERBERT MAY	Marquesas Reef	1922
HERMIS		1942
HERRERA, S.N. DE BELEM Y S. ANTONIO DE PADUA	East of Matecumbe Key	1733
HIGHLANDER	Carysfort Reef	1812
HILTON	Carysford	1937
HMS CARYSFORD	Carysfort Reef	1793
HMS FLY	Shoreward side of Little Conch Reef	1805
HMS LOOE	Looe Key	1744
HMS TYGER	Florida Keys	1742
HMS WINCHESTER	Southwest of Carysfort Reef	1695
HOLMES	East Key, Tortugas	1859
HONDURAS	Key West	1870
HOPE	Pickles Reef	1878
HOPE FOR PEACE	Carysford Reef	1821
HORACE	Pickles Reef	1860
HUDSON	Little Sand Key	1848
HUGH DE PAYENS	Abandonded off the Tortugas, she was later seen drifting upside down in the Florida Channel between Sal Key and Key West.	1919
HURRICANE	Key West	1846
HYDER ALLEY	Marquesas Key Shoals	1838
IDA C. SOUTHARD	Approximately 20 miles bearing West off Sombrero Light	1894
IMPULSE	Key West	1909
INDIAN HUNTER	French Reef	1859
IRENE	Dry Tortugas	1907
IRIS	Florida Reef	1846
IRON BALLAST WRECK	Dry Tortugas	Unknown
IRON BALLAST WRECK	Dry Tortugas	Unknown
ISAAC ALLERTON	Key West	1856
ISABELLA	Bahia Honda Key	1855
ISABELLA	On French Reef	1875
ISABELLA REED	Conch Reef	1850
ISHURIA	Mosquito Bank	1896
ISLAND BELLE	Key West	1926
ISLAND HOME	Near Sand Key Light (one source says Marquesas Key)	1882
IVORY WRECK	Delta Shoal	Unknown
J. A. MOFFET		1942
J.W. ROWLAND	Pickles Reef	1860
JALAPO	5 miles East of Marquesas	1876
JAMES W. LAWRENCE	Middle Sandbornes	1865
JERUSALEM	Florida Keys Reef	1815
JESUS SENORA DEL ROSARIO	Florida Keys	1622
JOHAN CARL	Florida Keys	1825
JOHN HENRY SHERMAN	Garden Key	1926

NAME	GENERAL LOCATION	YEAR LOST
JOHN HENRY SHERMAN	Dry Tortugas	1928
JOHN HOWELL	Dry Tortugas	1847
JOSEPH A. DAVIS	Grecian Shoals	1866
JOSEPH BAKER	Dry Tortugas	1881
JOSEPH BAKER	North Cay Flat, Tortugas	1891
JOSHUA H. MARVELL	Dry Tortugas	1887
JUDITH	Fowey Rocks	1748
JUNO	Carysfort Reef	1812
KEY WEST	Key West	1846
KEY WEST	Key West Harbor	1870
KINGSTON	Off Key Largo	1752
L. W. MAXWELL	Eastern Dry Rocks	1854
LA MARGARITA	Marquesas Key	1622
LA REUNION	Probably in Lower Florida Keys	1846
LADY FRANKLIN	French Reef	1862
LAFAYETTE	Key West	1846
LAKE CITY	Key West	1918
LALIA	Southwest Reef, Tortugas	1883
LANCASTER	Florida Keys	1752
LAS MULAS	Man Key	1860
LAURA	Carysfort Reef	1835
LEO	Tortugas	1831
LEONE	At Key West while entering Port	1872
LEOPARD	Florida Keys	1823
LEVINIA ADAMS	Looe Key	1855
LEWIS H. GOWARD	Key West	1921
LEWIS J. STOCKER	Key West	1878
LILY WHITE	30 miles Northwest of Key West	1897
LINEDORA	Carysfort Reef	1846
LITTLE CONCH REEF WRECK	Tavernier Key	Unknown
LIVELY	Florida Keys	1791
LIVELY	Florida Keys	1819
LOGGERHEAD KEY WRECK	Dry Tortugas	Unknown
LOGGERHEAD KEY WRECK 2	Dry Tortugas	Unknown
LOGGERHEAD REEF WRECK 3	Dry Tortugas	Unknown
LOGGERHEAD REEF WRECK 4	Dry Tortugas	Unknown
LOGGERHEAD REEF WRECK 5	Dry Tortugas	1850
LOGGERHEAD REEF WRECK 6	Dry Tortugas	Unknown
LONDON	Rebecca Shoal	1892
LONE STAR	North Dry Rocks	1891
LONG KEY REEF WRECK	Dry Tortugas	Unknown
LONG KEY REEF WRECK 2	Dry Tortugas	1850
LOUIS H	Sombrero Key Light	1919
LOUISIANA	South point of Carysfort Reef	1836
LOUISOANA	Off Sombrero Reef	1910
LOVELY ANN	Florida Keys	1792
LUCY M	50 miles Northwest of Key West	1881
LUISA A	Loggerhead Key	1882
MABEL	Pulaski Shoals Flat Reef, Tortugas	1891
MAGDALEN	Florida Keys	1816
MAGNOLIA	Key West	1910
MAJESTIC	Carysford Reef	1835
MAJESTIC	Key West	1943
MALCOM	French Reef	1858
MANAGUA		1942
MANATEE	Key West	1907
MANCHESTER	Florida Reef	1841
MANDARIN	Elbow Reef	1848
MANZANILLO	Several miles South of Key West	1942
MARCIA REYNOLDS	20 miles Northwest by West of Sombrero Light	1884
MARIA	Dry Tortugas	Unknown
MARIA	Ludberry Reef	1796
MARIA	Dry Tortugas	1806

NAME	GENERAL LOCATION	YEAR LOST
MARIA	Caryford Reef	1831
MARIA	Carysfort Reef	1835
MARIA		1944
MARIA		1949
MARIA FERGUSON	Dry Tortugas	1870
MARIA FERGUSON	Tortugas	1871
MARIA LOUISA	Dry Tortugas near Bird Key Harbor	1918
MARIE J. THOMPSON		Unknown
MARIE J. THOMPSON	Key West area	1935
MARINER	French Reef	1856
MARQUIS DE POMBAL	Florida Keys	1817
MARS	Dry Rocks	1851
MARTHA GILCHRIST	Dry Tortugas	1858
MARTHA REGAN	Marquesas Shoal	1859
MARY	Key Tavernier Creek	1836
MARY & PRISCILLA	Off Key Largo	1752
MARY E. BRIGGS	French Reef	1879
MARY ELIZA	Dry Tortugas	1911
MARY HART	Mosquito Shoal	1831
MARY HOWLAND	Delta Shoal	1839
MARY LONDON	Looe Key	1855
MARYLAND	Washerwoman Shoal	1849
MATAWA	Near Key West	1872
MATHILDA	Quicksands	1897
MATTHEW VON BREE	Yucatan Reef, a small reef near Alligator Reef	1852
MAY	Florida Keys	1752
MAYFLOWER	Carysfort Reef	1855
MEDFORD	Blown five miles from Key West toward Sand Key	1909
MEGGIE	Southwest Point of Loggerhead Reef	1877
MELEMORA	Key West	1846
MEMPHIS	Conch Reef	1877
MENEMOM SANFORD	Carysfort Reef	1862
MERCHANT	Carysfort Reef	1808
MERRI ENGLAND	French Reef	1878
MERRIE ENGLAND	Pickles Reef, just Southwest of the Lighthouse	1877
MERRIMACK	Florida Keys	1817
METEOR	Pickles Reef	1854
MEXICO	Shoals of the Tortugas	1891
MEZZIE	Dry Tortugas	1877
MINERVA	Near Light Ship, Carysfort	1847
MINI	Pickles Reef	1859
MISS SANDRA	Outside jetty of Northwest Channel Key West	Unknown
MISSISSIPPI	Looe Key	1829
MODESTE	Off Key Largo	1819
MOLLIE EMMA	30 Miles East of Key West	1876
MONROE COUNTY	At Key West	1928
MOONSTONE	Near Carysfort Reef	1894
MORRIS	Key West	1846
MORTOUN	Near Key Vaca	1848
MOUNT PLEASANT	Plantation Key	1905
MOUNT VERNON	Carysford Reef	1844
MOUNTAIN HOME	North of Key West	1875
MT. HOPE	Key West	1831
MULHOUSE	Quicksands near the Tortugas	1859
MULLER	Sugarloaf Reef	1869
MUNGER T. BALL	Far out to sea, many miles West of Cape Sable	1942
MUTTER SCHULTZ	American Shoal	1870
N. KIMBALL	Dry Rocks	1853
N.M. TERRY	Eastern French Reef	1864
N.S. DE LAS ANGUSTIAS Y SAN RAFAEL	Off the Long Key Bridge	1733
NADA	Inside of Tennessee Reef of Long Key	1894
NAFFAW	Florida Keys	1741

NAME	GENERAL LOCATION	YEAR LOST
NANCY HAWKS	Florida Reef	1926
NANCY W. STEVENS	Southwest Reef in Dry Tortugas	1849
NANNIE C. BOHLIN	Near Garden Key, Dry Tortugas	1909
NANNU	Key West	1828
NAPOLEON	Key West	1846
NATCHEZ	Carysfort Reef	1836
NAVIGATOR	Key West	1846
NELLIE M. SLADE	Dry Tortugas	1900
NEPENTHE	Tavernier Key	1932
NEW ORLEANS	Dry Tortugas	1850
NEW YORK	Dry Tortugas	1842
NEWARK	Carysfort Reef	1845
NEY	Pickels Reef	1859
NICHOLAS ADOLPH	Amelia Island Bar	1814
NOAH' ARK	Florida Keys	1795
NOR WESTER	Key West Harbor	1938
NOR'WESTER	Key West	1872
NORDKYN	Coffins Patch (one source says Vacas Key)	1875
NORLINDO	Far out to sea West of the Dry Tortugas	1942
NORMAN	Conch Reef	1836
NORMAN H. DAVIS	Key West	1942
NORTH AMERICA	Delta Shoal	1842
NORTHAMPTON	Molasses Reef	1883
NORTHERN LIGHT	Grand Key	1855
NORTHERN LIGHT	Florida Keys	1930
NUESTRA SENORA DE ATOCHA	Marquesas Key	1622
NUESTRA SENORA DE CONCEPCION Y SAN JOSEPHE	Key Largo	1689
NUESTRA SENORA DEL POPULO	Cabeza De Los Martires, in Biscayne National Park	1733
NUESTRA SENORA DEL ROSARIO	Matacumbe Key	1622
OCONEE	Stirrup Key	1845
OLD RIVER	Matacumbe Key	1947
OLIVE & ELIZA	Key West	1846
OMAHA	Presumed to be in Lower Florida Keys	1869
ORACLE	Conch Reef	
ORION	Florida Keys	1812
ORION	Sand Key	1839
ORLEANS	Carysfort Reef	1826
OSMOND	Dry Tortugas, Southwest Key	1898
OSTEAN	Navy Harbor, Key West	1858
OSTERVALD	Far out to sea off Florida Bay area in Gulf of Mexico	1858
OTHELLO	Collins Patch (likely Coffins Patch)	1832
OXFORD	Bearing Northeast by North of Carysfort Light on Pickles Reef	1894
PACIFIC	East Key of the Tortugas	1857
PACKET SHIP	Sandy Key	1841
PACKET SHIP	Key West	1842
PARGO	Cape Sabal	1905
PATRIARCA SAN JOSE	Pickles Reef	1870
PAULINE	Pickles Reef	1854
PEERLESS	Near Boot Key, Marathon Area	1909
PEGUOT	Key Vacas	1842
PELTON	Key West	
PENDLETON BROTHERS	Dry Tortugas	1913
PENNEKAMP WRECK		Unknown
PETRIE	Washerwoman Shoal	1888
PHILLIS	Florida Keys	1752
PHOENIX	Key Vaca	1857
PIGEON KEY WRECK	Narrow Channel, Northeast side of Pigeon Key	1906
PILGRIM	Dry Tortugas	1843
PILITA	Carysfort Reef	1851
PIZARRO	Carysford Reef	1835

NAME	GENERAL LOCATION	YEAR LOST
PLANTER		1921
PLATINA	Carysford Reef	1846
POACHER	South of Dry Tortugas	1840
POINT-A-PETRE	Carysfort Reef	1825
POINTE-A-PETRE	Florida Keys	1824
POLO(?)		1733
PRAIRIE BIRD	Key West Harbor	1875
PRAIRIE ROSE	Marquesas Keys	1876
PRINCE UMBERTO	Duck Key	1888
PRISCILLA L. RAY	Key West	1920
PROVIDENCE	Florida Keys	1805
PULASKI	On the Tortugas (possible that Pulaski Shoal was named after this vessel)	1832
PULASKI LIGHT WRECK	Dry Tortugas	Unknown
QUEBEC	Florida Keys	1818
QUEEN ANNE	Florida Keys	1752
QUOQUE	Carysfort Reef	1920
R-12	Off Key West	1943
R. B. GOVE	Dry Tortugas	1882
R. BOWERS	Southwest Reef, Dry Tortugas	1895
R.E. LEE	On a shoal (presumed to be in Lower Florida Keys)	1877
RACE	At Knights Key	1906
RAILROAD SITE	Nikes Channel	Unknown
RAINBOW	Thomas Harbor Key	1855
RANDOLPH GRONING	N'Th Key, Dry Tortugas	1847
RASK	Quicksands	1886
RATTLER	Carysfort Reef, Key Largo, Monroe County	1805
REBECCA	Dry Tortugas	1843
REBECCA BARTON	Key West	1866
REBECCA SHOAL IRON WRECKAGE	Dry Tortugas	Unknown
REFUSE SITE	Spanish Harbor Bridge	1906
RESTLESS	Lower Florida Keys	1872
REVENGE	Key West	1825
RHEE GALLEY	Florida Keys	1774
RHODE ISLAND	Florida Keys	1752
RIBS BARE WRECK		Unknown
RINGGOLD	Northwest Channel, Key West	1865
RIVER SMITH	Carysfort Reef	1858
RIVERSIDE	Quicksands, East by Northeast of Rebecca Shoal Light	1896
ROBERT	Key West	1918
ROBERT MORRIS	Pelican Shoal	1853
ROBIN HOOD		1924
ROSALINA	Pickles Reef	1837
ROSE MURPHY	Sand Key Light	1927
ROSE MURPHY	Sand Key Light	1927
ROSEMARY	Key West	1930
RUDOLPH GRONING	Dry Tortugas	1842
RUDOLPH GRONING	Southwest Reef, Tortugas	1843
RUGGED	50 Miles Southeast of Miami	1943
RUM RUNNER WRECK	Vicinity of Rodriquez Key	Unknown
S-16	14 Miles South Southwest of Key West	1944
S. O. CO. NO. 90	Dry Tortugas	1906
S.R. MALLORY	Key West	1909
S.S. GEORGE CROMWELL	Lower Florida Keys	1872
S.S. LEE	Off the Tortugas	1874
SADINO	Pulaski Shoal on the Southwest Reef, Tortugas	1888
SAMUEL H. CRAWFORD	Near Pickles Reef	1877
SAMUEL LAWRENCE	Grecian Shoal	1860
SAN ANTON	Florida Keys	1521
SAN ANTONIO	On reef near Key West	1768
SAN FELIPE		1733
SAN FERNANDO	Coffin Patch	1733

NAME	GENERAL LOCATION	YEAR LOST
SAN IGNACIO	Cayo De Bocas	1733
SAN JOSE DE LAS ANIMAS	30 ft. of water off Tavernier Key	1733
SAN JUAN	Near San Vincent off North end of Key Largo	1689
SAN PEDRO	South of Indian Key, off Islamorada	1733
SAN VINCENT FERRER	1/2 mile off North end of Key Largo	1689
SANDWICH	Florida Keys	1819
SANTA ANNA MARIA	Key Largo	1665
SANTA CHRISTINA	25 miles off Key West	1919
SANTA ROSA	Reported due South of Key West	Unknown
SANTIAGO DE CUBA		1942
SARAH ANN	Sombrero Reef	1837
SCHOONER WRECK	Dry Tortugas	Unknown
SEA DRIFT	Struck Carysfort Reef and was swept upon Key Largo	1835
SEA FLOWER	Southwest Tortugas	1834
SEA LARK	At Spanish Harbor	1865
SEA RANGER	Tavania, Tavernier?	1858
SEBRA CROOKER	Looe Key	Unknown
SEBULON	Dry Tortugas on Southwest Reef	1887
SELECT	Dry Tortugas, Tortugas Shoal	1844
SENORA	Bird Key	1872
SERAFINA	Key West	1926
SHANNON	Dry Tortugas	1892
SHELTER ISLAND	Looe Key	1896
SHELTER ISLAND	Newfound Harbor Keys	1896
SHIP	American Shoals	Unknown
SHIP	Boca Chica	Unknown
SHIP	Boca Chica	Unknown
SHIP	Boca Chica	Unknown
SHIP	Delta Shoals	Unknown
SHIP	Delta Shoals	Unknown
SHIP	Delta Shoals	Unknown
SHIP	Delta Shoals	Unknown
SHIP	Florida Keys	Unknown
SHIP	Florida Keys	Unknown
SHIP	Key West	Unknown
SHIP	Key West	Unknown
SHIP	Key West	Unknown
SHIP	Key West	Unknown
SHIP	Key West	Unknown
SHIP	Key West	Unknown
SHIP	Key West	Unknown
SHIP	Key West	Unknown
SHIP	Key West	Unknown
SHIP	Key West	Unknown
SHIP	Key West	Unknown
SHIP	Key West	Unknown
SHIP	Key West	Unknown
SHIP	Key West	Unknown
SHIP	Key West	Unknown
SHIP	Sambo Key	Unknown
SHIP	Sambo Key	Unknown
SHIP	Tavernier Key	Unknown
SHIP	Tennessee Reef	Unknown
SHIP	Key West	1866
SHIP	Key West	1881
SHOT WRECK	East Delta Shoals, Sombrero Light	Unknown
SIR JOHN SHERBROKE	Dry Tortugas	1816
SLOBODNA	Molasses Reef	1887
SMALL VESSEL WRECK		Unknown
SOLWAY	Florida Keys	1818
SONORA	Dry Tortugas	1872
SOUTH AMERICAN	French Reef	1900
SPANISH VESSELS	Los Martires (Key Largo Area)	1549

NAME	GENERAL LOCATION	YEAR LOST
SPARKLING WATER	Northwest of Tortugas	1875
SPEEDWELL	Carysfort Reef off Key Largo	1796
SPEEDWELL	Off the Marquesas, 18 miles from Key West	1899
SPINDRIFT		1944
SPLENDID	Florida Reef	1831
SPLENDID	Marquesas Key	1832
ST. JAMES	Conch Key	1871
ST. MARK	Carysford Reef	1846
ST. MARY'S	Sambos	1847
STAR	Either Conch Key or Conch Reef	1870
STEEL WRECK	Dry Tortugas	Unknown
STERLING	On Conch Reef	1854
STILLMAN F. KELLEY	Salt Key Bank	1909
STRANGER	Western Dry Rocks	1836
STURTEVANT		1945
SUBMERGED WRECK		1944
SUECO DE ARIZON, N.S. DEL ROSARIO, S.ANTONIO ETC.	Off Duck Key	1733
SULTANA	Rogers River (probably the Rogers River North of Cape Sable)	1910
SUNSHINE	Near Cross Key (connecting Florida Keys with Mainland)	1949
SWEETHEART	Long Key	1904
SWEETHEART	Off Long Key	1904
SWIFT	Off Key Largo	1824
SWIVEL GUN SITE	Dry Tortugas	Unknown
SYLPH	Sambo	1904
SYLPHIDE	Dry Tortugas	1850
TAGLIONI	Carysfort Light Ship	1848
TALLAHASSEE	Dry Tortugas	1836
TARTAR	East Key Reef, Dry Tortugas	1855
TENNESSEE	Long Key	1832
TEVONIA	Carysfort Reef	1845
THENDARA	Key West	1926
THEODORE	Florida Keys	1824
THEOPHILUS	Alligator Reef	1836
THIROVA	Turtle Reef	Unknown
THOMAS CLOONEY	Bay Point, in Sugarloaf Sound	1927
THOMAS P. BARKLOW	Florida Bay	1874
THOMAS R. PILLSBURY	Off the Tortugas	1878
THREE SISTERS	Carysfort Reef	1816
TIGER	Eastern Sandbornes	1860
TILAMON	Delta Shoals	1852
TOISON	Key West	1831
TOLOMEO	Dry Tortugas	1881
TOMAS DE RESA	Turtle Reef	1871
TONAWANDA	Elbow, Grecian Shoals	1866
TRES PUENTES, N.S. DE BELEM Y S. JUAN BAUTISTA	Off Snake Creek, Tavernier in the Florida Keys	1733
TRITON	Key West Harbor	1909
TRUE BRITON	Rebecca Shoal at the Quicksands	1889
TRUE BRITON	Rebecca Shoals	1889
U-157	Off Key West	1942
UNITED STATES	Quicksands	1835
UNITY	Carysfort Reef off Key Largo	1817
UNKNOWN	13 miles South of Sand Key	
UNKNOWN	Boca Chica Key area	
UNKNOWN	Key West area	
UNKNOWN	Key West area	
UNKNOWN		Unknown
UNKNOWN		Unknown
UNKNOWN	Bahia Honda	Unknown
UNKNOWN	Delta Shoal	Unknown
UNKNOWN	Looe Key (Loose Key?)	Unknown

NAME	GENERAL LOCATION	YEAR LOST
UNKNOWN	Marathon end of 7 Mile Bridge	Unknown
UNKNOWN	Molasses Reef area	Unknown
UNKNOWN	Near Elbow Reef Tower	Unknown
UNKNOWN	Bamboo Banks, off Northwest End of Grassy Key on Gulf Side	Unknown
UNKNOWN	North end of Carysfort Reef	Unknown
UNKNOWN	Turtle Reef	Unknown
UNKNOWN	Key Largo area	1530
UNKNOWN	Off Plantation Key	1533
UNKNOWN	Off Upper Matecumbe Key	1550
UNKNOWN	Off Vaca Key	1550
UNKNOWN	Los Cayos De Los Martires (Key Largo Area)	1551
UNKNOWN	Off Saddlebunch Keys	1554
UNKNOWN	Florida Keys	1577
UNKNOWN	Wrecked at head of Los Martires (Elliot Key Or Key Largo?)	1579
UNKNOWN	Caught in hurricane and many ships wrecked in Florida Keys	1589
UNKNOWN	Florida Keys, Monroe County	1590
UNKNOWN	Alligator Reef	1595
UNKNOWN	Off Alligator Reef	1595
UNKNOWN	Florida Keys	1619
UNKNOWN	Florida Keys	1619
UNKNOWN	Keys, Monroe County	1619
UNKNOWN	Dry Tortugas	1621
UNKNOWN	Matacumbe Key	1622
UNKNOWN	Off Marquesas Keys	1623
UNKNOWN	Off Upper Matecumbe Key	1623
UNKNOWN	Florida Keys	1630
UNKNOWN	Keys of Matecumbe	1634
UNKNOWN	Bamboo Banks, Florida Keys, Monroe County	1644
UNKNOWN	Coral Reef at Dry Tortugas	1649
UNKNOWN	3 miles off Crawl Key	1656
UNKNOWN	Key West	1677
UNKNOWN	Key West	1677
UNKNOWN	Key West	1677
UNKNOWN	Florida Keys	1688
UNKNOWN	Florida Keys	1740
UNKNOWN	Florida Keys	1752
UNKNOWN	Florida Keys	1752
UNKNOWN	Florida Keys	1752
UNKNOWN	Reefs off Key Largo	1767
UNKNOWN	Florida Keys	1768
UNKNOWN	Florida Keys	1768
UNKNOWN	Florida Keys	1768
UNKNOWN	Florida Keys	1769
UNKNOWN	Florida Keys	1770
UNKNOWN	Florida Keys	1770
UNKNOWN	Florida Keys	1771
UNKNOWN	Matacumbe Key	1775
UNKNOWN	Florida Keys	1781
UNKNOWN	Florida Keys	1785
UNKNOWN	Off Pidgeon Key	1788
UNKNOWN	Florida Reef	1790
UNKNOWN	Florida Reef	1790
UNKNOWN	Carysfort Reef	1792
UNKNOWN	Carysfort Reef	1792
UNKNOWN	Carysfort Reef	1792
UNKNOWN	Florida Keys	1792
UNKNOWN	Florida Keys	1792
UNKNOWN	One hour from Key Largo	1799
UNKNOWN	Carysfort Reef	1815

NAME	GENERAL LOCATION	YEAR LOST
UNKNOWN	Carysfort Reef	1815
UNKNOWN	Carysfort Reef	1815
UNKNOWN	Carysfort Reef	1815
UNKNOWN	Carysfort Reef	1817
UNKNOWN	Carysfort Reef	1817
UNKNOWN	Carysfort Reef	1818
UNKNOWN	Carysfort Reef	1818
UNKNOWN	Carysfort Reef	1818
UNKNOWN	Carysfort Reef	1819
UNKNOWN	Carysfort Reef	1819
UNKNOWN	Carysfort Reef	1819
UNKNOWN	Florida Keys	1819
UNKNOWN	Carysfort Reef	1821
UNKNOWN	Carysfort Reef	1821
UNKNOWN	Carysfort Reef	1822
UNKNOWN	Carysfort Reef	1822
UNKNOWN	Eastern Florida Keys	1822
UNKNOWN	Florida Keys	1822
UNKNOWN	Florida Keys	1822
UNKNOWN	Ledbury Reef	1822
UNKNOWN	Carysfort Reef	1824
UNKNOWN	Carysfort Reef	1824
UNKNOWN	Carysfort Reef	1824
UNKNOWN	Florida Keys	1824
UNKNOWN	Florida Keys	1824
UNKNOWN	Southwest end of Carysfort Reef	1824
UNKNOWN	Carysfort Reef	1829
UNKNOWN	Looe Key	1830
UNKNOWN	Dry Tortugas	1840
UNKNOWN	Key West	1841
UNKNOWN	Key West	1841
UNKNOWN	Key West area	1841
UNKNOWN	Key West	1842
UNKNOWN	Key West	1844
UNKNOWN	Key West	1844
UNKNOWN	Key West	1846
UNKNOWN	20 miles West of Carysfort Reef	1853
UNKNOWN	On Carysfort Reef	1854
UNKNOWN		1855
UNKNOWN	At Sand Key	1857
UNKNOWN	At Stirrup Key	1857
UNKNOWN	Key West	1866
UNKNOWN	Key West	1866
UNKNOWN	Key West	1870
UNKNOWN	Key West	1870
UNKNOWN	Key West	1872
UNKNOWN	Key West	1872
UNKNOWN	Key West	1875
UNKNOWN	Key West	1875
UNKNOWN	Channel near Western Dry Rocks at entrance to Key West Harbor	1876
UNKNOWN	Key West	1881
UNKNOWN	Jetty at Northwest entrance to Key West	1896
UNKNOWN	Key West	1897
UNKNOWN	Key West	1897
UNKNOWN	By Northwest Passage Lighthouse	1903
UNKNOWN	Marathon end of 7 Mile Bridge	1906
UNKNOWN	Spanish Harbor Bridge	1906
UNKNOWN	Key West	1909
UNKNOWN	Key West	1909
UNKNOWN	Key West	1909
UNKNOWN	Boca Chica	1910
UNKNOWN	Tennessee Reef	1913

NAME	GENERAL LOCATION	YEAR LOST
UNKNOWN		1919
UNKNOWN	Delta Shoal	1919
UNKNOWN	Florida Keys	1919
UNKNOWN	Key West	1921
UNKNOWN	South of Boca Chica	1921
UNKNOWN	Key West	1926
UNKNOWN	Key West	1928
UNKNOWN	South of Sambo Key	1942
UNKNOWN		1948
UNKNOWN	Several miles West of the Tortugas	1948
UNKNOWN		1949
UNKNOWN WRECK		Unknown
UNKNOWN WRECK	Craig Key	Unknown
UNKNOWN WRECKS	Near Sand Key	
USS ALLIGATOR	Southeast ofthe Light on Ocean Side of Alligator Reef	1822
USS ALLIGATOR	Reef in Keys named after it, Alligator Reef	1822
USS EAGLE BOAT		1948
USS RESTLESS	Off Cape Sable	1864
USS STURTEVANT	Less than 12 miles from Key West	1942
VACA CAY BALLAST MOUND	Vacas Key	Unknown
VENGERN	Pickles Reef	1877
VIDETTE	90 miles Southeast of Sand Island Light	1887
VIGILANT	Key West	1828
VILLANEUVA	Probably in Lower Florida Keys	1846
VINEYARD	Off Long Key on East side of the Bank	1830
VIRGINIA	Boca Chica	1910
VISITACION	Key Largo	1550
VITRIC		1944
VOLUNTEER	Sand Key	1905
W. EMPIRE	Tortugas	1855
W. J. COLLE	Key West	1930
WALKER KEY WRECK	Conch Reef	Unknown
WALTER D. WALLETH	Off Loggerhead Light bearing East by Northeast	1895
WALTHAM	Matecumbe Key	1865
WANDERER	Florida Bay near Money Key	1909
WANDERING CHIEF	Elbow Reef	1894
WARSAW	Probably in Lower Florida Keys	1846
WATT	Florida Keys	1815
WELLINGTON	Dry Tortugas Shoals	1844
WEST TURTLE SHOAL WRECK	Coffins Patch area, on West Turtle Shoals	Unknown
WILLIAM CHESNUT	Presumed to be in Lower Keys area	1859
WILLIAM JARVIS	Marquesas Key	1860
WILLIAM M. JONES	Dry Tortugas at Pulaski Shoals	1875
WILLIAM M. JONES	Pulaski Shoal, 10 miles West-Southwest of Loggerhead Light, 5 miles South-Southwest of East Key, Tortugas	1877
WILLIAM R. WILSON	Pickles Reef	1908
WILLIAM R. WILSON	Pickles Reef	1912
WILLIAM S. FEARWELL	Miller Reef, on bank of the Tortugas.	1882
WILLIAM T. DUGAN	Sand Key	1857
WILLIAM TELL	Bird Key near the Tortugas Light	1831
WRECK #12	Delta Shoals	Unknown
Y. P. 331		1944
YC 891	Off Key West	1943
YC 898 & 899	Off Key West	1942
YCK 8	Off Key West	1943
YOLE	Looe Key	1876
YORK	Carysfort Reef	1846
YUCATAN	French Reef	1847
ZODIAC	Elbow Cay (Reef)	1875
ZOTOFF	Dry Tortugas, Southwest Reef	1844

Note: Data from the State of Florida's Archaeological Site Files, Monroe County database. The database includes both historically-recorded and known archaeological sites. Some archaeological sites do not yet have historical names or dates assigned.

Proposed FKNMS Designation Document

Proposed Designation Document for the Florida Keys National Marine Sanctuary

On November 16, 1990, the Florida Keys National Marine Sanctuary and Protection Act, P.L. 101-605, set out as a note to 16 U.S.C. 1433, became law. The Florida Keys National Marine Sanctuary and Protection Act designated an area of waters and submerged lands, including the living and nonliving resources within those waters, as described in 16 U.S.C. 1433 note, the Florida Keys National Marine Sanctuary.

While this statutory designation obviated the need for a document to "designate" the area and characteristics of the Sanctuary, a designation document is still needed to identify what types of activities may be subject to the regular Federal rulemaking process in the future, as opposed to the more extensive and costly Sanctuary designation process. In that sense, the designation document acts like a character i focusing future Sanctuary regulations, as well as putting limits on what regulations can be proposed, without going through the entire designation process again.

Article I. Effect of Designation

The Sanctuary is already statutorily designated. There are no proposed modifications to the area. The effect of this designation document is primarily limited to identifying the types of activities (scope of regulations) which may be implemented through Federal rulemaking procedures at some time in the future, if necessary.

Nothing in this designation document is intended to restrict activities that do not cause an adverse effect to the resources or property of the Sanctuary or that do not pose harm to users of the Sanctuary.

Title III of the Marine Protection, Research, and Sanctuaries Act of 1972 as amended (the "Act" or "MPRSA"), 16 U.S.C. 1431 et seq. authorizes the issuance of such final regulations as are necessary and reasonable to implement the designation, including managing and protecting the conversation, recreational, ecological, historical, research, educational and esthetic resources and qualities of he Florida Keys National Marine Sanctuary. Section 1 of Article IV of this Designation Doucment lists activities of the type that will be regulated initially, or may have to be regulated subsequently, in order to protect Sanctuary resources and qualities. Listing does not necessarily mean that a type of activity will be regulated; however, if a type of activity is not listed it may not be regulated, except on an emergency basis, unless Section 1 of Article IV is amended to include the type of activity by the procedures outlined in section 304(a) of the MPRSA.

Article II. Description of the Area

The Florida Keys National Marine Sanctuary boundary encompasses approximately 2,800 square nautical miles (9,500 square kilometers) of coastal and oceanic waters, and the submerged lands thereunder, surrounding the Florida Keys in Florida. The Sanctuary boundary extends from the northeasternmost point of Biscayne National Park out to the Dry Tortugas, a linear distance of approximately 320 kilometers. The boundary on the Atlantic Ocean side of the Florida Keys runs south from Biscayne National Park following the 300-foot isobath, which curves in a southwesterly direction along the Florida Keys archipelago ending at the Dry Tortugas. The boundary on the Gulf of Mexico side of the Florida Keys runs in an easterly direction from the Dry Tortugas parralleling the Florida Keys, approximately five miles to the north, and then follows the Everglades National Park boundary until Division Point at which time the boundary follows the western shore of Manatee Bay, Barnes Sound, and Card Sound. The boundary then follows the southern boundary of Biscayne National Park and up its eastern boundary until its northeasternmost point.

The shoreward boundary of the Sanctuary is the mean high-water mark. The Sanctuary boundary encompasses all of the Florida coral reef tract, all of the mangrove islands of the Florida Keys, and some of the seagrass meadows of Florida Keys. The precise boundary of the Sanctuary is set forth at the end of this Designation Document. This area is the same as that area designated by Congress as a Sanctuary in P.L. 101-605.

Article III. Characteristics of the Area that Give it Particular Value

The Florida Keys extend approximately 220 miles southwest from the southern tip of the Florida peninsula. Adjust to the Florida Keys land mass are located spectular, unique, nationally significant marine environments, including seagrass meadows, mangrove islands, and extensive living coral reefs. These marine environments support rich biological communities possessing extensive conservation, recreational, commercial, ecological, historical,

research, educational, and aesthetic values which give this area special national significance. These environments are the marine equivalent of tropical rain forests in that they support high levels of biological diversity, are fragile and easily susceptible to damage from human activities, and possess high value to human beings if properly conserved. These marine environments are subject to damage and loss of their ecological integrity from a variety of sources of disturbance.

The Florida Keys are a limestone island archipelago. The Keys are located at the southern edge of he Floridian Plateau, a large carbonate platform made of a depth of up to 7,000 meters of marine sediments, which have been accumulating for 150 million years and have been structurally modified by subsidence and sea level fluctuation. The Keys region is generally divided into five distinct areas: the Florida reef tract, one of the world's largest coral reef tracts and the only barrier reef in the United Stated; Florida Bay, described as an active lime-mud factory because of the high carbonate content of the silts and muds; the Southwest Continental Shelf; the Straits of Florida; and the Keys themselves.

The 2.4 million-acre Sanctuary contains one of North America's most diverse assemblages of terrestrial, estuarine, and marine fauna and flora, including, in addition to the Florida reef tract, thousands of patch reefs, one of the world's largest seagrass communities covering 1.4 million acres, mangrove fringed shorelines, mangrove islands, and various hardbottom habitats. These diverse habitats provide shelter and food for thousands of species of marine plants and animals, including over 50 species of animals indentified by either Federal or State law as endangered of threatened. Federal, State, local,and private organizations currently protect, preserve and set regulations at 121 sites throughout the Keys, covering approximately 2.0 million acres.

The Keys were at one time a major seafaring center for European and American trade routes in the Caribbean, and submerged cultural and historic resources (i.e., shipwrecks) abound in the surrounding waters. In addition, the Sanctuary may contain substantial archaeological resources of pre-European cultures.

The uniqueness of the marine environment draws multitudes of visitors to the Keys. The major industry in the Florida Keys is tourism, including activities related to the Keys' marine resources, such as dive shops, charter fishing and dive boats and marinas, as well as hotels and resturants. The abundance of the resources also supports a large commercial fishing employment sector.

The number of visitors to the Keys grows each year, with a concomitant increase in the number of residents, homes, jobs, and businesses. As population grows and the Keys accomodate ever-increasing resource-use pressures, the quality and quantity of Sanctuary resources are increasingly threatened. These pressures require coordinated and comprehensive monitoring and research of he Florida Keys' region.

Article IV. Scope of Regulations
Section 1. Activities Subject to Regulation

The following activities are subject to regulation under the NMSA, either throughout the entire Sanctuary of within indentified portions of the Sanctuary or in areas adjacent to the Sanctuary, to the extent necessary and reasonable. Such regulation may include prohibitions to ensure the protection and management of the conservation, recreational, aecological, historical, research, educational or aesthetic resources and qualities of the area. The following 16 activities subject to regualtion are simply listed here in the Designation Document. Detailed definitions and explainations of the following "activities subject to regulation" are clearly defined in applicable and appropriate sections within the Sanctuary management plan:_

1. Exploring for, developing, or producing oil, gas or minerals (e.g., clay, stone, sand, gravel, metalliferous ores and nonmetalliferous ores or any other solid material or other matter of commercial value) in the Sanctuary;

2. Touching, climbing on, taking, removing, moving, collecting, harvesting, injuring, destroying or causing the loss of, or attempting to take, remove, move, collect, harvest, injure, destroy or cause the loss of coral;

3. Drilling into, dredging or otherwise altering the seabed of the Sanctuary, except incidental to allowed fishing and boating practices or construction activities permitted by county, state, or federal regulatory agencies; or constructing, placing or abandoning any structure, material or other matter on the seabed of the Sanctuary, except as authorized by appropriate permits (i.e., artificial reefs), and allowed fishing activities;

4. Discharging or depositing, from within or from beyond the boundary of the Sanctuary, any material that subsequently enters the Sanctuary and injures a Sanctuary resource or quality;

5. Operation of watercraft:

a) So as to injure coral, hardbottoms, seagrass, mangroves, or any other immoble organism attached to the seabed,

b) Carelessly in the vicinity of drivers, fishermen, and boaters,

c) so as to disturb marine mammals, marine reptiles, or bird rookeries.

6. Diving or boating activities that pose a threat to harm Sanctuary resources and other users of the Sanctuary

7. Artificial stocking or release of native or exotic species;

8. Tampering with markers by defacing, marking, or damaging in any way or displacing, removing, or tampering with signs, notices, or placards, or with any navigational aides, monuments, stakes, posts, mooring buoys, boundary buoys, trap buoys, or scientific equipment;

9. Removal, injury, preservation, curation, and management of historic resources without the appropriate state and/or federal permits;

10. Taking, removing, moving, catching, collecting, harvesting, feeding, injuring, destroying, or causing ths loss of, or attempting to take, remove, move, catch, collect, harvest, feed, injure, destroy or cause the loss of a marine mammal, marine reptile, or bird, without the appropriate state and/or federal permits;

11. Possessing or using explosives or releasing electrical charges or substances poisonous or toxic to fish and other living resources within the Sanctuary boundary or adjacent tothe Sanctuary boundary (possession of ammunition is not to be construed as explsoives);

12. Interfering with, obstructing, delaying or preventing an investigation, search, seizure or disposition of seized property in connection with enforcement of the Act or any regulation or permit issued under the Act.

13. Implementation of a marine zoning plan that prohibits the taking or removing Sanctuary resources form areas within the Sanctuary that so designated, except as permitted i.e no harvest and research-only zones;

14. Removal and disposal of illegal lost or out-of-season gear discovered within the Sanctuary boundary; removal of vessels grounded, lodged stuck or otherwise perched on coral reefs, hardbottoms, or seagrasses; and removal from any location within the Sanctuary and disposal of derelict or abandoned vessels or other vessels for which ownership cannot be determined or for which owner takes no action for removal or disposal; and salvaging and towing of abandoned or disabled vessels or of vessels otherwise needing salvaging or towing;

15. Harvest of marinelife as defined and regulated by the State of Florida marinelife rule (cite rule# currently found at ____);

16. Development or conduct of mariculture activities Sanctuary waters.

Section 2. Emergencies

Where necessary to prevent or minimize the destruction of, loss of, or injury to a Sanctuary resource or quality; or minimize the imminent risk of such destruction, loss or injury, any activity; including any not listed in Section 1 of this Article, is subject to immediate temporary reuglation, including prohibition, in accordance with the Administrative Procedure Act.

Article V. Effect on Leases, Permits, Licenses, and Rights

If any valid regulation issued by any Federal, State or local authority of competent jurisdiction, regardless of when issued, conflicts with a Sanctuary regulation, the regulation deemed by the Director, Office of Ocean and Costal Resource Management, National Oceanic and Atmospheric Administration, or his or her designee to be more protective of Sanctuary resources and qualities shall govern.

Pursuant to section 304(c) (1) of the Act, 16 U.S.C. § 1434(c) (1), no valid lease, permit, license, approval or other authorization issued by any Federal, State, or local authority of competent jursidiction, or any

right of subsistence use or access, may be terminated by the Secretary of Commerce, or his or her designee, as a result of this designation, or as a result of any Sanctuary regulation, if such authorization or right was in existence on the effective date of Sanctuary designation (November 16, 1990). However, the Secretary of Commerce or designee may regulate the exercise (including, but not limited to, the imposition of terms and conditions) of such authorization or right consistent with the purposes for which the Sanctuary is designated.

In no event may the Secretary or designee issue a permit authorizing, or otherwise approving: 1) the exploration for, development of, or production of industrial materials within the Sanctuary; or 2) the disposal of dredged material within the Sanctuary (except by a certificatio, pursuant to Section 940.10, of valid authorizations in existence on the effective date of Sanctuary designation). Any purported authorizations issued by other authoriities after the effective date of Sanctuary designation for any of these activities within the Snactuary shall be invalid.

Article VI. Alteration of this Designation

The terms of designation, as defined under Section 304(a) of the Act, may be modified only by the procedures outlined in sectin 304(a) of the MPRSA, including public hearings, consultation with interested Federal, State, and local agencies, review by the appropriate Congressional committees, and the Governor of the State of Florida, and approval by the Secretary of Commmerce or designee.

Florida Keys National Marine Sanctuary Boundary Coordinates (based on North American datum of 1983.)

The boundary of the Florida Keys National Marine Sanctuary—

(a) begins at the northeasternmost point of Biscayne National Park located at approximately 25 degrees 39 minutes north latitude, 80 degrees 5 minutes west longitude, then runs eastward to the 300-foot isobath located at approximately 25 degrees 39 minutes north latitude, 80 degrees 4 minutes west longitude;

(b) then runs southward and connects in succession the points at the following coordinates:

(i) 25 degrees 34 minutes north latitude, 80 degrees 4 minutes west longitude,

(ii) 25 degrees 28 minutes north latitude, 80 degrees 5 minutes west longitude, and

(iii) 25 degrees 21 minutes north latitude, 80 degrees 7 minutes west longitude;

(iv) 25 degrees 16 minutes north latitude, 80 degrees 8 minutes west longitude;

(c) then runs southwesterly approximating the 300-foot isobath and connects in succession the points at the following coordinates:

(i) 25 degrees 7 minutes north latitude, 80 degrees 13 minutes west longitude,

(ii) 24 degrees 57 minutes north latitude, 80 degrees 21 minutes west longitude,

(iii) 24 degrees 39 minutes north latitude, 80 degrees 52 minutes west longitude,

(iv) 24 degrees 30 minutes north latitude, 81 degrees 23 minutes west longitude,

(v) 24 degrees 25 minutes north latitude, 81 degrees 50 minutes west longitude,

(vi) 24 degrees 22 minutes north latitude, 82 degrees 48 minutes west longitude,

(vii) 24 degrees 37 minutes north latitude, 83 degrees 6 minutes west longitude,

(viii) 24 degrees 40 minutes north latitude, 83 degrees 6 minutes west longitude,

(ix) 24 degrees 46 minutes north latitude, 82 degrees 54 minutes west longitude,

(x) 24 degrees 44 minutes north latitude, 81 degrees 55 minutes west longitude,

(xi) 24 degrees 51 minutes north latitude, 81 degrees 26 minutes west longitude, and

(xii) 24 degrees 55 minutes north latitude, 80 degrees 56 minutes west longitude;

(d) then follows the boundary of Everglades National Park in a southerly then northeasterly direction through Florida Bay, Buttonwood Sound, Tarpon Basin, and Blackwater Sound;

(e) after Division Point, then departs from the boundary of Everglades National Park and follows the western shoreline of Manatee Bay, Barnes Sound, and Card Sound;

(f) then follows the southern boundary of Biscayne National Park to the southeasternmost point of Biscayne National Park; and

(g) then follows the eastern boundary of Biscayne National Park to the beginning point specified in paragraph (a).

Appendix L is not available electronically. For a paper copy of Appendix L, please contact:

The Florida Keys National Marine Sanctuary
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Appendix M is not available electronically. For a paper copy of Appendix M, please contact:

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Major Issues Addressed in Comments and NOAA's Responses

On March 30, 1995 NOAA published a proposed Designation Document and proposed implementing regulations and announced the availability of the draft management plan and environmental impact statement (DMP/EIS) (60 FR 16399). Public hearings to receive comments on the proposed regulations, and the DMP/EIS were held on November 1 in Miami; November 3 in Key Largo; November 6 in Marathon; November 7 in Key West; November 9 in St. Petersburg; and November 14 in Silver Spring, MD.

The nine month public review period ending on December 31, 1995, resulted in NOAA receiving over 6,400 statements of public comment on the DMP/EIS. In addition, the Sanctuary Advisory Council (SAC) provided NOAA with its comments on the plan. All comments received on the DMP/EIS were recorded in a computerized database and assigned a unique comment identification number. These records consist of the reviewer's name; company, organization, or agency; address; a synopsis of the comment; and NOAA's response. Details of this public review process are provided in the general introduction to Volume I of the final management plan and environmental impact statement (FMP/EIS).

Comments were received about many aspects of the management plan and EIS, however, a majority of the comments focused on a limited number of issues. Comments were received from diverse groups and individuals, including private businesses and organizations, elected officials, the SAC and representatives of Federal, State, and county agencies.

NOAA received a number of specific comments on the DMP/EIS, including recommendations on strategies, activities, and priority levels. Some comments were specific enough to cite page numbers and recommended language revisions. NOAA appreciates the level of public comment and has revised the document based on a balance of these comments in light of the requirements of the NMSA, FKNMSPA, NEPA, and other applicable laws. Consistent with the requirements of NEPA and the Administrative Procedure Act (APA), this section discusses the significant issues and substantive concerns that the commentors have brought to NOAA's attention.

All comments received by NOAA in response to the Federal Register notices and public hearings were considered and, where appropriate, were incorporated. A summary of the significant comments on the proposed regulations and DMP/EIS and NOAA's responses is set forth below. The comments are also presented and responded to in the administrative record.

The Need for the Florida Keys National Marine Sanctuary

Comment: There is no need for a Sanctuary.

Response: NOAA disagrees. In 1990, Congress enacted the FKNMSPA in recognition of the need to provide comprehensive protection and management of the diverse marine environments of the Florida Keys. These environments possess important and unique living and non-living resources, including seagrass meadows, mangrove islands, and extensive living coral reefs. These habitats support rich biological communities, possessing extensive conservation, recreational, commercial, ecological, historical, research, educational, and aesthetic values which give the area special national significance. Congress found these environments to be the marine equivalent of tropical rain forests in that they support a rich level of biological diversity, are fragile and easily susceptible to damage from human activities, and possess high value to human beings if properly conserved. To this end, the Act expressly prohibits oil drilling within the Sanctuary and prevents tank vessels or ships greater than 50 meters in length from entering the Area to be Avoided within the Sanctuary boundary.

Past resource management efforts in the Florida Keys have only focused on small portions of the coral reef ecosystem in a checkerboard fashion. These efforts have not taken a holistic approach to protecting the marine environment of the Florida Keys and as a consequence, the coral reef resources have declined steadily over the past two decades. Piecemeal management of the marine resources of the Florida Keys, especially the coral reefs, seagrass communities, hardbottom habitats, and mangrove fringed shorelines, combined with a continued decline in the quality of the water that flows over these habitats, has resulted in a threat to the stability of the marine environment in the Keys. Consequently, since the economy of the Florida Keys is so closely linked to a healthy marine environment, the status quo approach to managing the marine resources of the Keys could result in an economic collapse in the near future.

The Act directed NOAA to develop a comprehensive management plan and implementing regulations for the Sanctuary in consultation with appropriate Federal, State and local governments and with the SAC. Pursuant to this mandate, NOAA developed a comprehensive management plan and regulations to protect and manage the living and non-living resources of the Sanctuary. Regulations were developed to protect Sanctuary resources and minimize conflicts among the various users of those resources. For example, establishing zones with special restrictions to protect habitat in those zones and prohibiting potentially harmful activities such as prop dredging and prop scarring throughout the Sanctuary are effective management tools. Regulations supplement, but do not duplicate, existing management authorities with jurisdiction in the Sanctuary.

The FKNMS will provide a comprehensive and coordinated regime to protect, manage and conserve the nationally significant resources of the Florida Keys so they may be enjoyed by both present and future generations.

The Need for Management of the Sanctuary

Comment: Many commentors asserted that the Sanctuary will add another costly layer of bureaucracy, while others commented on the benefits of integration and the role the FKNMS has played in interagency planning.

Response: The Sanctuary is not an extra layer of bureaucracy and there are many ways in which the National Marine Sanctuary Program will improve management of the Keys' marine resources. National Marine Sanctuaries are designated to protect marine resources that are unique and possess high national significance. Boundaries of National Marine Sanctuaries only extend to the mean-high tide mark and do not include the land. The concept of a National Marine Sanctuary as a *"place"* seems to be overlooked by some of the public. The Sanctuary is not a thing or an "extra layer of bureaucracy"; and it is not a collection of agencies, environmental groups, or user groups, it is a very special place, deserving of protection for the use and enjoyment of present and future generations. The waters and marine resources surrounding the Keys are unlike any other on earth and they need and deserve our immediate attention. We will lose our coral reefs if the declines we've witnessed over the past two decades continue.

Congress, through the FKNMSPA, designated the Sanctuary, drew a line around the Keys and declared to the world that the marine resources of the Keys are special and unique. The Act also delegated to NOAA, an agency with experience in managing marine protected areas where the economy is highly dependent on healthy marine resources, the responsibility to manage the Sanctuary and make the Sanctuary part of a national program internationally known for its ability to manage marine resources for multiple uses, both recreational and commercial; a program that emphasizes an educational approach to management. The FKNMSPA also places an important safeguard on the agency: *"Nothing in this Act is intended to restrict activities that do not cause an adverse effect to the resources or property of the Sanctuary or that do not pose harm to users of the Sanctuary."*

The National Marine Sanctuary Program is not new to the Florida Keys. The program has had a very successful 20 year history in the Keys, protecting some of the most popular coral reef dive sites in the world. The Key Largo National Marine Sanctuary, designated in 1975, protects all the coral reefs along a 20 mile stretch in the upper Keys. The relationship of the Sanctuary with the business community has been excellent. The Key Largo Chamber of Commerce continues to be a tremendous supporter of the Sanctuary where divers, dive operators, recreational and charter fishermen, and commercial fishermen continue to work and play.

Looe Key National Marine Sanctuary was designated in 1981, following a very lengthy designation process where local businesses, divers, and commercial fishermen in the vicinity of Big Pine Key reacted in opposition. Rumors, misinformation, and a basic misunderstanding of what a "National Marine Sanctuary" actually is, were the fuels that fired lengthy debates. Shortly after Looe Key became operational and management measures were implemented, many of the fears such as commercial fishermen being "put out of business" disappeared. A good working relationship was established with the regular users of the Looe Key Sanctuary and businesses dependent on a healthy coral reef continued to flourish. As a result of good management, in 1985, a travel writer for the Miami Herald declared Looe Key as one of the top ten dive destinations in the world.

During the past 15 years Looe Key and Key Largo National Marine Sanctuaries have been used as models for managing marine protected areas, both domestically and internationally. This reputation was well known to the authors of the legislation that was passed to designate the Sanctuary.

The National Marine Sanctuary Program protects and manages Sanctuary resources for their continued use by present and future generations. A goal of National Marine Sanctuaries is to facilitate compatible use of marine resources by businesses that are economically dependent upon them, to the extent those uses are compatible with the primary objective of resource protection. This is the first step toward sustainability of this marine area for present and future generations.

The Key Largo and Looe Key National Marine Sanctuaries make up about 23 linear miles of the 220 mile long coral reef tract along the Florida Keys. The designation of the FKNMS provides resource protection to the remaining 197 miles of coral reef and marine ecosystem that were not previously protected. This is not an extra layer of bureaucracy because prior to the Sanctuary's designation little comprehensive resource protection management existed.

National Marine Sanctuaries are known for their integrated comprehensive management through establishing partnerships. In Florida, the Sanctuary Program started "reinventing government" in 1980, by establishing a cooperative agreement with the State of Florida, Department of Natural Resources, for the management of the Key Largo National Marine Sanctuary and later, the Looe Key National Marine Sanctuary. These were areas located entirely in Federal waters, but managed by State staff, through 100 percent Federal (NOAA) funding. Today, more than half of the Sanctuary staff are State employees paid entirely by Federal funds, including the education staff, Sanctuary officers, and the lower Florida Keys' administration.

The concept of interagency partnerships has been expanded in the management plan for the FKNMS. Dozens of representatives from local, State, and Federal agencies came to the table to assist in the development of the most comprehensive management plan ever attempted in a marine protected area. They also assisted in the development of the National Marine Sanctuary Program's first water quality protection plan. As a special place, the Keys are deserving of the best kind of management that could be afforded.

There are many agencies involved in various management activities in the Keys. However, these activities have not been integrated in the past, and consequently there has not been a holistic approach to managing the fragile marine resources of the Keys. The potential benefits of integrated management of marine resources are numerous including better protection of the marine resources, savings to tax payers by agencies sharing resources, less duplication of efforts, opportunities for increased interagency coordination, and the list goes on.

The regulations do not usurp the authority or jurisdiction of other agencies within the boundary of the Sanctuary. The State will continue to have its authority in State waters and other Federal laws, such as the Magnuson Act, will continue to apply. However, those authorities cannot authorize violation of Sanctuary regulations, and the Sanctuary regulations are not authority to violate other State and Federal regulations.

The FKNMSPA prohibits oil, gas and mineral development within the Sanctuary and prohibits tank vessels or ships greater than 50 meters in length from entering the Area to be Avoided within the Sanctuary boundary. No other management program provides this level of comprehensive protection to the marine resources (e.g., seagrasses, hard bottoms, and coral reefs) of the Florida Keys, or provides the legislative mandate and authority to holistically manage and protect all of the marine communities as an ecosystem. This is a charge given specifically to NOAA and is not redundant of other management programs, nor is it an extra layer of bureaucracy.

Furthermore, NOAA has developed regulations that complement, rather than duplicate, existing authorities. In some cases, NOAA regulations supplement and fill gaps in existing authorities. To this end, NOAA has integrated its planning efforts with the Federal, State, and local agencies in the Florida Keys. This will improve management coordination between the agencies and will lessen the amount of agency overlap in key management areas such as education, research, enforcement, damage assessment, and emergency response. Through integrated planning and implementation, the FKNMS will, at a minimum, streamline the use of public funds and programs to achieve resource protection. This will improve coordination between the various agencies responsible for management of the marine environment in the Sanctuary. Increased agency coordination will benefit Sanctuary resources and the public's use of those resources.

Coordination of Fisheries Management

Comment: The fisheries protocol should not be implemented because it will add another layer of regulations.

Response: NOAA disagrees. The existing fisheries management authorities will continue to manage fisheries under State law, the Magnuson Act, and other Federal law. However, there are three separate sets of fisheries regulations within the boundary of the Sanctuary and coordination of the fishing regulations within the Sanctuary was identified as a goal early in the scoping process. Under the current system, there is confusion in the fishing community which leads to less compliance by the public as they may not understand which regulations apply to a specific geographical area. Uniform regulations would make it easier for the fisherman to comply with the rules and for the agencies to enforce them. This management action will have a positive result on fisheries management by State and Federal agencies. The net result will be beneficial to Sanctuary resources and to the public. Under the protocol, the existing authorities may accomplish this goal under Sanctuary regulations or their own respective authorities. The existing fishery management authorities and NOAA may agree to develop uniform fishing regulations, but they can only be implemented as Sanctuary regulations if there is consensus. The establishment of a consistent set of fishing regulations for the Sanctuary will not result in a fourth set of regulations.

Funding

Comment: There were a variety of comments on the topic of funding of the FKNMS. Some commentors suggested the Sanctuary should be given the necessary funding to implement the management plan and its goals. Other commentors stated NOAA will never have adequate funding to implement all of the programs outlined in the management plan, implying that NOAA could never comprehensively manage the entire Sanctuary. Others suggested that the funding for the Sanctuary be totally directed at solving water quality issues before implementing any other management programs. Suggestions were made that Florida Tourist Development Council (TDC) "bed tax" funds be used for managing Sanctuary activities.

Response: Clearly, implementation of all the programs contained in the management plan would require more funding than the Sanctuary can anticipate presently, or in the near future. However, the management plan is comprehensive and includes suggested actions for the near and long terms. The plan offers a wide variety of management options to address various and diverse management problems in order to give Sanctuary managers the ability to select the most cost effective management tools to address immediate and future problems. It is not NOAA's intent to request funding for immediate implementation of all the management programs outlined in the management plan, but rather use it as a guide for immediate and future plans of action, including the effective use of human and financial resources.

Additionally, the human and financial resource costs for implementing the action plans established to focus Sanctuary management efforts will be shared among the participating Federal, State, and local agencies responsible for various activities. For example, Monroe County receives Boating Improvement Fund allocations that are designed to enhance boating and have specifically been applied to channel/reef marking needs in the Sanctuary. Further, Sanctuary volunteers perform tasks that benefit the goals at a substantial savings to the program. Finally, in addition to annual appropriations, the Sanctuary has the statutory authority to receive donations to support programs. These funds could be received from foundations, non-profit organizations, the Sanctuary Friends organization and others.

NOAA disagrees that all funding should only be used to address water quality or any other single issue within the Sanctuary. Congress, through the FKNMSPA, directed NOAA to develop a comprehensive management plan to manage the Sanctuary and gave specific directions as to what should be considered in the development of the plan. Many of the impacts affecting the health of the coral reef community arise from direct, physical injuries that can be lessened with the implementation of the comprehensive management plan. Additionally, the FKNMSPA requires that EPA, along with the State and NOAA, address Sanctuary water quality issues. Many of these management actions will take years to implement and their positive results will not be realized for some years into the future. By implementing the comprehensive management plan, the FKNMS will be able to address some of the immediate threats confronting the coral reef community as a result of direct human activity.

The State of Florida determines the use of Florida TDC funding (bed tax) for management activities.

User Fees

Comment: Some reviewers raised concern regarding the concept of user fees to fund various programs within the Sanctuary. While some commentors were supportive of the concept, the majority of commentors were against funding Sanctuary management through user fees. A small number of reviewers raised concern that the concept was still contained in the draft plan following a highly publicized workshop on user fees to fund the management of National Marine Sanctuaries where NOAA publicly announced it was not pursuing obtaining the general legislative authority to charge "user fees" to manage Sanctuaries.

Response: NOAA acknowledges that the concept of charging user fees to fund Sanctuary management is not popular, particularly among user groups. The strategy (B.8) for charging user fees to fund the management of the FKNMS has been dropped from the action plans in the FMP/EIS.

The process used to develop the draft management plan allowed all suggestions to be considered for the draft plan. The concept of user fees was suggested by some during the planning process and remained in the draft plan following the "user fee workshop" because of the process used to develop the draft plan. Considering that some were in favor of "user fees," NOAA felt it was necessary to get public comment on the concept in the draft plan.

Many innovative sources of alternative funding have been identified by the public in the workshop and otherwise. NOAA will work with the SAC to explore some of these options.

Ecosystem-Based Approach

Comment : There were conflicting comments on what NOAA's role should be in managing Sanctuary resources. Some recognized that NOAA has done a good job of managing the coral reefs within the Key Largo and Looe Key National Marine Sanctuaries and suggested that NOAA should focus its management on the coral reef tract. Some of these same reviewers pointed out that the primary cause of water quality decline in the Florida Keys was originating from water management and water quality problems in mainland South Florida and the resultant decline in water quality in Florida Bay. In some instances, the Federal Government was blamed for the cause of water quality decline in south Florida. Some reviewers stated NOAA could not have any influence on the water quality problems that were originating outside the boundary of the Sanctuary.

Other reviewers pointed to the decline of water quality in the near-shore waters of the Florida Keys as a result of improper waste water treatment facilities and poor management of storm water runoff and that NOAA should focus its management on these water quality problems.

Other reviewers recognized the importance of NOAA's role in ecosystem management and the significance of the authority that the FKNMS has to address water quality issues that originate both within its boundary, as well as those problems that originate outside and upstream of the Sanctuary. These reviewers were supportive of NOAA's active role in the South Florida Ecosystem Restoration Task Force and the Governor's Commission for a Sustainable South Florida.

Response: In light of its experience of the resource protection accomplished at Key Largo and Looe Key National Marine Sanctuaries, its role in ecosystem management in South Florida, and directions under the NMSA and the FKNMSPA, NOAA will continue to take an ecosystem based management approach in this Sanctuary.

The FKNMSPA directed the Federal Government and the State of Florida to develop a comprehensive program to reduce pollution in the waters offshore the Florida Keys to protect and restore the water quality, coral reefs, and other living marine resources of the Florida Keys environment. The FKNMSPA and NMSA direct NOAA's development of a comprehensive ecosystem management plan rather than one based solely on the coral reef tract. In order to be successful, Sanctuary managers must be able to address impacts that occur across the range of habitats that comprise the coral reef community in an ecosystem-based management approach. This is especially important in addressing issues that influence the quality of the water that affects the marine communities of the Sanctuary. Between 1982 and 1989, NOAA sponsored research projects that helped characterize the movement of water in and around the two existing Sanctuaries. The studies concluded that a portion of the water that influences the coral reef flows from Florida Bay and the Keys, before it mixes with water from the Florida Current in the vicinity of the reef tract. Scientists agree that the sources of the decline in water quality that influence the health of the coral reef resources originate

upstream of the reef tract, in the direction of the Keys and Florida Bay. No matter how intensely NOAA manages activities on the coral reef, the health of the corals will continue to decline until the sources of the water quality decline upstream are addressed in a comprehensive manner.

The designation of the FKNMS gave NOAA a role in the development and the implementation of a water quality protection program with EPA and the State. Sanctuary legislation directed EPA, the State and NOAA to look beyond the boundary of the Sanctuary toward the problems occurring upstream. The designation also gave NOAA the ability to manage in a holistic manner, all of the marine communities that are important to maintaining the biodiversity of the Sanctuary. This was the first step toward ecosystem management, the ability to manage all the marine communities of the coral reef component of the south Florida ecosystem.

NOAA disagrees with comments that it cannot influence, or does not have a role in addressing, the water quality problems originating outside the boundary of the Sanctuary, in Florida Bay, and mainland South Florida. The designation of the FKNMS has given NOAA a prominent role in the South Florida Ecosystem Restoration Task Force whose objectives include the restoration of clean water flows into Florida Bay. NOAA is currently funding approximately 40 percent of the research projects in Florida Bay and the South Florida ecosystem restoration effort. These efforts will result in a positive influence on water quality before it enters the Sanctuary. NOAA leadership has recognized the importance of supporting the efforts of the South Florida Ecosystem Restoration Task Force in order to be successful in the management of the Sanctuary.

The most prominent role for the Florida Keys in the south Florida ecosystem restoration effort has been through the representation of the Sanctuary on the Task Force and the roles of EPA and the State in the Water Quality Protection Program as it is represented on the Task Force. Without the efforts of these agencies on behalf of the FKNMS, the Florida Keys coral reef communities would not be represented on the South Florida Ecosystem Restoration Task Force. Thus, the Sanctuary clearly has a role in influencing the impacts of water quality originating outside its boundary.

Concerns over the demise of Florida Bay have been the topic of debate for at least a decade prior to the designation of the FKNMS. At the first SAC meeting in February 1992, members of the SAC familiar with problems in Florida Bay raised the issue of water quality decline in that area. Commercial fishermen and flats guides shared their observations of decline in Florida Bay water quality. In addition, the Water Quality Protection Program for the Sanctuary recognized that some of the sources of the water quality problems affecting the coral reef were originating upstream of the Florida Keys and Florida Bay. In just over a year, all of the agencies responsible for managing components of the South Florida region had signed an interagency agreement directed at restoring the South Florida ecosystem. The agencies had agreed that the ecosystem begins in the Kissimmee River basin and includes Lake Okeechobee, the Everglades Agricultural Area, the Everglades, Florida Bay, through the Keys, and all the way to the coral reef tract. This was the first time the scope and dimension of the ecosystem had been defined at this scale. It is with this vision that ecosystem management must be implemented in the Sanctuary. The proper water quality and hydrological and ecological linkages throughout the ecosystem must be re-established in order to reverse declines on the coral reef. Each of the agencies responsible for management of components of the ecosystem must work to improve the quality of water in their segment of the ecosystem, while working with other members of the restoration task force to improve the entire ecosystem functions.

Accountability and Power of NOAA

Comment: Some commentors were concerned about the powers of NOAA in general, and some were particularly concerned about the powers of the Director because decisions affecting user groups would be made by authorities in Washington headquarters, as opposed to locally. Some commentors indicated that NOAA should be held accountable for its management actions.

Response: NOAA notes that under various laws and the management plan itself, the powers of other Federal and State authorities remains intact. Moreover, there are a number of checks and balances whereby NOAA is held accountable for their management actions. The Congress holds NOAA accountable through its review of individual Sanctuary management plans and periodic reviews of the National Marine Sanctuary Program. There are also numerous Federal statutes which ensure the accountability of Federal programs, including the Administrative Procedure Act. For example, with the exception of emergency closures, all substantive changes to Sanctuary regulations will require public notice and comment before a change can occur. In this Sanctuary, the State of Florida, as a management partner, will continue to be a check on NOAA's authority,

including the application of Sanctuary regulations in State waters. The EPA and the State of Florida will continue to have the lead in addressing the Water Quality issues that affect the Sanctuary.

To user groups, perhaps the most important check on NOAA's accountability may be SAC. The SAC is comprised of members representing the various Sanctuary user groups (commercial fishermen, charter boat operators, tourism industry, scientific and educational organizations, and conservation groups, etc.). Consistent with the FKNMSPA, the SAC provides NOAA with advice and recommendations on the management plan and its implementation, including resource protection, research, monitoring, education, outreach and other general policy issues related to Sanctuary management. The SAC is also a forum to enhance communication and cooperation between the public, user groups, the Federal/State and local agencies, and non-governmental entities in furtherance of coordinated, efficient and effective management of the Sanctuary. SAC meetings are open to the public and interested persons are given the opportunity to present oral or written statements to the Council.

Under the NMSA and the FKNMSPA, the Secretary of Commerce is directed to develop and implement the Sanctuary management plan and regulations. Under Departmental Orders, this authority has been delegated to the Director of NOAA's Office of Ocean and Coastal Resource Management. The regulations were drafted accordingly. While the Director has in turn delegated most of the day to day Sanctuary management decisions to local Sanctuary managers with appropriate reservations, the regulations were not changed and will continue to reflect the Departmental Orders. The Director's responsibilities for the FKNMS are commensurate with other sanctuaries.

Designation Document/Appendix K

Comment: Many reviewers expressed concern over the Scope of Regulations contained in the draft Designation Document for the FKNMS (Volume III, Appendix K). The concerns were primarily over the broad range of regulations that were contained in the Scope of Regulations. Many feared that NOAA could easily implement these as regulations in the future with little to no public input. Other reviewers were surprised to see that the Scope of Regulations addressed airplane flights, dock construction, and a broad range of other activities that seemed outside the authority of the Sanctuary. Some questioned the need for a designation document as the Sanctuary was designated by statute. Many, including the SAC, urged NOAA to eliminate the Scope of Regulations. However, some reviewers expressed support of the broad Scope of Regulations and urged NOAA to retain what was presented in the draft plan.

Response: Consistent with the recommendations of the SAC and other comments, NOAA has reduced the Scope of Regulations contained in the Designation Document to more closely track the final regulations. As the Sanctuary was designated by the FKNMSPA, the terms of designations were addressed, except for the types of activities that would be subject to regulation which NOAA refers to as the Scope of Regulations. The Scope of Regulations sets forth the types of regulations that may be implemented in the future without going through the entire process set forth in section 304 of the NMSA. Thus, the document is viewed as a charter or constitution for the Sanctuary. NOAA could not implement regulatory amendments within in the Scope of Regulations without public input, as NOAA would still provide the public with the opportunity for notice and comment under the Administrative Procedure Act even if the NMSA section 304 procedures do not apply.

Degradation of Environmental Resources

Comment: NOAA received many comments providing anecdotal information concerning the state of the Florida Keys' marine environment. These comments were personal observations of significant changes in reef species assemblage, visibility of the water, and number of fish. Comments were also received to the effect that even though all people have a right to use the resources of the Keys, people do not use the resources equally and therefore some regulation of behavior is necessary.

Response: The Sanctuary was designated in recognition of the observed declines in the health of the natural marine resources of the Keys. The primary objective of the management plan is protection of natural resources while facilitating private and public use that does not compromise this objective. Thus, Sanctuary management will address such issues as water quality and habitat protection through various strategies and techniques ecosystem-wide in an effort to preserve or restore the resources to a more natural state.

Support for Sanctuary and Management Plan

Comment: NOAA received many comments of support for the Sanctuary, the management plan, and NOAA's history of protecting national marine sanctuary resources.

Response: NOAA thanks all who commented on the Sanctuary, the draft management plan, and proposed regulations and appreciates recognition of its efforts to facilitate all public and private uses of the Sanctuary consistent with the primary objective of resource protection. The Sanctuary will continue to encourage public involvement, interagency cooperation, and continuous management actions to achieve resource protection.

Limit the Sanctuary Boundary to the Reef Tract

Comment: Some reviewers recognized that NOAA has done a good job of managing the coral reefs within the Key Largo and Looe Key National Marine Sanctuaries but suggested that NOAA should only focus its management on the coral reef tract.

Response: The FKNMSPA directed the Federal Government and the State of Florida to jointly develop and implement a comprehensive program to reduce pollution in the waters offshore the Florida Keys to protect and restore water quality, coral reefs, and other living marine resources of the Florida Keys' environment. The Act set forth the boundary as well as the scale of protection necessary to effectively manage natural and cultural resources in a holistic manner. Thus, NOAA strongly disagrees that it should just focus its management on the coral reef tract. In order to be successful, Sanctuary managers must be able to address impacts that occur across the range of habitats that comprise the coral reef community in an ecosystem-based management approach.

Allowed Activities

Comment: NOAA received comments requesting that the management plan include a list of allowed activities, not only prohibitions. The SAC discussed a bill of rights and ultimately recommended that there be a list of activities that would be allowed in the Sanctuary.

Response: In response to these comments, NOAA has modified the regulations at § 922.42 to state that "all activities (e.g., fishing, boating, diving, research, education) may be conducted unless prohibited or otherwise regulated . . . ." The change is not intended to provide a legal defense for actions against those who violate Sanctuary regulations, but rather to clarify that such activities are allowed to be conducted in the Sanctuary at present and will be allowed in the future, subject to appropriate regulation.

Property Rights and Land-use

Comment: Many comments were received questioning what authority the Sanctuary will have over land use and property rights.

Response: The Sanctuary boundary includes the marine environment and submerged lands but does not include land above mean high tide. Sanctuary regulations are directed at activities in the marine environment, but may apply to activities that directly threaten or impact marine resources within the Sanctuary, which are those lying below mean-high tide. Sanctuary regulations do not take away rights of property owners nor affect activities that do not adversely affect Sanctuary resources.

Special-use Permits

Comment: Some commented that the section on Special-use Permits needs to be more specific.

Response: This regulatory section reflects the provisions of section 310 of the NMSA regarding Special-use Permits. The National Marine Sanctuary Program has had the authority to issue Special-use Permits since 1988, but has only issued few such permits to date. While the NMSA and its legislative history indicates that section 310 is self-implementing and does not require implementing regulations, NOAA has considered the comments and determined that additional information and public input would be appropriate before the development of more regulations with more specificity than is presently in section 310. To the extent more specificity is needed, it should be done in guidelines for the National Marine Sanctuary Program rather than for

this particular Sanctuary. In the interim, the Program will continue to work with individual applicants and the public on Special-use Permits.

Coordination with Other Agencies/Conflict Resolution

Comment: Some commentors expressed the need for coordination between agencies and a mechanism to resolve conflicts between agencies and the public. Others suggested a mechanism be established that provides an administrative appeals process consistent with the Administrative Procedure Act.

Response: NOAA is establishing an Interagency Group to assist in coordinating the implementation of the final management plan for the FKNMS. Additionally, Appendix J contains a Co-trustees Agreement that is accompanied by a series of draft protocols and memoranda of agreements that will serve to outline the way the agencies will conduct the management of the Sanctuary.

The administrative appeal process for Sanctuary management decisions is set forth at § 922.50. Agency decisions, including any amendments to Sanctuary regulations, must be done in accordance with the procedures and requirements of the Administrative Procedure Act.

Monroe County and/or the State Should Manage the Sanctuary

Comment: Some commentors suggested that the State of Florida or Monroe County be charged with developing a management plan and managing the resources of the Florida Keys.

Response: Under the FKNMSPA and the NMSA, NOAA is required to develop and implement a Sanctuary management plan. However, the Sanctuary planning process has included the State and county as partners in the development of the comprehensive management plan. The continuous management process, as described in Volume I of the FMP/EIS, includes Federal, State and county agency managers in the continuous management of the Sanctuary. This will help NOAA assure the integration of management programs between the various agencies in a comprehensive manner.

Socio-economic Impacts

Comment: Some reviewers commented that NOAA did not provide a thorough socio-economic analysis of its actions on commercial or recreational fishing. NOAA also received comments that the Sanctuary will negatively impact the economy of the Keys , as well as comments that the Sanctuary is the only hope to sustain the Keys' tourist economy which is heavily dependent on the presence of a healthy marine environment.

Response: NOAA prepared a socio-economic assessment for the Draft Management Plan and Environmental Impact Statement in compliance with the NMSA and National Environmental Policy Act (NEPA). In response to comments, NOAA has provided a more detailed explanation of the careful balancing of environmental and socio-economic impacts in developing the Preferred Alternative/Management Plan section of the Volume I. A more thorough assessment of the socio-economic impacts on various user groups from management alternatives is found in Volume III, Appendix M.

In an effort to maximize resource protection and minimize adverse impacts on users, NOAA considered socio-economic impacts in developing the draft management plan. Based on the public comments and reports supplied by the fishing industry, NOAA has further detailed this analysis in the final environmental impact statement and modified the final management plan accordingly.

Personal Watercraft

Comment: NOAA received many comments from the public reminding NOAA that personal watercraft owners and users act responsibly and requesting that personal watercraft not be singled out and treated differently from other vessels. NOAA also received comments noting frequent environmental nuisance and safety issues associated with the operation of personal watercraft. These included: reckless operating behavior, harassment of endangered and other species, harassment of other boaters (including disruption of fishing on flats), and noisy operation in canals or adjacent to residential shorelines. These commentors requested

limiting, restricting or banning the use of personal watercraft within the Sanctuary. One reviewer said, "jet skis take the magic out of the Keys."

The SAC recommended that NOAA work with the industry, the SAC, and the public to establish zones for the voluntary use of personal watercraft in specified areas within one year after issuance of the final management plan. The SAC also recommended that if these zones were not voluntarily established within one year, then NOAA should ban the use of personal watercraft throughout the Sanctuary. In addition, the SAC recommended adding to the regulations a prohibition against reckless operation of vessels. The SAC also recommended that the proposed vessel operation regulation (proposed § 929.5(a)(5)(iv)) be modified to restrict vessels from operating at speeds greater than idle speed only/no-wake in designated idle speed only/no-wake zones, and modify the minimum distance requirements in the regulation.

The personal watercraft industry commented that there was no basis to impose severe regulatory restrictions on the use of personal watercraft, but generally supported the strategy of restricting all motorized vessel use in certain buffer zones and establishing idle speed only/no wake areas. The industry also strongly endorsed the strategy of working with NOAA to educate recreational personal watercraft users in the Sanctuary, and develop industry standards for rental operations in the Sanctuary.

The State of Florida questioned whether distance restrictions delineated in the buffer zones could be adequately enforced.

Response: NOAA has developed a multi-pronged approach to address the public's concern about the use of personal watercraft. NOAA has accepted the SAC's recommendation to add a new section to the final regulations (§ 922.163(a)(v)) which prohibits reckless operation of all watercraft. Additionally, proposed §922.163 (a)(5)(iii) has been modified to prohibit operating a vessel at greater than idle speed only/no wake (except in marked channels) in designated areas within 100 yards from residential shorelines, stationary vessels and navigational aids marking emerging or shallow reefs. NOAA has also incorporated into its regulations the authority to enforce all idle-speed only/no wake areas throughout the Sanctuary. NOAA will use the existing county and State process for designating these areas. NOAA accepts that the industry is seriously committed to self regulation and will develop successful educational efforts geared toward changing user behavior. The final component of NOAA's approach is a modification of the SAC's recommendation. NOAA will begin establishing broad zones with restrictions on the use of personal watercraft (consistent with the SAC recommendation) in one year only if these initial efforts are not successful at significantly reducing or eliminating the nuisance and safety problems, as well as the threats to the natural resources.

Channel/Reef Marking Action Plan

Boater Education

Comment: Channel/reef marking must be supplemented with boater education in order to limit impacts on shallow water marine resources. The channel/reef marking action plan does not contain strategies that address education.

Response: NOAA agrees that boater education is a critical component for protection of shallow water resources of the Sanctuary. The education and outreach strategies directed at boating impacts are contained in other management action plans.

Marking Shallow Water Habitats and Vessel Routes

Comment: The action plan does not address marking coral reefs and other shallow water habitats outside of channels, to warn boaters of sensitive areas. The action plan should be revised to include navigational aides that warn boaters and should be renamed "Navigational Marking Action Plan" or the "Channel/Reef Marking Action Plan".

Response: NOAA agrees that providing navigational aides that warn boaters of sensitive, shallow water habitats is a necessary component of resource protection. NOAA will work closely with the USCG, the State, and the county to provide appropriate internationally recognized navigational aides to mark sensitive, shallow water habitats such as coral reefs. NOAA also recognizes that providing a logical and clearly marked system of channels in high traffic areas is the preferred method of routing vessel activity away from sensitive habitats. In addition, strategic placement of navigational aides used to warn boaters is necessary in many areas and will be

pursued. NOAA has revised the action plan and has renamed the plan as the "Channel/Reef Marking Action Plan."

Channel Marking Criteria

Comment: The criteria for determining the priorities for marking channels as well as the locations of high priority channels should be included in the plan. The SAC recommended draft channel marking criteria and a list of high priority channels to be marked.

Response: The criteria for channel marking prioritization as recommended by the SAC has been included in the final action plan. However, including a list of high priority channels recommended by the SAC is premature. Instead, the action plan establishes a process for identifying and prioritizing channels to be marked. The list of proposed channels recommended by the SAC has not been subject to review and prioritization by those criteria. All areas to be marked should be reviewed through the process set forth in the action plan. Thus, the list of priority channels has not been included in the final action plan, but the criteria and process have been included.

NOAA's Role

Comment: The draft action plan does not clearly define NOAA's role in the channel/reef marking program.

Response: The final plan (Strategy B.4, Activity 8, Implementation) more clearly defines NOAA's role in this effort.

Effectiveness Assessment

Comment: Expand the activity associated with the assessment of channel marking effectiveness to include on-site monitoring and research, in addition to aerial photography.

Response: NOAA agrees and the final action plan (Strategy B.4, Activity 6) reflects this comment. Further, Strategy B.4, Activity 8 has been expanded to address removal of markers that are found to have a detrimental effect.

Update Status

Comment: Many of the activities originally described in the action plan have already been completed or their status needs to be updated.

Response: NOAA agrees. The final action plan reflects the current status of activities.

Four Point Program

Comment: Some reviewers support the Boating Impact Working Group's (BIWG) "Four Point Program." The final management plan needs to be expanded to include establishment of no access and restricted access areas, as recommended by the BIWG.

Response: NOAA agrees that the establishment of no access and restricted access areas are an effective method to reduce shallow water impacts. The plan recognizes this and adopts a series of restricted access areas associated with the Wildlife Management Areas (see Regulatory Action Plan, Appendix III to Part 922.164(c) - Wildlife Management Areas, and the Zoning Action Plan maps). Most of these areas are part of or are adjacent to DOI National Wildlife Refuges, however seven non-associated areas were added. These are the only areas that NOAA received specific input on during the planning process. NOAA will monitor the effectiveness of designating these areas as Wildlife Management Areas and imposing access restrictions and will consider adding other areas in future revisions of the plan.

Removal of Problematic Aides to Navigation

Comment: There is no mechanism in the plan to remove channel markers that prove to be problematic because they increase vessel impacts to shallow water areas.

Response: Strategy B.4, Activity 6 provides a mechanism to evaluate the effectiveness of channel markers for the protection of marine resources. Strategy B.4, Activity 8 has been expanded to address removal of markers that are found to have a detrimental effect on marine resources.

Channel/Reef Marking is Expensive

Comment: The proposed channel/reef marking program is too costly at a time when the government is trying to economize.

Response: The primary funding source identified in the plan for channel/reef marking is the Boating Improvement Fund (BIF) and the current aides to navigation program administered by the US Coast Guard. The BIF is an existing funding source that is administered by Monroe County. The money is derived from a portion of State vessel registration fees which are returned to the county where they were generated. This money must be used for projects designed to enhance boating, and is specifically targeted at channel/reef marking, launching facilities and similar projects. Currently, Monroe County receives approximately $125,000 annually from this source. Therefore, this money is available for channel/reef marking already, and the management plan is designed to provide a coordinated effort at prioritizing expenditures. Additionally, the US Coast Guard continues to fund the installation and maintenance of many of the aides to navigation used in the Sanctuary. These funds do not come directly from NOAA.

Stay in the Channels Only

Comment: There are fears that once the channels are marked, boaters will be prohibited from going outside of the channels. Further, in the interim, boaters-especially fishermen-should not be penalized for prop dredging until the markers are installed.

Response: The regulations do not prohibit vessels from navigating outside marked channels regardless of depth. What the regulations do prohibit is the destruction of seagrass and other shallow marine resources as a result of imprudent operation of vessels.

Deep Water Access

Comment: Several reviewers requested that a definition of deep water access be added to the regulations and questioned how the Sanctuary will address areas that are accessible only at certain tides.

Response: The channel/reef marking action plan assumes a 4 ft mean low water as a threshold criteria for deep water access. This is consistent with current State and local regulation and criteria. Channel/reef marking will not be a substitute for local knowledge or normal prudent navigation skills.

Arrows on Channel/Reef Markers

Comment: Navigational aids should be clearly understandable to guide boaters through channels and warn them of shallow areas. It was also suggested that channel/reef markers include arrows indicating the direction of the channel.

Response: It is necessary that standardized channel marking for the Sanctuary conform to the international rules of the road as required by the US Coast Guard and the State of Florida. The Coast Guard discourages the use of arrows on posts, but will allow gated (double) markers to mark particularly sensitive areas.

Education and Outreach Action Plan

Education v. Outreach

Comment: A number of reviewers expressed concern that the draft management plan addresses education at the expense of outreach noting that, while compatible, they are distinct and address different needs and audiences.

Response: NOAA agrees, and the final management plan clearly reflects both responsibilities. The Education Action Plan has been renamed the Education and Outreach Action Plan.

Education Supports Resource Protection

Comment: A number of reviewers recommended the inclusion of a new education goal to reflect the intent of the Education Program in achieving resource protection and management goals of the Sanctuary. The National Park Service made several suggestions on how the plan should be modified to reflect that the educational strategies include cultural as well as natural resources. Additionally, some reviewers said that an adequate education program could alleviate the need for additional regulations.

Response: The final management plan states that the intent of the program is to educate the public about Sanctuary resources (natural and cultural), thus complementing the protection and management goals of the plan. Education and regulation are complimentary management tools in resource protection. It is hoped that increased education will result in voluntary compliance with regulations through increased understanding.

Spanish-Speaking Staff

Comment: A number of reviewers recommended the hiring of a Spanish-speaking staff member for the Education program.

Response: In order to address the multi-lingual nature of many Education and Outreach activities, the contracting or hiring of a Spanish-speaking education staff member or intern will be given priority consideration.

Funding for Education and Outreach

Comment: Reviewers recommended increased funding of the Education Action Plan. Additionally, the pursuit of alternative sources of funding was also recommended.

Response: Education is a primary management tool in resource protection and will be considered in budget allocations. The management plan addresses alternative funding.

Priorities

Comment: Many reviewers expressed concern that the education strategies ranged from an overall priority level of three to five and had an anticipated low level of action in year one.

Response: Some of these activities are already underway in the Sanctuary's Education and Outreach program. NOAA agrees that the priority level for education and outreach should be elevated. As a result, the document has been revised and updated.

Enforcement Action Plan

Interpretive Enforcement/Connection Between Enforcement & Education

Comment: Many reviewers did not understand the concept of interpretive enforcement. Others felt that law enforcement officers should supplement the Sanctuary's education program. Others commented that NOAA should educate the resource users rather than using enforcement officers to catch violators who are making mistakes.

Response: The term "interpretive enforcement" refers to the merging of education functions with the enforcement officers' duties. NOAA strongly agrees that an effective enforcement program includes not only enforcement of violations, but education of Sanctuary users to achieve voluntary compliance with regulations. Although Sanctuary officers have full authority to enforce regulations, education is a primary tool of enforcement as outlined in the Enforcement Action Plan and the Education and Outreach Action Plan. The Sanctuary will undertake an outreach effort to make users aware of the regulations. For example, law

enforcement officers distribute Sanctuary pamphlets in their contact with boaters during water patrols, and use this education opportunity to gain voluntary compliance.

Standardization

Comment: Wording in the draft management plan is ambiguous, therefore it leaves interpretation to the enforcement officers. The comment also charged that information received from officers is not consistent from officer to officer.

Response: Through coordination and training of law enforcement officers, standardized enforcement procedures, including interpretive enforcement, will be achieved. This is outlined in the Enforcement Action Plan.

Coordination with Existing Agencies

Comment: There are 24 agencies currently responsible for protecting the natural and cultural resources of the Florida Keys. What is NOAA going to do to make them do their jobs?

Response: There are numerous agencies with responsibilities and somewhat limited ability for full enforcement of all rules everywhere. NOAA will seek to coordinate their activities, thus achieving more effective enforcement of all regulations. To this end, the FKNMS has developed an agreement with other enforcement agencies such as the US Coast Guard, the State of Florida, the US Fish and Wildlife Service, and the National Park Service to maximize and coordinate existing assets concerning Sanctuary enforcement. Since the Sanctuary includes both State and Federal waters, close coordination between the State and NOAA is essential.

Funding/Additional Enforcement

Comment: The management plan states that an additional 30 law enforcement officers will be needed for the Sanctuary. Many reviewers agreed that additional officers are needed to enforce laws, but questions were raised: Where will the funding come from for these officers? What is the timing for hiring additional officers?

Response: NOAA agrees that enforcement is important for successful comprehensive resource protection and management. In balance with other Sanctuary management needs, the expansion of the law enforcement program will be phased in as funding allows. Funding is critical but limited and must be balanced with other management goals such as education and outreach, research and monitoring. The hiring of an additional 30 law enforcement officers is a goal of the enforcement program. NOAA will work actively with the State to identify alternative funding sources for hiring additional law enforcement officers.

Mooring Buoy Action Plan

Use of Volunteers

Comment: Encourage the utilization of volunteer assistance in mooring buoy management and reference the interaction with the Volunteer Action Plan.

Response: The benefit of using volunteers in various stages of mooring buoy management is recognized, and reference to utilizing volunteers and volunteer programs was included in the draft. However, NOAA agrees that more emphasis should be placed upon the use of volunteers and the plan has been revised to reflect this (Strategy B15, Activity 1, Implementation; Activity 8, Implementation). In the area of mooring buoy maintenance, volunteers will be used at the direction of those responsible under contract for the maintenance program.

Participation by the SAC

Comment: The SAC should be formally involved with all aspects of mooring buoy planning and management.

Response: NOAA agrees, and the Final Management Plan reflects this (Strategy B15, Activity 2, Activity 3, Activity 4, Activity 6, Activity 9).

Streamline Permitting

Comment: The permitting process to install mooring buoys needs to be streamlined to assure easier ability to accept donated mooring buoys or funding to install mooring buoys.

Response: The purpose of the mooring buoy plan is to identify appropriate sites for installation of new mooring buoys within the Sanctuary. Once the plan is finalized, it is NOAA's intent to obtain approval for the installation of all buoys from all applicable agencies.

Carrying Capacity Strategy

Comment: Considerable comment was received on the concept of carrying capacity. Some noted that the implementation of carrying capacity based on mooring buoy placement alone is inappropriate. This is because it is the number of divers on a vessel that is the most important aspect, not the number of vessels. The SAC recommended to remove the Carrying Capacity Strategy (Strategy R.5) from the Mooring Buoy Action Plan. This strategy should only occur in the Research and Monitoring Action Plan. Others suggested to separate the issue of carrying capacity from mooring buoys by developing a carrying capacity action plan. However, comment was also received that carrying capacity must be established for high use coral reef areas and that the use of mooring buoys is one method to implement carrying capacity.

Response: NOAA agrees that the issue of carrying capacity is much larger and more complex than can be addressed in the Mooring Buoy Action Plan alone. Mooring buoys are only one possible tool that could be used in the implementation of carrying capacity. At this time, there are no definitive studies available that could aid in establishing carrying capacity limits. The Research and Monitoring Action Plan will provide the opportunity for studying this topic. Therefore, it is necessary to undertake additional research before such limits can be considered. NOAA has revised the management plan to remove the carrying capacity strategy from the Mooring Buoy Action Plan. It remains in the Research and Monitoring Action Plan and will be given a high level of priority. It is not advisable to create an entire new action plan for carrying capacity at this time.

No Anchoring in the SPAs

Comment: A large number of comments were received that recommended a no-anchoring policy within Sanctuary Preservation Areas (SPAs) where mooring buoys are present. The SAC recommended that the SPAs become no-anchoring zones, but that this should be phased in as sufficient mooring buoys are placed to accommodate existing uses. They also recommended that this issue be divorced from the Mooring Buoy Action Plan and be inserted into the zoning and regulatory action plans.

Response: NOAA agrees that the SPAs should become no-anchor zones. Before this policy is implemented, there should be a sufficient number of buoys in each SPA to accommodate a reasonable level of demand. The Working Group established in the Mooring Buoy Action Plan (Strategy B.15, Activity 4) will determine the sufficiency of the number of mooring buoys in the SPAs in developing the mooring buoy management plan. In the meantime, the regulations require boaters to use mooring buoys when they are available in SPAs and prohibit anchoring on coral. Thus, anchoring would be allowed on sand.

Support for Mooring Buoy Program

Comment: Numerous comments were received that indicated strong general support for mooring buoys. Some indicated that the buoys should not be just for divers but should consider the needs of fishermen as well.

Response: NOAA feels that the mooring buoy program is one of the most important proactive resource management actions that the Sanctuary has taken. The mooring buoy program will continue to be a major emphasis of the FKNMS. The FKNMS management team will consider mooring buoys for fishing uses in addition to those used primarily by divers.

Installation and Management of Mooring Buoys by Non-Profits

Comment: Several comments were received that stated that the FKNMS should leave the management of mooring buoys in the hands of existing agencies and non-profit organizations. Federal money would be

better spent by giving it to non-profits. Some reviewers indicated that NOAA had overestimated the cost of mooring buoy maintenance.

Response: The Mooring Buoy Action Plan calls for encouraging new and continued efforts of non-profits and other organizations, as well as exploring other innovative funding mechanisms for installing and maintaining mooring buoys. The National Marine Sanctuary Program currently maintains approximately two thirds of the mooring buoys in the Florida Keys. It has been found to be a cost effective program utilizing local contractors for maintenance service. The costs in the action plan were somewhat high, as they were originally based on the maximum deployment of mooring buoys throughout the Sanctuary, not on current conditions. Cost was also based on a five year planning time frame, which was not made clear in the plan. The action plan has been revised to consider a more modest deployment of mooring buoys and has been clarified in regard to annual maintenance costs.

Raise the Priority of Mooring Buoy Program in Management Plan

Comment: Raise the overall Sanctuary priority level for mooring buoy activities from 3 to 2, in order to emphasize its importance.

Response: NOAA agrees that mooring buoy management is a high priority and the final management plan reflects the change from a medium to high level of priority.

Limit the Size of Vessels Using Mooring Buoys

Comment: Some reviewers recommended that NOAA limit the size of vessels using mooring buoys.

Response: Considering that the size of the anchoring apparatus increases with the size of the vessel, NOAA is hesitant to limit the size of vessels that use mooring buoys because this action may force large vessels to anchor thus increasing the potential impact to the coral reefs. However, the mooring buoy action plan contains activities that address the management of large vessel use on mooring buoys in high use or sensitive areas and NOAA is committed to improving mooring buoy technology to accommodate large vessel use. Additionally, NOAA has included a restriction on damaging mooring buoys in the regulations which places the burden on large vessel operators to assure that their use of mooring buoys is conducted in a manner so as not to damage the mooring buoy or hardware. This includes adding additional tag line to the mooring buoy in rough seas.

Regulatory Action Plan/Regulations

Definitions

Comment: NOAA received comments suggesting that several definitions be added to the list of definitions in the Sanctuary regulations.

Response: NOAA has added definitions, including those for coral, coral area, coral reefs, hardbottom, and residential shorelines, to the regulations.

Anchoring

Comment: NOAA has received several comments on the issue of anchoring within the Sanctuary. Comments ranged from requests for a Sanctuary-wide prohibition on anchoring on coral to those suggesting a prohibition only on the shallow reefs. Commentors stated that the bottom is often not visible in 50 feet of water, and therefore the anchoring restriction was impractical.

Response: NOAA has revised proposed § 922.163(a)(5)(ii) to prohibit anchoring a vessel on coral other than hardbottom in depths less than 40 feet when visibility is such that the seabed can be seen. This restriction does not apply to anchoring on hardbottom. This regulation is necessary to address the impact of anchoring on coral.

Vessel Operation

Comment: Operation of vessels, particularly personal watercraft (jet-skis) generated considerable comment during the review process. Many reviewers were concerned about the operation of personal watercraft in such a way as to create a nuisance, or in a manner that disturbed wildlife or affected the health of Sanctuary resources. One reviewer said, "jet skis take the magic out of the Keys." On the other hand, there were numerous comments that the operation of personal watercraft should not be singled out from the operation of other vessels. Others commented about the adverse impacts from all vessels on shallow water habitats and wildlife in the Sanctuary. Careless operation of all vessels was also an issue of concern by the public.

NOAA received considerable comment from the public, the SAC, and the State of Florida on the proposed regulations for operation of vessels at greater than idle speed only/no wake near islands, residential shorelines, stationary vessels, and emergent reefs. Considerable comment was received on the proposed regulation that restricted vessel operation at a speed greater than idle speed only or no wake within 200 yards of mangrove fringed islands, residential areas, flats, stationary vessels, and other features.

Response: NOAA recognizes the adverse impact on Sanctuary resources and the user conflicts that can occur from the operation of all vessels. The threat to Sanctuary resources is universal to the operation of all vessels, not just any one type. However, the size, maneuverability, and shallow draft of personal watercraft results in operator behavior that makes them a greater source of user conflict and threatens Sanctuary resources more than any other vessel, particularly in shallow water habitat. Approximately 40 percent of the boating accidents in Monroe County in 1995 resulted from personal watercraft. This statistic indicates that the potential for careless operation of personal watercraft is very high. Most of the negative public comments about personal watercraft were behavior related examples.

The final regulations do not single out personal watercraft. Rather, the regulations apply to operation of all vessels to comprehensively address the potential resource impact, user conflicts and safety problems within the Sanctuary. The final regulations specify that, except in marked channels, vessels are prohibited from operating above idle speed or creating a wake in areas marked idle speed only/no wake, and within 100 yards of residential shorelines, stationary vessels, and marked emergent reefs, and 100 feet from a divers down flag. As regards the 100 foot distance requirement from diver down flags, NOAA modified this from the proposed 100 yard requirement to be consistent with State regulations.

Personal Watercraft Rentals

Comment: Many reviewers commented on the use of rented personal watercraft. Some in support, some in opposition, and some in support with appropriate restrictions. The SAC recommended that NOAA work with the personal watercraft (PWC) industry to begin a process to identify whether there is a need to establish restrictive zones. Comments from the personal watercraft industry representatives indicate interest in self regulation.

Response: NOAA plans to work with the PWC industry, the SAC and the public to determine regulatory and non-regulatory steps to address the issue, including the potential need and location of PWC rental use-zones.

Emergency Closures

Comment: Some reviewers were concerned about the ability of the Director or his designee to be able to close areas for various purposes, such as emergency closures, for unspecified periods of time.

Response: The regulation has been revised to authorize the closure of areas, and/or the imposition of limited access provisions for a period of 60 days, with the option of one additional 60 day renewal. In addition, under the Co-Trustee Agreement, the Governor and Cabinet will be provided advance notice of emergency closures. The Governor has the authority to re-open the area in State waters by certifying his/her objection to NOAA. Similarly, the Florida Marine Fisheries Commission will be provided advance notice of closure of areas to fishing activities. Any closure beyond 120 days would require providing the public the opportunity for notice and comment as required by the Administrative Procedure Act. Such area closures will be limited to the minimum amount of area as necessary so as to achieve the purpose of the closure and avoid or minimize adverse impacts to Sanctuary users.

Civil Penalties

Comment: Some reviewers expressed an interest in having a penalty schedule published in the final management plan showing a scale of penalties for various infractions. Many reviewers have expressed concern about the discretion of enforcement officers in handling violations. Reviewers feared that NOAA could abuse it's authority and charge the maximum $100,000 civil penalty per day for a minor infraction. Some commented that civil penalties as outlined in draft regulations implied an "all or nothing" approach to enforcement and that the potential economic consequences if boaters are scared away from using the Sanctuary because of excessive regulations should be noted. Some commented that the penalty structure must be expanded to include degrees of violations, both intentional and unintentional. Some commented that the threat of enforcement for the intentional vandal should be significant while the inadvertent accident of a well-meaning citizen should not be the grounds for a severe penalty. Some asked who would develop the penalty structure and what public review process the penalty structure would go through?

Response: Civil monetary penalties are based upon publicly available penalty schedules.
Civil penalty schedules will be developed for Sanctuary violations by the Office of General Counsel for Enforcement and Litigation, with input from the Office of Law Enforcement, the Sanctuary program, the Regional Administrator for the Southeast Region, and the U.S. Coast Guard. The schedule will include enforcement actions that may be taken against violators which may include verbal warnings, written warnings, civil monetary penalties, permit sanctions, and/or seizures of property. Many factors are taken into account in determining an appropriate penalty for a particular violation, including prior violations, the severity of the offense, and other aggravating or mitigating circumstances.

Although civil penalty schedules are not published in management plans or the Federal Register, upon being made effective the schedules are publicly available. For example, the civil penalty schedules are publicly available for the current Key Largo and Looe Key National Marine Sanctuaries.

Sanctuary Certification/Authorization of Permits/Leases/Licenses

Comment: Some reviewers, including the SAC, expressed concern over the application of terms and conditions to leases, permits, licenses particularly those in existence prior to the designation of the Sanctuary. The public's concern was that the regulations on Sanctuary certification of pre-existing permits (proposed § 929.14) and Sanctuary authorization of other agency permits or authorizations after the effective date of the Sanctuary (proposed § 929.15) were too broad and appeared to give the Director the power to change existing authorizations. Commentors indicated that such power should not be handed over to a non-elected official without the right of appeal on the part of the individual holding the permit, lease, license or authorization.

Response : The State, county and other Federal agencies will continue to exercise their authority to issue permits. The Sanctuary will not pre-empt their authority to issue permits. In order to avoid duplicative permits and paperwork requirement, NOAA will seek to address Sanctuary concerns through those existing authorities. However, those authorities cannot authorize something that the Sanctuary prohibits. This regulatory authority is consistent with most sanctuaries and is based on provisions of the NMSA. Although the NMSA authorizes NOAA to regulate existing permits, including adding conditions, such regulations may not terminate any pre-existing permits, licenses or leases. Furthermore, §§ 922.167(i) and 922.168(h) provide that the Director's conditions or other decisions may be appealed. The appeal procedures are set forth in §922.50. In addition, there are other checks and balances in place that prevent abuse of discretion relating to permits. NOAA and the State have developed a draft interagency agreement which identifies which activities will be subject to certification and authorization, and how the review process will be coordinated.

Sanctuary Permits-Time Limitations

Comment: Some reviewers requested that NOAA place a time limit on itself in which to respond to a permit request. The SAC suggested a 60-day time limit.

Response: NOAA has not imposed any time constraint for responding to permit requests. However, NOAA agrees that 60 days is a reasonable time in which to respond to a permit application. Normally, NOAA responds within 3 weeks to a month after receipt of a complete application for most permits. However, a 60-day time frame may not be appropriate for large or complex projects.

Sanctuary Permit Reporting Procedures

Comment: Some reviewers expressed concern over the reporting requirements for permits.

Response: NOAA has not changed the permit reporting requirements. No reports are required more often than monthly. For permits issued for one year, the reports required are a "quick look" report and final report. Longer permits require a "quick look", annual, and final reports. Reports assist the Sanctuary in assessing the progress and impacts of a permitted activity and provide information useful to Sanctuary management.

Fee Schedule/Special Use Permits

Comment: Some reviewers suggested NOAA develop a fee schedule, based on fair market value, for the issuance of Special-use Permits.

Response: NOAA has not included a fee schedule in the final plan. The need for a Special-use Permit fee schedule is programmatic, not Sanctuary specific, and the details and specifics of Special-use Permits have not been completed by the Sanctuary and Reserves Division of NOAA. Further, the small number of Special-use Permits issued to date has not warranted the administrative review and development of such a schedule. Special-use permits will continue to be considered on a case-by-case basis.

Effectiveness of Enforcement of Regulations

Comment: There was comment expressing concern about the effectiveness of enforcing the Sanctuary regulations.

Response: NOAA feels that effective and efficient resource protection requires coordination with existing regulations. As a result, the Sanctuary is developing an agreement with other enforcement agencies such as the US Coast Guard, State of Florida, US Fish and Wildlife Service, and the National Park Service to maximize and coordinate existing assets concerning Sanctuary enforcement. Since the Sanctuary includes both State and Federal waters, close coordination between the State and NOAA is essential.

Florida Clean Vessel Act/Vessel Discharge

Comment: The State of Florida and other reviewers recommended that NOAA establish regulations throughout Federal waters that meet the requirements of the Florida Clean Vessel Act.

Response: NOAA has not incorporated the provisions of the Florida Clean Vessel Act in the final regulations. This act does, however, apply to the 65 percent of the Sanctuary in State waters. Further, the proposed regulations prohibited all discharging and depositing of any material or other matter except cooling water or engine exhaust in Ecological Reserves, Sanctuary Preservation Areas, Wildlife Management Areas, and Special-use Areas. The final Sanctuary regulations retain these prohibitions and also add it to the Wildlife Refuge Existing Management Areas. Thus, discharge from marine sanitation devices in these areas is prohibited. This will protect the shallow coral reefs from discharge of nutrients. In addition, NOAA will work with the State of Florida and the Water Quality Steering Committee concerning incorporation of provisions similar to the Florida Clean Vessel Act throughout the Sanctuary.

Transiting No-Take Zones

Comment: Some fishermen expressed concern over the inability to transit no take zones with their equipment on board and their catch taken from outside the zones.

Response: In § 922.164(d)(ii-iii), NOAA has amended the proposed regulations to allow the transit or possession of gear or catch provided the gear is stowed so as to be not available for immediate use before entering or transiting an Ecological Reserve or Sanctuary Preservation Area and the catch is stored in a manner which shows it was not taken within these areas.

Live Rock Harvest, Shell and Tropical Fish Collecting

Comment: Many reviewers commented on the collection and harvest of live marine organisms and mollusc shells.

Response: Live rock harvesting is currently prohibited under State and Federal fisheries law. The prohibition has been added to Sanctuary regulations to protect these Sanctuary resources should the restrictions under other laws be removed. Shell collecting and tropical fish collecting and other consumptive activities are prohibited in the SPAs and Ecological Reserves. In addition, the Florida Marine Life Rule has been incorporated by reference into the Sanctuary regulations and thereby extended into Federal waters. These regulations will address some concerns of exploitation while minimizing economic impact. The marine life rule is referred to in § 922.163(a)(12) of the Sanctuary regulations and is reproduced in Appendix VIII.

Diver Impact

Comment: Some commented that stronger regulations were needed to prohibit coral touching and recommended specific regulations dealing with diver and snorkeler impacts on the coral reefs. Some suggested prohibiting the use of gloves or requiring float coats for snorkelers. There was also a comment that there should be no prohibition against impacts to dead coral.

Response: Section 922.164(d)(iv) of the Sanctuary regulations prohibits divers and snorkelers from touching or standing on living or dead coral formations in the SPAs and ERs. Approximately eighty to eighty-five percent of the year-round diving and snorkeling activity within the Sanctuary takes place in the 18 SPAs and one ER established by the final regulations. This single regulation will address the issue of diver impact on coral reefs without having to develop a series of regulations on gear requirements that accomplishes the same goal. NOAA included "living or dead" coral formations with the understanding that some visitors to the Sanctuary do not know the difference between living and dead corals. Additionally, impacts to dead coral formations may disrupt new coral recruits. The removal or injury to corals is also prohibited Sanctuary-wide.

Spearfishing

Comment: Some reviewers expressed concern about spearfishing within the Sanctuary, while others urged NOAA to allow it to continue in a managed manner.

Response: In balancing the public's concern and interest over the issue of spearfishing within the Sanctuary, NOAA has prohibited spearfishing in the SPAs, ERs, Research-only Special-use Areas, and some of the Existing Management Areas. NOAA has addressed the concerns of over-harvest by this fishing technique in eighty to eighty-five percent of the total area within the Sanctuary dived by recreational divers and snorkelers. However, spearfishing will continue to be allowed and managed under fisheries management regulations in the remainder of the Sanctuary. This balance of concerns on the issue will have positive impacts on the resources.

Military Activities within the Sanctuary

Comment: Some commented that a prohibition on the use of explosives within the Sanctuary should be extended to the military.

Response: The final regulations provide that all military activities shall be carried out in a manner that avoids to the maximum extent practicable any adverse impacts on Sanctuary resources and qualities. Sections 922.163 and 922.164 do not apply to existing classes of military activities as identified in the final environmental impact statement. New military activities may also be exempted from all or part of these two sections upon consultation with the Director. NOAA has been assured by the Navy that live (explosive) ordinances are not currently used within the Sanctuary. The Patricia Range is the only target site within the Sanctuary and live explosives are not used.

Research & Monitoring Action Plan

Management Should be Based on Good Science

Comment: Management actions should be based on good science and should not occur until the science is done to back it up.

Response: Management actions should be based on the best available science. However, there is always a degree of uncertainty associated with science and, in some cases, it is imprudent to suspend management actions until the science is completed. A precautionary approach to management of Sanctuary resources should be taken in order to ensure that lack of scientific certainty does not preclude implementation of reasonable management measures. An adaptive management approach will be used in the Sanctuary when necessary.

Studies are Needed to Determine Sustainability

Comment: Studies are needed to determine the level of human activity sustainable by the resources.

Response: NOAA agrees and has included a carrying capacity strategy in the Research and Monitoring Action Plan. The strategy calls for carrying capacity research to be conducted at several of the SPAs and Research-only Special-use Areas.

Too Much Emphasis on Research and Monitoring

Comment: The draft management plan places too much emphasis on research and monitoring.

Response: Research and monitoring is an essential component of effective resource management. The reason many strategies have a research or monitoring component is to assess the strategies' effectiveness or feasibility in order to determine whether it needs to be modified, continued, or terminated prior to committing additional resources in the future.

Queen Conch Stocking

Comment: A moratorium on stocking would adversely effect the State's queen conch stocking program.

Response: NOAA has revised Strategy F.3 by eliminating the moratorium on stocking and replacing it with a requirement for permitting of all stocking programs.

Monitoring of Zones

Comment: Research and monitoring of zones needs to be a top priority.

Response: Scientific monitoring to determine the effectiveness of the zones is a top priority for NOAA. In 1993, NOAA began to collect baseline data on reef fish populations in and around the proposed no-take zones in preparation for their implementation. Research in the zones is also a top priority and will begin once the zones are finalized. The Research and Monitoring Action Plan explains how the zones will be used for research and monitoring.

Volunteer Research and Monitoring Programs

Comment: Some reviewers pointed out the need to incorporate volunteer monitoring efforts such as some of those currently underway by groups like Reef Relief, The Nature Conservancy, and R.E.E.F. They also pointed out the importance of using the knowledge of local experts to help better understand the health of Sanctuary resources.

Response: NOAA has incorporated the use of monitoring projects by the public and volunteers in the Research and Monitoring Action Plan. The long-term goals of the Sanctuary include using such monitoring programs as a basis of detecting change in the coral reef environment.

Submerged Cultural Resources Action Plan

Prevent Treasure Hunting & No Permits for Private Profit

Comment: Several reviewers, including the National Park Service, Minerals Management Service, and the Department of the Navy stated that no treasure hunting should be permitted in the Sanctuary and that the proposed Submerged Cultural Resources (SCR) permit system was in conflict with the Federal Archaeological Program and particularly the Abandoned Shipwreck Act (ASA) guidelines. Other reviewers indicated that some commercial treasure salvage should be permitted, but should be strictly regulated to prevent any harm to the natural resources of the Sanctuary.

Response: NOAA agrees that "treasure hunting" that is, the search for and recovery of intrinsically valuable artifacts with little, if any, regard for the archaeological context and historical significance of the finds, should not be allowed in the Sanctuary. However, the Submerged Cultural Resources (SCR) Action Plan does provide for public and private sector recovery of shipwrecks consistent with protecting historical values and the environmental integrity of the shipwrecks and sites. NOAA and the State of Florida have agreed that the SCR plan, consistent with the multiple use mandates of the NMSA and the ASA, should provide for the *in situ* preservation of highly significant historical Sanctuary resources under strict regulations protecting historical values and the environmental integrity of the shipwrecks and sites and that the recovery of SCRs should only be permitted when it is determined to be in the public's interest and done in an environmentally and archaeologically sound manner.

No recovery permits will be issued in areas where there is coral, seagrass or other significant natural resources. However, private recovery of certain SCRs may be permitted in other areas of the Sanctuary which are relatively devoid of natural resources. In such recovery efforts, the highly significant resources will be required to be preserved in a museum of public access consistent with the standards of the Federal Archaeological Program. Objects of low to moderate historic or archaeological significance may be deaccessioned or transferred for sale or other disposition.

As regards the ASA guidelines, NOAA acknowledges that the accommodation of commercial salvage, that is, the search for and the recovery of shipwreck artifacts using archaeological recovery techniques and historical documentation to maximize the intrinsic value of the finds, does appear to conflict with certain ASA guidelines suggesting that no commercial salvage be permitted in marine sanctuaries. However, NOAA's position is that the SCR Action Plan is consistent with the ASA guidelines when read as a whole. In other words, there is no commercial salvage permitted in the zoned areas and other areas of significant natural resources. Commercial salvage will be permitted only in areas relatively devoid of significant natural resources. NOAA does not suggest that the FKNMS SCR Action Plan be used as a model for other national marine sanctuaries, or for other Federal/State protected areas or preserve systems. There are several distinguishing reasons for the departure from those ASA Guidelines in the FKNMS: 1) 65 percent of the Sanctuary is in State waters--under the NMSA and the ASA due deference must be given to the State's interests in managing Sanctuary resources, particularly abandoned shipwrecks to which the State has title; 2) treasure hunting and commercial salvage of historic shipwrecks has been a traditional activity in the Keys for decades and is part of the local culture; 3) the NMSA and the ASA are multiple use statutes; 4) the establishment of multiple use areas where commercial salvage can occur as well as not permitting any recovery where there is coral, seagrass or other significant natural resources is analogous to the zoning approach proposed for protecting natural resource habitat areas; 5) the SAC recommended that some commercial salvage be permitted in the Sanctuary; and 6) numerous other public comments recommended that some commercial salvage should be permitted in the Sanctuary.

Consistent with the recommendations of the SAC, the State, and public comments, the SCR Action Plan provides a permit system which will strictly regulate private, for profit, recovery of SCRs, to ensure that it is done in an environmentally and archaeologically sound manner. Private, for profit, recovery will not be allowed unless it is in the public interest and will include public display of the recovered SCRs. Certain SCRs will be required to be maintained in museums and similar institutions of public access while duplicative objects may be deaccessioned and transferred to the permittee for sale or other disposition, but only after there has been a proper recording and reporting of the archaeological information. Under the multiple use mandate of the NMSA and the ASA, some SCRs may be recovered while other more significant SCRs will remain in the Sanctuary for *in situ* preservation and use by present and future generations.

Comment: The National Park Service commented that the Antiquities Act applies in National Marine Sanctuaries and therefore an Antiquities Act permit should be required for the excavation and recovery of SCRs.

Response: NOAA agrees that the Antiquities Act applies in the Sanctuary. However, as the Federal agency that exercises control over Sanctuary resources, NOAA is the appropriate Federal agency to issue permits for the management of Sanctuary resources, including antiquities. Moreover, as the Sanctuary SCR permits will be issued in compliance with the NMSA, the ASA, the NHPA, and the standards and guidelines of the Federal Archaeological Program, an additional permit under the Antiquities Act appears unnecessarily duplicative.

Comment: The Department of the Navy objected to the SCR permits and expressed concern about the Navy's historic shipwrecks in the Sanctuary as well as the potential precedent for other Navy historic shipwrecks outside the Sanctuary.

Response: The permits for private recovery and deaccession/transfer only apply to abandoned vessels. As a trustee for such resources, NOAA will continue to respect the interests of the owners of the vessels and the sovereigns that represent those interests consistent with domestic and international law. Sunken warships and other public vessels entitled to sovereign immunity, regardless of location, remain the property of the nation to which it belonged at the time of sinking, unless that nation has taken formal action to abandon it or to transfer title to another party. It is a long-standing Navy policy that it does not abandon its public vessels. Therefore, no permits will be issued for the private recovery of Navy vessels without the express written permission of the Department of the Navy. In considering permits for the private recovery of other vessels entitled to sovereign immunity, NOAA may require the express permission of the appropriate sovereign representatives, or otherwise consider their interests in the vessel and its recovery.

SCR Plan/Permits & Costs to Treasure Salvors Business

Comment: At the scoping meetings, workshops, SAC meetings, other public meetings, and in public comments the treasure salvors have continuously asserted that the FKNMS would put them out of business and commented that the Sanctuary should adopt the State's existing contract system. Others commented that commercial treasure salvage should be permitted, but should be strictly regulated to prevent harm to natural resources from various commercial treasure salvage methodologies, including "mail-boxing" (propeller dredging device).

Response: The Florida contract system and the division ratio (80 percent salvor to 20 percent State) was considered as an alternative, but was not preferred because it is inconsistent with the Federal Archaeological Program and with the ASA Guidelines. Prohibiting commercial salvage throughout the Sanctuary was also considered and rejected for reasons indicated in the response to the comments above. The SCR Action Plan is the result of a careful balancing of resource protection and reasonable accommodation for commercial salvage in certain areas for certain SCRs. If the cargo from a wreck is of little or no historical or archaeological significance and duplicative, then nearly all of the recovered objects will likely be transferred to the permittee. On the other hand, if the artifacts are of high historical significance, then the permittee will have possession of the artifacts and may seek return on the investment through other means. However, in this instance there would be no transfer of ownership of a public resource to a private party unless and until it is determined that the resource is of little or no historical or archaeological value. In developing the SCR Action Plan, NOAA considered the threats to natural and historical resources and sought to develop strict regulations to ensure that recovery will be environmentally and archaeologically sound, while at the same time, taking into account the socio-economic considerations of the commercial salvors and others. In response to comments, changes were made to the proposed regulations and draft management plan in an effort to make the permit management system more pragmatic from the perspective of the commercial salvors without compromising the primary objectives of protecting significant natural and historic Sanctuary resources. Between the draft and the final, NOAA issued several permits to commercial salvors with pre-existing admiralty rights. While the permit conditions may be more rigorous than the requirements of the Admiralty Court or the State contract system, and thus may involve additional costs, those permittees continue to work their sites.

Comment: The Historic Shipwreck Salvage Policy Council (HSSPC) (treasure salvors group) and other treasure salvors also raised specific concerns about the economic burden to permittees in the SCR Action Plan such as requiring performance bonds, general liability insurance, permanent public display of certain SCRs, professional nautical conservators and supervision by professional archaeologists.

Response: Pursuant to consultation with the State of Florida, NOAA has deleted the requirement for a performance bond for all applicants. As the treasure salvors noted, the regulations elsewhere require all permittees to demonstrate their financial ability to carry out proposed projects and activities requiring permits. NOAA agrees that the underlying purpose of requiring a performance bond (to ensure that there are ample funds to finish research-recovery work once initiated) appears to be covered by the other regulations and that by removing the regulatory requirement for a performance bond, there will be more flexibility in the permit system. While the removal of the regulatory requirement should reduce the costs for meeting the permit criteria for most applicants, requiring such a performance bond may still be reasonable and appropriate in certain cases where applicants historically have not finished projects or have difficulty demonstrating their financial ability to complete a proposed project.

General liability insurance is required by Section 310 of the NMSA. However, NOAA has modified the regulatory provision implementing that requirement to clarify that other security instruments may be utilized in lieu of an insurance policy. In addition, NOAA has modified the regulatory language to clarify that the scope of coverage required is for potential claims for destruction, loss of or injury to Sanctuary resources arising out of permitted activities and to clarify that the amount of insurance or security should be equivalent to the estimated value of the Sanctuary resources in the vicinity of the permitted area and activities.

With regard to the requirement that SCRs be publicly displayed, NOAA did not intend to require that all SCRs be publicly displayed for all time. Instead, it was expected that this would be addressed in the curation agreements and that standard museum practices would be followed, consistent with the FAP. The regulations have therefore been modified to indicate that public access and "periodic" public display must be provided.

With regard to the requirement that a professional archaeologist be in charge of the archaeological research and recovery, that requirement has not been changed or modified. Recovery of historical resources inherently involves the destruction of contextual and other important archaeological information. The only way that such information is preserved is through scientific recording of the recovery efforts consistent with standard archaeological principles. It is therefore imperative that a professional archaeologist supervise the recovery operations. That is not to say that, as supervisor, the archaeologist needs to be on site all the time. However, the archaeologist needs to oversee the operations. The public's interest in the preservation of this archaeological information justifies the additional costs to the permittee. In addition, the administrative record indicates that many commercial salvors already employ an archaeologist.

With regard to the requirement of a professional nautical conservator, the regulations have been modified to delete "professional" and insert "authorized" as suggested in comments in order to provide more flexibility in the permit system and allow for the consideration of field experience. As the professional archaeologist is responsible for supervising the operations, NOAA will give due deference to the supervising archaeologist's selection for nautical conservator in considering its authorization.

Special Use Permits; Fees/Waiver in SCR Context

Comment: The HSSPC suggested adding a third criteria for Special-use Permits, i.e., "to promote private sector participation when advantageous to the taxpayers" and shifting the costs for Special-use Permits from the permittee to NOAA and the State. The HSSPC also suggested that the costs for Special-use Permits should be limited to the costs of issuing the permit. Other administrative costs such as monitoring activities should not be included. The fair market value for use of Sanctuary resources also should not be included.

Response: Section 310 of the NMSA provides the authority, and sets forth the two criteria, for issuing Special-use Permits. Section 310 also provides for the assessment of associated fees which are to cover the administrative costs as well as a fair market value return to the public for use of public resources. This portion of the management plan merely describes these statutory provisions and remains consistent with section 310.

With regard to adding the third criterion, promotion of private participation, it is not a section 310 criterion or even a general statutory purpose or policy. However, facilitation of compatible multiple use is a statutory policy and the SCR Action Plan has been modified accordingly.

With regard to the assessment of costs and waiver of fees in implementing Special-use Permit authority, NOAA has the discretionary authority to consider waiver of costs and/or fees on a case by case basis when permitted activities result in a public benefit, whose value can be determined. For example, in the SCR

context, the preferred policy is that the SCR be preserved on site. Waiver of fees for the removal of SCRs which are not under threat is unlikely. However, if it is determined that the SCR is being threatened by remaining in the Sanctuary, the research and recovery would appear to be in the public interest and reduction and/or waiver may therefore be considered in the cost and/or fee determination. The extent that private use is furthering resource protection, research, education and similar FKNMS management strategies is given due consideration in determining the amount of costs and fees.

Public Access to SCRs (Land v. Sea)

Comment: The HSSPC suggested that the plan should require SCRs to be managed in a manner that brings SCRs to the largest segment of the populations noting that scuba divers amount to less than 1% of the population. Several others, including the National Park Service, commented that SCRs should be preserved in the Sanctuary but that non-intrusive public access for research, education and recreation should be allowed, and that intrusive public access should be strictly regulated.

Response: The policy preference under the FKNMS SCR Action Plan, consistent with the preservation policy in the Federal Archaeological Program, and the resource protection mandate in the NMSA, is that SCRs be preserved on site in the Sanctuary, unless the SCRs are under threat and removal is required to preserve them. As indicated in the comments above, there has been some accommodation for commercial salvage in certain areas of the Sanctuary and for certain SCRs to facilitate multiple use of the SCRs. However, besides being inconsistent with resource protection, the suggestion that all or most of the SCRs be removed from the Sanctuary is not consistent with the multiple use mandates of the NMSA and the ASA and has therefore not been incorporated. The ASA and the NMSA are both concerned about public access to SCRs for boaters, divers and others within the Sanctuary. The suggested change in policy appears to primarily benefit one special interest group, the commercial salvors. Access to Sanctuary resources for members of the public unable to enter the Sanctuary itself is accomplished through a variety of education and outreach and research products and mediums, including print, film, and computer informational products. The public access goal does not require physical access to the SCRs, nor does it require their removal for land based exhibits. However, as previously indicated, in this Sanctuary, the SCR Action Plan provides for commercial salvage which will in turn result in the public display of certain recovered SCRs in museums and similar institutions of public access.

Inventory of SCRs: Responsibility & Expense

Comment: The HSSPC suggests that the Florida Department of State/Bureau of Archaeological Resources have the lead responsibility in the inventory of SCRs and that NOAA's role be limited to a financial assistance role. The HSSPC also suggested that the inventory be accomplished through the use of the private sector, when funding is available, in order to lessen the burden on taxpayers.

Response: No change was made to the plan regarding NOAA's lead responsibility for the inventory of SCRs because it is NOAA, not the State, that is legally responsible for accomplishing this task. Section 110 of the National Historic Preservation Act requires Federal agencies to inventory historic resources such as SCRs under the Federal agencies management responsibility. However, as indicated in the plan, NOAA will work with the State and any other public and private entities interested in activities which fulfill this responsibility. Accordingly, the SCR Agreement has been revised to indicate that NOAA will also consider all public and private opportunities for accomplishing the inventory in a reasonable and cost-effective manner, including private sector funding through permits and otherwise.

Survey/Inventory Permits

Comment: The HSSPC suggested that the regulations expressly state that no Sanctuary permit is required for non-intrusive, non-exclusive remote sensing activities, but also suggested that the survey/inventory permits expressly grant exclusive rights to explore the permitted areas. The HSSPC also suggested that these permits provide for limited manual alteration of the seabed, including hand fanning, provided there is no negative impact to coral, seagrass, sponges and other natural resources.

Response: Section 922.42 of the regulations states that unless an activity is prohibited, it is expressly allowed. In addition, the sections on Sanctuary permits, certification, and authorizations indicate that they are only required for conducting activities which are prohibited by Sanctuary regulations. Non-intrusive remote

sensing is not prohibited. Therefore, the regulations expressly state that such activity does not require a permit. The regulations will indicate that permits may provide for limited manual alteration of the seabed, including hand fanning, provided there is no adverse effect on Sanctuary resources. Such activity will continue to be considered on a case-by-case basis as part of the public interest balancing on whether to issue a permit and for determining the appropriate conditions to protect resources and manage multiple uses.

The HSSPC suggestion for exclusive rights for a survey-inventory permit is not entirely consistent with the suggestion that remote sensing not require a permit. NOAA cannot prevent non-intrusive remote sensing in an area unless it is prohibited in the regulations and the regulations do not prohibit remote sensing. However, NOAA and the State of Florida are cognizant of the underlying economic concerns of applicants and permittees in investing and expending financial resources. Therefore, in an effort to reconcile these comments, the regulations have been modified to indicate that NOAA will not grant survey and inventory permits or research and recovery permits for areas covered by existing permits, unless authorized by such permittee. There is no entitlement to these and other permits, rather it involves the discretionary authority of NOAA and the State of Florida in granting a privilege which is determined to be in the public's interest.

Volunteer Action Plan

Recruitment of Volunteers

Comment: A number of reviewers, including the SAC, recommended the development of a new strategy in the Volunteer Action Plan which targets the recruitment, training and recognition of Sanctuary volunteers.

Response: NOAA agrees with this comment and the management plan has been revised accordingly.

Volunteer Coordinator

Comment: Some reviewers expressed concern that the Sanctuary's Volunteer Coordinator is not a full-time NOAA employee and recommended that this be changed. Others stated their satisfaction with the Nature Conservancy's role in the volunteer program because of its stability and broad geographic influence.

Response: The Sanctuary's Volunteer Coordinator continues to effectively administer and oversee the Sanctuary's Volunteer Program. In the future, NOAA will consider whether it is either necessary or appropriate to modify the Volunteer Coordinator's role or position.

Water Quality Action Plan

Support the Water Quality Action Plan

Comment: Many reviewers of the draft management plan and Environmental Impact Statement commented on the issue of water quality within the Sanctuary. There was almost unanimous agreement that deteriorating water quality is the major threat to the health of Sanctuary resources and most supported actions to correct the problems. Many reviewers specifically expressed support for the Water Quality Action Plan (WQAP).

Response: NOAA agrees that the major threat to the health of the Florida Keys coral reef ecosystem is deteriorating water quality. The FKNMSPA directed EPA, in coordination with the State of Florida and NOAA, to develop a Water Quality Protection Program (WQPP) for the Sanctuary. This was the first Congressionally mandated Water Quality Protection Program for a National Marine Sanctuary and was established to take corrective actions to restore water quality in the Sanctuary. The Water Quality Action Plan reflects strategies developed under the Water Quality Protection Program.

Water Quality is an Issue Broader than the Sanctuary

Comment: Although the majority of the reviewers recognized that deteriorating water quality was the major threat to marine resources, the source or cause of problems was questioned. Many claimed the problems originate outside Sanctuary boundaries in the upper portions of Florida Bay, or come as a result of poor water management practices in south Florida. Reviewers stated that the problem is outside the FKNMS boundary, thus, the Sanctuary does not have the authority to address these significant water quality issues.

Response: Some of the water quality problems in the Florida Keys occur outside and upstream of the Sanctuary's boundary. Deteriorating water quality in Florida Bay is largely a result of water management practices in south Florida as has been documented by scientists. Other scientists point to possible sources of nutrients and pollutants that enter Florida Bay through the Everglades drainage. The Florida Keys are at the end of the south Florida ecosystem and are the recipient of degraded water quality that originates upstream. While EPA, the State of Florida and other agencies will continue to address the land-based sources of pollution and water quality in the Sanctuary, particularly through the Water Quality Steering Committee and the South Florida Ecosystem Task Force, NOAA has an appropriate supplementary role in these efforts.

Water Quality Problems in Nearshore Waters

Comment: Some reviewers stated that there are no water quality problems in the Florida Keys. Other reviewers cited the poor wastewater treatment practices in the Florida Keys, such as septic tanks, injection wells, and cess pits, as the main source of water quality degradation in the Sanctuary. Storm water runoff was also viewed to as a contributing factor to poor water quality. Some reviewers cited the findings from a recently released State hearing officer's report.

Response: NOAA disagrees with the implication that there is not a water quality problem in the Florida Keys. Scientists have documented the decline of water quality in the nearshore waters of the Florida Keys. This deterioration is caused by a variety of sources including excessive nutrients entering the nearshore waters because of inadequate sewage treatment practices and problems related to storm water runoff. The findings of a State Hearing Officers were that the nearshore waters of the Florida Keys have exceeded their carrying capacity and are in danger of collapsing. In addition, the report identified nutrients originating from inadequate treatment facilities as the primary cause of nearshore water quality degradation in the Florida Keys.

The WQPP was established to take corrective actions to restore water quality in the Sanctuary. This must be accomplished at the same time as, or prior to, the restoration of water quality upstream in Florida Bay in order to be successful. Improvement of water quality in the FKNMS will not be successful if only the upstream ***or*** nearshore portion of the ecosystem is restored. All parts of the ecosystem, all the way to the coral reefs, must be restored and relieved of increasing human impacts.

Implementation

Comment: Some reviewers stressed that the implementation of the water quality action plan should supersede the implementation of other action plans such as zoning. They emphasized cleaning up the water quality problems before continuing with other management actions. Other reviewers stressed the importance of addressing the deteriorating water quality issue in the Sanctuary, but advocated implementation of a variety of management programs, including those that protect Sanctuary resources from continued degradation. In addition, some reviewers supported a plan with direct action strategies to correct water quality problems.

Response: NOAA agrees that the major issue affecting the health of the Florida Keys coral reef ecosystem is deteriorating water quality. Implementation of the WQAP and the WQPP for the FKNMS will lead to improvement of the water quality in the Sanctuary. Currently, some of the corrective actions identified in the WQPP are being implemented both within the boundaries of the Sanctuary and upstream in the South Florida ecosystem. These on-going activities will have a net positive benefit to Sanctuary resources.

However, NOAA disagrees that all other management actions should be deferred until the implementation of the WQPP and the WQAP for the FKNMS. Many of the management actions necessary to halt the decline of water quality in the Florida Keys will take years to implement, and the physical stresses and impacts currently placed on Sanctuary resources from other sources could be lessened with management actions such as mooring buoys to prevent anchor damage, channel markers to mark boating routes through sensitive habitats, and outreach programs to educate users about the resources of the Florida Keys.

Mosquito Spraying

Comment: Several reviewers expressed concern about NOAA's role in addressing currernt mosquito control practices in Monroe County.

Response: Representatives from FKNMS and Monroe County will work together through the Water Quality Protection Program to refine aerial mosquito spraying based on research findings. This action will reduce threats to marine resources which may result from mosquito spraying over the near-shore waters of the Florida Keys.

Zoning Action Plan

The Term Replenishment Reserve

Comment: Some reviewers expressed that the term Replenishment Reserve is confusing because it implies that these areas are for fisheries replenishment.

Response: NOAA has changed the name Replenishment Reserve to Ecological Reserve (ER). Ecological Reserve more accurately represents the purpose of this zone, that is, to restore natural ecosystem dynamics and habitat, by setting aside a portion of the coral reef environment (including seagrass beds, hardbottom, rubble habitat, patch reefs and sand areas) that is protected from all forms of "harvesting".

Establishment of Zones

Comment: Many commented on the Zoning Action Plan and proposed regulations regarding Sanctuary Preservation Areas, Wildlife Management Areas, Special-use Areas, and Ecological (formerly Replenishment) Reserves. Some recommended deleting all marine zoning; others recommended the zoned areas be expanded; while still others supported the zoning concept but recommended delay in implementation until there was more detailed scientific research and economic impact analysis of certain proposed zones. Some reviewers recommended zoned areas be closed to all human uses, except for boat transit. Many reviewers supported the proposed Zoning Action Plan including, in some instances, an increase in the amount of area proposed as Ecological Reserves.

As regards the Key Largo ER, some reviewers suggested that because of the existing protection afforded by the John Pennekamp Coral Reef State Park and the existing Key Largo National Marine Sanctuary, that the Key Largo ER would not provide significant additional protection for the area and should, therefore, be eliminated. A number of reviewers suggested that if not eliminated, the boundaries of the Key Largo ER should be shifted to the south. Several reviewers suggested that the elimination of the Key Largo ER be accompanied by an increase in the size of the Carysfort SPA to protect additional patch reef and coral habitat. Other reviewers suggested that the boundaries of the Dry Tortugas ER be reconfigured to minimize impacts on fishers. In addition, a number of reviewers suggested reconfiguring the Dry Tortugas ER to encompass more of the reef community as opposed to low-profile, barren habitat, but not reducing its overall size. A number of reviewers also expressed concerns about commercial fishing displacement as a result of establishment of the Western Sambos ER.

Comments from some representatives of the recreational and commercial fishing industries and some individuals recommended elimination of all or some SPAs and ERs. These reviewers cited unreasonable burdens and negative economic impacts resulting from the closures, primarily due to displacement from closed areas. Examples of the uses most commonly cited as likely to be displaced are baitfishing, shrimping, and lobster trapping. Some recommended that bait fishing and catch and release trolling be allowed, while others were opposed to all fishing in SPAs.

The State of Florida Marine Fisheries Commission generally supported the proposed zoning, but recommended the elimination of the Key Largo ER and suggested making provisions to allow certain baitfish harvest. Other State and Federal agencies supported the proposed zoning and one recommended establishing an additional replenishment zone in the back country of the Keys. Other reviewers supported the Zoning Action Plan as proposed or recommended additional areas for inclusion.

The SAC recommended that the management plan: (1) keep the proposed Special Preservation Areas as configured with provisions to allow bait fishing and catch and release trolling in selected SPAs; (2) keep the research-only areas; and (3) keep the Western Sambos ER but eliminate the proposed Key Largo ER; and reconfigure the Dry Tortugas ER.

Response: NOAA developed the Ecological Reserves to protect some of the most significant habitat, but in a manner to avoid or minimize impacts to fishers and other users. In the DMP/EIS, NOAA proposed boundaries based on distribution of the most significant coral habitats and spur and groove configurations and a user survey identifying where fishing, diving and other uses occur. NOAA also used maps provided by the SAC members that indicated specific information about the resources and uses of the marine resources. The goal was to include the most coral reef communities in a manner which avoids or minimizes economic impact to users, particularly fisherman. NOAA has modified the final regulations and management plan to reflect several of the recommendations made in the comments. Consistent with recommendations from the SAC and others, and upon careful weighing the environmental and socio-economic impacts, NOAA has retained the Western Sambos ER but revised its Zoning Plan to eliminate the Key Largo and defer the Dry Tortugas Ecological Reserves, add the Eastern Sambos Research-only Special-use Area and slightly expand the Carysfort SPA to include additional intermediate reef, back reef, and patch reef areas. In weighing the socio-economic impacts on commercial and recreational users against the additional benefit of the Key Largo ER, NOAA eliminated that Reserve from the final plan and regulations. The resource protection provided by the existing protected areas, John Pennekamp Coral Reef State Park, Key Largo National Marine Sanctuary, and Biscayne National Park contributed to this decision. NOAA has, however, enlarged the SPA at Carysfort Reef to protect additional patch reef and coral habitat..

Public comment also identified serious adverse economic impacts which would result from implementation of the no-take regulations within the proposed boundary of the Dry Tortugas ER. Recommendations suggested reconfiguring the boundary of that Reserve to minimize such impacts. Others recommended the Dry Tortugas ER be reconfigured to include additional reef communities. Consequently, NOAA did not set forth a boundary or regulations for the Dry Tortugas ER. Rather, NOAA will continue the process for establishing a proposed final boundary of the Dry Tortugas ER in coordination with the National Park Service, fishing representatives, scientists, and others to identify an appropriate final boundary for the Reserve, which may include portions of the Dry Tortugas National Park. NOAA and the National Park Service will use the information gathered as part of the public review of the draft management plan, and hold workshops with users, agency representatives, environmental organizations, scientists, and the public. Prior to making a final decision, the proposed final boundary of the Dry Tortugas ER will be published for public comment.

In summary, public comments indicated that the impacts on fishers from the proposed Replenishment Reserves were greater than considered in the DMP/EIS. As a result, the final regulations designate the Western Sambos area as an ER. The Key Largo and Dry Tortugas areas were not made ERs in order to minimize adverse impacts to fishers. An area of the Dry Tortugas with a boundary with less of an adverse impact on fishers will be proposed to be designated at a later date.

Bait Fishing

Comment: Some reviewers recommended allowing baitfishing in SPAs and ERs or reducing the number or size of SPAs to lessen the impact on baitfishing.

Response: NOAA has revised the management plan to provide for the issuance of permits for limited bait fishing in SPAs rather than reduce the number of SPAs. NOAA will issue permits for catching ballyhoo for bait by net.

Catch and Release Trolling

Comment: Some reviewers recommended allowing catch and release trolling in SPAs and ERs or reducing the number or size of SPAs to lessen the impact on this activity.

Response: Catch and release fishing will continue to be allowed throughout greater than 98 percent of the Sanctuary. In addition, NOAA has modified the management plan and regulations to allow catch and release trolling in four of the eighteen SPAs: Conch Reef, Alligator Reef, Sombrero Key, and Sand Key. This will facilitate multiple uses and allow for comparisons to be made between SPAs, therefore determining the impact of catch and release trolling.

Snorkeling/Diving Access

Comment: Some reviewers expressed concern about the lack of restrictions on divers and snorkelers in the zones, asserting they harm coral and other Sanctuary resources, while others commented that there should be no access at all to any zones where access is restricted to any one group.

Response: NOAA does not agree that all zones should be entirely closed to public access. Non-consumptive use of SPAs and ERs is compatible with the purposes for which they were established. Consumptive activities (e.g., spearfishing, fish collecting, shell collecting, lobstering) are prohibited in SPAs and ERs. Non-consumptive activities (e.g., diving, snorkeling) are not expressly prohibited, however regulations prohibit consumptive activities such as spearfishing, and prohibit physical impacts to corals and coral reef habitat by prohibiting contact (e.g., touching and standing). Snorkeling and diving will be allowed in the Research-only Special-use Areas only by permit. By being closed to snorkeling and diving, these areas may then be compared to SPAs and ERs to examine diver impacts.

Support the Zoning Plan

Comment: NOAA received a number of comments generally supporting the Zoning Action Plan as proposed or requesting a larger proportion of zoned areas.

Response: NOAA appreciates the support of the zoning plan. This is the first attempt at large scale marine zoning in the USA. Five years after their implementation, NOAA will lead a team to evaluate the effectiveness of zoning in ecosystem protection. At that time the zones will be re-evaluated and may be modified as necessary and/or appropriate.

Zoning is Too Overbearing or Will Limit Work/Play

Comment: A number of reviewers expressed concern that the zoning scheme is too restrictive and will unduly limit their ability to conduct recreational and commercial activities.

Response: NOAA does not agree that the Zoning Action Plan overly restricts traditional uses of the resources. The area encompassed by the zones, including a Dry Tortugas ER, a boundary for which will be proposed in the future, will comprise no more than five percent of the Sanctuary. Moreover, non-consumptive uses (e.g., diving, snorkeling) will not be prohibited in all zones. Consumptive uses (e.g., commercial and sport fishing) will be restricted in SPAs and ERs and some Special-use Areas. However, based on aerial surveys and visitor use data, approximately 94 percent of the recreational fishers fish outside these zones on a regular basis. Commercial fishers agreed early in the planning process that they do not rely on SPAs as areas to conduct their activities. The impact of ERs has been raised as a concern because of the perceived displacement of commercial activities (e.g., fishers). The ERs have been re-designed to minimize impacts to such activities through a process that relied on input from commercial fishers. This input, in part, led NOAA to eliminate the Key Largo ER, and postpone the establishment of a Dry Tortugas ER.

Sanctuary Preservation Areas and Ecological Reserves

Comment: Some reviewers expressed opposition to all SPAs and ERs.

Response: The purpose of a SPA is to protect a heavily used area of the marine environment (e.g., coral reefs) where conflicts often occur between user groups. These areas are critical for protecting the coral reefs and biodiversity of the FKNMS. The purpose of an ER is to minimize human influences, to provide natural spawning, nursery, and permanent residence areas for the replenishment and genetic protection of marine life, and to protect and preserve natural assemblages of habitats and species, and restore natural ecosystem dynamics. The FKNMSPA directed NOAA to consider temporal and geographic zoning. Zoning is a proven tool for marine conservation and is consistent with NOAA's mandate to accommodate multiple, compatible uses by providing long-term benefits to all consumptive and non-consumptive users through increased biodiversity.

Ecological Reserves are Redundant with Fisheries Management

Comment: Eliminate all ERs because they are redundant with traditional fisheries management.

Response: NOAA does not agree. Zoning in the FKNMS is for habitat protection and to preserve biodiversity, not for fisheries management. Traditional fisheries management focuses on managing stocks of a small number of the over 6000 species reported in the FKNMS. The primary purpose of an ER is to protect a portion of the coral reef environment (including seagrass beds, hardbottom, rubble habitats, patch reefs and sand areas) from all forms of harvesting in order to restore natural ecosystem dynamics.

The establishment of no-take areas in specific portions of the coral reef tract should lead to replenishment of reef inhabitants that are currently being lost, or whose balance in the ecosystem has been altered. Moreover, with respect to fish stocks, some fisheries scientists suggest that ERs provide ancillary benefits to fisheries, similar to "harvest refugia" and other protected fisheries areas. The ERs are an important tool for effective ecosystem management in the FKNMS. NOAA will monitor the effectiveness of zoning in ecosystem protection and consider modifications as necessary and reasonably appropriate.

A Monitoring Program is Needed to Determine the Viability of Zoning

Comment A number of reviewers recommended the establishment of a monitoring program to assess the viability of the zoning scheme.

Response: The Zoning Action Plan provides for the establishment of a five-year monitoring program to assess the effectiveness of zoning in the Sanctuary.

Western Sambos Ecological Reserve

Comment: A number of reviewers expressed concerns about commercial fishing displacement as a result of establishment of the Western Sambos ER.

Response: NOAA believes there will be some displacement of fishermen, but that the long-term environmental benefits will far outweigh short-term economic losses. The ecological value of protecting the area does not warrant eliminating or modifying the boundary of the ER.

Establishment of a Back Country ER and/or an Alligator Reef ER

Comment: Several reviewers recommended the establishment of an ER in the Back Country and/or Alligator Reef. The State of Florida recommended the establishment of a Back Country ER.

Response: A full ecosystem representation in a comprehensive zoning plan should include Back Country marine habitats. However, given the priorities established in the Zoning Action Plan, this cannot be accomplished in the short-term, but will be considered for future implementation in the five year review cycle.

Jewfish and Steamboat Creek Wildlife Management Areas

Comment: Some reviewers indicated that fishers and others regularly transit through Jewfish Creek and Steamboat Creek and raised concern over the proposed designation of no-access buffers in the Crocodile Lake Wildlife Management Area.

Response: NOAA agrees. There was no intent to prohibit the use of this area for transit. Thus, consistent with existing US Fish and Wildlife Service regulations, the no-access designation was removed from the final management plan and regulations.

Crocodile Lake Wildlife Management Area

Comment: Some reviewers indicated that the Crocodile Lake Wildlife Management Area no-access restriction was too limiting.

Response: NOAA agrees and, upon consultation with the US Fish and Wildlife Service and the Florida Game and Freshwater Fish Commission, changed the designation of Crocodile Lake Wildlife Management Area to a no-access buffer zone (100 feet) along the shoreline between the dates March 1 and October 1.

Pelican Shoal Research-only Special-use Area

Comment: Many reviewers requested that Pelican Shoal be kept open to public access. The Department of the Interior requested that a 50 meter buffer be established during Roseate Tern nesting season.

Response: NOAA agrees and has eliminated Pelican Shoal as a Research-only Special-use Area. It has been replaced with the Eastern Sambos Research-only Special-use Area. The new area will provide a better research and monitoring site, while simultaneously lessening impact on the public from limiting access to the reef around Pelican Shoal. However, in order to complement the State's seasonal closure of the land area, NOAA has designated a no-access 50 meter buffer as a Wildlife Management Area around Pelican Shoal between April 1 and August 31. These dates coincide with those established by the Florida Game and Freshwater Fish Commission for the protection of nesting terns.

Research Only Areas

Comment: Many comments supported the establishment of research-only zones.

Response: NOAA agrees that some zones should be used to determine the impacts of specific activities, such as diving and fishing. The final management plan and regulations establish four Research-only Special-use Areas. Pelican Shoal was eliminated as a Research-only Special-use Area and a Research-only Special-use Area surrounding the forereef habitat at Eastern Sambos has been added in its place. The Eastern Sambos area will serve as a control to determine the impacts of specific activities such as diving, snorkeling and fishing. Furthermore, Eastern Sambos, which is located in an area of good water quality, can be compared with the Tennessee Reef Research-only Special-use Area, located in an area of poor water quality. The impacts associated with water quality as compared to those from human uses can also be determined from research and monitoring at these sites.

Reviewers who provided oral testimony on the DMP/EIS

November 1, 1995
Miami, Florida - 36 Speakers

Alesi, Alan - South Florida Flats Anglers Fishing Club
Arbuthnott, Kathy - Palm Beach Reef Research Team, Sierra Club, American Littoral Society
Avila, Ralph - Personal Watercraft Club of Miami
Brana, Armando
Chapman, Geof - Conch Coalition
Charles, Brooks
Cottrell, Gordon
Criscola, Kathy - Sierra Club, Miami and Florida Chapters
Farago, Alan - Tropical Audubon Society & Environment In Focus
Greenberg, Michael - New Era Video
Greene, Juanita - Izaac Walton League, Florida Keys
Hagenkotter, Carl - Victims of NOAA
Hansen, Don - Florida Marine Fisheries Commission
Holtz, Dave - Coral Reef Coalition
Horan, David Paul - Greater Key West Chamber of Commerce
Kelly, Doug - Florida Sportsman Magazine
Kelly, Warren - South Florida Flats Anglers
Lindeman, Ken - Coastal Research and Education
Mason, Richard - South Florida Free Beaches
Mckillop, Roy
Mullins, Sheila - Last Stand
Murray, Marcus - Special Marine Projects Company
Neidhardt, Rick
Pareja, Salvador E.
Pearson, Geoffrey
Petrick, Pops
Pontin, H.T. - Ramrod Key Yacht Club
Roffer, Mitchell - Roffer - Ocean Fishing Forecasting Service
Stone, Alexander - Reefkeeper International
Straun, Lynn
Stromfield, Andrew - Defenders of Wildlife
Tupper, Mark - Harbor Branch Oceanographic Institute
Wattigun, Felix
Wells, David
Wilson, Susan - Izaac Walton League, Mangrove Chapter
Yeider, Dan, A. - Conch Coalition

November 3, 1995
Key Largo, Florida - 57 Speakers

Allen, Hugh - Summer Sea Colony Association
Avila, Raphael - Personal Watercraft Club of Miami
Bates, John - Last Stand
Bednar, Michael
Brack, Ronald
Bricker, Mel - Ocean Reef and Angler's Club
Causey, Charles
Chaplin, Bettye
Chapman, Geof - Victims of NOAA, Conch Coalition, Salvors
Dargis, Raymond - Florida Keys Personal Watercraft Association
Dawson, Sherry - Friends of Islamorada Area State Parks
Dixon, Rob
Dukehart, Larry - Monroe County Port Advisory Committee
Dunn, James
Dye, Paul - The Nature Conservancy
Fowler, Rochelle
Friend, Jerry
Greene, Juanita - Izaak Walton League
Grimm, Tom
Hagenkotter, Carl - Victims of NOAA
Harrison, Debra - Coral Reef Coalition
Hawkins, Frank - Friends of the Sanctuary
Higgins, Ed - Florida Park Service
Hill, Rick
Holtz, Dave - Center for Marine Conservation
Kelly, Kevin - Jet Ski Association of the Florida Keys
Klock, Joe
Lee, Karen
Lozano, Raymond - Mid-Keys Chapter of O.F.F.
Magursky, John - Islamorada Charter Boat Association
Martin, Pam - Vice Chair, Marine and Port Advisory Committee
Mobley, Curtis
Mullins, Sheila
Neidhardt, Rick
Nichols, Gary - Organized Fishermen of Florida
Olson, Roger - Upper Keys Sailing Club
Pontin, H. T.

Rentz, Walter
Richardson, Laurie
Ritz, David - Ocean Reef Community Association
Rosendahl, Bruce
Sanchez, John - Monroe County Commercial Fishermen
Sands, Gary
Shaw, Deborah - Florida Keys Audubon Society
Smith, Eugene
Sproul, Ginny
Stone, Alexander - Reefkeeper International
Swenson, Cynthia
Tooker, Fred
Usher, Jay - Salvors
Webster, Ned
Wells, David
Wilkinson, Jerry
Wilkinson, Mary Lou
Williams, Nora - Key Largo Chamber of Commerce
Yeider, Dan - Conch Coalition
Young, Bonnie

November 6, 1995
Marathon, Florida - 75 Speakers

Alexander, Terry
Arutt, Samuel
Baier, Cathy
Bateman, Freeman - Capt. Cliff's Seafood, and Southeastern Fisheries Association
Bates, John - Last Stand
Benvenuti, Larry
Brown, Tina - Marathon Guides Association
Chaplin, Diane
Chaplin, Bettye
Cooper, Leo - National Fish
Dantzcher, William
Decker, Bob
Deutsch, Peter
Dietrick, Walter - Big Pine Civic Assoc
Dye, Paul - The Nature Conservancy
Dykhuisen, Jerry
Edelson, Gary
Ernst, Bob - Dodge Lake Stormwater Drainage Pond District
Feddern, Henry - Florida Marine Life Association
Fortmann, Rich - Captain Hooks Marina and Dive Center
Gratwohl, Richard
Grimes, Bill
Hagenkotter, Carl
Hanson, Richie
Harper, Jon - Friends of the Sanctuary
Harrison, Debbie - Coral Reef Coalition
Hellmuth, Rich
Hill, Rick
Holtz, Dave - Center for Marine Conservation
Horan, David Paul - Key West Chamber of Commerce
Johnson, Don
Kaminskas, Adam
Kelly, Kevin - Upper Keys Jet Ski Association
Kite, Joe
Klein, Pauline - United We Stand America
Knecht, Arlene - Yellow Bait House
Lebo, Paul
Martin, Pam - Key Largo Commercial Fishermen's Association
Mayette, Clara
Mcdowell, Jim
Meng, Don
Meyers, Ron - Monroe County Commercial Fishermen
Mickaelis, Mike - Conch Coalition
Mitchell, Charles
Moises, Teudis
Moretti, Richie - Hidden Harbor Marine Environmental Project
Mullins, Sheila
Newman, Joyce
Pedersen, Eric
Petrick, Pops - Organized Fishermen of Florida
Pokorski, Vern
Pontin, H. T.
Rentz, Walter
Ruddell, Dick
Sanchez, John - Monroe County Commercial Fishermen, Inc.
Sands, Gary
Sansom, Jerry - Organized Fishermen of Florida
Schneider, Robert
Shinkevich, Eugene - Florida Keys Citizens Coalition
Shinkevich, Marie - Big Pine Key Civic Association
Smith, Seamus Bruce
Smith, Phil
Stiglitz, Hans
Stone, Alexander - Reefkeeper International
Tarnowski, Marilyn - League of Women Voters
Usher, Jay - Salvor's Committee
Usher, Michele Wells - Conch Coalition
Vail, Betty
Violette, Ron
Waterhouse, Robert
Weekly, Jimmy - Commissioner City of Key West
Wilkinson, Karen Farley
Wimer, Michelle - Dolphin Research Center
Worthington, Pete
Yeider, Dan

November 7, 1995
Key West, Florida - 64 Speakers

Bacle, Jim
Bacle, Peter - Key West Stock Island Lobster Company
Baron, Elliot - Last Stand
Bates, John - Last Stand
Beck, H. L. - Conch Coalition
Butko, Marjore
Chapman, Geof - Victims of NOAA
Clyne, Pat - Salvors, Inc.
Crane, Ellie - Unitarian Universalist Fellowship of Key West
Crimmins, Patti
Crist, Kady
Dargis, Raymond - Florida Keys Personal Watercraft Association
De Pierrefeu, Alain
Dye, Paul - The Nature Conservancy
Farrell, Jim
Foltz, Larry
Fujio
Gibson, William - Monroe County Commercial Fishermen
Gladding, Peter
Goetz, Robert - Get Wet Water Sports
Hagenkotter, Carl - Victims of NOAA
Halloran, George
Hardy, John
Harris, Ken
Herrick, Homer - Florida Keys Audubon Society
Hirshfield, Mike - Center for Marine Conservation
Hobbs, Jace
Holcomb, Ken
Holcomb, Nancy
Holtz, Dave - Center for Marine Conservation
Horan, David Paul - Key West Chamber of Commerce
Keeley, Robert
Kirkland, Kathy
Kuypers, Bill - Reef Relief
Lyda, Sam
McGehee, Jon
Miller, Jerome
Morrison, Dan
Mulhall, Tom
Mullins, Sheila
Newman, Joyce
Niles, Billy - Monroe County Commercial Fisherman
Owl, Eddy
Parker, Dave - Conch Charters Inc. Queen Conch Catamaran
Pederson, Eric
Petrick, Pops - Organized Fishermen of Florida
Pillar, Bobby - Monroe County Commercial Fisherman
Pontin, H. T. - Ramrod Key Yacht Club
Rampy, P. T. - Treasure Coast Coalition Inc.
Rutherford, Jake
Sanchez, John - Monroe County Commercial Fisherman, Inc
Sanders, L. A.
Sheehan, Katha - Chronicle of the Keys
Simmons, Dexter
Smith, Phil
Stone, Alexander - Reefkeeper International
Swift, Ed - Conch Train Trolley
Tatgenhorst, Wendy
Usher, Jay - Commercial Salvors
Van Steelandt, Naomi
Weeks, Vicki - Watersport People
White, Susan
Yeider, Dan - Conch Coalition
Zarnowski, Michael

November 9,1995
St. Petersburg, Florida - 25 Speakers

Blanton, Cole
Decrosta, Mark - Florida Marine Science Educators Association
Drew, John - Island Packing Company
Erickson, Grant
Escardo - Boomsma, Joan
Hagenkotter, Carl - Victims of NOAA
Hempstead, Beverly
Henderson, Dennis
Holland, Roger - Marathon Guides Association
Horan, David Paul - Greater Key West Chamber of Commerce
Kruer, Curtis
Mcdowell, Jim
Murray, Tom - Monroe County Fishermen
Paterson, Robert - Tampa Bay Fisheries

Patterson, Paul
Pederson, Eric
Peel, Ellen - Center for Marine Conservation
Phipps, Clay
Sanchez, John - Monroe County Commerical Fishermen, Inc.
Shafer, John - Beach Shrimp Packers
Smith, Francia
Smith, Phil
Stevens, Dianne - League of Environmental Educators, Florida
Versaggi, Sal - Versaggi Shrimp Corp.
Webster, Ned

November 14, 1995
Silver Spring, Maryland - 34 Speakers

Agardy, Tundi - World Wildlife Fund
Bacle, Peter - Stock Island Lobster
Chapman, Geof - Conch Coalition
Clyne, Pat - Salvors, Inc.
Cooper, Leo
Detrick, John
Dickson, David
Dunn, James
Friend, Jerry
Grathwohl, Richard - Marathon Guides Association
Hagenkotter, Carl - Victims of NOAA
Hill, Jack
Hill, Rick - Key Largo Fisheries
Hirschfield, Michael - Center for Marine Conservation
Hudson, Rob - Coastal Research and Education
Iarocci, Anthony - Monroe County Commercial Fishermen
Marshall, Carole - Palm Beach County Shell Club, Conchologists of America
Martin, Pam - Key Largo Commercial Fishermen Association
McCreedy, Cliff - Oceanwatch
Mcdowell, Jim - Hook and Line Fishermen, Inc.
Murray, Tom - Monroe County Commercial Fisherman
Mutz, Bill
Piton, Ernest
Pontin, H. T. - Ramrod Key Yacht Club
Rampy, P. T. - Treasure Coast Coalition, Inc.
Rentz, Walter
Sanchez, John - Monroe County Commercial Fishermen
Sands, Gary
Smith, Eugene
Sobel, Jack
Stein, Bruce - The Nature Conservancy
Swift, Ed - Key West Chamber of Commerce
Wiegard, Michael - Personal Watercraft Industry Association
Yelder, Dan - Conch Coalition

Reviewers who provided written comment on the DMP/EIS

State of Florida

Florida Department of Community Affairs
Florida Marine Fisheries Commission
Florida Department of Environmental Protection
Florida Department of Transportation
Florida Department of Health and Rehabilitative Services
South Florida Water Management District
South Florida Regional Planning Council
Florida Game and Freshwater Fish Commission
Florida Department of Commerce
John Hunt, FDEP/Florida Marine Research Institute
Richard F. Ogburn, Senior Planner, South Florida Regional Planning Council
George W. Percy, Florida Division of Historical Resources

Monroe County

Shirley Freeman, Mayor, Monroe County

Elected Officials

Mac Collins, U.S. Congressman, 3rd District, Georgia
Keith L. Douglass, Monroe County Commissioner, District Four
Ed Healey, State Representative, District #86, Florida House of Representatives
Edward Royce, U.S. Congressman, 39th District, California

Federal Agencies

Heinz J. Mueller - Chief, Environmental Policy Section, U.S. Environmental Protection Agency
Willie R. Taylor, Director - Office of Environmental Policy and Compliance, U.S. Environmental Protection Agency
Rolland Schmitten - National Marine Fisheries Service, U.S. Department of Commerce
E.A. Shinn - U.S. Geological Survey, U.S. Department of the Interior
Francis P. McManamon - Departmental Consulting Archeologist, U.S. Department of the Interior
Elsie Munsell - Deputy Assistant Secretary, U.S. Navy
R.D. Utley - Chief, Law Enforcement Branch, U.S. Coast Guard
Roger Rufe - Rear Admiral, Commander Seventh Coast Guard District, U.S. Coast Guard
J.C. Sinnett - U.S. Coast Guard
Winfred G. Dodson - Environmental Program Manager, U.S. Air Force
Jack Irion & Richard Anuskiewicz - Marine Archaeologist, Minerals Management Service, U.S. Department of the Interior
Daniel Lenihan - Program Leader, Submerged Cultural Research Unit, National Park Service, U.S. Department of the Interior
William Dudley - Director of Naval History, U.S. Navy
A.J. Salem - Chief, Planning Division, U.S. Army Corps of Engineers
Andreas Mager - Assistant Regional Director, Habitat Conservation Division, National Marine Fisheries Service, U.S. Department of Commerce
Barry Stieglitz - Project Leader, National Key Deer Refuge, U.S. Fish and Wildlife Service, U.S. Department of the Interior

Businesses and Organizations

1st Dental Care
Advanced Energy Management Corp.
Adventures In Marine Biology
Advisory Council on Historic Preservation
Advisory Council on Underwater Archaeology
Aerobic Slimnastics
Aircraft Owners and Pilots Association
All Saints Lutheran Church
American Heritage Corporation
American Littoral Society-Gulf/S. Atlantic Chapter.
American Society of Journalists & Authors
American Sportfishing Association
Amherst College
Amy Slate's Amoray Dive Resort
Andrew P. Derwin DDS
Animal Care and Welfare, SPCA
Aquarion
Atlantis Dive Center, Inc.
Auto Suture Company
Avirom-Hall & Associates, Inc.
B & P Jet Ski & Polaris
B & K Marine
Bayly, Inc.
BEK
Benisch & Company Insurance
Bertram
Bishop Bros., Inc.
Blue Beard Rental
Bob's Marine Village
Bombadier Corp
Brazosport Underwater Club
Buddy Taylor Middle School
Captain's Corner
Captain's Marine Services, Inc.

Cardinal Crest
Caribbean Watersports
Cayman Islands National Museum
Center for Marine Conservation
Challenger Enterprise, Inc.
Charles J. Nowotny, Inc.
Charles River Laboratories
Class Act, Inc.
Clean Water Trust
CMO Associates
Coconut Cove Resort & Marina
Conservation Network International, Inc.
Conservation Treaty Support Fund
Continental Mgd. Pharmacy Svcs.
Coral Forest
Coral Reef Coalition
Coral Reef Park Co., Inc.
Corriveau Arctic Cat Plus
Creative Corporate Business Service
Cross Key Marine Canvas Upholstery, Inc.
Cruising Guide to the Florida Keys
Cutler Ridge Motor Cycles and Watercrafts
Cycle Barn
Dadeland Civitan Club
DEMA Legal and Legislative Committee
Dennis Point Marina, Inc.
Diagnostic Portable Imaging, Inc.
Discovery International Ltd.
Emerson Allsworth Consulting, Inc.
Emmanus United Methodist Church
Environment In Focus
Environmental Defense Fund
Express Cycle Kawasaki
Fishin' Buddy
Fitzgerald Properties
Florida Keys Guides Association
Flanagan Bilton Brannigan
Flat Rock Metal, Inc.
Flatsmaster
Florida Audubon Society
Florida Defenders of the Environment
Florida Keys Audubon Society
Florida Keys Harbor Services
Florida Keys Outfitters
Florida Keys Yellow Pages
Florida Marine Science Education Assoc.
Florida Sportsman Magazine
Freed International, Inc.
Freeman/McCue
Friends of St. Sebastian River
Fun Times Recreation, Inc.
Gallopin Ghost Charters
Genesee County Health Department
Genito-Urinary Surgeons, Inc.
Glencove Marine
Go Jet Ski
Harry Harris Neighborhood Association
HCF Enterprises, Inc.
Help Save the Manatee
Hershoff and Defoor, PA
Historic Shipwreck Salvage Policy Council
Historical Preservation Society of the Upper Keys
Hog's Breath Saloon
Honda of Dothan
Honda of Fort Walton
Honda Town
Horizon
Horner Equipment
Hubbard Broadcasting, Inc.
Hudgins Tigershark, Inc.
Hull & Company, Inc.
Hunt Equipment Co., Inc.
Ice Universidade Santiago
Illinois State University
Indian Hills Resort & Marina, Inc.
Innerspace Visions
Integrated Medical Delivery Corp.
Izaak Walton League
J D's Sports & Repair
J. Taylor Companies, Inc.
Schmidt - Florida - Corp
Jetset Airmotive Co. Inc
Jobber Chevron Products
John S. Caldwell Trust
Just Add Water Boats
Kawabunga Rentals
Kawasaki Motor Corporation
Kawasaki Motors Corp. Inc.
Kawasaki Motors Corp. USA
Keen Battle Mead & Company
Kendall Plastics
Key Largo Chamber of Commerce
Key West Hotel and Motel Association
Keys Association of Dive Operators
Klick's Artic Cat
Koons Ford
Cranson & Sons, Inc.
Lafleur's Gymnastic Club
Last Stand
Lawrence Residential Funding Corp.
Lee Coast Enterprises, Inc.
Lee H. Dunn, Inc.
Leisure Aquatic Products
Lost Reef Adventures
Loving Heart Home Healthcare, Inc.
Lumberjack Shack
Mandy's Perfomance
Marathon Guides Association
Marco Island Shell Club
Marine Industries Assoc. of Florida, Inc.
Marine Paintings
Market Place Motor Sport
McGriff, Seibels, & Williams, Inc.
Merin.Hunter.Codman
Merlinn Guest House
Mermaid Smiles
Middle Keys Marine Association
Monroe Cty. Commercial Fishermen, Inc.
Moravian College
Multiline Marketing Group, Inc.
Nielsen Enterprises
Norman Harris Services
O'Day Group
Ocean Expo Productions, Inc.
Ocean Reef Club
Ocean Reef Community Association
One Valley Bank
Otto Brothers Motor Sales
PADI Legal and Environmental Affairs
Paul, Hastings, Janofsky & Walker
Perdue-Dean, Inc. Yachts
Planning & Conservation League
Plato Partners
Poller & Jordan Advertising Agency
Professional Plumbing Services
Quality Lawn
Quiescence Diving Services, Inc.
R & R Jet Tech South
Ray's Yamaha
Realty & Management Associates
Reef Ball Development Group, Ltd.
Reef Life, Inc.
Reef Relief
Reefkeeper International
Reflex Design, Inc.
Reliable Tractor, Inc.
Rhodes University
Richard B. Ryon Insurance
Rick's Cycle
RKT Constructors, Inc.
Ron Turner Cycles, Inc.
Russell Post Properties
Ryden's Marine
S & S Sports, Inc.
Scalamandre
Sea Boots Charters, Outfitters & Enterprises
Sellers Oil Company
Shamrock Investments
Shipley Oil Company
Sierra Club
Sierra Club Florida Chapter
Sierra Club Gulf Coast Regional Conservation Committee
Sierra Club/Broward County Group
Ski-Safe
Smithereen Exterminating Company
SOLMAR, Corp.
South Florida Sport Fishermen's Club
Southernmost Sailing, Inc.
Southwest Florida Shrimp Assoc.
Spectrum
State Central Bank
State Historical Society of Wisconsin
Stern Advertising
Stor All Systems, Inc.
Stovall's Yamaha Country
Streit's
Sunset Jet Ski
Sunset Watersports
Sunspot Towing & Salvage, Inc.
Suzuki of Russellville
Temperature Equipment Corporation
The Conservation Consortium
The Graham Companies
The Lake Company
The Landings of Largo
The Macdonald West Company
The Nature Conservancy
The Nature Touch, Inc.
The Temporomandibular Joint-Head and Neck Care Ctr.
The Union Institute
The University of North Carolina at Wilmington
The Wilderness Society
The Wildlife Center of Virginia
The Woods Hole Research Center
The Worden Company
Thomas C. Stellwagen, Inc.
Tortugas Unlimited, Inc.
Treasure Coast Coalition, Inc.
Treetop Inn
University of Kentucky
University of Rhode Island
Upper Keys Citizens Association
Venerkloot, Rentrop, Martin, Haynes, &Morrison
Venice High School Environmental Club
Versaggi Shrimp, Corporation
Victims of NOAA
Watercross, International
Watson's Garden Center
WBI Trucking
West Coast Operations
Westcoast Personal Watercraft Association
Wheels of "O" Inc.
White & Case
Wickstrom Publishers, Inc.
Wildlife Habitat Preservation Assoc., Inc.
WKLG 102.1 FM
Yamaha Motor Corporation, USA
Yamaha Motor Manufacturing Corporation of America
Yamaha Motors Co.

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Abercrombie, Abie
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Aberley, Ronald G.
Aberman, Erica
Abramson, Elissa
Abuza, Maizie
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Acton, Tom & Carolyn
Acuna, Aura
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Adams, Jane
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Adams, Ronald L.
Adams, William D.
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Adler, H.K.
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Albury, William R.
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Alvarez, Luis
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Ambrose, Gary
Ambrose, Patti
Ammirati, Catherine & Carmine
Ammon, Diane & Scott - Kawabunga Rentals
Amory, Lloyd R.
Amory, Phyllis
Andary, Alison B.
Anderson, Benjamin H.
Anderson, Charles & Joyce
Anderson, Charlie - Stor All Systems, Inc.
Anderson, Cindy
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Anderson, James
Anderson, Jennifer - Caribbean Watersports
Anderson, Jimmy
Anderson, John
Anderson, Joseph
Anderson, Mavis
Anderson, Michelle
Anderson, Robert E.
Anderson, Sid - Adventures in Marine Biology
Anderson, Victor
Anderson, William H.
Andre, Ernesto
Andreoli, Dominic
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Angeles, Maria Delos
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Aquila, Frank C.
Aquilar, Jose
Arcelus, Victor
Arcuni, Lois
Argano, Karen
Arias, Annette
Ariosa, Joseph
Ariosa, Robert
Ariosa, Robert J. - L.H. Cranson & Sons, Inc.
Arlt, Mike
Armas, Carmen
Armas, E.
Armbrust, Bill
Armbruster, Edward
Armington, James
Arms, Charles S.
Armstrong, Elaine
Armstrong, Gary
Arnett, Charles E.
Arnett, Charles
Arnhalt, Amy L.
Arnholt, Pat
Arnoldi, Mary Lewis
Aronoff, Marvin
Arquez, Richard A.
Arrington, Lee
Arroalte, Adofo
Arutt, Samuel A.
Ash, William J.
Ashmore, Otis R.
Ashmore, Susan
Asip, Bill
Athanasiou, Lee
Attaway, Susan
Atwater, Katherine
Atwood, Jean
Aucevski, Melita - Sunset Watersports
Augustyn, Lawrence
Aunster, Lonny - Caribbean Watersports
Austin, Eder - Caribbean Watersports
Avery, Trudy K.
Avey, Noll
Avila, Abe
Avila, Daisy
Avila, Henry A.
Avila, Margarita G.
Avila, Martha E.
Avila, Raphael A.
Avirom, Michael D. - Avirom-Hall Associates, Inc.
Avirom, Michael
Ayala, David S.
Ayres, Irene & James
Ayrey, Jose
Baal, Bob
Babbitt, Edward
Babernitch, Brian
Babich, Rita B.
Babich, Rita & George
Bacburn, Felix
Bach, Marsha
Bacher, Fred
Bacon, Kelly
Baer, Dorothy
Baer, James F.
Bagank, Sid
Bague, Julio
Bahr, Robert
Baiamonte, Kimberly S.
Baier, Cathy
Baier, Charles J.
Bailey, Brian
Bailey, Faye
Bailey, Jeffrey
Bailey, June
Bailey, Lisa
Bailey, Melissa K. - Aircraft Owners and Pilots Association
Bailey, Steve
Bailey, Walter
Bailey, Warren C.
Baines, Roberto A. - Sunset Watersports
Baitt, Greg - Sunset Watersports
Baitt, Robert - Sunset Watersports
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Baitt, Virginia - Sunset Watersports
Baker, Carlyle
Baker, Chris - Caribbean Watersports
Baker, Clayton
Baker, Helen & Bob
Baker, Jeff
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Baker, Jill
Baker, Lee
Baker, Suzan - Pen Key Club
Baker, Tom
Balch, Jeffrey - Sunspot Towing & Salvage, Inc.
Baldwin, Armand D.
Baldwin, Arthur W.
Baldwin, Charles Jackson.
Baldwin, Nancy
Ballen, Barbara
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Balog, Ranko
Baltazar, Estanisalo
Balzer, Frank
Bamdar, Stephen P.
Bamdas, David
Bamdas, Joe
Bamdas, Lynn
Bamdas, Stephen
Bamddi, Stephen P.
Ban, Stephan C.
Bancroft, Catherine
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Banks, Nicholas M.
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Barbarino, Gina
Barber, Todd R. - Reef Ball Development Group, Ltd.
Barclay, Leanna B.
Barker, Wayne
Barkowski, Steven
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Barlow, Rodney
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Barnes, Luther
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Barnett, Lindsay - Coconut Cove Resort
Barr, Becky
Barrett, Marvin
Barrett, William
Barringer, Joanne
Barrios, Aylin
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Bartlett, Larry
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Barton, Bryant
Basel, Charles F.
Basore, Shawn
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Bass, John D.
Bassett, Bob
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Bates, Henry
Bates, John - Last Stand
Battle, Benjamin G. - Keen Battle Mead & Company
Battles, Michael
Baughmon, Kelly
Baum, Larry
Baumann, Stan
Bayko, Jason - Caribbean Watersports
Bazo, Henry R.
Beach, Amanda
Beach, Dennis
Beach, John
Beach, Tiffany
Beal, Terry
Beamish, Bob - Otto Brothers Motor Sales
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Beaver, Dale
Beaver, Dennis W.
Beavers, Kally
Beck, Jakes
Beck, Paul
Beck, Sheila
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Becker, Robert H.
Beckley, Cary W.
Beckwith, Jerry
Beckwitt, Jules Irwin
Bednar, Angela
Bednar, Michael
Beebe, William
Beeler, Joy Susan
Beigel, Joe
Belabert, Antonio
Belcher, Thomas
Beleker, Dorsey
Bell, Robert
Belland, F.W.
Bellcourt, Frank
Bellcourt, Patricia
Bellcourt, Thomas
Beller, Joel
Bellido, Dano
Bellman, Nicole
Bello, Jorge
Bello, Maria
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Benavent, Guadalupe
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Bender, Aaron
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Bennett, Lora
Bennett, Marvin
Bennett, Mitchell D.
Bennett, Robert
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Benson, George A.
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Benson, William
Bentley, Danny
Benton, Kelly
Benton, Petronella & Bob
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Berkley, William
Berman, Fred
Berman, Michael
Bermiller, Sanna E.
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Bernardi, Kari
Bernethy, Willard
Bernhard, Robert A.
Bernot, George
Bernstein, Oliver
Berry, Arthur
Berry, Robert
Bertot, Jorge
Bessant, Christina - Sunset Watersports
Betancourt, Rafael
Betts, Christopher
Bevan, Brian
Bialas, Michael - Sierra Club
Biddle, Joel
Bieder, Frand - Caribbean Watersports
Bieira, Pollyanna
Bienstock, Robert
Bierwirth, John
Bieur, Craig
Biggs, William
Bilitter, Eric
Billingsley, Charles
Bingham, Richard & Patricia
Bingham, Robert
Bingler, Joan
Binkowski, Karen
Binsfield, Jacqueline - Jetset Airmotive Co. Inc.
Birsh, Arthur
Bishop, Jobber - Chevron Products
Bishop, Clinton
Bishop, Johnny
Bitter, Edwin W. - Scalamandre
Bitter, Edwin
Bjorkman, Karl
Black, Brian
Black, James
Black, William
Blackburn, Marsh
Blackburn, Marsh H. - Plato Partners
Blacklidge, Marian & Kent
Blackwell, Micheal Lee
Blair, Edward
Blair, M.H.
Blake, Ellen
Blanchette, Tammy & David
Blanco, Daniel
Blandford, Bob
Blansfield, Frank
Blanton, Alex
Blanton, Cole
Blash, Thomas
Blaylock, M. Bradley
Blazek, Joe
Blazevic, R.L.
Blebese, Don
Bleser, Rob - Quiescence Diving Services, Inc.
Bliss, Dena
Blomber, Roy
Blomberg, Julia
Blomberg, Linda
Bloom, James D.
Blotzer, Edward J. - Animal Care and Welfare, SPCA
Blount, Jerry
Blount, Thomas
Blount, Tom
Blum, Warren
Blytt, Dale
Bocanegra, Honatanm A.
Bodden, Ashby & Jane
Bodell, Michele
Bogage, Jerry
Bohnsack, Barbara A.
Bollinger, Lynda
Bolton, Bruce
Bolton, D.
Bolton, Diane M.
Bolton, Neil F.
Boltz, James R. - Cycle Barn
Boomsma, Joan Escardo
Booth, Isabel M.
Booth, Ronald
Borden, Graham
Borden, Marolie & William
Borden, Tim
Borel-Saladin, Claude
Borgman, Chris
Borgo, Doug
Boris, Mike
Boris, Tom
Boro, Michael
Borras, Dave
Borreno, L.
Borten, William
Bortz, Ted & Mary
Bos, Robert
Bosco, John D.
Boss, Julie
Bourne, Lester
Boutillier, Robert
Bouza, Jorge
Bovingdon, James H.
Bowden, Keith
Bowen, R. Klien.
Bowen, Sharon K.
Bowers, Brad
Bowes, Joyce
Bowling, Judith
Boyd, Maurice
Boyd, Pat
Boyer, Robert M. - Caribbean Watersports
Boykin, Rita
Boyle, Joshua J.
Bozych, Gary
Braceras, Fermin
Brackenbury, Rosalind
Bradford, Peter
Brado, James
Bradshaw, Rae A.
Brady, Stephanie
Brady, Stephen
Brady, Win & Rosemarie
Braisted, Pete
Branch, Bill
Branch, Harry
Brander, Rachel
Brandich, Ronald
Brann, Diane
Brannan, Dennis
Braswell, Doug
Braum, Robert G.
Brawer, Carl
Brawner, Sam W.
Brendel, M.L.
Brennan, Alice
Brennan, Virginia M.
Brenner, Kristen
Brenner, Rosalie
Brennon, Devin D.
Breuer, Carla M.
Breuer, Roseanne
Breuer, Timothy
Brewer, George E.
Brewer, Jeanette
Brewster, Allison & Unreadable
Bricker, Melvin
Brickey, Tonda
Brickman, B.C.
Bridgman, David & Mary
Brieler, Joan
Brielevi, Herb
Brigham, David
Bright, Peter L.
Brink, Bruce
Brinson, Becky
Brinson, Cynthia
Brinson, Elwood
Briohlia, Nicholas B. - Caribbean Watersports
Brit, Grady
Brite, Bill & Bonnie
Brittain, Mike
Britton, Edward M. - West Coast Operations
Britton, Judy & Don
Brock, Genia
Brodie, Elizabeth
Broffman, Michael
Brokaw, Donald
Broll, Arthur
Broodman, Bill
Brook, Dwayne
Brookfield, Wesley
Brooks, Annette & Jim
Brooks, Charles S.
Brooks, James
Brooks, James F.
Brooks, Mark
Brooks, Michael P.
Brooks, Sheldon
Broten, Steve
Brothers, Bruce
Brower, Greg E.
Brown, Carol C. - Bob's Marine Village
Brown, Corey
Brown, Dale
Brown, David
Brown, David
Brown, Debra
Brown, Donna M.
Brown, H.T.
Brown, Hank
Brown, Helena
Brown, Holly
Brown, Joy
Brown, Joyce
Brown, L. Page
Brown, Michael D.
Brown, Nancy
Brown, Pamela & John
Brown, Rayford
Brown, Robert
Brown, Shirley
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Brown, Tina - Marathon Guides Association
Brown, Vivian & Herbert
Browning, Larry P.
Browning, Maryln
Broxson, Martha
Bruehl, E. Wayne
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Brunett, Alex
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Brunner, Carol
Brunner, William F.
Bruno, Joe
Bruno, Joseph
Brutto, Carmine
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Buchanan, Kimberlie
Bucher, Susan
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Buckley, Constance
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Bueno, Juan
Bukachek, Jim
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Bulloch, Dave - American Littoral Society-Gulf/S. Atlantic Chapter
Burchell,
Burchett, Robert
Burdock, Maria & John
Burges, Ray
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Burgos, Julia
Burke, Mary W.
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Burkes, Dave
Burks, Eric A.
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Burner, David
Burnett, Paul
Burnham, T.
Burns, Carol
Burns, G.
Burns, Heather E.
Burns, Patty
Burns, Scott
Burst, Donald
Burtis, Chris
Burton, Rachel
Burts, Bernice R.
Burwell, Michael J.
Busch, John
Bush, C.T.
Bush, Howard
Bush, Rowen
Bushnell, Martha
Bustamante, Juan
Butera, Jamie
Butler, Chris
Butler, Reute

Buxh, Howard
Buxton, Colin - Rhodes University
Buyers, John W.
Buyers, Marianne
Bye, Mary
Byer, D.
Bynum, Shari
Byron, Samuel T.
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Cadman, William
Cagle, Larry
Cain, Linda
Cajigal, Wanda Janice
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Calamoneri, Richard J.
Calderon, Evelyn
Calderon, Rene
Calderon, Ruben
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Campbell, Nicole
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Gyrkos, Ron
Haas, Greg - Caribbean Watersports
Haas, Robert J.
Haddard, Lois D.
Hagan, Don
Hagen, Andi
Hagenkotter, Carl - Victims of NOAA
Hager, Randy B.
Haggerty, Betty-Ann
Haggerty, Kerry Anne
Haigh, Henry A.
Haight, D.M.
Haimowitz, Morris
Haisington, Delva
Hajimian, Hrand
Halbasch, Wayne
Hall, Charles
Hall, Dennis
Hall, Elmer
Hall, Howard
Hall, M.H.
Hall, Patrick B.
Hall, William
Halusser, Caren
Hambrick, Lisa
Hambrick, Tyler
Hamer, David
Hamilton, Betty E.
Hamilton, Edward - Caribbean Watersports
Hamilton, Siddhartha
Hamman, Elizabeth

Hammer, Rob - South Florida Sport Fishermen's Club
Hammerl, Margaret S.
Hampton, Warren S.
Han, Heeja
Hancock, Bill
Hancock, JiM
Handevidt, Bob
Handy, Joseph
Hanley, Joyce K.
Hanley, Mari T.
Hanna, Paul J.
Hannon, Robert & Tracy
Hans, Hazel
Hans, Robert
Hansen, Fay & Lee
Hansen, Garian
Hansen, Gary
Hansen, Glenn R.
Hansen, John
Hansen, Nick
Hanson, Carl
Happ, Eric N.
Hardy, Jesse J.
Hare, Chester
Harel, Amit
Harkey, Pat
Harkins, Jane
Harman, Alan
Harman, Terry
Harness, Hugh G.
Harness, Hugh
Harnu, Chris
Harrell, William
Harrington, Brian A.
Harrington, Daniel
Harrington, David M.
Harrington, Javier
Harris, Alexander
Harris, Carol
Harris, Dave
Harris, James R.
Harris, Janet R.
Harris, Kenny
Harris, Nancy A.
Harris, Peter
Harris, SL
Harris, Will - Yamaha Motors Co.
Harrison, Bonnie - WKLG 102.1 Fm
Harrison, Carolyn N.
Harrison, Debra S. - The Wilderness Society
Harrison, Douglas
Harrison, Terry
Harry, Everette
Hart, Jery
Hart, Robert - Florida Defenders of the Environment
Harter, Phillip C.
Hartley, Amy Jo - Sunset Watersports
Hartman, A.
Hartman, Murray R.
Hartzog, Stewart
Harvey, Laura
Harward, Coby
Haskell, Monica
Haskins, Jack
Haskins, Michael
Hassen, Sandi
Hatch, Jill & Denny
Hatches, Peter
Hatfield, Wendy
Hauck, Frederick
Haurty, Gwen
Hausin, Toni - Andrew P. Derwin DDS
Hawk, David
Hawkins, Jack - Emmanus United Methodist Church
Hawthorne, William
Hayden, Mike - American Sportfishing Association
Hayes, Carl R.
Hayes, Judith
Hayes, Mary
Hayman, Mike
Haynes, Jeffrey K. - Venerkloot, Rentrop, Martin, Haynes, & Morrison
Haynos, Donaus
Hazelip, Carol
Hazelip, L.A.
Healey, John W.
Healey, John
Hearth, H.
Heatherly, Joseph
Hebert, Kathleen M.
Heck, Cheva
Heckert, Richard
Hedges, Robbin
Heffner, Joyce A.
Heffner, Ralph W.
Hefner, David
Hegelund, Gail
Heining, Troy
Heintz, Carl J.
Heintz, Kurt
Heise, Nancy
Heistra, J.
Helbig, Karen
Helgeland, Marilyn
Helinger, Kerry
Hellen, Lori
Heller, Adam B. - Caribbean Watersports
Helmka, Thomas
Hemond, Stacy E.
Hencolia, Jose
Henderson, Charles & Jane
Henderson, Jim
Hendrick, Chip
Hendrick, William B. - The Worden Company
Hendricks, Roger - Glencove Marine
Hendrickson, Peter
Henell, Kenneth
Henrich, Conrad
Henrich, Harold
Henry, Alexander
Henry, Jeffrey
Henske, John
Hensley, Judy
Henson, Ida
Henson, Mark
Hepp, Randy J.
Herdia, Jannet
Heredia, Carlos
Heredia, Carlos
Herlth, Mike
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Hermes, Richard G.
Hernadez, Aracelio
Hernandez, Egan
Hernandez, George
Hernandez, John
Hernandez, Madelin
Hernandez, Miguel
Hernandez, Raul
Hernandez-Adan, Carlos
Herrera, Arturo O.
Herrera, Christina
Herrera, Maria
Herrera, Pedro
Herrera, Ramon
Herrrick, Homer - Florida Keys Audubon Society
Herschelman, Richard
Herzoa, Keide S.
Heutel, Jack
Hevel, Jeannette & Tom
Hewitt, Cynthia A.
Heynes, Margaret F.
Hibbard, Frank
Hickman, John
Hicks, Greg
Hidalgo, Bill
Hideshimo, N.
Hietala, Todd
Higashiyama, Cynthia
Higgins, Elaine
Higgins, Gary F.
Higgins, Norman
Higgs, Stephen
Higgs, Wayne
Highland, Cecil B. - One Valley Bank
Higley, Steven R.
Hilbro, Rosemary
Hilker, Bruce R.
Hill, Anthony L. - Yamaha
Hill, Clifford, Barb, & Greg
Hill, Edwin
Hill, Essie M.
Hill, Jack
Hill, Lori
Hill, Michael
Hill, Rick
Hill, Roy
Hill, Sandra
Hill, William
Hillard, Anthony S.
Hillen, Jayson
Hillman, David
Hilmer, Wayne J.
Hilton, Herbert
Hindman, Don
Hindman, Jerry
Hines, Alberta (Taps)
Hines, Jordan
Hinkson, Matt
Hiratsuka, Lea
Hire, Robert C.
Hires, Robert P.
Hisellini, Bruno G.
Hobart, Grant
Hochhauser, Paul
Hodges, Matt
Hodges, Michael
Hodlick, Tom
Hoecker, Elizabeth A.
Hoff, Richard
Hoffar, Cathy
Hoffman, Jayson
Hoffman, Jim
Hoffman, Pat - Merlinn Guest House
Hoffman, Robert - Reef Life, Inc
Hogan, Steve
Hogberg, Ann
Hogberg, Myles
Hogelack, Dwain A. - Caribbean Watersports
Hogland, Denis
Holak, Thomas G.
Holcomb, Ken - Professional Plumbing Services
Holcomb, Nancy
Holderfield, Jennifer
Holguin, Juan
Holl, Joseph
Hollock, Jill
Holloway, Jimmy
Hollowell, Thomas
Holmes, Jay T.
Holohan, Ginny
Holson Scratch, Verna
Holstun, Lane
Holt, Jan
Holt, Tammy
Holte, Dale
Holten, Darren
Homer, Cindy
Homer, Paul
Homer, Sondra
Hon, Charles
Honigman, Gerald - Buddy Taylor Middle School
Hontz, Wayne H.
Hood, Gregory C.
Hoopingarner, Cheryl A.
Hoover, Sam & Sorrel
Hope, Jason
Hopkins, John
Hornsby, Al - PADI Legal and Environmental Affairs and Dema Legal and Legislative Committee
Horspool, Stan - Caribbean Watersports
Horton, Mark
Horton, W.A.
House, W.C.
Houston, Johnny
Houston, Judith
Houston, Robert
Hoversen, Elizabeth
Howard, Howard
Howard, Pat & Rick
Howell, Sheri
Howland, Barbara
Hoxsey, Kevin - Genesee County Health Dept.
Hoysa, Matthew J.
Hubbard, Stanley S. - Hubbard Broadcasting, Inc.
Huber, Arthur
Hudson, C. Fred.
Hudson, Douglas
Hudson, Hamp
Hudson, Hank
Huff, Ralph
Huggins, Barbara B.
Hughes, Herbert
Hughes, Mary & William
Huizinga, Wayne
Hulan, Marie E.
Hull, Richard J. - Hull & Company Inc
Hung, John W.
Hunt, Brian
Hunt, Kimberely
Hunt, Mary Ellen
Hunt, Susan - Hunt Equip. Co. Inc.
Hunter, Rose Marie.
Huppert Jr., Bruce W.
Huppert III., Bruce W.

Huppert, Lynn
Huppert, Ryan
Hurd, Donald E.
Hurley, Bob
Hurley, John Matthew
Hurst, Billy
Hurst, David
Hurst, Frank
Hurst, Larry
Hurtz, L.E.
Husnander, Angela
Hutchens, Pauline
Hutchinson, Donnie
Hutchinson, William
Hutt, Steve
Hutto, Patrick
Hutton, George N.
Hutton, Stephen E.
Iglesias, Jose
Ilchuk, Peter K.
Illiano, Cathy
Ilson, Jeff
Imbriaco, Angelo
Impallomeni, Steven - Gallopin Ghost Charters
Ingalls, Melville
Ingersoll, Marjorie
Irizarry, Amy
Isaacson, William R.
Isabelle, Collet - Caribbean Watersports
Iturralde, Leonel & Margie
Ivy, David
Iwasa, Colin
Izzo, Anthony
Jacaruso, Linda & James
Jack, Kelley
Jackson, Bruce - Glencove Marine
Jackson, Kelly
Jackson, Leon
Jackson, Robert
Jackson, Roy
Jackson, Sherry - Glencove Marine
Jackson, Tony
Jacobs, Cheryl
Jacobs, David
Jacobs, Jenny
Jacobs, John L.
Jacobs, John L.
Jacobsen, Barbara & Ray
Jacobsen, Rhonda C.
Jacobson, Patty
Jacome, Marina
Jaen, Jose
Jaen, Jose
Jaime, Stevanon - Sunset Watersports
James, Sharon
Janji, Barbara
Jappe, Paul
Jaret, Tricia
Jason, Brian
Jaspersen, Jeanna
Jasperson, K.
Jasperson, Karl
Jasperson, Yvonne
Jayne, Elizabeth
Jelenic, Steve
Jenkins, Tadd
Jennings, Richard E. - Smithereen Exterminating Company
Jennings, Richard
Jensen, Gayland
Jensen, Gunnar
Jenssen, T.A.
Jepson, Jay
Jester, Gary - Caribbean Watersports
Jewett, Dwight
Jewson, Havelock & Sheila
Jezdimir, Diane
Jibiki, Joe
Jilwon, Maro
Jimo, James
Joder, Gregory
John, Charlotte - Indian Hills Resort & Marina, Inc.
John, Kelley
Johnansen, J.A.
Johnne, Ken
Johnson, Andrew
Johnson, Barbara
Johnson, Charlie
Johnson, Claudia L.
Johnson, David
Johnson, David R.
Johnson, Deborah
Johnson, Edward B.
Johnson, Gary
Johnson, Ginger
Johnson, Glyn - Bombadier Corp.
Johnson, Gordon
Johnson, Jeanne N.
Johnson, Jimmy
Johnson, Linda E.
Johnson, Marlynn
Johnson, Martin
Johnson, Mary
Johnson, Robert
Johnson, Ronald
Johnson, Terry
Johnson, Vickey
Johnson, Wes & Gina - S & S Sports, Inc.
Johnston, Stephen Eric.
Johnston, Timothy
Johnstone, Ian
Jones, Charles
Jones, Charles Jeff
Jones, Chilton R.
Jones, Harold
Jones, J.
Jones, John Paul
Jones, Joseph R.
Jones, Lynn
Jones, Marianne Y.
Jones, Shanron
Jones, Steven
Jones, Teri
Jordan, Michael D.
Jordan, Patricia
Jordan, Robert
Jordan, Steven
Jorge, Miguel
Jorstad, David
Joslyn, Robert
Jospey, Sheldon
Joyce, Frank
Joyner, Don
Joyner, Lisa Kay
Joynt, Brian
Joynt, Charlotte
Judge, Chuck
Judy, William
Juergen, P. - Caribbean Watersports
Juniper, Steve & Irene
Jura, Russell - Yamaha Motor Corporation, USA
Jurgens, Richard
Justile, R.S.
Kabel, Jill
Kadloc, Brian
Kaemmlein, Hans
Kahn, Bonnie
Kahn, Stone
Kaholig, Al
Kaiser, Paul
Kalinowski, Brian
Kalohi, Kathy
Kaminskas, Adam
Kamlade, Kevin
Kammer, Jill
Kane, Thomas
Kantarjian, Stephen
Kanzier, W.M.
Kanzler, Euphemia
Kanzler, Walter H.
Kanzler, Walter
Kaple, Jerome W.
Karam, Phillip
Karlen, Bernard E. Bek
Karmen, David
Karnes, Debra
Karnes, William
Karpach, E.J.
Karpach, Joe
Karshna, Karen M.
Kasprowicz, Kevin - Caribbean Watersports
Kaste, Steve
Kaszowski, Gary
Katz, Edward A.
Katz, Michael & Urania
Kaufman, Elaine
Kawatski, Jerry
Kay, William J.
Kay, William
Kazakevich, Kevin
Keefe, Debra
Keefe, Jack
Keeney, Cheryl
Keevers, Mike
Keffer, Richard
Keidel, Albert
Keith, Tommy
Kelinhon, David
Keller, Carol Betts
Keller, George H.
Keller, Jeffery
Keller, John W.
Kelley, David
Kelley, Tim
Kelly, Doug - Florida Sportsman Magazine
Kelly, Karen Wells
Kelly, Kevin
Kelly, Sharon
Kelly, Shirley Dycked
Kellysmith, Lisa
Kelster, James
Kempsell, Mark
Kenestod, Scott
Kennedy, James
Kennedy, Marla
Kennedy, Mary
Kennedy, Webb J.
Kent, John
Kenwood, Clifford
Kepley, Richard
Kerekes, John & Nancy
Kerkesner, Dean
Kerr, Ilka
Kershus, Fredirick W.
Kersten, Timothy A.
Keskinen, Ken
Key, Ronald D.
Kibil, Henry
Kiddy, Carla
Kihne, Michael
Kilby, Robert
Kiley, Jessie
Kiley, Joan L.
Killen, Eric
Kimball, Joan
Kimball & Family, Charles B.
Kimmel, Derek
King, Cheryl
King, Diane
King, Jeffrey
King, Linda
King, Robert
King, Virginia
King, W. Griffin
King, Willard V.
Kinnebrew, Kevin
Kinsella, Sean
Kinsley, Chris
Kinter, Sean M.
Kipp, Tom
Kippenhan, Heidi
Kirbar, Eugene
Kirblac, Kathy
Kirby, Gerald
Kircher, Spencer
Kirk, Amy
Kirk, Cary & Carol
Kirk, James P.
Kirk, John
Kirk, Richard
Kirkey, Mary Kay
Kirsch, J.L.
Kirschner, Henry
Kirtley, Deavis
Kislak, Lynn
Kitchings, Chester
Kittka, Ernest J.
Klaver, Dean
Klayf, Joan
Klein, Bernard M.
Klein, Harvey & Judith
Klein, Helene
Klepper, Robert
Kline, Charles C. - White & Case
Kline, Jim
Klingbeil, Gerald
Klinger, Paul
Klipping, Steve
Klum, Michael
Knight, Edward
Knopf, Amy
Knowles, David
Knowles, Thomas B.
Koch, Arcia A.
Koch, James R.
Koczak, Wayne
Koenig, John A.
Kogut, Pamela
Koide, A.
Koivu, Brenda
Kolojay, Adam
Kolsner, Ken
Kombert, Dieter

Konickson, Mike
Konkler, Johnny - B&K Marine
Koones, Blux N.
Koop, Margarete
Kopach, Christopher
Kopcza, Walter
Kopczyk, Raymond A. - University of Kentucky
Korheva, Dawn
Kornblau, Bryan E. - Caribbean Watersports
Korpak, Charles & Kathyrn
Kosel, Brad
Koslofsky, Craig M.
Koslofsky, Dean
Koslofsky, Gene J.
Koslofsky, Jacob
Kotler, David
Koukari, Raymond
Kozimbo, John C.
Kramer, Bill
Kramer, James
Kramer, John
Kramer, Sandra G.
Krantz, Marcus & Helen
Krapf, Betty
Krauitz, Sonny
Krause, Carl
Krause, Marylou
Krause, Paul
Krebs, Barbara B.
Krech, Micheline B.
Kreger, Allen
Krich, Kelly
Krisko, Robert - Sunset Jet Ski
Kroeger, Dorann
Kroll, Jackie
Kronk, Rachel - Sunset Water Sports
Kropp, Kathryn
Krowe, Allen J.
Krueger, Sharon
Kruer, Curtis - Florida Audubon Society
Kruskamp, Susan C. - Sunset Water Sports
Krussman, Rosemary
Kuack, Dennis
Kuczynski, Florence
Kuehn, Dana L.
Kuhn, Anthony
Kuhn, Bill
Kuhn, David
Kuhn, Don
Kulpa, Mike
Kunde, Clifford
Kuoff, Rich
Kurebayashi, Sam
Kurtines, William
Kushner, Mike - Coconut Cove
Kushner, Randall S. - Coconut Cove Rental & Marina
Kushner, Vince - Coconut Cove
L'keith, Rickey
Labarera, Robin
Labeau, David, G.
Laber, Nancy
Lacina, Mike
Lacoste, Patricia
Lacoste, Rodney
Lacote, Diane & Anthony
Ladish, John, H.
Lafleur, Mike - Lafleur's Gymnastic Club
Lafollette, Robert
Lafontaine, Roger
Lageson, Carol
Lageson, Steven
Laguna, Larry - Sunset Water Sports
Lake, John - The Lake Co.
Lake, John
Lake, Walter J.
Lallo, April
Lalmde, Gustavo
Lalue, Carol
Lamgesfeld, Pablo
Lammers, George M.
Lampe, Jeff
Lamperelli, Karlen
Lanard, Elizabeth, E.
Lancaster, Steven, J.
Land, Manica
Lander, Raymond, A.
Landis, Mark
Lando, Marcia
Landon, Christopher J.
Landrum, B.L.
Landrum, Paul W.
Lane, Frank B.
Lane, Howard - Tortugas Unlimited Inc.
Lang, Claire
Lang, Margaret
Lange, George
Langer, Maureen
Langesfeld, Andres
Langley, Randy
Langlie, Scott
Lanham, Jim
Lanigan, David
Lanigan, John
Lapointe, Buddy - Fishin' Buddy
Lapphon, Amie
Lappohn, April
Lappohn Sr., Sharon
Lappohn, Sharon
Larento, Richard L.
Larges, Cora May
Laroe, Ken
Larrieu, Jorge
Larsen, Charles
Larson, Christopher
Larson, John
Larson, Kimberly
Larson, Lewis C.
Larue, Lois
Lashway, David
Lauber, Chris - Watercross, International
Laufle, Michael
Laumeister, Hugh M.
Laver, M.B.
Lavergne, R.G.
Lawery, Jane
Lawler, Michael
Lawler, Suzanne
Lawrence, C. Richard.
Lawrence, Cynthia
Lawrence, Daniel J. - Lawrence Residential Funding Corp
Lawrence, Ricardo
Lawrence, Robert - Auto Suture Company
Lawson, Angela
Lawson, Rodolfo
Lawton, Paul
Lay, H. Frank
Layton, John
Lazarowicz, Vonnie
Lazko, Peter
Le, Yo
Leach-Pratt, Jerrilyn
Leake, Sue & Fred - Treetop Inn
Leavell, Becky
Leavell, John
Leban, Barry
Lebar, Charles
Lech, Leo
Lechler, Mary Lou
Lederer, Roger F.
Lee, Donna
Lee, Janice
Lee, John - Creative Corporate Buisness Service
Lee, Kent
Lee, Kyung - The Landings of Largo
Lee, Rodney
Leger Frazier, Lisa
Leggett, Gary
Lehman, Robert J. - Key West Hotel and Motel Assoc.
Lehmhuhl, Connan
Lehmuller, Paul
Lehor, Barbara
Leibount, Michal
Leider, Joe M.
Leighow, George
Leighton, Andrew
Lembo, Laura - Jetset Airmotive Co. Inc.
Lemens, Pat - Glencove Marine
Lemens, Steve - Glencove Marine
Lemke, Craig
Lemoine, Gerard
Lemons, Larry
Leo, John M.
Leo, Theresa
Leonard, Carol
Lergo, Mark
Lerma, Marlina
Leshikar-Denton, Margaret - Cayman Islands National Museum
Lesmeister, Joe
Lessard, Tim
Levine, James
Levis, Leslie - Captain's Corner
Levison, Karen
Levy, Linda
Levy, Richard
Lewis, Bernard
Lewis, Kevin R.
Lewis, Lawrence B.
Lewis, Lenard
Lewis, Miriam
Lewis, Richard C.
Lewis, Robert W.
Leydic, George D.
Lezaro, Olga
Lianzi, Theresa L.
Lieberman, Vanessa
Liens, Harriet
Lienz, Vmi H.
Liggett, Pete
Lindbald, Andy
Lindberg, Vicki
Lindsay, Ward
Lindsey, Carol L.
Lipe, Betty
Liptak, Linda C.
Lipthay, Margaret
Litman, Alan
Litowitz, Donna Balkan
Littleton, Dana & John
Livoti, Marilyn
Llorca, Christopher
Llorca, Sherry
Lloyd, Carrington M.
Loaiza, Alexandro
Locke, Simeon
Loeffler, Daniel M.
Loester, Virginia
Loewer, John H.
Logan, Jim
Logan, William - State Central Bank
Logsdon, John
Lohman, Robert
Lohmneller, Freddie
Lombardo, Bud
London, Michele
Long, Scott
Looker, Elizabeth
Looker, Roberta
Looper, Patricia
Lopex-Trigo, Eddie
Lopez, Carlos F.
Lopez, Carols
Lopez, Cesar A.
Lopez, Francisco
Lopez, Juan
Lopez, Maria
Lopez, Michelle
Lopez, Patricia, P.
Lora, Ogo - Caribbean Watersports
Lorkes, Jordan
Loseke, Kevin J.
Lossn, Barb & Darwin
Lotiereo, Christopher
Lotz, Kathy A.
Lovern, Sharla B.
Lowe, Matthew Ryan
Lownes, Holly
Lowny, Charles
Lowry, Sue
Lozar, Jimmy
Lrumay, William
Lubae, Penelope
Lucas, Re
Lucas, Sandra R.
Luceir, Julia M.
Luciano, Michelle
Lueptow, Lloyd
Lugo, John J.
Luis, Eduardo E.
Luke, B.C.
Lukens, Miriam H.
Lund, Jerome
Lunger, Lisa
Lurig, Alex
Lurig, Alexander
Lurvey, Mary W.
Luttrell, D. Scott
Lyn, Kenneth A.
Lynn, James
Lynn, Ronnie B.
Lyons, Elizabeth E. - Amherst College
Lyons, James E.
Lyons, Michael
Lyse, Pat E.
Lyssenko, Taras C.
Maaskant, Walter
Mac Donald, Leslie
Mac Korvick, Kelly
Mac Korvick, Shayla
Mac Korvick, Vickie
Mac Lellan, Eleanor

Mac Lellan, George & Audrey
Mac Wiliams, Ruth & Bill
Macarthur, James S.
Macdowell, Robert
Machione, Tony R. .
Machusak, Barbara
Mack, Chad A.
Macovganey, John
Macpherson, Brenda J.
Madden, John J.
Madden, Mary
Maddin, Lucille
Maddin, Ted F.
Madguely, Stan
Madrigal, Martha
Madsen, Majorie
Maebrig, Ann M. - Caribbean Watersports
Maggio, Pietro
Magill, Robert T.
Magner, Kevin
Magnussen, Carl
Magsby, Ray D.
Maguire, Bruce J.
Mahag, Greta
Maile, Joyce
Makoff, Les
Malasha, Pamela J.
Malinosky, Michael
Mall, Greg
Mallo, Sally
Mallo, Sandry
Malloy, Patrick - Caribbean Watersports
Malone, Bonnie
Malone, Eric
Malone, Meredith
Malone, Robert
Mammei, Anthony
Maney, Jack - Sierra Club Florida Chapter
Mangles, Joan
Mann, James R. - Caribbean Watersports
Mann, Troy
Mannchen, Brandt
Mannillo, Frederick C.
Manning, Kevin R.
Manos, Guy
Manos, Guy
Manuel, John - Quality Lawn
Maradik, Michael
Marchman, Ray
Marcos, Marclys
Marcus, E.M.
Marcus, Peter A.
Marimon, Owen
Marinelli, Margaret A.
Markeloff, Robert
Markham, Wade M.
Markman, Russell/Kyle/Jason
Marks, Antonio
Markus, Mary
Marmolejo, Stacey
Marquez, Alvaro
Marr, Chester
Marren, Thomas W.
Marrison, Albert
Marrone, Anthony G.
Marshall, Carole P.
Marshall, Derek
Marshall, John S.
Marshall, Patricia
Marshall, Ralph
Marshall, Richard
Martens, Jim
Martin, Brad
Martin, Cheryl
Martin, Christy
Martin, Dorothy
Martin, Duke R.
Martin, Edward A.
Martin, Eve
Martin, Greg
Martin, Gregory
Martin, James V.
Martin, Jim
Martin, John
Martin, Joseph
Martin, Judy L.
Martin, Kyle
Martin, Lemay
Martin, Lynne
Martin, M.B.
Martin, Mark
Martin, Michael R.
Martin, Michael B.
Martin, Randy
Martin, Sharon
Martin, Sheila K.
Martin, Steven
Martin, Yamel
Martine, Mike
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Martinez, John
Martinez, Linda - Caribbean Watersports
Martinez, Mike
Martinez, Omara
Martinez, Susan
Martz, Ben
Marx, Betty
Mary, Ron
Mas, Jose
Mashburn, Cromer
Mason, Pamela S.
Mast, Alfred
Mast, Lynne
Masters, Deborah & Steve
Mastrorocco, Anthony
Masuda, Shirley Y.
Matenaer, Mark
Mathews, Brett
Mathews, Peggy
Mathews, Walt
Mathewson, Duncan - The Union Institute
Mathias, Fred
Mathis, Billy L.
Mathis, Gary - Suzuki of Russellville
Matkowski, Marilyn
Matlock, Dee
Matthew, Charmain
Matthew, Ronald
Matthews, Douglas G.
Mattin, Helen
Mattison, Alan
Mattison, James
Matusik, Edward
Matzie, Wm. & Patricia
Maxcy, Greg
May, Don
May, Donald, E.
May, Gordon
May, Jeff
May, John
Mayberry, Kristina
Mayes, Nathan
Maymo, Miguel
Maynury, Lesley P. - Caribbean Watersports
Mayo, Shawn
Mayorga, Maximillian
Maza, Pedro
Mc Bride, Scott
Mc Carthy, Dan
Mc Chargue, Julie
Mc Clure, Amanda A.
Mc Clure, John D.
Mc Comb, Theresa
Mc Cord, Blair & Louann
Mc Cormick, John
Mc Cullough, Carrell - Caribbean Watersports
Mc Daniel, Kent
Mc Dermit, Karen L.
Mc Dermito, Dennis
Mc Donald, Maurice
Mc Elroy, David
Mc Garry, Michael J.
Mc Ginnis, Margaret
Mc Gowan, Mike, Cathy & Michaela
Mc Guire, Diane, M.
Mc Hale, Brion
Mc Hendon, Kelly
Mc Intosh, Mike
Mc Intosh, Tricia
Mc Kinnies, Barbara
Mc Mahon, James
Mc Millan, Barbara
Mc Millan, Carrie
Mc Neil, Josette
Mc Pherron, Cheryl
McBurney, Mark
McCaffrey, James
McCaleb, Shawn - Stovall's Yamaha Country
McCall, Kelly D.
McCarthy, Daniel
McCarty, Barbara
McCarty, J.C.
McCarty, Larry
McCauley, Jill
McCauley, W.
McChargue, Dave
McClellan, Joseph
McClever, Debra - Caribbean Watersports
McClure, Lois
McConnaughey, Bayrd
McCormick, Marquirite
McCraken, Dena
McCraw, Mark
McCririck, Joanne & Alan
McCullough, John
McDermit, Dennis
McDonald, Bruce
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McElroy, Kenneth
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McGee, Ronnee
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McGriff, Lee - Mcgriff,Seibels &Williams, Inc.
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McKenzie, Tommy
McKenzie,Rs, Brian - Genesee County Health Dept.
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Michel, Coky
Michel, Paul J.
Michels, Daniel
Midera, Andy - Caribbean Watersports

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Newman, Rae
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Pedrosa, Linda - Jetset Airmotive Co. Inc.
Pellar, Joesph J.
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Perez, George
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Piassa, Perry - Sunset Watersports
Pickard, Dawn, S. - Genesee County Health Dept.
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Ra, Michael
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Seda, Nelda
Seeger, Jon
Segallos, Jeff
Segner, Jesse
Segsworth, Peter
Sehlinger, Peter J.
Seiglar, Celia
Selbo, Derek
Self, Dan
Selinger, Max
Sellers, Mabel - Sellers Oil Company
Selsky, Denise
Sephenson, Richard J. - Integrated Medical Delivery Corp.
Sepulveda, Claudia
Serge, Dale
Sermarni, Matt
Sermen, Joseph
Serra, Roman
Setlock, John
Settlemoir, Donna
Settles, Deborah
Settles, R.D.
Severino, Rob
Severts, Karen
Sexton, Laurie
Seymore, Marilyen
Seymour, A.E.
Seymour, Mary - Genesee County Health Dept.
Sfone, Joseph
Shadix, Jimmy
Shafer, James E. - South Florida Sport Fishermen's Club
Shaffer, Ed
Shallow, Michael
Shamama, Gale
Shannon, Tom
Sharp, James M.
Sharp, Jeff
Sharpe, Jim - Sea Boots Charters, Outfitters & Enterprises
Shaver, Joy
Shaw, Deborah A.
Shaw, Lonny - Florida Keys Guides Assoc.
Shaw, Richard
Shaw, Russ
Shaw, William H.
Sheehan, K.D.
Sheehan, Katha
Sheely, R.
Shelton, Carol D.
Shepard, Donald
Shepherd, Clayton
Shepherd, Joel
Shepherd, Therese
Shergalis, William
Sheridan, Kathleen R.
Sherk, Jerome
Sherk, Wendell J.
Sherman, Carolyn
Shermen, Glenn
Shields, Paul
Shields, Peter F. - Flat Rock Metal, Inc.
Shields, Peter
Shiffer, Lou
Shiling, Mike
Shimer, Jeff & Denise Kahler
Shinn, E. Elise.
Shipley, W.S. - Shipley Oil Company
Shirk, L.
Shively, James
Shook, Rhonda
Shular, Julie
Shultis, Karen - Go Jet Ski
Shultz, Dan - Go Jet Ski
Shumway, Frank R.
Shupe, Reed
Shurley, Fletcher
Sibila, Joy
Siebenthaler, William
Sieg, Carol - Glencove Marine
Sieg, Willis - Glencove Marine
Siegel, Robert A.
Siewert, Mark
Silkett, Robert
Silvain, Peter
Silver, Ben
Silver, Debra
Silverman, Peter
Silvern, Marilyn
Simmons, Dexter - Flatsmaster
Simmons, Lynne, Marie.
Simmons, Robert
Simms, Ruth
Simone, Alice
Simonowski, Cheryl
Simonowski, George
Simons, A.T.
Simons, Gloria
Simorenko, Shana
Simpson, Joan
Simpson, Shelia
Sims, Helena
Simurra-Sharp, Linda - Coral Reef Park Co. Inc.
Singer, Albert R.
Singer, Christine B.
Singer, S. Leonard
Singgeman, Lisa - Coconut Cove Resort & Marina
Sinnamon, Jack - Dadeland Civitan Club
Sirbons, Robert F.
Siroslowski, Kathy - Fun Times Recreation, Inc.
Siskin, Sanford
Sittman, Sue
Sitto, Felipe
Sixto, Emilo
Skapik, Marty
Skawski, Barbara H.
Skehan, Linda
Skelly, Richard
Skinner, Michael D.
Skudder, Paul
Slate, Spencer - Keys Association of Dive Operators
Slate, Spencer - Atlantis Dive Center, Inc.
Slate-O'byrne, Amy M. - Amy Slate's Amoray Dive Resort
Sletten, Marva Mizell
Slevcove, Tricia
Slone, Dale A.
Slott, David
Smernoff, Shelley - Caribbean Watersports
Smith, Ashley
Smith, Ben - Sunset Watersports
Smith, Carolyn
Smith, Charles
Smith, Daniel A.
Smith, Dennis - Caribbean Watersports
Smith, Don - Sunset Watersports
Smith, Donna
Smith, E. Whitfield
Smith, Edgar Wayne
Smith, Fred
Smith, Glen
Smith, Harry J.
Smith, Jacquelyn
Smith, James
Smith, Jeffrey - Ayers, Reflex Design, Inc.
Smith, Julie
Smith, Kenneth
Smith, Kevin
Smith, Lis F.
Smith, Mary
Smith, Melissa A.
Smith, Mildred
Smith, Pamela A.
Smith, R.
Smith, Ron
Smith, Shelia
Smith, Stan - Yamaha Motor Mfg. Corp of America

Smith, Steffi - Marine Paintings
Smith, Susan
Smith, Travis
Smith, Wayne
Smittle, John - Southernmost Sailing, Inc.
Smolan, Marvin
Smyth, James & Arline
Snay, Sharon
Snell, Linda
Snijdewind, Cynthia
Snowden, Guy B.
Snowder, Clarence T.
Snyder, Earl
Snyder, Matto
Snyderman, Jacob
Snyer, Dale
Sodergren, Garnet
Sodergren, Nancy J.
Soffler, Judy W.
Soliday, Alvin & Yvonne
Solis, Jose
Solman, Susan
Solomon, Barbara
Solomon, Michael
Sondra, Annette
Sondra, Joseph
Sontag, Ben
Sontag, Rosemarie
Sorenson, Julia R.
Sorenson, Robert C.
Sorenson, Robert
Soursby, Mike - Kawasaki Motors Corp. Inc.
Southwick, Donald
Sovacool, Benjamin
Sovacool, Theresa
Spalsitch, Jim
Spano, Wayne
Sparkman, Will
Sparks, Gordon
Sparks, Paul
Sparo, Wayne
Spau, Lucas
Spaulding, Greg
Spear, Mike
Spearman, Wesley R.
Spence, J.B.
Spencer, David
Spencer, Mike
Speroni, Ken
Spindler, Max
Spitzer, Michael
Spitznagel, Kim
Sport, William
Spotts, Richard
Sprague, Harold
Sprague, Jean
Sprague, Nick
Sprenkle, Clarence
Sprogell, Rob
Sproul, Virginia
Spurney, Dick - Shamrock Investments
Srednl, Erwin
St. Clair, Donald R.
St Clair, Sally M.
St. John, Ray
St. Louis, Martha
St. Uil, Stevie
St. Ville, Tom - Caribbean Watersports
Staebler, Ma
Stafford, Mimi
Stafford, Simon
Stagg, Bruce
Stagg, Mary Ann.
Stahl, Lee A.
Stahlberg, Per
Staines, Lupe
Stamps, Chris
Stanley, William
Stansbury, Gary & Rebecca
Stanski, Charles J.
Stanton, J.S.
Stanton, Robert M.
Star, Millicent
Staren, John - Sunset Watersports
Stark, Christine M.
Stark, Mel S. - Political/Environmental Activist
Starke, Gary
Starling, Lee
Starr, B.
Starr, Christopher A.
Starr, Larry
Starr, Ray
Stavenes, Stephen
Stavos, Steven
Steen, Joseph W.
Steiger, Annette - Sunset Watersports
Stein, Herbert
Stein, Herbert
Stein, Herman, Riley.
Stein, Martin
Steinbach, Steve
Stellwagen, Thomas C. - Thomas C. Stellwagen, Inc.
Stender, Bonnie
Stenvik, Owen
Stephens, Garrick
Stephens, James
Stephens, John D.
Stephens, Wayne W. - Sunset Watersports
Stephensen, Lex
Steponvicius, Vincent
Stern, Bill
Stern, Harry F.
Stern, William J. - Stern Advertising
Stetson, Stephen
Stevens, Elizabeth
Stevens, Ratt
Stewart, David
Stewart, Dion
Stewart, Don
Stewart, Emilie
Stewart, Emilie Caldwell
Stewart, Jane
Stewart, John & Brenda
Stewart, Karen
Stewart, Steve
Stickles, Betsy
Stiglitz, Hans
Stinson, Harold
Stinson, Lois
Stockebrand, Daniel
Stocker, Robert
Stoddard, Ron
Stoffer, Michael - Caribbean Watersports
Stoll, Chris
Stoltz, Roger
Stoltzfus, Cindy D.
Stone, Alexander - Reefkeeper International
Stone, Donna L.
Storm, Larue S.
Stoter, James
Stover, William
Strahl, Cinder
Strahl, Michele
Strassheim, Thomas J.
Straun, William T.
Strawbridge, Elizabeth W.
Strawser, Justine
Streety, Toni
Strickland, Ben Lee
Strickland, Laurie K.
Strickler, Mary & Darryl
Strode, J.P.
Strohm, Michael
Stropki, Jason
Stropki, Jason P.
Struch, James
Stubblefield, David
Stuckey, Brian
Stuckey, Fred
Stuhlmann, Don
Stultz, Catherine A.
Sturnick, Mark
Styles, Bill
Suavez, Jose
Sublett, Mark
Suergen, P. - Caribbean Watersports
Sugrue, Stan
Suhr, Walter
Suko, Elizabeth Faye
Sullivan, Marelyn & Leo
Sullivan, Philip F.
Sult, Anastasia
Suman, Geosvanys
Sumpter, John
Sundal, Safder
Sunder, Thomas
Sundermen, Doreen
Superdock, William T.
Sutherland, Janis
Sutton, James
Svete, Joseph
Swalkowdki, Christina
Swann, Steven Phillip
Swanson, James
Swanton, Scott
Swares, Richard
Swauer, James
Sweat, Kevin
Sweeney, Mark C. Bertram
Sweet, Elnora
Sweet, Robert
Sweitzer, Dennis E.
Swenson, Bruce K.
Swenson, Peter
Swenson, Randolph
Swift, Edwin O.
Swift, John S.
Swindell, John
Swint, Willie
Sykes, Oliver J.
Sylvester, Manuel
Sylvester, Sandra L.
Symbolick, William
Sywolski, Bob
Szoke, Joe - Caribbean Watersports
Szymanski, Joyce
Tabares, Jorge
Tabullo, Juan
Tackett, Ken
Taetsch, Thomas
Taggart, Susan
Taggart, Thomas P.
Tagliareni, Nick
Tame, J.G.
Tamlyn, Jeff - Caribbean Watersports
Tani, Satoshi
Tansakuh, L.O.
Taquechel, Elizabeth Greene.
Tarss, Victoria L.
Tasman, Alicelea
Tatro, Rebecca M.
Taubensee, Shirley
Tausig, Heather C.
Taylor, Ben
Taylor, James
Taylor, John B.
Taylor, John J,. - J.J. Taylor Companies, Inc.
Taylor, Kenneth
Taylor, Patricia
Taylor, Shirley - Sierra Club Gulf Coast Regional Conservation Committee
Taylor, Susan
Taylor-Hatton, Michael & M.J.
Teague, Donald
Teas, Mary K.
Terry, Douglas L. - Brazosport Underwater Club
Terry, Richard
Theilaker, D. Roberts & E.
Thibos, Charles R.
Thies, Dennis
Thies, Stacey
Thiule, Patty
Thomas, Aaron - Yamaha
Thomas, Celena - Andrew P. Derwin DDS
Thomas, Charlelle
Thomas, Donna
Thomas, Gary
Thomas, Hugh
Thomas, Jack
Thomas, James
Thomas, Kathy
Thomas, Kristine
Thomas, Mark
Thomas, Spencer
Thomas, Thornton
Thomforde, Hugh
Thompson, Carol
Thompson, Courtney
Thompson, David
Thompson, Harold
Thompson, Mark
Thompson, Pamela
Thompson, Ronald - Glencove Marine
Thompson, Sarah G.
Thompson, Sharon
Thompson, Steve
Thompson, Thomas
Thomson, Richard P.
Thomson, S.V.
Thorne, Maurice A.
Thornes, Lisa - Caribbean Watersports
Thornton, Alanna - Glencove Marine
Thornton, Joe - Glencove Marine
Thornton, Lucinda - Glencove Marine
Thornton, Marilyn
Thornton, William - Glencove Marine
Thweatt, Michael
Thyrre, Rolf G.
Tichman, Nadya
Tiffany, Kiki
Till, Gary

Tillmen, Sonny
Tindall, Cheri
Tiphaine, Lebelllour
Tippett, Carol Lobel
Tippiins, Wade
Tirrell, Roderick - Sierra Club/Broward County Group
Tod, Fred
Tod, Fred
Tokarz, John S.
Tomasulo, Helen G.
Tomb, Geoffrey
Tomecek, Martha
Tomsche, Paul
Tonning, John & Maryanne
Tontrup, J. & J.
Topercer, William E.
Tophunter, Joe
Toreno, Bobbi
Toreno, Joseph
Torres, Tony
Torrey, Mark A.
Torrez, Juan
Toth-Nielsen, Cynthia
Towers, John
Towers, John & Virginia
Towner, Barbara
Townsend, Philip H.
Trapp, Bob
Tratulsy, Norman
Traut, Vincent C.
Travieso, Eduardo
Travis, Claude
Trenthorn, Paul
Trepel, Martin
Triggs, Michael
Trillo, Jose
Trimble, Chester
Tripician, Gil
Tripka, Robert
Troitino, Lynne Marie
Truche, Sylvia A.
Truman, William
Trybula, Stan
Tucker, Joan
Tucker, Richard
Tumas, John
Tumm, Michael A.
Tuperman, Walter
Turcott, Ronald, Lyle & Betty
Turner, Dave
Turner, John L.
Turner, Kenneth
Turner, Linda
Turner, Ronald W. - Ron Turner Cycles, Inc.
Turner, William
Tuso, Thomas
Tuthill, Kris
Tweedy, Robert J.
Tweet, Ole
Twining, Kristie
Tyler, Gene
Tyler, Neal
Uisdenes, Susan, N.
Ullman, Howard
Ulrich, David
Ulwick, Anthony
Unger, Julian S.
Uran, Madeleine
Ureck, Billy
Usatorres, Lidia
Usher, Jay - Discovery International Ltd.
Vaeth, Mary, E.
Vail, Elizabeth
Valle, J.
Valledor, Nelson
Van Cheri, Bobbe
Van Hoff, Terry
Van Sickle, R.G.
Van Tassell, Greg
Vandemark, Kay
Vanderveer, Ron
Vandyk, Daniel
Vanhorn, Suzanne L.
Vanmeter, Dave
Vanpelt, David
Vanstahandt, Naomi
Vanwagner, Earl
Vanwagner, Jimmy
Vanwagner, Tonya
Varela, Antonio
Varela, Vicky
Varnadore, Dawn
Varona, Pete - B & P Jet Ski & Polaris
Vasquez, Elena
Vaughan, Kathryn F.
Vecellio, Cheryl
Veg, Carlos
Vega, Frank
Velasquez, George
Velazgo, Barabara
Vellon, Lacey, & Osegueda, Heber, Susan, & Mauricio
Venema, W.M.
Venin, Lazaro
Vennos, Alex N.
Venolia, Jan
Venuto, Charlie & Barbara
Vera, Rudy W.
Verdon-Roe, Vivienne
Verret, Cathy
Versaggi, Salvatore J. - Versaggi Shrimp, Corp.
Vestal, Stephanie
Vicario, Bob
Vieira, Guy A.
Vieira, Nigel A.
Viele, Pamela S.
Villela, Aldo
Vinas, Gretel
Vincunas, Raymond
Virgil, Sol
Vitlomizar, Javier
Vodrazka, Christine - Go Jet Ski
Voll, David
Von Ziegesar, Franz
Voorhies, Donald
Vrh, Anthony
Wade, Gunilla W.
Wagener, Robert
Wager, Curtis B.
Waggener, Lee
Wagley, Mary Francis
Wagner, Drew
Wagner, Judith E.
Wagner, Nathan
Wagner, Richard B. - Bayly, Inc.
Wagner, Richard
Wagster, Melissa
Waite, George
Waite, Patricia
Wakeman, Charles
Walder, Jean M.
Waldschmidt, A.F.
Walker, Clint
Walker, Eric
Walker, Gina M.
Wall, Scott
Wallace, Clyde
Wallace, Mandy
Wallce, Jay Berry
Waller, Allen C.
Waller, Roberta
Waller, Seth
Wallin, Bruce
Walling, Jeff
Walls, Brenda
Walsh, Jeffrey M.
Walter, Richard
Walter, Susan
Waltz, Scott
Wan, Daniel
Wappert, Kenneth
Ward, Barbara Kato.
Ward, Gerald M.
Ward, Mike
Ward, Stephen - Caribbean Watersports
Warner, Elizabeth B.
Warner, Elizabeth
Warner, William S. - Aquarion
Warner, William
Warren, Christopher
Warren, Edith
Warren, Kelly
Waswil, Paul
Watcke, Jim
Watkins, Mark
Watkins, Nancy A.
Watson, James S. - Watson's Garden Centre
Watson, Jan C.
Watson, Leon
Watson, Robert
Watson, Robert C. - Watson's Garden Center
Watson, Scott
Watson, Thomas
Waxman, Stephanie
Way, John W. - Coconut Cove Resort & Marina
Way, Peter N.
Weady, Matt
Weaver, Buck
Web, William
Webb, Donald & Linda Kay
Webb, Robert
Weber, Edward
Weber, Elaine
Weber, Floyd
Weber, Gerard F.
Webster, Daniel
Webster, Dennis
Webster, James
Webster, Ned J.
Weckelman, Wayne N.
Weed, Steven H.
Weekley, Patrick
Weeks, Vicki
Weesner, John
Weger, J.P.
Weidman, Donald
Weidman, Jane
Weihl, Alfred
Weil, Amanda
Weinberg, Garrett
Weir, Clarences & Rita
Weise, Ed
Weithas, Liz
Welborn, E. Hambleton
Welborn, Patricia & Robert
Welch, Joesph F.
Welch, Marsha
Welker, Douglas N.
Weller, J. Warren
Weller, Roy
Wellington, Joanna
Wells, Fredrick B.
Wells, Jeff
Wells, Marshall
Wells, Stanley
Wells, Thomas B.
Welsh, John
Welton, J.R.
Welton, Tim
Wendel, Jon
Wendel, P.J.
Wengbert, Lorry
Wenrick, Susan
Wenst, Jack
Wenzel, Chris
Wert, Dane
Wesley, Jason - Sunset Watersports
West, Carolyn
West, Lee
West, Macdonald - The Macdonald West Co.
West, Stan
West, Susan
Westbrook, Kim
Westerlund, Patrick D.
Weston, Diane
Wetng, Michael - Caribbean Watersports
Wettergren, Ola
Whalen, Anne
Wheeler, Richard
Whetstone, Roger
Whidden, Richard R.
White, A.J. & Glenn M.
White, Daniel M.
White, Gerald
White, Gloria
White, Janice
White, Jason R.
White, John & Dorothy
White, Kathleen - Aerobic Slimnastics
White, Kim R.
White, Peter J.
White, S. Brooke.
White, Sandy
White, Susan
Whiteme, Ben - Sunset Watersports
Whitemore, Stafford S.
Whittinger, Ralph
Wickers, Bill
Wickle, Gregory Kyle.
Wickstrom, Karl - Wickstrom Publishers, Inc.
Wickworth, Ruth
Widner, Edith
Wiecha, Joseph, A.
Wiegard, Michael A. - Paul, Hastings, Janofsky & Walker
Wiener, Ben & Josy
Wienzek, Aduc
Wienzek, Mark
Wilcox, C.A.
Wilcox, Jennifer

Wiley, Ruth
Wilfong, Cheryl A.
Wilhelm, Bob
Wilkin, Randall
Wilkinson, Jerry & Mary- Historical Preservation Society of the Upper Keys
Wilkinson, K.L.
Wilkinson, William
Wilkinson, William S.
Willen, Barbara R.
Willer, Rickey
Willermet, Gail
Willett, Kevin
William, Joy
Williams, Amy
Williams, Carter
Williams, Clyde E.
Williams, Daniel J.
Williams, Dorothy
Williams, Edgar L.
Williams, Elizabeth C.
Williams, George
Williams, Gordon
Williams, Holly K.
Williams, Patrick K.
Williams, Regina L.
Williams, Ron
Williams, Suzanne M.
Williams, Vernon P.
Williamson, Carol
Williamson, Thomas
Willis, Glen - Reliable Tractor, Inc.
Willis, P.
Willis, Tom
Willson, William
Wilma, Katz
Wilmers, Elaine
Wilson, Ann
Wilson, Comd
Wilson, David
Wilson, John A.
Wilson, Kesha L.
Wilson, Mary E.
Wilson, Phil L.
Wilson, Richard C.
Wilson, Russell H.
Wilson, Sharon
Wilson, Virginia
Wilson, William
Wilwert, Clay
Winans, Bonnie
Winder, Irene & Calvin Bartelt
Wine, Gail
Wine, Paul
Winemiller, Paul - All Saints Lutheran Church
Winfield, Martha
Winnett, Jeff
Winnett, Susan - Caribbean Watersports
Winter, Elizabeth C.
Winters, Deborah L.
Wisdom, Mark
Wiseman, Suzy
Wishengrad, Arlene
Wismer, Richard
Wisneski, David S.
Witchek, Phillip
Withowski, Sheri
Wittenberg, George
Witz, Robert S.
Wojtusik, David
Wolf, John H.
Wolf, Morris H.
Wolf, Morris
Wolfe, Heather & Fredrick
Wolfner, John
Wolten, Doug
Wood, Barbara
Wood, Ellen B.
Wood, Irwin B.
Wood, Louise & Orvelo
Woods, Ernest
Woods, William
Woodwell, George M. - The Woods Hole Research Center
Woolley, Harry L.
Woolwich, Alan
Wooten, David
Worley, Anthony
Worth Reyes, Jean
Worthington, Casey
Wowosadeki, Katie - Sunset Watersports
Woytko, Stephanie
Wright, Daniel M.
Wright, Darlene & Wm.
Wright, Donna Jean
Wright, Doug
Wright, Frank
Wright, Max
Wright, Robert J.
Wroda, William - Glencove Marine
Wulle, Ed
Wulle, Jane
Wurzelvazher, Richard
Wyer, Bill & Bardee
Wyland
Wyllie, Stuart S. - The Graham Companies
Wylly, Mlly
Wyman, Richard
Yahia, Richard
Yananton, Patrick M.
Yawn, Margaret & John
Yeager, Jim
Yoda, Abdel
Yoda, Omar
Yonkman, Edward
Young, Bonnie
Young, Cynthia
Young, David W. - Blue Beard Rental
Young, Dean
Young, John - Blue Beard Rental
Young, Richard
Young, Tesa - Andrew P. Derwin DDS
Young, Tony - Blue Beard Rental
Zabkar, James & Terre
Zaccheo, Veler
Zachariah, Dale
Zackman, Brad
Zahorski, Ted
Zaldivan, Laureano
Zalud, Juli & Paul
Zanowic, Steven P.
Zaret, Edward
Zavar, Hermine
Zawadsky, Joseph
Zednick, Joe
Zelinski, James
Zeller, Joseph - Westcoast PWC Association
Zenoniani, Jeff
Zerbe, David P.
Zick, John
Ziegler, John
Zifferer, Morton
Zimmer, Thomas W.
Zimmerman, Lawrence
Zimmerman, Mike
Zimmerman, Sarah
Zimmerman, Tom
Zimmerman, Troy
Zinn, Anita
Zinn, Blake C.
Zinn, Christopher S.
Zinser, Victoria L.
Zinsmeyer, Linda
Ziruk, Chris
Zivin, Nat
Zocki, Ronald & Claudia
Zoller, Charles
Zorniger, Frank
Zuehls, Warren
Zulowski, Dennis
Zuraw, Laurie
Zwissler, Chester J.
Zwissler, Robert

Petitions

Petition: PET01
Subject: Opposes designation of Pelican Shoal as a "research only" area.
From: No single author identified.
Signatures: 4

Petition: PET02
Subject: Opposes any further legislation or regulations that apply to personal watercraft only.
From: No single author identified.
Signatures: 26

Petition: PET03
Subject: Opposes any further legislation or regulations that apply to personal watercraft only.
From: John Donaldson
Signatures: 78

Petition: PET04
Subject: Supports regulation of personal watercraft in the FKNMS.
From: No single author identified.
Signatures: 74

Petition: PET05
Subject: Opposes any no-fishing replenishment zones in public waters because of their impact on the recreational fishing public.
From: Captain Mike Ackerman
Signatures: 375

Petition: PET06
Subject: Opposes the proposed designation of Pelican Shoal as a "research only" area in the draft management plan.
From: No single author identified.
Signatures: 33

Petiton: PET07
Subject: Supports regulation of personal watercraft in the FKNMS.
From: No single author identified.
Signatures: 37

Petition: PET08
Subject: Opposes any further legislation or regulations that apply to personal watercraft only.
From: No single author identified.
Signatures: 91

Petition: PET09
Subject: Opposes any further legislation or regulations that apply to personal watercraft only.
From: No single author identified.
Signatures: 13

Petition: PET10
Subject: Supports the proposed management plan, its marine zones (replenishment reserves and sanctuary preservation areas) and the Water Quality Action Plan.
From: No single author identified.
Signatures: 25

Petition: PET11
Subject: Opposes any further legislation or regulations that apply to personal watercraft only.
From: No single author identified.
Signatures: 32

Petition: PET12
Subject: Opposes any further legislation or regulations that apply to personal watercraft only.
From: No single author identified.
Signatures: 20

Petition: PET1
Subject: Supports the Draft Management Plan, including the Water Quality Action Plan, replenishment reserves, and sanctuary protection areas for the FKNMS.
From: Friends of the Keys-Christina Plummer, organizer
Signatures: 22

Petition: PET14
Subject: Opposes any further legislation or regulations that apply to personal watercraft only.
From: No single author identified.
Signatures: 35

Petition: PET15
Subject: Supports the Draft Management Plan, including but not limited to the Replenishment Reserves, Sanctuary Preservation Areas, and the Water Quality Action Plan.
From: Mt. Sinai Medical Center, medical staff
Signatures: 13

Petition: PET16
Subject: Opposes severe restrictions and outright banning of personal watercraft use in the Florida Keys.
From: No single author identified.
Signatures: 18

Petition: PET17
Subject: Opposes any further legislation or regulations that apply to personal watercraft only.
From: Alex Vennos
Signatures: 24

Petition: PET18
Subject: Opposes draft plan and the unrestricted power it gives to the FKNMS because due process was not used to designate this Act and public consensus has been denied throughout the planning process. In addition, the proposed regulatory action programs are already in place and are funded through existing agencies.
From: General and Mrs. Louis C. Menetrey
Signatures: 53

Petition: PET19
Subject: Proposes limiting the Sanctuary to an area which includes only the major living hard coral reefs between Miami and Key West lying in two fathoms or less of water.
From: Mel Fisher
Signatures: 25

Assessment of the Potential Costs and Benefits of the Final Management Plan Regulations

Appendix M is part of the Florida Keys National Marine Sanctuary (Sanctuary) Final Management Plan/ Environmental Impact Statement (FMP/EIS). Appendix M is the EIS assessment of the socioeconomic impacts of the FMP, including its implementing regulations and alternatives. Appendix M is supplemented by the socioeconomic assessment of the management alternatives in the draft management plan (DMP) set forth in Volume II. Volume I, *The Preferred Alternative-Management Plan* is the heart of the EIS and describes the process and reasoning by which the preferred alternative was chosen - by balancing public comments on the DMP, Sanctuary Advisory Council (SAC) recommendations and the goals and requirements of the National Marine Sanctuaries Act (NMSA), the Florida Keys National Marine Sanctuary and Protection Act (FKNMSPA) and the National Environmental Policy Act (NEPA). Volume I provides a narrative explanation of the way in which resource protection and the public welfare were considered together in building the FMP. The final socioeconomic assessment in Appendix M and Volume II, together with the analysis of the environmental consequences in Volume II, provide the basis for the analysis in Volume I.

The Preferred Alternative/Management Plan summarily explains the factors considered in developing the final management plan and regulations. These factors include the need for resource protection, for facilitating compatible multiple uses, and for balancing the related environmental and socioeconomic impacts of the alternatives. Public comments on the DMP, particularly those from the SAC, comprised of representatives of local user groups, were also carefully considered in development of the FMP.

NOAA's assessment of the potential socioeconomic impacts on various user groups in the EIS has been designed to also satisfy the Regulatory Impact Review (RIR) requirements of Executive Order 12866.

Under Executive Order 12866, if the regulations are "significant" as defined in section 3(f) of the Order, an assessment of the potential costs and benefits of the regulatory action must be prepared and submitted to the Office of Information and Regulatory Affairs (OIRA) of the Office of Management and Budget (OMB). The Administrator of NOAA has determined that although the regulatory action is not expected to "have an annual effect on the economy of $100 million or more," or otherwise meet the definition of a significant regulation under section 3(f) (1), (2), or (3), certain controversial and innovative aspects of the regulations may meet the definition under section 4, "Raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in [the] Executive Order."

Appendix M constitutes the primary socioeconomic impact of both the RIR and NOAA's FMP/EIS. Appendix M reviews the problems and policy objectives prompting the regulatory proposals and evaluates the major alternatives that were considered. It demonstrates that NOAA systematically and comprehensively considered a reasonable range of alternatives in order to ensure that the resource protection objectives would be achieved in such a way that national and local interests would be enhanced while costs and benefits would be duly taken into consideration.

NOAA's socioeconomic assessment places special emphasis on the regulations governing the establishment of marine zones and the conduct of activities in those zones. Particular attention is paid to the Ecological Reserves (ERs) and Sanctuary Preservation areas (SPAs), since the concept of no-take zones or reserves is the most innovative and controversial element of the FMP, and has aroused significant public interest and debate. NOAA has concluded that the Sanctuary regulations will have broad benefits to most users of the Florida Keys, and especially to the tourist industry which is very significant from a local and statewide perspective. No significant adverse socioeconomic impacts are anticipated to non-consumptive users. Among consumptive users, most will not be affected greatly by the Sanctuary-wide regulations nor the restrictions applicable to various zones, but a small percentage will undergo some costs due to displacement from no-take areas. These costs are expected to be offset with time as better habitat protection and protection of biodiversity within the zones improves the ecological health of the area.

Regulations which received considerable public scrutiny include those affecting the operation of vessels, particularly personal watercraft (PWC) (e.g., jet-skis); and to a lesser extent the Submerged Cultural Resources (SCR) permit system regulation of commercial treasure salvage. NOAA's approach to the PWC issue was multi-pronged and resulted in regulations that apply to PWCs as well as other vessels; and in non-regulatory management strategies which specifically apply to PWCs. NOAA took public input into account, as in its approach to all the regulations. The final preferred alternative attempts to address user conflicts and environmental concerns while avoiding regulatory impacts as much as possible consistent with the major

objectives of the Sanctuary. The process is described in Vol. 1, pp. 16-17, in Appendix L (Comments Received on the DEIS/MP and NOAA's Response), and in Appendix M.

NOAA also considered public comments, particularly those from the commercial treasure salvage community, in revising the SCR permit system to make it more pragmatic from the perspective of commercial salvors while maintaining the primary objective of protecting the natural and submerged cultural resources of the Sanctuary. (See Vol. 1, pp. 20-24, and the relevant sections in Appendix L and Appendix M.)

NOAA's preferred alternative in the FMP for marine zoning, PWCs, the SCR permit system and other issues took all comments received from the public into full account and represents a considerable alteration from the DMP so as to disrupt users as little as possible, without compromising the objectives of NMSA or the FKNMSPA.

Socioeconomic Impacts of Sanctuary Regulations

Drawing upon 20 years of management experience in Key Largo, Looe Key and other National Marine Sanctuaries, NOAA has developed regulations that protect the natural and historic resources of the Sanctuary. Along with education and research, regulations are an integral tool for managing human activities in National Marine Sanctuaries. The revisions to these regulations from those proposed in the DMP/EIS are primarily based on the comments made on the draft plan during the public review process. Other changes are refinements on the draft which came about through interagency review. The FMP/EIS is the result of a careful balancing of the goals of protecting the resources and facilitating compatible multiple uses of the Sanctuary.

In greater detail, the goals and objectives of FKNMSPA and NMSA which the regulations were designed to meet are as follows:

- to protect and preserve the living and other resources of the Sanctuary (FKNMSPA §3(b));
- to educate and interpret for the public the Florida Keys marine environment (FKNMSPA §3(b));
- to manage human uses of the Sanctuary consistent with FKNMSPA (FKNMSPA §3(b));
- to facilitate all public and private uses of the Sanctuary that are compatible with the primary objective of resource protection (NMSA §301(b)(5));
- to support, promote, and coordinate scientific research on, and monitoring of Sanctuary resources, especially long-term monitoring and research (NMSA §301(b)(3));
- to enhance public awareness, understanding, appreciation, and wise use of the marine environment (NMSA §301(b)(4));
- to maintain, restore, and enhance living resources by providing places for species that depend upon marine areas to survive and propagate (NMSA §301(b)(9));
- to create models of, and incentives for, ways to conserve and manage the area (NMSA §301(b)(7));
- to implement coordinated plans for the protection and management of the Sanctuary with appropriate federal agencies, state and local governments, Native American tribes and organizations, international organizations, and other public and private interests concerned with the continuing health and resilience of the Sanctuary (NMSA §301(b)(6)).

Because coordination with existing authorities is an important component of comprehensive ecosystem management, the Sanctuary regulations supplement, rather than replace, existing authorities.

The regulations ensure the protection and use of Sanctuary resources in a manner that:

- complements existing regulatory authorities;
- utilizes a system of temporal and geographic zoning to ensure effective site-specific resource

protection and use management;

- ensures coordination and cooperation between Sanctuary management and other federal, state, and local authorities with jurisdiction within or adjacent to the Sanctuary;

- achieves simplicity in the regulatory process and promotes ease of compliance with Sanctuary regulations;

- promotes mechanisms for making informed regulatory decisions based on the best available research and analysis, taking into account information about the environmental, economic, and social impacts of Sanctuary regulations; and

- complements coordination among appropriate federal, state, and local authorities to enforce existing laws that fulfill Sanctuary goals.

The Sanctuary regulations are found in the Regulatory Action Plan. The heart of the regulations is the restriction or prohibition of certain activities throughout the Sanctuary or in specified parts of it. The Sanctuary-wide regulations prohibit hydrocarbon and mineral exploration, development and production; injury or removal of coral or live rock; alteration or construction on the seabed; discharging materials such as pollutants; operating vessels in a dangerous or destructive manner; diving without a flag; releasing exotic species; tampering with markers; removing or injuring Sanctuary historical resources; taking or possessing protected wildlife; possessing or using explosives or electrical charges; and interfering with law enforcement officers. The regulations also incorporate state regulations on collecting tropical fish marine life and make them applicable to federal waters.

This section includes a description of the revisions. Also included is a discussion of the expected environmental and socioeconomic consequences of the regulations. A longer discussion of the environmental consequences is contained in Volume II.

This assessment attempts to identify the potential impacts (costs and benefits) to society that can be expected from the regulations. Net socioeconomic benefits include: (1) potential changes in consumer surplus (the difference between the price the consumer is willing to pay and what he has to pay) derived from non-consumptive activities such as recreational diving and viewing; (2) potential changes in consumer surplus from recreational fishing; (3) potential changes in producer surplus and consumer surplus from landings from the commercial fishery; and (4) potential changes in management costs.

The determination of benefits depends on values derived from non-consumptive and consumptive uses of the Sanctuary. The effect of the regulations on the integrity of the habitat and the balance and population of marine species will tend to increase values derived from non-consumptive use. Values deriving from consumptive use can be affected in both directions, because short-term costs from complying with the regulations may be partially or totally offset by a long-term improvement in habitat.

The assessment is primarily qualitative, but values and impacts have been quantified where possible given the administrative record. Where there is no numerical valuation, an attempt has been made to predict the direction of benefits and costs. Data on the complex ecosystems of the Florida Keys are limited, as are landings data from both commercial and recreational harvest. NOAA and the University of Miami are currently conducting studies on tourist visitation and on non-market valuations of the Sanctuary, and the Florida Marine Research Institute is studying landings in the commercial fisheries. A University of Miami-University of Florida study is examining changing perceptions of the reserve concept by different user groups. These ongoing studies will help in understanding the socioeconomic dynamics of the area and may be of use in the continuing management process.

Based on NOAA's experience in the Looe Key and Key Largo National Marine Sanctuaries, and elsewhere, the assumption is made that the level of compliance with the regulations will be high and that therefore the potential benefits (to the extent that they exist) can be achieved. There are administrative costs to the government in obtaining voluntary compliance and in the enforcement of the regulations. There are costs to the private sector for compliance and additional costs to those subject to enforcement actions. Overall, the benefits to the Sanctuary users, the state and the nation are expected to exceed the costs.

The assessment describes the existing management regime, discusses the problems which the plan is

designed to address, discusses the benefits and costs associated with coral reefs and related habitats, describes the Monroe County regional economy, and reviews the regulations and their expected impacts on users of the Sanctuary.

Existing Management Regime

The Final Management Plan is designed to complement an already-existing management regime of considerable complexity. Key Largo and Looe Key National Marine Sanctuaries have had management plans and regulations in place since 1975 and 1981, respectively. Additionally, the United States Fish and Wildlife Service (USFWS) has had a system of refuges in the Keys since the early 1900s, and John Pennekamp Coral Reef State Park was established in 1960.

Various federal laws, including the Endangered Species Act, the Marine Mammal Protection Act, the Magnuson Fishery Conservation and Management Act (Magnuson Act), the Abandoned Shipwreck Act of 1987, the Coastal Barrier Resources Act of 1982, the Coastal Zone Management Act of 1972, the Migratory Bird Treaty Act, the National Historic Preservation Act and the Lacey Act, all affect the Florida Keys. Various state statutes also affect Sanctuary resources, and authorities often overlap. The relevant statutes are described in Appendix C of Volume III.

Commercial and recreational fishing in the Exclusive Economic Zone (EEZ) adjacent to the Florida Keys are managed by regional fishery management councils which were established by the Magnuson Act to manage fishery resources in the United States' EEZ. The councils prepare fishery management plans for domestic and foreign fishing of species within their areas of authority.

Federal jurisdiction extends out 200 nautical miles, which is the limit of the EEZ, but waters up to three nautical miles from shore on the Atlantic side, or nine on the Gulf side, are considered state waters, and under the jurisdiction of the Florida Marine Fisheries Commission. Some differences exist between state and federal regulations. A protocol for a consistent set of federal-state regulations has been drafted, and is expected to lead to greater compliance and to reduce fishermen's confusion over such things as size limits and bag limits.

The marine zoning plan was developed in consultation with the South Atlantic Fishery Management Council, the Gulf of Mexico Fishery Management Council, and the Florida Marine Fisheries Commission. A protocol for continuing cooperative management has been developed and is described in the regulatory section of Volume I.

For further information about fishery management in the Florida Keys, including a description of fishery management plan preparation by the councils, the national standards used in development of fishery management plans, and a list of fishery management plans governing fisheries within the Sanctuary and their implementing regulations, see Appendix D, Volume III.

Problem Statement

The problems that were considered in the development of the regulations in the FMP/EIS are grouped into the following four categories:

Habitat Loss and Degradation

Outbreaks of serious coral disease, a general pattern of environmental decline, and three major ship groundings on the Keys' reef tract in 1989 are major factors that led to the enactment of the FKNMSPA in November of 1990. The loss of coral reef and seagrass habitats directly affects a wide range of species that are heavily dependent on reef habitats for food and shelter. The habitat degradation is caused primarily by human activities, both legal and illegal. Some of the more important causes are ship groundings, small boat groundings, anchor damage, dredging and dumping, and careless collection by scientists and commercial collectors. Another cause is injury by divers. Currently in Key Largo and Looe Key National Marine Sanctuaries and in state-protected areas, divers are prohibited from physically impacting corals, but are not prohibited from doing so elsewhere.

Increased Pressure from Harvest of Resources

Recreational and commercial fishing have been, and continue to be, major activities throughout the Keys. Fishing occurs in the Keys year-round, with peaks during the winter tourist season and during the summer.

The situation in the Keys is complicated because of the large number of species and the variety of fishing gear used. Since the 1960s, gear such as styrofoam floats and polypropylene line have placed additional pressures on the fishery. Technological advances such as lorans, Global Positioning Systems, and depth recorders have changed the way fishermen work and increased their efficiency.

These technological advances, along with an increase in the numbers of participants, has meant that, like so many open-access fisheries worldwide, basically all of the Florida Keys fisheries are overcapitalized, including the commercial fisheries and the for-hire recreational fisheries.[1] Overcapitalized fisheries are, by definition, economically inefficient fisheries, in which more and bigger vessels and more gear is being used to catch a given number of fish than are needed to produce the most profit for the fishery.

In Monroe County, the finfish and shellfish catch has remained relatively stable over the past 25 years. In 1971, the finfish catch was 6.5 million lbs, and the shellfish catch was 16.8 million lbs. In 1995, Monroe County landings of finfish were 7.8 million lbs, and of shellfish 15.1 million lbs.

Overcapitalization is most easy to see in the lobster fishery. The number of traps used on the Florida west coast, which includes the Florida Keys, tripled from 55,000 in 1960-61 to 150,000 in 1970-71, nearly quadrupled again over the following ten years to 570,000 in 1980-81, and continued to rise until a peak of 857,000 traps was reached in the 1991-92 season. Meanwhile the catch per unit effort, after fluctuating over a range of 35 lbs per trap to 56 lbs per trap in the years 1960-1970, began declining precipitously, reaching a low of 6.1 lbs per trap in 1992-93. The overcapitalization problem was addressed in Florida in 1992 by a Florida State trap certificate program designed to gradually reduce the number of traps by 50 percent. Catch per unit effort has been gradually increasing again and reached 10.2 in the 1994-95 season (Harper 1995).

Overcapitalization does not necessarily lead to overfishing in the presence of effective regulations, but it often does put pressure on fish populations. Many of the Florida Keys fisheries are still in a healthy condition, but some are not. King mackerel, black grouper and other grouper species, sharks, mutton snapper, amberjack, spiny lobster, stone crabs, some aquarium species, and soft corals have all been placed under strict management plans because of declining stocks. Other marine species including jewfish and nassau grouper, queen conch, five species of sea turtles, live rock and coral have declined to the point of being closed to all harvest.

A broader issue concerns the alteration of species composition through removal of target species. In particular, the removal of a large proportion of top finfish predators and adult lobsters may allow such species as sea urchins and damselfish to multiply, which in turn has consequences for algal biomass, coral reef growth rates, bioerosion rates and other aspects of the ecosystem.

User Conflicts

Conflicts among users have increased as overall demand on the marine resources of the Sanctuary has risen. Conflicts range in severity from annoying situations to very serious, even life-threatening ones.

Commercial fishermen and recreational fishermen in many areas of the world are involved in a competition over scarce resources. Normally, the allocation issue is dealt with through fishery management decisions. Sometimes, however, the competition may not be over who gets to take a fish which both want, but over available space within the fishing grounds. Anglers may complain about commercial lobster fishermen setting traps in high concentrations, thereby impeding recreational trolling grounds. On the other hand, severe losses occur annually from recreational fishermen molesting commercial traps. The most frequent complaint from both commercial and recreational fishermen involves their trap buoys being run over, both by other fishermen and by charter dive boats, which results in entanglement and loss of fishing gear.

Conflicts between recreational fishermen usually involve some invasion of perceived territory. Many recreational fishermen place a high priority on solitude, which can be disrupted if an area becomes a popular fishing spot.

Conflicts between fishermen and other users of the Sanctuary are the most relevant to the new zoning regulations. Swimmers and divers frequently have problems with fishermen's lost gear. Occasionally, they are injured by fishing gear. More often, they are annoyed by the sight of fishing line and sinkers wrapped around coral, or hooks embedded in fishes' mouths.

[1] Richard Raulerson, NMFS, pers. comm., May 6, 1996.

A more recent problem is the conflict between operators of personal watercraft (e.g., jet skis) and other vessels, fishermen, swimmers, and nearby residents who are disturbed by the increased activity level, manner of operation and noise.

Inadequate Information Base

The interaction of reef community species and the roles of the various species are not thoroughly understood, although these associations are crucial to the long-term health and productivity of the reef system. Insufficient scientific and fishery information exists on reefs, reef-associated invertebrates, fish, and plants—on growth rates, life span, colonization patterns, distribution, abundance, landings, catch, effort and mortality. Changes in consumptive and non-consumptive use patterns affect the habitat and the ecosystem in ways which are complex and do not lend themselves to a simple accounting process.

One problem in evaluating the effect of increased fishing on the marine ecosystem is that data on individual species in a multi-species fishery is often insufficient for a stock assessment (Roberts et al. 1995). Even if such statistics were more complete, data on individual species catch give only clues on the overall health of the reef system.

Information on landings locations is also inadequate. Fishermen fill out landings data as part of the Florida trip ticket information system established in 1984 by the Florida Department of Environmental Protection. The information on catch is in 60-mile grids, which is not sufficiently detailed for assessing many biological and socioeconomic questions.

A subsidiary problem is that when data does exist, it is sometimes difficult to evaluate because of diverse reporting systems and units of measure. Commercial fisheries traditionally report landings by weight, while recreational and marine life fisheries report catch by numbers of individuals, which can make some fisheries hard to compare.

The regulations do not address this data problem as the Sanctuary is primarily focused on habitat and ecosystem protection and management and leaves fisheries management to existing authorities. However, under the Protocol for Sanctuary Fishing Regulations, a cooperative process has been established for the development of uniform fishing regulations in the Sanctuary under existing laws or, if there is consensus among the existing fisheries management authorities and NOAA, under the Sanctuary regulations. Under the Protocol, the Florida Marine Fisheries Commission would generally take the lead in development of the administrative record, which would include data collection. The strategy for uniform fishing regulations could thus also address standardized data collection.

Coral Reef Costs and Benefits

The coral reefs in the Florida Keys are the only extensive reefs in the continental United States and the third largest fringing-barrier reef system in the world. Quantification of the value of a natural resource like a coral reef is somewhat akin to putting a dollar figure on the value of a human life. Both are considered priceless. Regardless, economists and others quantify the value on human lives, or at least on lost earning power; and similarly quantify the value of natural assets such as coral reefs, for purposes of assessing damages in litigation or for the development of policies, and management choices about the best use of increasingly scarce resources. The valuation may vary depending on the intended use, and purpose of valuation.

James Spurgeon (1992) uses coral reefs as an example for valuing environmental resources. Three categories make up what he calls the "Total Economic Value" of a habitat: direct values, indirect values, and non-use values. The following discussion summarizes Spurgeon's system of valuation. It relates to the ensuing assessment of zoning in that zoning represents an effort to protect coral reef habitat. The benefit of a zoned area could be considered as the difference between its value with increased protection and the value it would have without that protection.

Most of these uses are capable of being valued numerically if data are available. Unfortunately, most of the needed data are not available for coral reefs worldwide, and it is possible that for some categories of use the cost of collecting all the relevant data could be excessive.

Direct Uses

These include tourism, research and education, and the harvesting of resources for both consumptive and

non-consumptive uses. The tourist industry derives the greatest direct economic benefit from coral reefs. Tourism generates revenue for the local economy through such things as boat tours and charters, boat rentals, diving and fishing equipment rental and nature tours; and indirectly through hotel accommodations, transportation, food and other purchases.

The benefits deriving from tourist visitation also include tourist consumer surplus value, which is the satisfaction derived by tourists in excess of payment. For example, tourists may visit reefs for free or receive value greater than the market price and hence receive a consumer surplus benefit. The travel cost method is one way of evaluating consumer surplus; the value of a site is estimated by using travel costs from different distances and imputing consumer surplus based on the willingness to undergo different travel costs. Consumer surplus for use of the Florida Keys resources for selected tourist and resident activities was estimated using the travel cost method at $653 million annually in 1990 (Leeworthy et al. 1993).

Another major direct use of coral reefs is in recreational and commercial fisheries. In 1984, potential harvests of reef fish were estimated at nine million tons per year, an eighth of the world fish harvest at that time (Munro 1984, cited in Spurgeon); the most recent available worldwide commercial fish harvest figure is 101 mt in 1993 (FAO 1994). For commercial fisheries, the harvest has a measurable financial value. Fish and other organisms which are taken for subsistence use provide additional social benefit which is not measured by any market but does represent consumer surplus.

Scientific research generates revenues for the local economy in two ways, from the budgets of marine researchers and from research findings. For example, coral reef research might result in biomedical discoveries or might have important consequences for environmental and climate change monitoring. The value of pure research would be harder to quantify. Similarly difficult to quantify are educational efforts involving the coral reefs, which add social benefits in the form of a better informed public which in turn has a greater appreciation of the marine environment.

Finally, coral reef organisms have potential for pharmaceutical and other industrial applications. Coral skeletons have been used in bone grafts, and corals, gorgonians and sponges contain many biological compounds of potential value. However, these values cannot be measured for substances which have not yet been shown to be of commercial value, and which often face competition from synthetic products.

Indirect Uses

These may be lumped under the heading "biological services." Coral reefs and their ecosystem support other species and related ecosystems. Juveniles of many species drift on currents to other ecosystems where, upon maturation, they may become a target for fishermen or food for commercially valuable fish. Mature fish of some species commute between reefs and other ecosystems. Reef fish are a food source for seabirds and turtles, and thus provide an indirect benefit for tourists interested in viewing sea life.

Reefs also provide physical protection to coastlines. They produce emergent reef structures which form a barrier that dissipates wave energy. They produce beach material. They provide calm conditions, allowing seagrass beds, lagoons and mangroves to thrive. These habitat types are of great economic benefit to commercial fisheries.

Coral reefs have a role in global life support as well. The reefs affect world calcium and carbon balances. Calcification from coral reefs delivers much of the $CaCO_3$ delivered to the sea each year. The reefs also act as a sink for about 111 million tons of carbon per year. This is about two percent of the current output of Co_2, and may rise to 4 percent within 100 years. This carbon sink role may be economically significant in that it may mitigate the effects of global warming. On the other hand, reef calcification could lead to initially increased concentrations of CO_2, which would exacerbate global warming (Kinsey & Hopley 1991).

The importance of the coral reef and the various species as components of the ecosystem is not well understood. It is therefore difficult, if not impossible, to quantify the value of the coral reef and ecosystem components to various users and society as a whole.

Non-Use Values

Non-use values encompass existence value, the value of simply knowing that a place such as a wilderness area or coral reef exists; option value, the value of being able to use a resource at a future date; "social value," which accrues to local communities in the form of traditions and customs, aesthetic and cultural benefits

associated with natural areas; and intrinsic value, which can be interpreted as the worth of natural areas and of other species, apart from their valuation by people.

Attempting calculations of existence and option values for a coral reef system would require an extensive contingent valuation survey of people living near the reef and people from other areas, which would ask for their willingness to pay for the resource to be preserved in its current state. The answer would likely depend on the quality, extent, accessibility and uniqueness of the reef system, and on the educational level, income level, and attitude of the people surveyed. Numerical conclusions about existence value tend to be open to debate; what is clear is that assets such as coral reefs, which are highly productive and have a strong fascination for tourists, do have high existence and option values for society, and that their value decreases when they are subject to degradation and increases with scarcity.

The intrinsic value of the reefs and their organisms is difficult, if not impossible, to measure monetarily, but some consensus exists that the value of other species extends beyond their utilitarian value to humans (Spurgeon 1992).

Costs

Coral reefs also entail some costs to society. They pose hazards to navigation. In addition to damaging the reef and related system, ship groundings also cause loss of life, limb and property. Besides the direct costs associated with groundings, costs are associated with the avoidance of reefs, including extra time and fuel, and the purchase of navigational aids to warn shipping traffic of reef location. Thus, some of the costs of the regulations are already inherent costs to users of reef areas for the prevention of the destruction of their ships, cargo, and other property. Some of the regulations, particularly regarding vessels and their operation, are somewhat of a codification of existing practices by the more careful and prudent users of the reef area.

Overview of Regional Economy

The population and economy of Monroe County grew rapidly in the 1980s and early 1990s. The population increased from 63,188 to 80,968 or 28.1 percent from 1980 to 1992, and gross sales increased from $720 million to $1747 million or 143 percent, in the same period (Bureau of Economic and Business Research 1992). The regional economy is driven by three important components: recreation and tourism; commercial fishing; and retirement communities. Bell (1991) estimates that these three provide over 80 percent of the export base of the local economy. The U.S. military and state government make up the remaining portion of the local export base. The rest of the local economy depends upon these basic industries.[2]

Tourism

In 1990, about 2 million tourists visited the Florida Keys for about 13 million days and spent almost $800 million, about half the total $1.6 billion in gross sales for the Florida Keys (A.T. Kearney, Inc. 1990). It is estimated that tourism accounts directly for half the expenditures, earnings, and employment in the retail trade and services sectors, which together account for over a half of total Monroe County gross earnings (Gorte 1994).

Leeworthy et al. (1993) estimated the nonmarket user value of water-based recreation activity in 1990 to be worth about $660 million per year to both the residents and tourists of the Florida Keys. Using extremely conservative assumptions, including no growth in total recreational activity and constant value per activity day, and using a real rate of interest (interest net of inflation) of three percent, the calculated asset value of the Florida Keys for water-based recreation was estimated to be about $22 billion.[3]

Since 1990 tourism has grown. A study in progress (Leeworthy & Wiley 1995) counted 854,000 visitors in July and August of 1995 alone. The preliminary results show that 79 percent of visitors participate in beach activities, 27 percent in recreational fishing, 28 percent in wildlife viewing on land and water, and 48 percent in snorkeling and scuba diving. Some overlap is expected in these figures as individuals may participate in more than one activity per visit.

The most recent estimate of economic benefits arising from visitor expenditures in the Sanctuary was done by the Florida Atlantic University/Florida International University Joint Center for Environmental and Urban

[2]The ensuing discussion is largely based on Bell and Sorensen 1993.
[3]These values are all stated in 1990 dollars.

Problems. Using 1994 data from the Monroe County Convention and Visitors Bureau showing 2.6 million visitors to the county, they estimated that 34.7 percent took part in water recreational activities including visiting beaches, boating, fishing, snorkeling and diving, with about $241 million in visitor sales expenditures, $16 million in tax expenditures, and over 7,000 new jobs created (Correia 1995).

Commercial Fishing

The commercial fishing industry is vital to Monroe County, which ranks first in all Florida counties in poundage and dockside value. In 1995, the ex-vessel value of commercial fishing in Monroe County was at a high of $68.9 million; the aquarium trade added $2.7 million to that. This represented a sharp rise after a seven-year decline from $63 million in 1986 to $47.7 million in 1993 (not corrected for inflation).[4] Shellfish has historically been the most important component of the fishing industry in Monroe County, accounting for 65.6 percent of the ex-vessel value in 1995; finfish was next with 15.8 percent, and the rest was accounted for by food shrimp and bait shrimp.

In 1991, gross earnings for the forestry/fisheries industry, of which fishing represents about 90 percent in Monroe County, were $20.2 million, or 2.37 percent of Monroe County gross earnings (U.S. Dept. of Commerce 1994). Chuck Adams (1992) estimated out-of-county wholesale sales by the commercial fishing industry in Monroe County in 1990 as generating between $87 million and $94 million in total economic activity, between $29 million and $36 million in local earnings, and providing the equivalent of between 1,968 and 2,492 full-time jobs. [5]

Retirement Community

Probably the most significant aspect of the Monroe County/Florida Keys economy is what can be termed the "retirement community." Florida is generally considered a mecca for retirees because of the climate, low taxes and cost-of-living, and the variety of natural resources to support leisure activities. In economic accounting, this shows up most clearly when income by place of work is compared with income by place of residence. In 1988, total income by place of work in Monroe County was about $803.4 million, whereas total personal income by place of residence was about $1.4 billion. The nearly 43 percent difference is mostly explained by transfer payments ($154 million) and dividends, interest and rents ($333.4 million)(Bell & Sorensen 1993). These two sources of income are mostly accounted for by people that are retired and living in Monroe County but receiving social security, pensions and return from investments outside the county. An important, but unanswered, question is to what extent the retirement community is dependent on the environmental quality of the Sanctuary. It seems a reasonable assumption that a good portion of the retirement community chose the Florida Keys because of the rich abundance of high quality resources.

Socioeconomic Assessment of Zoning Regulations

In accordance with the requirements of the FKNMSPA, marine zoning was considered as a means of establishing differing levels of management of Sanctuary resources. The final regulations establish zones in five categories—Wildlife Management Areas (WMAs), ERs, SPAs, Existing Management Areas (EMAs), and Special-use Areas.

The only ER, the Western Sambos ER, is approximately nine square nautical miles (snm) in area. The largest of the 18 SPAs is Carysfort, which is about 1.5 snm in area. The other 17 SPAs are each well under one snm as follows: Alligator Reef (0.2 snm), Coffins Patch ((0.4 snm), Cheeca Rocks (0.05 snm), Davis Reef ((0.2 snm), Conch Reef (0.7 snm), Sand Key (0.5 snm), Rock Key (0.1 snm), Eastern Dry Rocks (0.1 snm), Dry Rocks (0.05 snm), Grecian Rocks (0.3 snm), Hen and Chickens (0.2 snm), French Reef (0.1 snm), Molasses Reef (0.3 snm), Looe Key (0.3 snm), Sombrero Key (0.2 snm), the Elbow (0.3 snm) and Newfound Harbor Key (0.1 snm). The four Special-use Areas are: Conch Reef (Research Only) (0.2 snm), Eastern Sambos (Research Only) (0.15 snm), Looe Key (Research Only) (0.1 snm), and Tennessee Reef (Research Only)(0.2 snm).

The four EMAs are the Key Largo Management Area (105 snm), the Looe Key Management Area (5.3 snm), the Great White Heron National Wildlife Refuge (246 snm), and the Key West National Wildlife Refuge (247 snm). There are 27 WMAs. For more details about the Zoning Action Plan and these areas, see Volume I of the FMP/EIS.

[4]Data supplied by Florida Department of Environmental Protection Fisheries Statistics Dept.
[5]The lower figures are based on the assumption that 75 percent of fishery products are exported out of Monroe County, and the higher estimate assumes that 95 percent of the fishery products are exported. Adams cautions that his figures are estimates, based on available secondary data and some anecdotal observations, and should not be taken as precise measurements.

Each of the zones is designed to reduce damage to resources and threats to environmental quality, while allowing uses that are compatible with resource protection. Marine zoning is one of the most practical tools available to management for achieving the primary objective of the FKNMSPA of ensuring the viability of the Florida Keys ecosystem by safeguarding its system of coral reefs and associated habitats.

A sixth category, Areas to be Avoided (ATBAs), was established by the FKNMSPA. The statute prohibits the operation of tank vessels or vessels greater than fifty meters in registered length. The regulations merely set forth the boundaries of these areas as established by the statute and repeat the statutory prohibition.

Although the use of no-take areas has a long history worldwide as a tool for protecting sensitive habitat or enhancing fishery production, marine zoning is an innovative approach for the United States that has aroused considerable public interest.

The overriding purpose of the marine zoning action plan is to protect habitats and species by limiting consumptive activities. The objectives are to reduce habitat damage in sensitive areas, protect rare and endangered species, reduce conflicts among users, and allow the ecosystem to change and evolve with minimal human influence.

Protection of the resources in the Florida Keys implies protection of the regional economy as well, which depends on the preservation of the Keys' outstanding natural resources.
The discussion will center on the ERs and SPAs because these are expected to have the largest socioeconomic impacts. WMAs and Special-use Areas are expected to have only small or negligible socioeconomic impacts due to their size and location. Existing Management Areas are expected to have little additional socioeconomic impact, since these areas, and their protections (with minimal exceptions), are already in place. There may be adverse socioeconomic impacts on the operators of tankers and vessels in excess of 50 Meters in rerouting around the ATBAs, however, since the ATBAs were previously established by the USCG, approved by the International Maritime Organization (IMO), and codified by statute (FKNMSPA), the impacts to these operators have already been addressed and no additional impacts from the regulations are expected.

Wildlife Management Areas

The FMP Preferred Alternative establishes 27 WMAs. WMAs are the marine portion of areas which were established for the management, protection, and preservation of Sanctuary wildlife resources. Twenty-one of these are the marine portions of, or the marine waters surrounding, Bay Key, Boca Grande Key, Woman Key, Cayo Agua Keys, Cottrell Key, Little Mullet Key, Big Mullet Key, Crocodile Lake, East Harbor Key, Lower Harbor Keys, Horseshoe Key, Marquesas Keys, the tidal flat south of Marvin Key, Mud Keys, Pelican Shoal, Sawyer Keys, Snipe Keys, Upper Harbor Key, East Content Keys, West Content Keys, and Little Crane Key. Nineteen of these WMAs are part of the U.S. Fish and Wildlife Service (USFWS) management of the backcountry portions of the existing National Wildlife Refuges in or surrounded by Sanctuary waters and already subject to special restrictions. One is the USFWS refuge area Crocodile Lake and the other is Pelican Shoal which is closed by the Florida Game and Freshwater Fish Commission between April 1 and August 31 of each year.

Six other areas were identified by the SAC, USFWS, and members of the public as wildlife habitats with marine portions and surrounding waters in need of protection by the Sanctuary. The six new areas are Rodriguez Key, Tavernier Key, Snake Creek, Cotton Key, Dove Key, and Eastern Lake Surprise.

The USFWS refuge regulations already restrict access partially or entirely to the 19 existing USFWS National Wildlife Refuges and Crocodile Lake in order to protect sensitive nesting habitats of endangered, threatened and other species. The Sanctuary regulations complement those USFWS restrictions by restricting access to the marine portions of those areas and surrounding waters. Beach areas below mean high water are closed where the USFWS has closed the beach areas above mean high water. For Pelican Shoal, the regulations complement the state's seasonal closure with a 50 meter seasonal no-access buffer zone.

In the six new areas, the regulations impose idle speed only/no wake restrictions, no motor restrictions, no access buffer zones, and closures. Except for closures, other activities such as fishing and diving are allowed.

Costs

Socioeconomic costs of the WMA regulations are expected to be negligible for 21 of the 27 areas since the

regulations only affect the marine portions of land already subject to similar USFWS and state restrictions or provide a small marine buffer area for the land. For example, most of the Sanctuary regulations for WMAs apply only to the waters within 300 feet of land already subject to restrictions established by USFWS or within 50 meters of land subject to state restrictions. Some of the existing USFWS restrictions already apply to certain marine waters, based on agreements with the state. However, these restrictions also have been incorporated into the Sanctuary regulations to fortify the federal authority, and to add a potential civil penalty component (violations of the USFWS restrictions are subject to criminal sanctions only), as well as apply the interpretive enforcement approach. In many circumstances, civil penalties are less severe and more appropriate than criminal penalties. They are also easier to apply because there is no need to prove criminal intent.

The increased enforcement and administrative costs for the government are set forth below and in the FMP/EIS. Corresponding increased costs are also expected for violators of the Sanctuary regulations, although voluntary compliance is expected to be high.

The Pelican Shoal WMA is closed out to 50 meters between April 1 and August 31. The shoal itself is closed during this time by the Florida Game and Freshwater Fish Commission. Therefore, displacement costs for users during this time period are not expected.

With regard to the six WMAs not already controlled by the USFWS or the Florida Game and Freshwater Fish Commission, there may be some additional incremental costs to users of this areas, but they are not expected to be significant. The only restriction imposed on five of these WMAs is a no-motor zone on tidal flats. Because the rule only applies in the shallow tidal flats, it should have little or no adverse economic impact on fishing and other recreational activities currently conducted in these areas. Users of PWCs may suffer some dislocation costs. However, these areas are only a small portion of the waters in which PWCs can be operated, and the dislocation would be more of a inconvenience than an out-of-pocket expense.

Lake Surprise is a new WMA where an idle speed only/no wake zone is established east of US 1 highway where it crosses Lake Surprise. The western portion has higher levels of use for fishing and other recreation than the eastern portion. Regardless, the rule will not halt the public's current use for fishing. There may be some additional time delays, but, once again, this is expected to be more of an inconvenience than a significant cost. If PWCs are operated here, they may relocate to areas where there are no speed or wake restrictions and thus incur only minor relocation costs.

In the Dove Keys WMA, a no-access buffer area is created around two small islands. While there may be some displacement costs for users, there is no data or public comments indicating that will be the case.

Rodriguez Key is a big flat fishing area. The rule will not halt the public's current fishing activities, but there may be some additional time delays. Again, this is expected to be more of an inconvenience than a significant cost. If PWCs are operated here, they may relocate to areas where there are no speed or wake restrictions, and thus incur only minor relocation costs.

Benefits

The primary benefit of the WMAs will be the additional protection afforded to the Sanctuary's wildlife and habitat. People engaged in viewing, studying or photographing wildlife will benefit, along with the tourist industry. In the new idle-speed only/no wake areas, the use for fishermen and other recreational users may be enhanced by minimizing some user conflicts. This in turn may result in some incremental socioeconomic benefits to users. For example, the Florida Keys Fishing Guides Association estimated that 30 fishing guides currently take clients to the WMAs. The Association estimates that banning jet skis from the refuges would make these areas more desirable fishing destinations. The Association estimated that each of the 30 fishing guides would get an 30 additional days of fishing charters with a total of approximately $315,000 in direct positive impacts. Then, using a multiplier of 3.25, the Association estimated that would be an additional $1,000,000 to the local economy.[6] It is unclear to NOAA how objective or accurate these estimates are, and whether the accuracy, scope and scale of areas and activities is directly applicable to all of the WMAs. However, the estimates do support public comments indicating there are socioeconomic benefits to existing users from the rule, particularly the flat fishing guides and related industries and users.

Minimizing user conflicts may also result in fewer accidents. In 1995, there were 503 personal watercraft (e.g., jet-ski) accidents involving 856 vessels in Florida waters. Of the 503 jet-ski accidents, 325 involved a collision

[6]Communication with Capt. Mike Collins, Florida Keys Fishing Guides Association. The multiplier used by the Association was the same on used in the 1986 study by David Rockwell, PHd, for the Sportfishing Institute.

with another vessel. There were over 66 accidents in the Sanctuary waters off Monroe County. Of these 66 accidents, 48 resulted in injuries, and damages were estimated to be $79,477.00.[7] It is difficult to predict how many accidents will be avoided or minimized by these rules, which apply in portions of the Sanctuary; however, it is clear that there should be some reduction in accidents, injuries, and damages, which is a socioeconomic benefit.

As stated above, the new status of the marine portions of the USFWS wildlife management areas as Sanctuary-protected areas allows enforcement agents to apply civil penalties. The potential exists for sharing of human resources by the Sanctuary and USFWS to educate the public and manage these special areas. This will allow a more comprehensive interpretive effort as well as increased enforcement options. It is also likely that education efforts by the Sanctuary staff will result in increased awareness of the wildlife areas and appreciation of their function, which in turn will cut down on behavior that could disrupt sensitive areas. Thus, voluntary compliance should increase, which should in turn result in significant resource protection benefits. And those users who voluntarily comply with the rules may have better experiences, which is in effect a socioeconomic benefit.

Net Benefits or Costs

While it is not possible to quantify net benefits or costs for the WMAs on the available record, some incremental costs in operation and relocation in complying with the WMA restrictions is expected. However, such impacts are not expected to be significant. The restrictions will increase protection for wildlife and habitat and, in turn, increase enjoyment or instruction for the people using them, as well as for industries catering to tourism and recreation, including recreational fishing. Overall, the benefits to society are expected to be greater than the incremental costs for complying with the regulations.

Ecological Reserves

The most important purpose of an ER is to protect critical habitat areas in the Florida Keys from further degradation from consumptive uses. The primary protection afforded an ER is the prohibition on taking, moving or disturbing fish, invertebrates, shells, coral, seagrass, bottom formations, or any other living or dead organisms. Other regulations include prohibitions on discharging any material other than cooling water or engine exhaust, touching coral, or on placing an anchor so that it touches living or dead coral. The chief consideration in establishing ERs in the Sanctuary is to protect a diverse portion of coral reef habitat and the related species in that habitat ecosystem, particularly in areas which are in good biological condition. Another consideration is the area's suitability as a control for monitoring and better understanding the biology of exploited species.

Much of the literature on marine reserves has stressed fishery management aspects. While fishery management is not the objective of establishing reserves in the Sanctuary, some of the beneficial effects to fish stocks that have been seen in marine reserves elsewhere can be expected in Florida. For example, marine reserves can afford some protection to species which are not managed under existing federal and state regulations. Marine reserves also offer a method of protecting a multispecies assemblage and can benefit surrounding areas to the extent that larvae, juveniles, and adults are exported to surrounding fisheries.

A panel of biologists and social scientists who attended a symposium in Tampa, Florida, in 1995 to review the use of marine fishery reserves in the U.S. Southeastern Atlantic wrote in a summary statement that marine reserves offer the "best option" for protecting reef fishes. They issued a statement encouraging the creation of reserves in suitable areas (Roberts et al. 1995):

> there is overwhelming evidence from both temperate and tropical areas that exploited populations in protected areas will recover following cessation of fishing and that spawning biomass will be rebuilt. Also, there is widespread recognition throughout the world that loss of biodiversity is largely driven by ecosystem modifications and the habitat loss that ensues. Hence preserving biodiversity implies the maintenance or re-establishment of the natural ecosystems as in marine reserves in which no extractive anthropogenic effects are allowed or are minimized.

Some of the benefits to fish stocks which may be provided by larger reserves are not expected to occur to any great extent in the Florida Keys. Large reserves may provide insurance against stock collapse resulting from

[7] 1995 Boating Accidents Report by the Florida Department of Environmental Protection, Division of Law Enforcement.

the possible failure of traditional management methods which target individual species. They may also offer protection of genetic diversity against the risk of genetic selection by fishing gears; especially, fish stock characteristics associated with long life spans can be preserved. However, if the reserves are small, and if fish are exposed to fishing during part of their life cycles, then not much genetic protection can be expected.

Marine reserves have a history in parts of the United States and in Australia, Bermuda, New Zealand, the Cayman Islands, the Philippines, and other places. Studies of reserves in these areas indicate that they have generally been effective in raising the average density of most protected species and the average size of individuals. A survey of 31 study areas around the world concluded that species size and diversity increased under reserve protection in all but three or four of the cases in which results were available. Species that benefited most were nearshore coastal species with sedentary habits and relatively long lives (Dugan & Davis 1993).

Direct evidence of the effects of reserves on larval export is limited, but strong reasons exist to believe that larval export occurs. Studies in the Philippines and elsewhere show that substantially increased local catches more than made up for the reduction in fishable area caused by the establishment of reserves (Rowley 1992). A model of the red snapper fishery in the Gulf of Mexico, which assumed 20 percent of habitat protected by reserves, showed that total egg production was potentially 1200 percent greater than under the status quo, and that the increased fecundity and subsequent fish availability more than compensated for an assumed 25 percent greater fishing effort caused by displacement of fishermen moving to open areas (Bohnsack 1994).

Of particular relevance to the Sanctuary is the experience of three marine protected areas within Florida waters. The regulations implementing the designation of the Looe Key National Marine Sanctuary, established in 1981, ban spearfishing and the use of wire fish traps, among other activities. After two years in reserve status, total predator abundance had increased exponentially. Snapper stocks increased by 93 percent, grunts by 439 percent, and hogfish by 1900 percent; all 15 of the examined target species increased in abundance, and five potential target species not observed before the spearfishing ban were observed after the ban (Clark et al. 1989).

Portions of the estuary surrounding the Kennedy Space Center have been restricted since 1967 and have been used to test the effectiveness of the reserve concept. Studies conducted between 1986 and 1988 showed a statistically significant increase in catch per unit effort in closed areas as compared to similar open areas, after accounting for all other factors. Fish tagging studies also showed that fish routinely moved from non-fished areas to fished areas (Funicelli 1988).

Finally, the Oculina Banks area off Ft. Pierce, Florida was established in June, 1994, as an experimental marine reserve. This experiment has not yet shown results.

Proposed Reserve Plan

In the Draft Management Plan, three alternatives for Replenishment Reserves (RRs)(renamed ERs in the FMP) were proposed. The preferred alternative would have established three RRs totaling 485.7 km^2 (141.6 nm^2), including a 77.6 km^2 area at Key Largo, a 29.9 km^2 area at Sambos, and a 378.2 km^2 area at the Dry Tortugas.

Criteria were developed by the SAC and the constituent groups they represent for use in identifying potential RRs and SPAs in the DMP/EIS. These criteria for selection zones were also considered in developing the Final Preferred Alternative (ERs and SPAs) are as follows:

- Consider areas of high habitat and species diversity representative of the Florida Keys marine ecosystem.
- Consider environmental and socioeconomic impacts on other areas resulting from displacing existing uses.
- Consider long-term impacts from establishing RRs in areas of critical economic value.
- Consider areas with good water quality.
- Consider socioeconomic impacts on displaced user groups.
- Consider ownership of nearby waterfront property.
- Consider sufficient size to include range of habitats.
- Consider other areas within and adjacent to the Sanctuary with existing or proposed restrictions.
- Consider existing managed areas.

The process involved collecting data on where significant coral was located, on water quality, and on where significant commercial and recreational fishing and diving activities were conducted. The areas were chosen primarily for purposes of habitat protection, not fishery management. The goal was to minimize adverse impacts on user groups while extending needed protection to the coral reefs.

A series of zoning workshops were held and maps were drawn to identify resources, user group activities, areas of conflict, and zone criteria to determine where zone boundaries should be for each alternative. The public process to elicit the problems, concerns and information about various strategies and plans is extensive and has been summarized in Volume I, Overview of the Planning Process, p.4. Unfortunately, but perhaps understandably, the fishing community is often reluctant to provide information about where it fishes and how much is caught. Some of the information about fishing in the reserves and the potential impacts, particularly in the Dry Tortugas were not raised by members of the fishing community until after the draft plan had been published.

Based on the information received, the FMP and implementing regulations dropped the Key Largo RR, partly because it would have duplicated the protection provided by the John Pennekamp Coral Reef State Park and the Key Largo Existing Management Area. Because of the potential impact on fishermen, the lack of detailed information on the precise boundary to minimize such impacts, and SAC recommendations, the Dry Tortugas RR was also dropped. Creation of a Dry Tortugas ER is still planned. Over the next two years, NOAA and others will gather data and obtain additional public input on boundary alternatives and relative impacts for the Dry Tortugas ER. NOAA will bring all interested parties including managers, scientists, environmental groups, fishermen and other affected groups together to develop these boundary alternatives. After this process has been completed, NOAA will propose a Dry Tortugas ER through a notice and opportunity-for-comment rulemaking and Supplemental EIS.

Based on this FMP/EIS, including public comments, the new boundary of the Dry Tortugas ER likely will be further to the west as opposed to the north-south configuration in the draft MP, which will likely be dropped from further consideration. Such realignment of the preferred alternative boundary should still afford a high level of protection to coral reef habitat while minimizing adverse socioeconomic impacts to shrimpers, lobster fishermen, and others who identified these as areas of high use. Changes to the original boundary proposed will be consistent with the objectives of protecting as much coral reef, as opposed to barren substrate, as possible, while avoiding or minimizing the displacement of fishermen. NOAA also will be working with the National Park Service to develop regulations for the Dry Tortugas National Park so that the park and adjoining areas will have compatible rules. Currently, commercial fishing is banned in the park, while recreational fishing is allowed.

Upon the establishment of an ER, scientific studies will be initiated in order to determine whether it is succeeding in protecting biological diversity and increasing the productivity of important marine life species. The ERs will also serve as control areas for research into the impacts of water quality, pollution, and different human user groups on the Keys ecosystem. Based on the results of these studies, the five-year update of the MP will consider expanding, modifying, or eliminating the ERs.

The expected costs, benefits and net benefits of the Preferred Alternative in the FMP will be examined below for the habitat, non-consumptive users, commercial fishermen, recreational fishermen, and the larger economy, followed by a shorter discussion of the costs and benefits of the rejected alternatives.

1. Habitat

Costs

The primary purpose of establishing an ER is to protect habitats and maintain the biodiversity of the Sanctuary. No adverse effects or costs to the habitats of the Western Sambos ER are expected to result from the regulations protecting that ER. However, there may be some costs to non-protected habitats outside the ER from the displacement of users. The habitat areas outside the ER for relocation are vast. The displacement impacts are expected to be spread out through different areas as opposed to more confined habitat areas. This should spread the adverse impacts out over different areas sufficient so the impacts are short term and negligible over the long-term.

The regulations include curtailing consumptive use and monitoring non-consumptive use carefully. There will be some management costs for administration and enforcement. Estimates of the management and enforcement costs for Zoning and other regulations is provided at the end of this assessment.

Benefits

Protection of the habitat within the reserve boundaries entails the benefits discussed in the preceding "background" section and in the list of benefits on p.7 in the section "Coral Reefs Costs and Benefits."

The primary benefit is the protection to sensitive habitat from further degradation. The protected reefs are expected to return to a more natural mix of species with more large predators. Establishment of marine reserves elsewhere has proven effective for protection of the coral reef habitat and for restoring the natural mix of species, the natural mix of ages, and for increasing populations of fish and other organisms. For example, in Mombasa Marine National Park, Kenya, the coral increased, fish populations and numbers of species present increased, and many sea urchin populations declined. (McClanahan & Obura 1995).

Preserving the natural mix of species is expected to benefit the coral reefs in many ways. The ecosystem balance is changed in areas that are heavily fished. For example, bicolored damselfish, which essentially clear areas of coral so that they can "farm" algae, tend to increase greatly in the absence of large predators. Sea urchins display high population numbers on unprotected reefs and low numbers on protected reefs. Sea urchins affect benthic algal biomass, bioerosion rates, and coral reef growth rates.

Another important benefit to the coral reef system is increased resistance to environmental stresses. Work with Kenyan coral reefs has shown that unfished, relatively intact reefs are more resistant to stresses such as eutrophication and sedimentation, than fished reefs (McClanahan & Obura 1995).

The more healthy and productive the coral reefs are, the greater the direct, indirect, and non-use values that can be derived from them. Their increased value for snorkelers and divers is apparent. If the coral reefs are in good condition, they can more ably fulfill their role of biological support of other ecosystems such as seagrass communities. Clearly, too, if the habitat is in good condition, whatever existence and option values the reefs have will be concomitantly higher. If the coral reefs are productive, they will positively affect stock levels in neighboring areas. Finally, protection of the habitat, particularly coral, is the primary goal of the Sanctuary and the underlying legislation.

Net Benefits

The benefits to habitat and biological diversity overall are expected to exceed the costs to areas where consumptive users have relocated. This is because the costs to habitat are expected to be spread out over a vast area where recovery is expected to be reasonably accomplished over time. The number of species is expected to be increase over time because the restrictions will prevent further degradation of some of the most significant habitat areas. This is expected to assist in the recovery of these habitat areas which is expected to have secondary or indirect benefits for the production of species which utilize the habitat. To the extent that the relocation activities are localized just outside the zones, these secondary benefits to species may be less than expected.

2. Non-consumptive Users

Costs

Some costs are predicted for non-consumptive users, but they are not expected to be significant because this class of users will not be excluded from using the reserves. The restrictions put on their use of the reserves, such as prohibiting discharge of marine sanitation devices, touching coral, and anchoring so as to avoid coral may have some incremental costs to users, but many non-consumptive users already voluntarily conduct their activities accordingly. The costs to charter boat operations and private users of the ER to avoid touching the coral involve some additional time and care, but are not expected to be significant. Additional expenditures for equipment are not expected, as marine sanitation devices can be discharged outside the zones consistent with other laws. There may be some additional costs for personnel to dive down and inspect the anchor to avoid touching coral, but they are not expected to be significant, as most dive charters already have personnel employed able to conduct the task. There may be some delays in getting the divers into the water, but the delay time should be minimal.

Costs to the tourist industry and divers are expected for those who violate the regulations and are subjected to civil penalties. However, based on public comments as well as NOAA's experience at Looe Key, Key Largo and elsewhere, compliance with the regulations from divers and charter operators is expected to be high.

Benefits

The reserves are expected to be beneficial to non-consumptive users, who represent a substantial portion of visitors to the area. A NMFS aerial survey (McClellan 1996) discovered that approximately half the vessels in

the area proposed for designation as the Western Sambos ER over a four-year study period were diving or cruise vessels, and the other half were recreational or commercial fishing boats. The surveys were conducted on Fridays however, and probably underestimated the numbers of both recreational dive vessels and recreational fishing vessels present on weekends.[8]

The habitat quality will be improved because the absence of such things as fishing gear and anchors means those items will not be caught in the coral. In the areas where fish are allowed to reproduce naturally, the populations of many species is expected to rise. These areas, with higher-quality habitat and larger numbers of diverse fishes, will improve the quality of experience for non-consumptive users. This implies an increase in consumer surplus as, in a sense, each individual user is getting an experience which is worth more, without paying an additional price. The number of non-consumptive users should also rise, which will in turn increase expenditures for transportation, food, lodging, services, and local purchases. The Monroe County economy will benefit from increased tourism. The national economy should also benefit, as many of the tourists are seeking a recreational experience which they might otherwise look for in marine areas outside the United States.

Another benefit for non-consumptive users is that they will no longer experience conflicts with consumptive users. In the absence of zoning, non-consumptive users pay a cost: an implicit decision is imposed which favors consumptive over non-consumptive users automatically. All consumptive uses of the Sanctuary impose some costs on non-consumptive users because of ecological damage and sometimes direct conflicts.

Net Benefits

There will be some costs to non-consumptive users in complying with the restrictions in an ER. There will be an increase in numbers of flora and fauna and an improvement in habitat quality, all of which will benefit the experience for non-consumptive users. There should be an increase in trips as well as increased consumer surplus from individual trips. The local economy will benefit and there should be a net socioeconomic benefit for society as a whole.

3. Consumptive Users—Commercial Fishermen

Costs

Some short-term costs resulting from increases in operations and reductions in fish catch are foreseen for commercial fishermen. Fishermen who presently use the Western Sambos ER area to catch spiny lobster, reef fish, coastal pelagics, and stone crab, and to collect tropical fish, will be displaced. Fishermen will be able to continue to fish outside the ER, but may incur some dislocation costs in moving to other fishing grounds. There may also be increased competition in existing fishing grounds from the displacement and therefore, depending on the availability of stock, some reduction in catch could occur. Also, trap fishermen who know the bottom areas through years of experience may find it difficult to learn new grounds and may accordingly have some learning curve costs incurred in additional travel and time to get the same level of catch. The potential costs to lobster fisherman from not being able to set traps in the Western Sambos ER may be mitigated by potential secondary benefits to lobster stocks by protecting the coral habitat areas from fishing and other consumptive activities.

These potential costs should also be placed in the larger context of the open-access fishery with declining catch per unit effort. The potential costs to lobster fisherman from the Western Sambos ER may also be mitigated by Florida's trap certificate program, which is designed to reduce crowding and should make it easier for neighboring fishing areas to absorb displaced fishermen.

The Florida trap certificate program has been in place in the spiny lobster fishery since August of 1993. The lobster fishermen received allocations for traps, one certificate per trap, based on their historical catch. The certificates are transferable. An annual reduction in certificates has been imposed; in 1993 there were 825,000; in 1995 there were 600,000. There will be no reduction in 1996, but the eventual goal is to arrive at a level which will maximize catch per unit effort while substantially reducing environmental impacts.[9] The purpose has not been to reduce harvest, which has increased over the past three years, but to reduce the overcapitalization in the industry by putting a cap on the number of traps in use, while reducing environmental damage caused by an overcrowded fishery.

The potential loss to fishermen cannot be readily quantified based on existing data. Landings data is taken in

[8]This survey is discussed at greater length in following section, "Costs to Commercial Fishermen."
[9]Pers. comm., John Hunt, Florida DEP, Florida Marine Research Institute, April 3, 1995.

60-square mile grids, which do not allow examination of the impact on smaller areas. Furthermore, the majority of fishermen do not fill out landings information on their fish tickets. A lobster study in which amount and location of take is being recorded by independent observers on vessels is currently in progress.[10]

A survey developed by the University of South Florida for the Monroe County Commercial Fishermen, Inc. (CEMR 1995) attempted to discover the answer to this question for two of the three proposed Replenishment Reserves: the Dry Tortugas and Western Sambos RRs. The grid zones used in the survey were larger than the boundaries for the two proposed RRs.

The survey was conducted by representatives of the Monroe County Commercial Fishermen and the sample was chosen by surveyors asking for names of interested fishermen at fish houses and by distributing surveys at a meeting. No steps were taken to ensure a random sample.[11] Out of 1875 restricted species license holders countywide, 1148 held lobster permits. Of the 41 captains who completed the survey, 29 were spiny lobster fishing vessel operations.

The fisherman were asked how much of their catch came from the two proposed areas, and how much they expected to lose if forced to go to other fishing grounds. It is unclear how the fishermen estimated their potential loss from establishing the RRs, upon which the report bases its estimates of impact to the fishing industry and county.

In the case of spiny lobsters, 12 indicated they fished in the area of the Sambos RR included in the data for estimated catch and loss.[12] They estimated that they would lose on average 102.6 percent of their estimated current catch in the draft Preferred Alternative Dry Tortugas RR. Thus, there is no accounting for their ability to make up some of the lost catch by fishing in other areas. For the Sambos ER, they estimated a 95 percent loss from their current estimated catch.

The report assumes that the majority of fishermen (ranging from 63 percent for spiny lobster to 83 percent for coastal pelagics) who did not fill out "area fished" information on their trip tickets fish the relevant statistical zones in the same ratio as the minority who did report collection area. That assumption is debatable.

The CEMR analysis estimates total primary economic impact of landed shellfish and finfish for 1995 using a multiplier of 1.7; Adams (1992) used a multiplier of 1.49, stating that would be an extreme upper limit since it was originally estimated for the Lee County, Florida commercial fishing industry, which likely has a more diverse economy. The report also assumes that all landings are exported out of Monroe County; Adams assumes a range between 75 percent and 95 percent.

Because of the problems both with collection of data and use of that data, NOAA does not agree with the quantitative conclusions of this report. The costs are expected to be lower than this report concluded, as indicated by the two aerial surveys discussed below. However, the CEMR report has been considered as part of the public comments on the socioeconomic impacts of zoning on fishermen. The report is valuable in that it highlights the concern of the fishermen surveyed about the effects of zoning. In their written responses, fishermen using the proposed reserve areas were concerned about the costs of displacement, and other fishermen who did not fish within the proposed boundaries expressed anxiety over increased crowding. It was largely as a result of these concerns that the SAC recommended the deletion of the Key Largo RR and further study before establishing a Dry Tortugas ER. NOAA in its selection of the Preferred Alternative in the FMP largely followed the SAC recommendations.

As previously indicated, the criteria for the draft and final zoning criteria included consideration of the socioeconomic impacts upon fisherman. The balancing of these criteria and statutory considerations is set forth in the selection of the preferred alternative. The only ER established by the FMP is the Western Sambos ER. It is a small area, nine snm, or 0.3 percent of the total Sanctuary area of 2800 snm. Because of its small size, most fishermen are expected to be able to incur relocation costs and only short term reductions in catch which should be minimal. Local fishermen who favor the area will experience some loss of revenue in moving, although the loss will be substantially smaller than the value of their current catch in the Western Sambos ER, since presumably they will be able to make up the majority of their catch in neighboring areas. Two studies involving aerial surveys of the SPAs and ERs proposed in the Draft Management Plan did not discover an extraordinary level of fishing activity in the Western Sambos ER. These include a year-long study run by the

[10]Report is being conducted by Florida Marine Research Institute, Florida Dept. of Environmental Protection.
[11]Pers. comm. John Sanchez, Director, Monroe County Commercial Fishermen, April 29, 1996.
[12]Figures based on data supplied by Monroe County Commercial Fishermen to the University of South Florida Business Center.

Florida Marine Institute[13] of the Department of Environmental Protection from June 3, 1992 through May 29, 1993 (FMI 1996) and a survey run by NMFS, Southeast Fisheries Science Center, from September 1992-December 1996 (McClellan 1996) The Florida Marine Institute study will be discussed below under "Costs to Recreational Fishermen."

The NMFS survey was conducted randomly through the first year, with up to two surveys per month. Beginning in January 1994, the surveys were attempted once a week, barring bad weather, on Fridays, generally from about noon to 2 pm. All flights were aboard United States Coast Guard aircraft based at the Miami Air Station. Vessels were listed as recreational, commercial/lobster, charter/yacht, or unknown.

Of 158 fishing, dive and cruise vessels observed in 30 surveys in the area designated as the Western Sambos ER, 15, or 9.5 percent, were commercial fishing boats (two were lobster boats and the other 13 were classified as "unknown" in type). This translates to an average of 0.5 commercial vessels per survey, and an average of 5 vessels of all types per survey. The sum of all boats per survey (the sum of the averages) for zones 10 through 14 of the report, taking in the Florida Keys from Carysfort Reef in the east to Sand Key in the west, is 187; the sum of the averages for commercial fishing boats is 11.2. Thus, the Western Sambos ER area had on average 2.8 percent of all vessels in the portion of the Florida Keys which was included in the survey, and 4.4 percent of commercial vessels.

It is important to note that the flight path through zones 10-14 covered 132 nautical miles, and observers were able to count for a mile in each direction, so were able to survey a total of 264 square nautical miles, approximately one-tenth of the total Sanctuary area of 2800 square nautical miles.[14] The average number of vessels in the Western Sambos ER per snm was 59 percent lower than the average for zones 10-14, and the average number of commercial vessels was 31 percent higher than the average in those zones. The NMFS study did not include important fishing areas to the west of Sand Key, including Sand Key West, the Marquesas and the Dry Tortugas.

It seems fair from this data to assume that substantially less than 4.4 percent of all commercial fishing in the Florida Keys takes place in the Western Sambos ER. Since fishermen will be able to make up some of their catch by fishing elsewhere, the percentage of overall catch that will be lost by ER designation will be minimal. Without an accurate random survey of the fishermen in the area it is impossible to do more than make a qualitative estimation of probable loss.

But given the small percentage of commercial fishing which takes place in the Western Sambos ER area relative to the entire Florida Keys area, the costs of displacement to commercial fishermen overall should not disrupt the industry in a significant way. The boundary of the Dry Tortugas ER when it is proposed will be drawn to minimize the displacement of fishermen. However, the area of that ER could be as much as ten times larger than that of the Western Sambos ER, and more fishermen will likely be displaced.

Benefits

There are expected long-term benefits to commercial fishermen. As productivity increases within the reserves, some spillover of adults and juveniles will occur, from the highly productive reserves into the less productive fished areas, as was observed during a ten-year marine reserve experiment off Sumilon Island in the Philippines (Alcala 1966). The size of the spillover depends on individual species behavior and mobility, and the location and size of the protected areas. Fishermen can often be found along the edges of reserves where the fishing tends to be very productive.

The enhanced biomass in a reserve leads to enhanced egg production. Marine reserves have a larger percentage of large fish than fished areas, and this is important because egg production is a geometrical function of size. A 24 inch red snapper, for example, produces the same number of eggs as 212 16.5 inch red snappers (Norse 1993). Some of the fish eggs and other marine life may be dispersed to adjoining areas. This will have a major or minor effect on the total stock, depending on the species, the size and location of the reserves, and the circulation of water within the area.

A related benefit is the protection of some of the hundreds of species which are not covered by fishery management plans. The major targeted species are covered by fishery management plans, but other species may be fished or taken as bycatch, and these will generally be the same species for which information on

[13]The survey is discussed further under following section, "Costs to Recreational Fishermen".
[14]David McClellan pers. comm. 7/29/96.

status is inadequate. ERs to some extent offer these species an insurance policy, although the strength of that policy is dependent on the size of the reserves; the Western Sambos ER and the Dry Tortugas ER still in the planning stage may not be of sufficient size to be effective, particularly in the case of species with a wide range which may swim into areas which allow fishing.

All of the potential benefits to commercial fishermen may not be realized. One major reason is that reserves are most helpful as a management tool if carried out as a part of an overall plan of stock protection for the entire South Atlantic fishery. In the absence of overall effort controls in the fisheries, the displacement from reserve to other areas of the Sanctuary may undermine the expected benefits. The other reason, again, is that the size and number of the reserves will affect the amount of benefits to be expected. The Western Sambos ER is a small reserve and will therefore only have limited benefits in terms of increased production, biodiversity, etc. The Dry Tortugas ER, to be proposed in the future, will probably be substantially larger and may offer more of these benefits.

Net Benefits

The long-term effect of the Western Sambos ER on commercial fishermen is predicted to be neutral to positive. Again, this is a small reserve, and according to the NMFS aerial study only 4.4 percent of commercial fishermen in the zones surveyed, and therefore a considerably smaller proportion in the entire Florida Keys, have fished there on average over the past five years. Furthermore, the increased productivity expected within the reserve should produce an "edge effect" which will benefit nearby areas.

4. Consumptive Users—Recreational Fishermen

Costs

The short-term costs are expected to include some displacement, and possibly some crowding as displaced fishermen move to other areas. For the Western Sambos ER, these effects are not expected to be major since the area is so small. The Florida Marine Institute's aerial study conducted from June 3, 1992 through May 29, 1993 (FMI 1995) found fishing boats, including recreational and commercial boats, present on only 20 out of 51 surveys; an average of 0.9 fishing boats per survey were counted. Excluding the proposed Western Sambos SPA from the grid, an average of 0.46 boats were present in the ER at any given time.

The NMFS study, which was conducted over a longer time frame, recorded a higher average of three recreational and commercial fishing vessels in the Western Sambos ER in 30 surveys over the period September 1992–March 1996, out of a total average per survey of 115 fishing vessels for the area of the Florida Keys covered (Carysfort Reef to Sand Key). This is an average of 2.6 percent of fishing vessels (about 90 percent are recreational) in the Florida Keys area surveyed by NMFS, which did not take in the major recreational area around Key West.

Given these small numbers, the cost to recreational fishermen of establishing the Western Sambos ER will be minor.

Benefits

In the Marine Institute survey discussed above, an average of 0.43 boats were found in the nine mile-square grids to the east, and 1.24 boats in the nine mile-square grids to the west of the area proposed for designation as the Western Sambos ER. It seems reasonable that these areas can absorb the fishermen from the proposed ER. Fishermen in the adjacent areas are expected to benefit from increased productivity in the ER, spilling over to adjacent areas through larval dispersal and movements of adult fish. An additional benefit for recreational fishermen is that the expected effects of a reserve strategy would be to produce larger, more abundant "trophy" catches for recreational users. The edge effect of reserves, which produces excellent sport fishing at the boundary of the reserve, will also be a benefit.

5. Consumptive Users—Commercial Treasure Salvors

This group of small businesses are likely to be adversely impacted but it is difficult to quantify the amount as there is little or no data in the record as to the amount of treasure in these zoned areas or in other areas of coral, seagrass beds and other significant habitat. However, NOAA and state efforts to mitigate the adverse impacts on this group have been addressed in permits for research/recovery and deaccession/transfer of Sanctuary resources discussed below.

Net Benefits

The logic of the case for recreational fishermen is similar to that for commercial fishermen. Again, since the final boundaries of the Dry Tortugas ER are still open to a public process, and data is still being collected, it

seems prudent to be cautious in making a prediction. However, the most reasonable prediction is that the net effect will be positive, and more so than for commercial fishermen since territoriality is less of an issue and sport fishing benefits from the increase in numbers of large fish produced by the reserves.

6. Larger Economy

Costs

There will be some short-term costs to the regional economy in Monroe County from the short-term loss in catch due to the Western Sambos ER. As stated previously, NOAA has taken costs to commercial fishermen and the regional economy into account in writing the FMP. Dropping the Key Largo and the Dry Tortugas ERs will result in a much lower cost to the regional economy from short-term commercial fishing loss than the Preferred Alternative from the DMP.

Benefits

The zoning plan is expected to provide the benefit of helping to maintain the quality of the resources in the Florida Keys, which in turn will maintain all the benefits currently associated with tourism, fishing, and other uses.[15] If the habitat is allowed to deteriorate, most of the associated benefits to the regional economy, regardless of their size, will tend to disappear over time.

The added consumer surplus from the added value derived from ER status, even if that added value were quite small for each tourist, would be quite substantial in light of the enormous importance of tourism in the area. The same can be said for the value added by the ERs to existence and option values for the nation.

Net Benefits

Benefits to the regional economy from establishing the reserves are expected to be strongly positive. Tourism and recreation represents the largest industry in Monroe County, and it is clear that zoning will benefit tourism, even if the effect on commercial fishing is negative, against expectations.

Sanctuary Preservation Areas

SPAs protect shallow reefs where concentrated visitor activity has been leading to resource degradation. In designating the SPAs care was taken to protect areas identified as most in need while minimizing the cost to fishermen by avoiding areas with high fishing use wherever possible. Criteria which were used in selecting the SPAs, and again were reconsidered in drawing up the Final Preferred Alternative, included:

- Protect representative locations of the most rare habitats.
- Consider long-term impacts on areas of critical economic value.
- Protect areas that are buffered from poor water quality.
- Consider the accessibility of areas to fishermen and other user groups.
- Minimize conflicts.
- Provide geographic spread.
- Maintain sufficient size to ensure viability.
- Consider potential for research and use as control areas.

The concept of SPAs has been less controversial than the concept of ERs because the areas proposed for designation as SPAs are experiencing significant population or habitat declines as a result of human impacts, and the SPA strategy addresses this immediate and obvious issue of overuse and observed environmental degradation. Most of the SPAs are not heavily used by fishermen, and fishermen's groups agreed with the establishment of the SPAs early in the planning process.

In consideration of public comment on the draft plan and SAC recommendations, the FMP allows catch and release fishing by trolling in four SPAs-Conch Reef, Alligator Reef, Sombrero Key, and Sand Key. These four were selected using information gathered through aerial census data and from public comments. These four areas will give NOAA the ability to compare and contrast SPAs where catch and release fishing is allowed and not allowed in order to determine its short and long-range impact.

The DMP/EIS proposed prohibition against all consumptive activities, would include baitfishing in the SPAs. The public comments, particularly from small baitfishing businesses, indicated that certain SPAs would adversely impact their operations and that relocation of their operations was not practicable in the providing of live bait for offshore, pelagic fishing in certain areas. The SAC reiterated these concerns in their

[15] See discussion on page 8 under "Monroe County Economy"

recommendations. Consequently, to mitigate the impacts on these small business entities, the final regulations allow ballyhoo fishing by net in the SPAs pursuant to a Sanctuary permit.

Costs

Recreational diving, dive charter operators and other non-consumptive users may incur some incremental costs in complying with the increased restrictions to protect the habitat from further degradation. The restrictions put on their use of the SPAs, such as prohibiting discharge of marine sanitation devices, touching coral, and anchoring so as to avoid coral may have some incremental costs to users, but these costs are expected to negligible. Additional expenditures for equipment are not expected, as marine sanitation devices can be discharged outside the zones consistent with other laws. There may be some additional costs for personnel to dive down and inspect the anchor to avoid touching coral, but they are not expected to be significant, as most dive charters already have personnel employed able to conduct the task. There may be some delays in getting the divers into the water, but the delay time should be minimal.

Costs to the tourist industry and divers are expected for those who violate the regulations and are subjected to civil penalties. However, based on public comments as well as NOAA's experience at Looe Key and Key Largo National Marine Sanctuaries and elsewhere, compliance with the regulations from divers and charter operators is expected to be high.

Tropical fish collectors, lobster fishermen, recreational fishermen, and spearfishermen displaced from these areas are expected to incur relocation costs and may be negatively impacted in their catch overall, at least in the short-term. These adverse impacts are not expected to be significant in the long term.

There is very little commercial fishing in the SPAs. As mentioned previously, two studies have surveyed vessel use in the SPAs. The NMFS survey (McClellan 1996) over a four-year period from September 1992 through December 1996, found that fishing activity was almost even between SPAs; Alligator reef, Davis reef, and Sand Key were the most popular, with 4.6, 4.5 and 3.9 fishing boats per survey. The great majority of these were recreational boats: nine out of ten boats in Alligator reef, twenty-nine out of thirty in Davis reef, and five out of six in Sand Key. The percentage of recreational fishermen is probably even higher than reflected by these numbers, since the surveys were conducted on Fridays, and more recreational fishing takes place on weekends.

The Florida Marine Institute study (1995) found a lower amount of fishing than the NMFS study. It found that what fishing does occur in the SPAs is inconsistent, with occasional higher usage, often coinciding with holidays.

Allowing catch and release fishing in four SPAs will significantly reduce the costs to charter boat operators who rely on these SPAs for fishing during inclement weather.

Allowing baitfishing by permit in the SPAs will significantly reduce the costs to small commercial baitfishing companies and recreational offshore fishermen. Although there may be some incremental costs for management and fishermen for the permit process, they are expected to be minimal. The permit process will be along standardized lines as opposed to requiring a more rigorous case by case analysis.

Benefits

Groups that will benefit are those that value an abundance and diversity of marine wildlife, especially divers and snorkelers. Dive vessels were found by the NMFS survey (McClellan 1996) to be slightly more abundant than fishing vessels: adding up the averages for all the SPAs, the study found 43 dive vessels and 40.7 fishing vessels in the SPAs per aerial survey. Again, the flights were on Fridays, generally between noon and two, and missed some of the weekend traffic.

The habitat protection and reduction of habitat degradation in the SPAs is expected to have some secondary benefit for species which use the habitat, including species which are subject to recreational and commercial fishing. Thus, the habitat protection may in the long term provide benefits for such fisherman or at least mitigate the short term adverse impacts. Based on experiences in other protected areas, more fishing near the SPAs by recreational and commercial fishermen is expected.

Net Benefits

SPAs are expected to have little cost since they are small in area and displaced recreational and commercial fishermen can easily move to nearby areas at little cost. The benefits of allowing these stressed habitat areas

to rejuvenate clearly justify the displacement costs to small numbers of recreational and commercial fishermen.

Existing Management Areas

Consistent with the FKNMSPA, the regulatory protections for the Looe Key and Key Largo National Marine Sanctuaries (which became part of the Florida Keys National Marine Sanctuary) have been incorporated into Sanctuary regulations. The regulatory protections applicable to these areas are found in the Sanctuary-wide prohibitions and in the Existing Management Areas restrictions. The prohibitions and restrictions applicable to Looe Key and Key Largo Sanctuaries are substantially the same as before. The Key Largo/Looe Key NMS regulations and NOAA's corresponding experience at these sanctuaries provided a basis or model for the general Sanctuary wide-prohibitions and zoning restrictions for the entire FKNMS. The impact analysis for the Sanctuary-wide restrictions appears later, below. The analysis here is limited to the four prohibitions applicable to Key Largo and Looe Key set forth in the EMA regulations: (i) removing coral or marine invertebrate, or any plant, soil, rock, or other material, except commercial taking of spiny lobster by hand or gear; (ii) taking tropical fish; (iii) fishing with wire traps, bottom trawls, dredges, fish sleds, or similar vessel-towed or anchored bottom fishing gear or nets; and (iv) fishing with, carrying or possessing pole spears, air rifles, bows and arrows, slings, rubber powered arbalates, pneumatic and spring loaded guns or similar devices known as spearguns.

These restrictions are presently applicable to the Looe Key and Key Largo NMSs and accordingly their continuance imposes no new cost on any entity. It would be inconsistent with the NMSA under which these sanctuaries were originally designated and protected to lessen the protections afforded them. Maintaining the protections here without substantial change involves the least amount of disruption to users of these and other Sanctuary areas. If the protections were lessened here, then protections in other areas may need to be added. Thus, maintaining the status quo for these areas was considered to be the best alternative from a socioeconomic impact perspective.

Also designated Existing Management Areas are the Great White Heron and Key West National Wildlife Refuge Management Areas. Sanctuary regulations incorporate existing U.S. Fish and Wildlife Service restrictions which prohibit waterskiing, operating personal watercraft, and operating airboats within the Great White Heron and Key West National Wildlife Refuge Management Areas. By incorporating these provisions into the Sanctuary regulations, civil penalties can be sought for violations of Sanctuary regulations. Currently, only criminal sanctions, which are more difficult to prove and not always the best means of obtaining compliance, are available. To address water quality concerns and complement the Florida Clean Vessel Act, this section also sets forth a prohibition against the discharging or depositing of any material or other matter except cooling water or engine exhaust in these areas.

The costs to users of the Wildlife Refuge Management Areas are not expected to be significant. Additional costs are expected to be limited to civil penalty enforcement. This may mitigate some costs because the remedy under USFWS regulations is criminal sanctions, which require greater costs to management as well as to violators.

Special-use Areas

Only four small research only Special-use Areas are established under these regulations. The places chosen are coral reef habitats which will serve as control areas for studying environmental, biological and human impact issues in the Sanctuary. Academic and scientific communities will be the primary initial beneficiaries of this zone type. Some comments indicated that one of the areas identified in the DMP would impact recreation use by local residents. The FMP was modified to avoid such impacts. Based on the zoning process for the DMP, and the public comments, no adverse impacts are expected upon fisherman or the tourist industry because these areas not generally used by those businesses. Later, additional areas may be established to address restoration needs, high-impact activities or user conflicts.

Except for passage without interruption through the area or for law enforcement purposes, no other person may enter the research only Special-use Areas except to conduct or cause to be conducted scientific research or educational use specifically authorized by and conducted in accordance with the scope, purpose, terms and conditions of a valid National Marine Sanctuary General or Historical Resources permit. The socioeconomic impacts of the four Special-use Areas are not expected to be significant because they are not areas traditionally used by commercial and recreational fishermen. Some local users and some tourists may be displaced but not to any great degree; these areas are small and located apart in discrete portions of the Sanctuary.

Conclusion: Net Benefit of Zoning Plan to All Users

The overall net benefit of the zoning plan is expected to be strongly positive. Most sectors, including the habitat itself, non-consumptive users, and recreational fishermen, are expected to benefit. Recreational fishing is expected to benefit from increased productivity due to the reserves, with in particular increased numbers of large fish. Consumer surplus from non-consumptive activities will increase. It is expected that long-term producer surplus and consumer surplus for the commercial fishing industry will not change much or possibly increase. The worst case scenario is that the net benefit to that one sector will be mildly negative. However, this assessment has considered benefits across the board and the cost in that case would be justified by the benefits to all other sectors of society.

It should be emphasized again that although the non-consumptive use zones impose a short-term cost on commercial fishermen, the failure to adequately protect resources and ameliorate conflicts imposes a cost on non-consumptive users of the Sanctuary. In areas which allow both, an implicit decision is imposed which favors consumptive over non-consumptive users. Both consumptive and non-consumptive uses are important for the regional and national economy. Most of the Sanctuary, over 96 percent, will remain open to fishing. SPAs and ERs are areas of critical habitat where it seems most reasonable to favor non-consumptive uses.

COMPARATIVE IMPACTS OF ZONING ALTERNATIVES

The above discussion centers on the FMP Preferred Alternative. The following is an assessment of the socioeconomic impacts of the zoning plan for each of the five zones for the three mid-range alternatives in the DMP.

Wildlife Management Areas

Only minor changes were made to the WMAs from Alternative III to the Final Preferred Alternative. The FMP and regulations allow transit through Jewfish Creek and Steamboat Creek. Alternative III restricts access. Also, an idle speed only/no wake zone in the area of Lake Surprise east of US Highway 1 was added to the final plan to protect endangered American Crocodiles and West Indian Manatees.

Alternative III, then, would basically provide all the benefits and costs outlined in the assessment of the Final Preferred Alternative. Alternative III would add certain additional habitat protection for the two creeks, and the slight additional socioeconomic cost of incrementally greater restricted access. The overall net benefit of Alternative III would be strongly positive, to nearly the same degree as the FMP Preferred Alternative.

Alternative IV includes fewer WMAs (19) than Alternative III (26) and would therefore entail fewer benefits to habitat and values deriving from benefits to habitat, as well as slightly lower costs to those whose access would be limited; enforcement costs would be concomitantly lower. Alternative II includes more WMAs (37) than Alternative III (26) and would have relatively concomitantly more benefits to habitat and values deriving from benefits to habitat, including enjoyment by con-consumptive users and higher existence and option values. However, there would also be higher costs for Sanctuary users desiring free access to as much of the Sanctuary as possible, and higher enforcement costs.

Ecological Reserves

This is the zoning type which underwent the greatest changes from Alternative III to the FMP Preferred Alternative. The proposed Key Largo and Dry Tortugas Ecological Reserves were dropped. The Western Sambos ER was maintained with the same boundary.

The categories of costs and benefits of the Alternative III ER plan are similar to those of the FMP Preferred Alternative, but different in magnitude. The inclusion of the Key Largo and Dry Tortugas ERs in Alternative III would have involved greater protection of the habitat and species biodiversity within the Sanctuary, and therefore more of the benefits of such protection for non-consumptive users, and higher benefits deriving from existence and option values. The short-term costs from displacement of some fishermen will be lower in the FMP Preferred Alternative than they would have been with the DMP Preferred Alternative, because of the inclusion of only one ER instead of three. The Dry Tortugas ER in its Alternative III configuration in particular contained some shrimping grounds which were identified in public comment on the draft plan. Alternative III would also involve higher administrative and enforcement costs, from having to manage two additional ERs.

Alternative IV establishes the same three ERs as Alternative III but all are smaller. This alternative was rejected as not providing enough habitat protection. Alternative II establishes eight ERs, including the three in

Alternative III, with roughly the same boundaries as in Alternative III.
The socioeconomic implications of these alternatives, clearly, are that the short-term costs to fishermen will rise, and the costs to management will rise, the more area is declared off-limits to fishing. The benefits foreseen for ERs, including protection of habitat and of biodiversity, maintaining control areas for scientific research, providing areas rich in marine life for high-quality viewing and enjoyment, and increasing stocks of species which will improve neighboring fishing areas, should also rise as greater area is placed in reserve status. Since the net benefits to users and the environment from ERs are expected to be strongly positive, the net benefits of Alternative IV would be higher, and the net benefits of Alternative II would be lower, than for Alternative III.

Sanctuary Preservation Areas

Little change was made to the SPAs in developing the FMP Preferred Alternative from the DMP Preferred Alternative. One SPA, Western Sambos, was dropped because that area was made an ER, with the same protections provided the SPAs. The Carysfort Reef SPA was slightly enlarged to provided need protection that would have been supplied by designation of the Key Largo ER which was dropped from the FMP. The socioeconomic assessment for Alternative III is therefore identical to the assessment of the FMP Preferred Alternative.

Alternative IV contains the same 19 SPAs as Alternative III, but generally with each SPA being larger in area, and Alternative II contains 12 SPAs with roughly the same boundaries as in Alternative III. Alternative II was rejected for not providing sufficient habitat protection. The qualitative assessment of costs and benefits for each SPA is the same as for all SPAs together, so that the net benefits of Alternative IV would be expected to be higher, and the net benefits of Alternative II lower, than the net benefits for Alternative III.

Existing Management Areas

The Existing Management Areas are the same in all alternatives in the DMP and in the FMP Preferred Alternative, so the assessment of benefits and costs is the same. No environmental or socioeconomic impacts are anticipated across the alternatives since these zones are currently managed by other agencies, except that costs may be lower due to interagency cooperation.

Special-use Areas

The four research only Special-use Areas included in Alternative III are the same as in the FMP Preferred Alternative except that Alternative III includes Pelican Shoal, which was eliminated in the FMP and replaced with the Eastern Sambos (Research Only) Special-use Area. Alternative III would have a higher socioeconomic cost to the public because of the limited access to Pelican Shoal, and a higher research benefit, if NOAA's judgment that the Eastern Sambos area is a better research and monitoring site is correct. Alternatives IV and II were identical to Alternative III in the draft plan.

The conclusion that net benefits of the DMP Preferred Alternative III would be positive for all user groups is supported by the Florida Department of Commerce, which conducted a consistency review of the DMP/EIS. Their conclusion was:

> the proposed plans and actions are consistent with criteria in Chapter 288, Florida Statutes: positive net impacts on income and employment; social benefits outweigh identifiable social costs; no adverse effects on any key Florida industry; and official local agency support for the project.[16]

Socioeconomic Assessment of Sanctuary-wide Regulations

§ 922.163 Prohibited Activities - Sanctuary-wide.

(1) Mineral and hydrocarbon exploration, development and production
Section 6(b) of the FKNMSPA states that "[n]o leasing, exploration, development, or production of minerals or hydrocarbons shall be permitted within the Sanctuary." The regulations merely codify this statutory prohibition, which became effective in November 1990 when the statute was enacted, rather than expanding upon it. Potential lost revenues from the statutory prohibition on the oil and gas industry and on the local

[16]Letter from Wynnelle Wilson, Economic Development Policy Coordinator, Bureau of Economic Analysis, to Suzanne Traub-Metlay, Director, State Clearinghouse, Office of Planning and Budgeting, Executive Office of the Governor, August 7, 1995.

economy which could provide support services for this industry; and the potential adverse impact on the energy self-sufficiency of the United States, and on energy costs, have not been thoroughly researched and quantified by NOAA.

The Minerals Management Service (MMS) has indicated that the hydrocarbon potential is poorly know in the South Florida Basin because few exploratory wells have been drilled in the geochemically mature offshore portions of the basin. While MMS indicates that the South Florida Basin is a promising, frontier for oil and gas exploration, in the context of the nation's overall oil consumption, MMS hydrocarbon resource estimates for South Florida are modest. MMS states that the most favorable location for commercial hydrocarbons in South Florida are in the Eastern Gulf of Mexico Planning Area because of the location of the depocenter of the South Florida Basin. The Straits of Florida Planning Area which includes the Florida Keys has the lowest relative economic interest for commercial development for the South Florida Basin. The Marginal probability of commercial hydrocarbons is estimated by MMS to be 0.18 for the Straits of Florida Planning Area and 1.00 for the Eastern Gulf of Mexico Planning Area.

MMS has estimated the potential existence of hydrocarbons in the Straits of Florida to range from 180 to 680 million barrels of oil and 0.21 to 0.79 trillion cubic feet of gas. The mean estimated reserves 350 million barrels of oil and 0.44 trillion cubic feet of gas equate to about 27 days of total U.S. oil consumption at the 1988 rate (13 million barrels per day). Several exploratory wells drilled in the Florida Keys area had shows of oil, but were considered not economically viable. Two wells drilled in the vicinity of the Marquesas Keys in 1959 and 1960 were determined to be possible low-volume oil producers. While the mean reserves estimated by MMS for the Straits of Florida Planning Area appear too low to generate much industry interest because of the low potential return on investment, companies that want to drill in a frontier area could be hoping to discover new reserves that might be considerably greater than those estimated by MMS.

The lost revenues and costs to the hydrocarbon industry and related industries is considered to be moderate to low, depending on the resource potential. Whatever the costs, they were evidently deemed acceptable, particularly when considered with other societal concerns. These costs are reduced by removing the potential for damaging the resources of the Sanctuary that the conduct of such activities presents (e.g., oil spills fouling reefs and beaches, decreasing tourism, and making valueless fishery resources spoiled by a spill). There are also potential benefits to the tourism industry of preserving aesthetic views not spoiled by oil production platforms. It is not possible here to reach a conclusion as to whether the economic costs would be offset entirely by the expected benefits.

(2) Removal of, injury to, or possession of coral or live rock

The purpose of this regulation is to protect and preserve an important and slow to regenerate resource of the Sanctuary-live rock and coral. The damage to the resources of the Keys caused by the removal for resale of coral and live rock, from damage due to divers touching same, and from vessels running aground are well documented and was a primary reason for the designation of the Sanctuary by the FKNMSPA. If divers comply with this restriction, the restriction itself should have no economic impact on them. The same is true for vessels. As the collection of coral or live rock is already regulated by other federal and state authorities, there should be no adverse impacts from this restriction, except to the extent that these other authorities incorporate Sanctuary concerns into their permits. The state of Florida already prohibits the taking of coral and life rock, as does the South Atlantic Fishery Management Council. The Gulf Council will have its prohibition phased in by the end of the year. Life rock aquaculture may be conducted pursuant to a permit. Presently there are approximately 12 permits in the Gulf and 12 in the Atlantic; none of these permits are in Sanctuary waters.

The benefits of preserving the remaining coral and live rock in the Sanctuary from environmental damage through dive tourism will offset either partly or completely the adverse economic impacts on consumptive users. Failing to impose this prohibition would be inconsistent with obtaining the objectives of the NMSA and the FKNMSPA. No alternative which would lessen the impact on consumptive users would be consistent with the statutes.

(3) Alteration of, or construction on, the seabed

The purpose of this regulation is to protect the seabed and to act as a type of safety net for activities not covered by existing federal and state permit regimes. Certain activities have been expressly exempted in order to lessen the prohibitions costs on users of the Sanctuary. The exempted activities include anchoring, traditional fishing, installation of navigational aids, harbor maintenance, and the construction and repair of docks, seawalls, piers and marinas with less than ten slips. Other activities, not exempted, can still be

conducted if authorized by a US Army Corps of Engineers and/or state DEP permit through the Sanctuary certification and authorization procedures (§§ 922.167 & 922.168) and further delineated in the Permit Memorandum of Agreement with the Florida Department of Environmental protection (DEP). The Sanctuary certification/authorization process avoids duplication, but also ensures that other federal and state authorities address Sanctuary concerns comprehensively and holistically. There may be some socioeconomic impacts from this process to the government agencies involved, as well as permittees. However, the process has been set up to avoid time delays and ensure that additional terms and conditions are justified.

The regulation also acts as a safety net to ensure that some future activity which disturbs the seabed and is not covered by other agency federal or state permits cannot be conducted without a Sanctuary permit.

While commercial salvors will continue to be required to obtain DEP permits in state waters, the Sanctuary permit process will govern salvage in Sanctuary waters. While the permitting process is rigorous for treasure hunters and may remove much of the financial incentive to conduct such operations, the potential profit for treasure hunters appears currently to be diminishing because of environmental and historic preservation laws, and a diminishing resource base. Historical resources in the Sanctuary are a public resource which should be preserved for present and future generations. Treasure that is not historically significant will be allowed to be transferred to permittees.

(4) Discharge or deposit of materials or other matter

This prohibition acts as a safety net for Sanctuary water quality and living resources. Costs on users have been substantially ameliorated by exempting common activities which do little harm: fish, fish parts, chumming material, bait produced or used incidental to traditional fishing activities, biodegradable effluents discharges incidental to vessel use and generated by USCG approved marine sanitation devices, water generated by routine vessel operations (gray water, cooling water), and vessel engine exhaust. Where an exempted activity has a greater potential for harm such as in the SPAs and ERs, the exemption has been withdrawn. Most of the significant discharges and deposits subject to this prohibition, such as sewage outfalls, will be subject to other federal and state agency permits, and Sanctuary concerns will be addressed through the permit certification and authorization process. Additional costs for addressing Sanctuary concerns are expected, but the processing costs are expected to be minimal, as are the impacts to permittees.

Like the prohibition on alteration of the seabed, the prohibition on discharges acts as a safety net. For example, some sponge fishermen pour used oil on the surface to make it easier to see sponges, or bleach to get fish to move out of hiding. This prohibition have have significant impacts on such fishermen, who use non-traditional fishing practices which are potentially harmful to the coral reef, habitat, and ecosystem.

(5) Operation of vessels, including anchoring

The final regulation prohibits operating a vessel at a speed greater than idle speed only/no-wake:

- in areas designated idle speed only/no wake zones;
- within 100 yards of navigational aids indicating emergent or shallow reefs (international diamond warning symbol);
- within 100 feet of the red and white "divers down" flag (or the blue and white "alpha" flag in federal waters);
- within 100 yards of residential shorelines; or
- within 100 yards of stationary vessels.

These restrictions apply to the operation of all vessels, including personal watercraft. Vessel operators may incur some time delays in going slower or in steering their course, but the adverse impacts are expected to be minimal and reasonable to avoid adverse impacts arising from conflicting uses of areas. Socioeconomic benefits are expected from compliance with these rules through reduction in the harm to Sanctuary resources, life and property from collisions.

In idle-speed only/no wake areas, the rule may enhance the use for fisherman and other recreational uses, by minimizing some user conflicts which harm those use experiences. This in turn may result in some incremental socioeconomic benefits to users such as fisherman, divers, charter operators and others. The aforementioned example of the Florida Keys Fishing Guides Association estimated benefits from such vessel restrictions to the 30 fishing guides currently utilizing the WMAs is somewhat analogous the these restrictions.

As these restrictions minimize user conflicts they will also result in fewer accidents. As previously indicated, in

1995, there were 503 personal watercraft (e.g., jet-ski) accidents involving 856 vessels in Florida waters. Of the 503 jet-ski accidents, 325 involved a collision with another vessel. There were over 66 accidents in the Sanctuary waters off Monroe County. Of these 66 accidents, 48 resulted in injuries, and damages were estimated to be $79,477.00.[17] It is difficult to predict how many accidents will be avoided or minimized by these rules, which apply in portions of the Sanctuary; however, it is clear that there should be some reduction in accidents, injuries, and damages, which is a socioeconomic benefit. Adverse socioeconomic impacts from these restrictions are expected to be greatest upon PWC users.

Fifty-five percent of the public comments on the DMP/EIS addressed the issue of personal watercraft (e.g., jet-skis). The majority of them requested that NOAA not single out personal watercraft in its final regulations. Many of the public comments reminded NOAA that personal watercraft owners and users should act responsibly. Others asked that NOAA severely restrict or even prohibit the operation of personal watercraft within the Sanctuary. NOAA also received comments noting frequent environmental nuisance and safety issues associated with the operation of personal watercraft. These included: reckless operating behavior, harassment of endangered species such as the East Indian manatee, harassment of other boaters (including disruption of fishing on flats), and noisy operation in canals and adjacent to residential shorelines. These reviewers requested limiting and restricting or banning the use of personal watercraft within the Sanctuary.

NOAA has developed a multi-pronged approach to address the public's concern over this issue. NOAA has accepted the SAC's recommendation to add a new section to the final regulations, which prohibits reckless operation of watercraft. Additionally, the regulations have been modified to prohibit operating a vessel at greater than idle speed only/no wake within 100 yards from residential shorelines, from stationary vessels (except in marked channels), and from navigational aids marking emerging or shallow reefs. NOAA has also incorporated into its regulations the authority to enforce all idle speed only/no wake zones established throughout the Sanctuary. NOAA will use the existing county and state process for designating these zones, and it is likely that these personal watercraft will be restricted in certain residential areas and other places where they continue to be a nuisance or safety problem. The industry has indicated it is seriously committed to "self regulation" and is willing to work with NOAA to develop educational efforts geared toward changing user behavior. In particular, the PWC industry agreed to work with Sanctuary staff to establish criteria for the management of commercial PWC rental operations. The final component of NOAA's approach to PWCs is a modification of the SAC's recommendations. If initial efforts are not successful at significantly reducing or eliminating the nuisance and safety problems, NOAA will consider implementing broad zoning restrictions consistent with SAC recommendations. Restrictions of this type have been implemented successfully in the Monterey Bay National Marine Sanctuary.

The PWC industry, operators and others provided comments raising concerns about restricting only PWCs under the regulations. The PWC rental operators are small business entities and their comments were given due consideration. Despite pressure from other commentors, these restrictions do not single out PWCs, but apply uniformly to all vessels. The focus is not on the type of vessel, but the manner of operation. The restrictions are expected to have some adverse socioeconomic impacts on PWC users, but no such impacts are expected upon PWC rental operations. In addition, the adverse impacts on PWC users should be limited to relocation costs.

Additional regulations on the operation of vessels include a prohibition on: (1) operating a vessel in such a manner as to injure, take, or cause disturbance to wading, roosting, or nesting birds or marine mammals; and (2) operating a vessel in a manner which unreasonably or unnecessarily endangers life, limb, property or marine resources, including but not limited to weaving through congested vessel traffic, jumping the wake of another vessel unnecessarily closely or when visibility around the other vessel is obstructed, and swerving at the last possible moment to avoid a collision.

To a certain extent, these activities are already prohibited
by existing laws. These activities may trigger the ESA and MMPA for certain Sanctuary resources. The restriction on reckless operation of vessels is based primarily on existing restrictions in state law, and therefore the incremental impacts are likely limited to users in the federal waters portion of the Sanctuary. As with the other vessel operation restrictions, some adverse socioeconomic impacts are expected, but primarily on PWC users. Overall the socioeconomic impacts are expected to be positive because vessels are restricted to operating in a manner which does not harm other recreational and commercial users of the Sanctuary, including fishermen and divers; but does not prevent them from carrying on with their own recreational or

[17] 1995 Boating Accidents Report by the Florida Department of Environmental Protection, Division of Law Enforcement.

business pursuits.

Also specifically prohibited is anchoring a vessel on coral other than hardbottom in less than 40 feet of water when visibility is such that the seabed can be seen. This prohibition does not apply to anchoring on hardbottom.

Anchoring on corals is a threat to the health of coral reefs in the Florida Keys. This is especially true in areas of concentrated vessel use. Mooring buoys have been installed on some heavily used reefs to prevent anchor damage (see Mooring Buoy Action Plan, Volume I). This is not a practical solution for all the areas where fishing occurs, especially over some of the deeper reef habitats. The problem of anchoring on corals can be addressed areas where the water clarity and depth are such that boat operators should reasonably be expected to see the bottom.

The alternative of prohibiting anchoring on corals throughout the Sanctuary was rejected as being overly restrictive and having unacceptable adverse socioeconomic impacts on users.

The proposed regulations would have prohibited anchoring a vessel on coral in depths less than 50 feet. Visibility in Sanctuary waters has been declining, particularly in the last decade. Reviewers of the proposed regulations, including the SAC, stated that the proposed prohibition was too restrictive, especially in the Lower Keys where visibility often prevents a boat operator from being able to see the bottom at such depths. While there would be greater environmental benefits from prohibiting anchoring a vessel on coral in all waters shallower than 50 feet, the inconvenience to fishermen and others who regularly use areas where they can't see the bottom would not appear to be justified.

The SAC recommended the anchoring restriction adopted in the final regulations in its comments to NOAA. Other groups favored the proposed regulation, requested an anchoring on coral ban throughout the Sanctuary, or objected to any prohibition on anchoring. The alternative chosen will help prevent anchor damage to coral reefs. The restriction will not have any direct economic impact on users. While impossible to quantify, the overall, long-term economic benefit to society from protecting coral reefs from anchor damage should far outweigh the inconvenience people face of having to be careful when they anchor.

(6) Conduct of diving/snorkeling without flag

This prohibition is designed to prevent user conflicts and to protect the health and safety of divers/snorkelers from being damaged inadvertently by other Sanctuary users. The cost of a flag is insignificant and is more than offset by the potential benefit of using one.

(7) Release of exotic species

The damage to the Florida environment and to other areas of the United States from the inadvertent or deliberate release of exotic species is public knowledge. The cost of the potential damage to the ecology of the Keys dwarfs the cost of a user complying with this requirement. The cost of compliance should be minimal.

(8) Damage or removal of markers

The overall cost of markers, their placement, and upgrade is not insignificant but is necessary for the safety of Sanctuary users and for the protection of fragile ecological areas. There is no cost associate with a prohibition on removing or damaging a marker. If a Sanctuary user damages a marker, that user should bear the costs of repair or replacement.

(9) Movement of, removal of, injury to, or possession of Sanctuary historical resources

Also included under this prohibition is a discussion of the § 922.166 permit system under which this prohibited activity could be conducted.

The regulations prohibit the removal or injury of Sanctuary historical resources. Three types of permits may be issued under § 922.166 to allow this activity: Survey/inventory, Research/Recovery, and Deaccession/Transfer permits. However, permits will not be issued for recovery of shipwrecks in any of the WMAs, EMAs, SPAs, ERs, or Special-use Areas or in any areas where coral or significant amounts of seagrass or other significant natural resources would be injured by recovery of submerged cultural resources (SCRs). Further, permits will not be issued for shipwrecks which are relatively intact and are of high historical significance. However, for shipwrecks of low to moderate historical significance where recovery will not injure significant natural Sanctuary resources, permits for the recovery of SCRs will be considered pursuant to these

regulations and the SCR Agreement, which is a Programmatic Agreement consistent with section 106 of the National Historic Preservation Act.

This regulation and the SCR Agreement will adversely affect commercial treasure salvors. Commercial treasure salvors generally run small business operations. Treasure salvors may be grouped into three categories: 1) professional treasure salvors whose search, recovery, sale, and/or display of recovered items is a full-time endeavor and primary source of income; 2) paraprofessionals who hunt for treasure regularly on a part-time basis, but for whom treasure salvage is not their primary source of income nor a full-time job; and 3) souvenir collectors/hobbyists, who combine the search for treasure with their recreational diving activities.

The discovery of the 1715 Spanish fleet off Vero Beach in the early 1960s resulted in a treasure hunting boom (Throckmorton 1990). In the mid-1980s another surge of treasure salvage activities occurred in South Florida. From 1985 to 1987, for example, Mel Fishers Salvors, Inc. dove the ATOCHA and the MARGARITA with up to six boats in the water at once. The operation employed over 100 people as divers, crew, and support staff for office, laboratory, and museum work. In addition to these activities, it was estimated that 40 to 50 people were actively conducting commercial treasure salvage during the 1980s at sites in the Florida, mostly outside the Keys. Thus the government has estimated that a total of 150 people were directly involved in treasure hunting at its peak. Treasure salvors have stated that 25 companies and over 100 people worked the 1715 Fleet and have asserted that 1,000 to 2,000 people were directly or indirectly involved with treasure operations in Florida in the heyday of operations in the 1980s.

While the potential for commercial treasure salvage operations is provided for in the plan, the number of companies and individuals involved directly and indirectly is not expected to reach those of the peak years in the 1980s because other finds like that of the ATOCHA are unlikely.

Since the enactment of the ASA in 1988, and perhaps due to the improbability of significant new finds, professional treasure salvors appear to have shifted their efforts to the Caribbean and other areas. Most professional treasure salvage in Florida is currently conducted by Salvors, Inc., which has federal Admiralty claims to the 1715 Fleet (outside the Sanctuary) as well as to the ATOCHA and the MARGARITA (inside the Sanctuary). The company employs approximately 50 to 100 people, but this varies with the number of expeditions planned and financed. Some treasure hunters have estimated that there are numerous companies employing hundreds of workers in the Keys (Arnold, 1991; Haskins, pers. comm.; Chapman, pers. comm.). While it is difficult to precisely estimate the number of commercial treasure salvors in the Keys, commercial treasure salvors have been considered as a small business enterprise in developing the plan and permit system.

To the extent that there are rich treasures to be found in the areas and shipwrecks which have been closed to recovery. It is impossible to quantify those impacts. While the government asserts that most of the gold and other treasure has been discovered, the commercial salvors argue there are hundreds of millions of dollars worth of treasure yet to be recovered. The records indicate that the industry finds peaked in the 1980s, and the likelihood of the discovery of shipwrecks with millions of dollars of treasure is not supported by a review of the state contracts or the admiralty court salvage records.

Regardless of whether there are millions to be found or not, a permit system was developed to accommodate commercial treasure salvors. The permit system will significantly increase the costs of treasure hunting in the Sanctuary because of the increased costs in hiring a professional marine archaeologist to supervise the research and recovery of the historic resources. There are also additional costs for compliance with the research and reporting requirements of the Federal Archaeological Program (FAP). These requirements are not new. Rather, they are new to this industry and the requirements are more rigorous than those that have been required in the past under state contracts and Admiralty law.

Some professional commercial treasure salvors have indicated that they have professional staff and comply with standard archaeological practices. For those, the adverse impacts should only be incremental. For the paraprofessional who conducts only amateur archaeology, the costs will be significantly more.

Another change involves ownership of the recovered treasure. In state contracts, the treasure salvor is guaranteed 80 percent of what is recovered, and the state gets the other 20 percent. Under these regulations, the commercial treasure salvor gets possession of everything recovered; however, the permittee must conserve and make available for public display all unique or highly significant historical resources. Through a Special-use permit, the permittee would be able to sell or transfer duplicative jewels, coins, bullion

and other valuable objects whose historical and/or archaeological significance has been determined to be diminished because the information about those artifacts has been preserved in final reports, photographs, drawings, videotapes and representative samples for future research. The economic costs to commercial treasure salvors are significantly greater than under the existing system, but there are also socioeconomic benefits from preserving certain historic shipwrecks in the Sanctuary, as well as in the more rigorous research, reporting and conservation requirements. Some of the costs to commercial treasure salvors should be mitigated by charging admission fees to museums for the viewing of conserved artifacts, as Mel Fisher does through his museum.

In response to comments from commercial treasure salvors and others, the permit requirements were revised to make the permit management system more pragmatic from the perspective of the commercial salvors without compromising the primary objectives of protecting the submerged cultural resources. Increased costs are expected in complying with permit requirements for liability insurance and performance bonds.

After consultation with the state of Florida, NOAA deleted the regulatory provisions requiring a performance bond for all applicants, although it still may be required in certain instances where the financial ability of the applicant to carry out the potentially harmful work is in question. At the suggestion of commercial treasure salvors, NOAA also modified the regulations to clarify that other security instruments may be utilized in lieu of insurance policies. Similarly, in response to these small businessmen concerned about having to get policies for millions of dollars of liability insurance, NOAA modified regulatory language to clarify that the scope of insurance coverage required is for potential claims for damages to Sanctuary resources arising out of permitted activities and to clarify that the amount of insurance or security should be reasonably equivalent to an estimated value of the Sanctuary resources in the vicinity of the permitted area and activities. These changes should make the requirement more flexible and thereby lessen some of the potential adverse socioeconomic consequences to these small businessmen as compared to the consequences of the draft plan.

(10) Take or possession of protected wildlife

Taking or possessing protected wildlife is prohibited, except pursuant to permits, under a variety of statutes such as the Marine Mammal Protection Act and the Endangered Species Act. Accordingly, this prohibition should impose no additional costs on Sanctuary users. However, civil penalties available under the NMSA and the FKNMSPA will make a violation easier to address. Enforcement costs should not increase since Sanctuary enforcement officers would enforce these statutes anyway.

(11) Possession or use of explosive or electrical charges

This restriction is primarily to protect Sanctuary resources from non-selective destructive fishing practices that have occurred on occasion in the past. It similarly would restrict the unauthorized use of such materials and practices in new activities. Use of explosives or electrical charges to fish or collect marine species already is prohibited in state waters by the state of Florida and by the National Marine Fisheries Service in federal waters. While significant construction and development activities requiring the use of explosives are not expected in the Sanctuary, should explosives need to be used in connection with some activity to be conducted in the Sanctuary, the permit provisions of § 922.166, the certification provisions of § 922.167, and the notification requirements of §922.168 could be used to allow the activity. Costs of certifications would be incremental to the total costs of obtaining any needed federal or state permits.

(12) Harvest or possession of marine life species

The Florida State marine life species rule (which governs the taking of tropical fish and plants in state waters) has been incorporated by reference into the Sanctuary regulations and made applicable to all Sanctuary waters, including federal waters. Thus, the socioeconomic costs of this incorporation are limited to those currently collecting those species in federal waters where the state rule does not currently apply. Generally, the state rule imposes general requirements for landing various species, and therefore the incremental administrative costs should be minimal. As Sanctuary users are already familiar with the state rule, the adverse impacts upon marine live species collectors should be limited to those taking species inconsistent with the existing state law. There are approximately 70 full-time marine life collectors in the Keys. A number of those collectors already comply with the state rules when in federal waters.

NOAA does not have data on the number of marine life collectors in federal waters who comply with the state rules, but does not expect any significant adverse socioeconomic impacts from this regulation. In the public comment process, including the SAC process, some tropical fish collectors indicated that compliance with

uniform rules throughout the Sanctuary would have positive socioeconomic benefits to the industry as a whole because minimizing destructive collecting practices increases the stocks for future harvest.

(13) Interference with law enforcement

This regulation, which essentially codifies the NMSA statutory prohibition, is intended to protect enforcement officers and the integrity of the enforcement process, including the collection of evidence, and is therefore expected to have socioeconomic benefits from the administrative perspective and well as to society overall. This regulation should have no adverse socioeconomic impacts on users.

§ 922.165 Emergency Regulations

There was some concern raised by the SAC and members of the public about the ability of the director or his or her designee to close SPAs to public access for a period of time, which it was felt could have serious socioeconomic impacts on user activities. The comments requested establishing some kind of time limit or process to close areas to public access for emergency reasons. NOAA has agreed and has revised the regulation to read as follows:

> The Director or designee will provide public notice of the limited access designation or temporary area closure by publishing a notice in the Federal Register, and through such other means as the Director or designee may deem appropriate. With respect to a temporary area closure, the Director or designee may only close and/or limit access to an area for a period of 60 days, with one additional 60-day renewal. Continued closure and/or limited access of an area will be established pursuant to notice and comment rulemaking under the Administrative Procedure Act. Such closures and/or limited access will be kept to the minimum amount of area necessary to achieve their purposes.

Overall Costs for Implementing Sanctuary Regulations

Costs to Federal Government for Implementing and Enforcing Regulations

Zoning Regulations

Establishing zones (startup costs)

Installing boundary buoys:

SPAs- 18 @ 4 buoys each @ $400 /buoy = $28800
WMAs- 7 new @ 4 buoys each @ $300 /buoy = $2100
ERs- 1 @ 8 buoys @ $400 /buoy = $3200

Administering zones (annual costs)

Maintaining zone boundary buoys

SPAs- 18 @ 4 buoys each @ $500 /buoy = $36000
WMAs- 7 new @ 4 buoys each @ $200 /buoy = $5600
ERs- 1 @ 8 buoys @ $500 /buoy = $4000

Enforcing all zones = $800K

Monitoring zones = $800K

Total Annual Costs for Administering Zones = $1,645,600

Boating Regulations

Enforcement = $600K

Administering Permits

General Permits:

140 permits x 1.0 hours x $13/hr = $1820

Historical Resource Permits (including 3 subtypes):

18 permits x 3.0 hours x $13/hr = $702

Special Use Permits:

10 permits x 6.0 hours x $13/hr = $780

Voluntary Research Registry

15 registrations x 1.0 hours x $13/hr = $195

Certifications:

40 certifications x 1.0 hours x $13/hr = $520

Notifications:

40 notifications x 1.0 hours x $13/hr = $520

Total Annual Costs for Administering Permits = $4537

Total Annual Costs for Administering Regulations = $2.25 million

Costs to Businesses to Comply with Regulations

Permitting

General Permits:

140 requests x 1.5 hours x $12/hr = $2520

Historical Resource Permits (including 3 subtypes):

18 requests x 6 hours x $12/hr = $1296

Special Use Permits:

10 requests x 6 hours x $12/hr = $720

Voluntary Research Registry

15 requests x 0.5 hours x $12/hr = $90

Certifications:

40 requests x 0.5 hours x $12/hr = $240

Notifications:

40 requests x 0.5 hours x $12/hr = $240

Total Annual Costs for Obtaining Permits = $5106

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