

Flower Garden Banks National Marine Sanctuary

Final Environmental Impact Statement: Sanctuary Expansion Volume I: Chapters 1-6



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Cover Photo: Manta ray swims over the reef in Flower Garden Banks National Marine Sanctuary. Photo: G.P. Schmahl/NOAA

Abstract

In accordance with the National Environmental Policy Act (NEPA, 42 U.S.C. §§ 4321 et seq.) and the National Marine Sanctuaries Act (NMSA, 16 U.S.C. § 1434), the National Oceanic and Atmospheric Administration (NOAA) has prepared a Final Environmental Impact Statement (FEIS) that considers alternatives for the proposed expansion of boundaries at Flower Garden Banks National Marine Sanctuary (FGBNMS), and application of the existing sanctuary regulations (including prohibitions) codified at 15 C.F.R. part 922, subpart L and management plan to the expanded boundaries. The proposed action serves NOAA’s mission to conserve and manage coastal and marine ecosystems and resources, and furthers the FGBNMS mission to “identify, protect, conserve, and enhance the natural and cultural resources, values, and qualities of FGBNMS and its regional environment for this and future generations.” NOAA evaluated six (6) boundary expansion alternatives. This FEIS evaluates the environmental consequences of each alternative, applying criteria and evaluation standards under the regulations implementing NEPA (40 CFR parts 1500-1508 (1978)) and the NOAA implementing procedures for NEPA (NOAA Administrative Order 216-6A). While the Council on Environmental Quality (CEQ) regulations implementing NEPA were revised as of September 14, 2020 (85 FR 43304, Jul. 16, 2020), NOAA prepared this FEIS using the 1978 CEQ Regulations because this environmental review began on February 3, 2015 when NOAA published a Notice of Intent to prepare a Draft Environmental Impact Statement (DEIS) for expanding FGBNMS boundaries (80 FR 5699).

This FEIS also serves as a resource assessment under the NMSA, documenting (i) present and potential uses of the areas considered in the alternatives; (ii) commercial, governmental, or recreational resource uses in the areas that are subject to the primary jurisdiction of the Department of the Interior; and (iii) any past, present, or proposed future disposal or discharge of materials in the vicinity of the proposed sanctuary. NOAA’s Final Preferred Alternative is the expansion of the existing boundaries from approximately 56 square miles (145 square kilometers) to an area that encompasses approximately 160 square miles (414 square kilometers) in the northwestern Gulf of Mexico, including additional important and sensitive marine habitat areas outside the current sanctuary boundaries. No significant adverse impacts to biological and physical resources, cultural and historic resources, or marine area use, recreation, and socioeconomics are expected under any alternative. Long-term beneficial impacts are anticipated if the proposed action is implemented. Although an environmental assessment would have sufficed to analyze the impacts of the proposed action under NEPA, a FEIS has been prepared to satisfy the procedural requirements of the NMSA.

Lead Agency: National Oceanic and Atmospheric Administration

Cooperating Agency: Bureau of Ocean Energy Management; Bureau of Safety and Environmental Enforcement

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UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE
Office of National Marine Sanctuaries
1305 East-West Highway
Silver Spring, Maryland 20910

Dear Reviewer:

In accordance with the National Environmental Policy Act (NEPA), we enclose for your review the National Oceanic and Atmospheric Administration (NOAA) Office of National Marine Sanctuaries (ONMS) final environmental impact statement (FEIS) for the proposed expansion of Flower Garden Banks National Marine Sanctuary (FGBNMS).

NOAA prepared this document to assess the environmental impacts of a range of alternatives under consideration for the proposed expansion of the boundaries of FGBNMS, and the application of the existing sanctuary regulations and management plan to expansion areas in accordance with the National Marine Sanctuaries Act and NEPA.

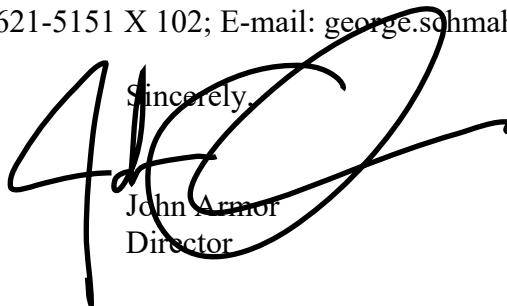
Please send any comments on the enclosed FEIS to the sanctuary official identified below. The review period for this FEIS ends January 11, 2021. Although NOAA is not required to respond to comments received as a result of issuance of this FEIS, NOAA will review any comments received and consider them during preparation of its record of decision for the proposed expansion of FGBNMS.

Under the NMSA, the final rule for revisions to the terms of sanctuary designation becomes effective after 45 days of Congressional session. During this time, Congress and the Governors of Texas and Louisiana will review NOAA's expansion documents. Following that review, NOAA will publish a Federal Register Notice of the effective date of the revised terms of designation for FGBNMS.

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Sincerely,



John Armor
Director

About This Document

This Final Environmental Impact Statement (FEIS) provides detailed information and analysis of a range of reasonable alternatives for the proposed expansion of Flower Garden Banks National Marine Sanctuary. The National Oceanic and Atmospheric Administration (NOAA) prepared this FEIS in accordance with the National Environmental Policy Act of 1969, as amended (NEPA; 42 U.S.C. §§ 4321 *et seq.*), its implementing regulations (40 CFR parts 1500-1508 (1978)), and NOAA's NEPA implementing procedures (NOAA Administrative Order 216-6A).

While the Council on Environmental Quality (CEQ) regulations implementing NEPA were revised as of September 14, 2020 (85 FR 43304, Jul. 16, 2020), NOAA prepared this FEIS using the 1978 CEQ regulations because this environmental review began on February 3, 2015 when NOAA published a Notice of Intent to prepare a Draft Environmental Impact Statement (DEIS) for expanding the sanctuary's boundaries (80 FR 5699).

The public scoping period began on February 3, 2015 and ended on April 6, 2015, during which time NOAA held three in-person public hearings. During this scoping period, NOAA received approximately 200 comments generally supportive of the concept of sanctuary expansion.

On June 10, 2016, based on public input received during the scoping period, NOAA prepared and published a DEIS (81 FR 37576, June 10, 2016). NOAA accepted public comments on the DEIS from June to August 2016 and held five in-person public hearings. During the comment period on the DEIS, NOAA received a total of 8,491 comments, the majority of which were supportive of sanctuary expansion.

In response to input received from the public and other stakeholders on the DEIS, NOAA published a Notice of Proposed Rulemaking on May 1, 2020 (85 FR 25359). NOAA solicited public comment on the proposed rule from May 1 to July 3, 2020 and held three virtual public hearings through webinar and telephone. NOAA received 36,111 comments, all of which supported sanctuary expansion. The proposed rule presented a revised preferred alternative, which was a modification of Alternative 3 in the DEIS. NOAA also prepared a Supplemental Information Report which evaluated the changes reflected in the revised preferred alternative and new circumstances and information related to fishing and oil and gas activities. Based on this evaluation, NOAA determined that a supplemental EIS was neither required nor necessary under NEPA.

NOAA is the lead agency for this action and NOAA's Office of National Marine Sanctuaries (ONMS) is the implementing office. The Bureau of Ocean Energy Management (BOEM) and Bureau of Safety and Environmental Enforcement (BSEE) are cooperating agencies.

Recommended Citation

Office of National Marine Sanctuaries. 2020. Flower Garden Banks National Marine Sanctuary Expansion Final Environmental Impact Statement. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Office of National Marine Sanctuaries, Silver Spring, MD.

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List of Acronyms and Abbreviations

BEWG	Boundary Expansion Working Group
BOEM	Bureau of Ocean Energy Management (formerly MMS)
BSEE	Bureau of Safety and Environmental Enforcement (formerly MMS)
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
DEIS	Draft Environmental Impact Statement
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FGBNMS	Flower Garden Banks National Marine Sanctuary
FMP	Fishery Management Plan
FR	Federal Register
GHG	Greenhouse Gas
GIS	Geographic Information System
GMFMC	Gulf of Mexico Fishery Management Council
HAPC	Habitat Area of Particular Concern
MMbbl	Million Barrels of Oil
MMPA	Marine Mammal Protection Act
MMS	Minerals Management Service (now BOEM and BSEE)
MSA	Magnuson-Stevens Fishery Conservation and Management Act
NAAQS	National Ambient Air Quality Standards
NAO	NOAA Administrative Order
NAZ	No Activity Zone(s)
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NMSA	National Marine Sanctuaries Act
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollution Discharge Elimination System
NRDA	Natural Resource Damage Assessment
NTL	Notice to Lessees
OCS	Outer Continental Shelf
ONMS	Office of National Marine Sanctuaries
PNAS	Proceedings of the National Academy of Sciences
PSBF	Potentially Sensitive Biological Feature
ROV	Remotely Operated Vehicle
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
U.S.C	United States Code
VMS	Vessel Monitoring System

Executive Summary

History of the Sanctuary Expansion Process

Located in the northwestern Gulf of Mexico, 70 to 115 miles (113 to 185 kilometers) off the coasts of Texas and Louisiana, Flower Garden Banks National Marine Sanctuary (FGBNMS or sanctuary) currently encompasses 56 square miles and includes three separate undersea features: East Flower Garden Bank, West Flower Garden Bank, and Stetson Bank (Figure ES.1). The banks range in depth from 55 feet (17 meters) to nearly 500 feet (152 meters). Geologically they are underwater hills formed by ancient depositional salt layers pushed up through dense overlying sedimentary layers due to structural uplift or weaknesses in the overlying beds. The banks provide a wide range of habitat conditions that support distinct biological communities, including the northernmost coral reefs in the continental United States (Schmahl et al. 2008) and mesophotic coral habitats. These and similar formations throughout the north central Gulf of Mexico provide the foundation for essential habitat for a variety of species. The combination of location and geology makes FGBNMS extremely productive and diverse, and presents a unique set of challenges for managing and protecting its natural wonders.

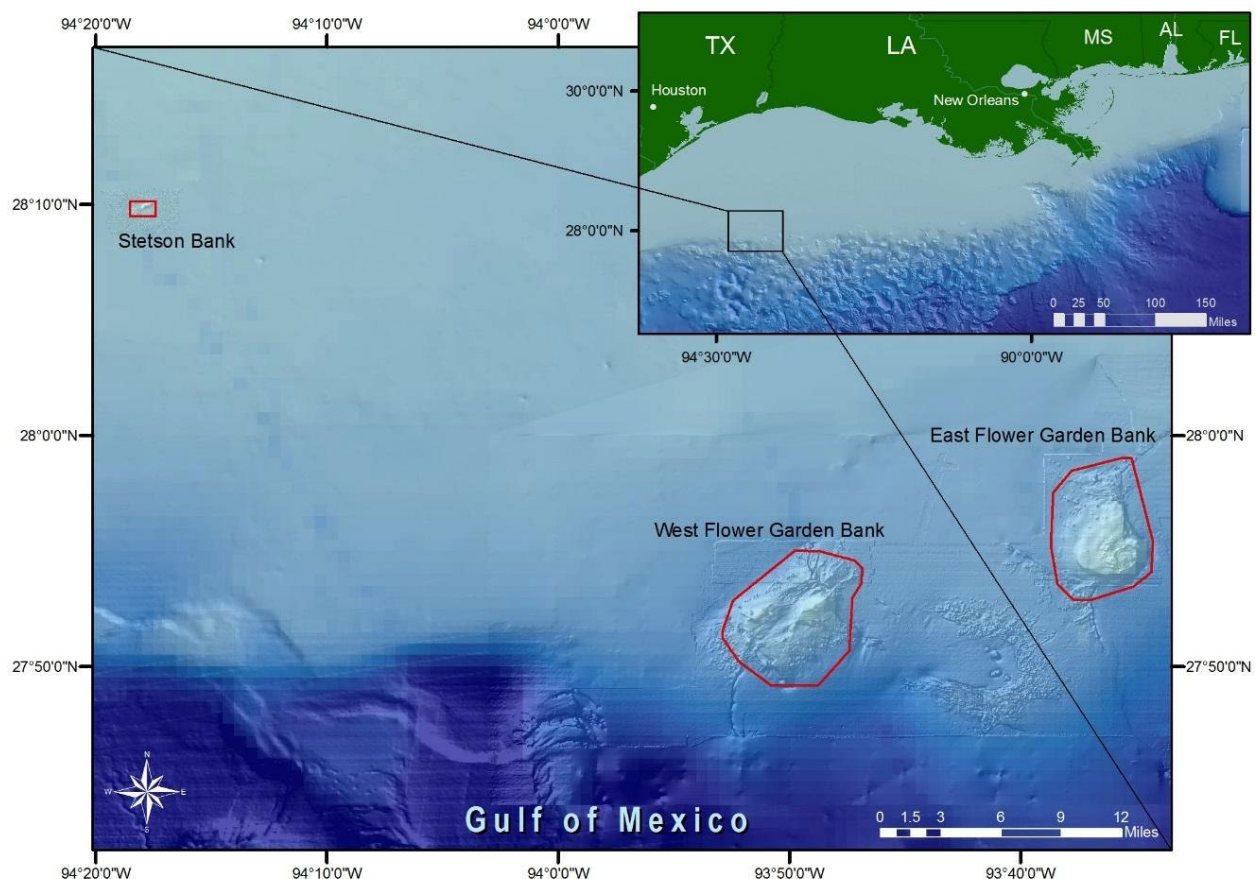


Figure ES.1. Flower Garden Banks National Marine Sanctuary. Image: NOAA

The National Oceanic and Atmospheric Administration (NOAA) designated East and West Flower Garden Banks as a national marine sanctuary in 1992 for purposes of protecting and managing the conservation, ecological, recreational, research, educational, historical, and

aesthetic resources and qualities of these areas (56 FR 63634, Dec. 5, 1991).¹ Congress added Stetson Bank to the sanctuary in 1996 (P.L. 104-283). In 1991, as part of the designation process, NOAA developed the first Flower Garden Banks National Marine Sanctuary Management Plan (56 FR 63634).

NOAA is required to periodically review sanctuary management plans to ensure that sites in the National Marine Sanctuary System continue to best conserve, protect and enhance their nationally significant living and cultural resources. In 2012, NOAA updated and revised the 1991 Flower Garden Banks National Marine Sanctuary Management Plan to address recent scientific discoveries, advancements in managing marine resources, and new resource management issues (NOAA 2012a). The sanctuary mission—as revised in the 2012 management plan review—is to:

Identify, protect, conserve, and enhance the natural and cultural resources, values, and qualities of FGBNMS and its regional environment for this and future generations.

The 2012 FGBNMS Management Plan contains several action plans, including a Sanctuary Expansion Action Plan. The 2012 FGBNMS Management Plan explains the process that the FGBNMS Advisory Council (Advisory Council) undertook to arrive at its 2007 recommendation for expansion. This process included working group meetings and public workshops to explore the issue, deliberation of the working group’s recommendation, and adoption of a final recommendation by the Advisory Council in 2007. The Advisory Council’s primary reasons for recommending expansion of the sanctuary included: identifying impacts to sensitive biological and geological resources; providing safe boater and diver access to the marine areas under consideration for expansion; restoring prior damage that occurred in the absence of adequate regulatory protection; and, protecting nationally significant biological and geological resources from further sustained damage in the absence of sufficient regulatory protection.

The Advisory Council concluded the comprehensive management approach offered by national marine sanctuary designation of additional areas could provide the necessary protection to these nationally significant habitats and would balance well-established research, education, resource protection, and law enforcement with compatible uses. Public comments during the 2012 management plan review also strongly supported expansion as a priority issue for the sanctuary.

In February 2015, NOAA began the public scoping process for the potential expansion of FGBNMS. In June 2016, based on input received during the public scoping period, NOAA released for public comment a draft environmental impact statement (DEIS) that considered a range of alternatives for expanding the network of protected areas within FGBNMS by incorporating selected reefs, banks, and other features in the north central Gulf of Mexico.² The DEIS evaluated five alternatives, ranging from No Action (maintaining the current boundaries) to the largest alternative that included a total of 45 discrete boundary units and encompassed approximately 935 square miles. NOAA’s Preferred Alternative in the DEIS, Alternative 3, would increase the number of protected areas from three banks to 18 banks, represented in 11 polygons (including three multi-bank complexes), and expand the size of the sanctuary boundaries from

¹ Although the Final Rule became effective on Jan. 17, 1992, some parts of the rule did not take effect until January 18, 1994 (58 FR 65664).

² The 2016 DEIS for the FGBNMS Expansion is available at <https://flowergarden.noaa.gov/doc/expansion/fgbnmsexpansiondeis.pdf>

56 square miles to approximately 383 square miles. Under all action alternatives considered in the DEIS, NOAA proposed to apply the existing sanctuary regulations and management plan to the expanded areas.

NOAA's Proposed Rule

In May 2020, following public comment on the DEIS and input from the Advisory Council, the Gulf of Mexico Fishery Management Council, and other federal agencies, NOAA issued a Notice of Proposed Rulemaking (NPRM or proposed rule) to expand the sanctuary that included a revised preferred alternative.³ NOAA's revised preferred alternative in the 2020 NPRM would add 14 banks, for a total of 17 banks, represented in 19 polygons (including 3 banks with multi-polygons), and would increase the current sanctuary area to approximately 160.4 square miles. The banks in NOAA's revised preferred alternative included all of the same banks identified in the DEIS Alternative 3, except Bryant Bank. The revised preferred alternative represented a reduction in the size of the proposed expansion areas to facilitate compatible use with stakeholders that operate in the area and reduce potential economic impacts to the offshore energy and fishing industries.

The revised preferred alternative presented in the 2020 NPRM is now deemed NOAA's Final Preferred Alternative and will be referred to as such herein (Figure ES.2). Expanding the FGBNMS boundaries under NOAA's Final Preferred Alternative would modify the existing Stetson Bank boundary as well as East and West Flower Garden Banks boundaries. NOAA's Final Preferred Alternative would establish sixteen new discontinuous boundaries encompassing seventeen individual banks (Stetson, East Flower Garden, West Flower Garden, McGrail, Geyer, Sonnier, Alderdice, Horseshoe, MacNeil, Elvers, Parker, Bright, Rankin, 28-Fathom, Bouma, Rezak, and Sidner banks).

³ The proposed rule was published on May 1, 2020 and is available at <https://www.govinfo.gov/content/pkg/FR-2020-05-01/pdf/2020-08128.pdf>

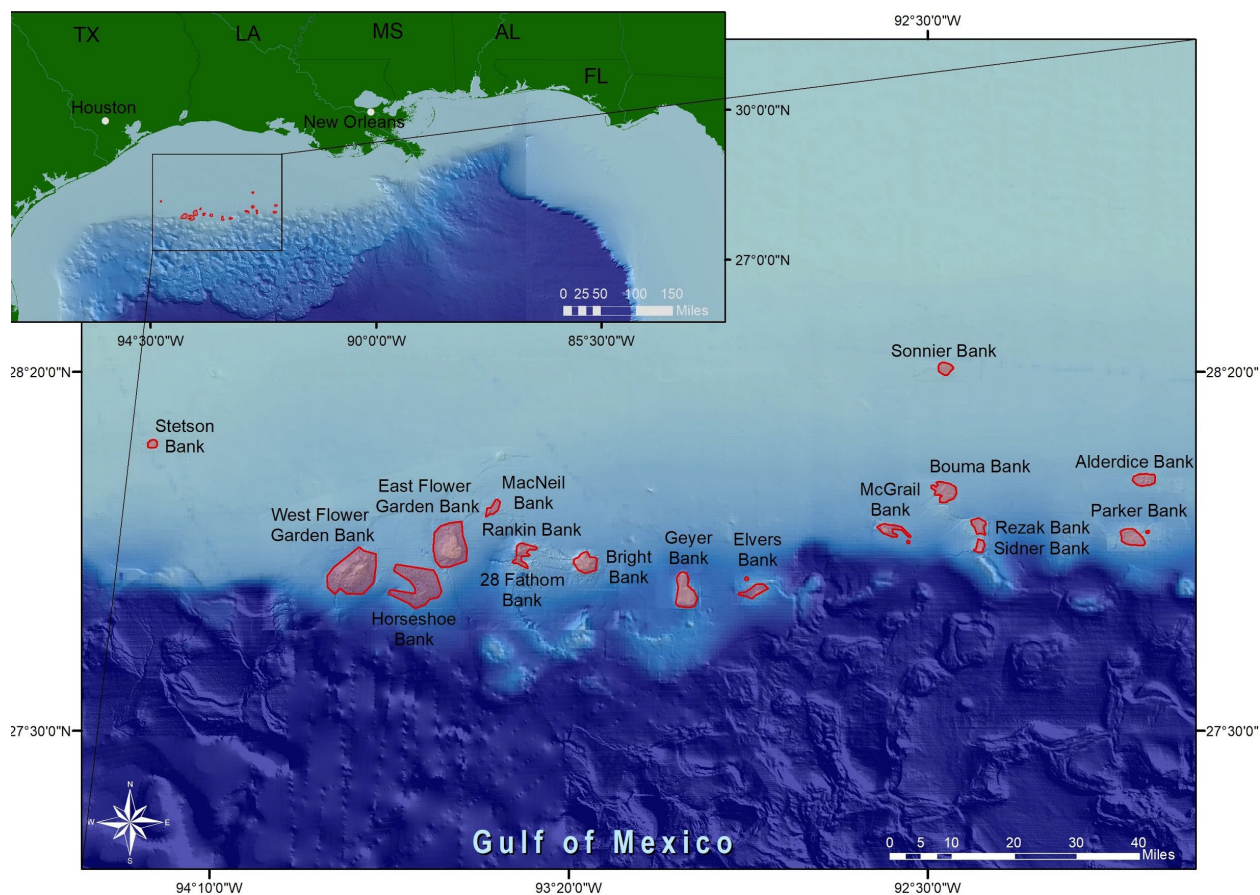


Figure ES.2. NOAA's Final Preferred Alternative for FGBNMS sanctuary expansion. Image: NOAA
 The banks in this map from left to right are as follows: Stetson Bank, West Flower Garden Bank, Horseshoe Bank, East Flower Garden Bank, MacNeil Bank, Rankin Bank and 28 Fathom Bank, Bright Bank, Geyer Bank, Elvers Bank, McGrail Bank, Sonnier Bank, Bouma Bank, Rezak Bank, Sidner Bank, Parker Bank, and Alderdice Bank.

Range of Alternatives Evaluated in the FEIS

The proposed action evaluated in this final environmental impact statement (FEIS) is to expand, as appropriate, the network of protected areas within the sanctuary, and apply the existing sanctuary regulations and management plan to the expanded areas. NOAA's Final Preferred Alternative is based on the criteria developed by the Advisory Council's Boundary Expansion Working Groups (BEWGs) and the Advisory Council's 2018 recommendation, over 30 years of scientific studies and explorations, research and consultation with other federal and state agencies, strong public support and comment during public meetings preceding this proposal, and extensive input from oil and gas, and fishing interests.

The range of alternatives evaluated in this FEIS is as follows (Table ES.1):

- NOAA's Final Preferred Alternative is a modified version of Alternative 3 in the DEIS, based primarily on recommendations from the Sanctuary Advisory Council, which encompasses approximately 160 square miles (approximately 414 square kilometers). This alternative includes 17 nationally significant biological and geological features within 19 polygons.

- Alternative 1, the No Action Alternative, maintains the existing FGBNMS boundaries, which encompass approximately 56 square miles (approximately 145 square kilometers) and includes 3 distinct geologic features and biological communities at East Flower Garden Bank, West Flower Garden Bank, and Stetson Bank.
- Alternative 2 is the sanctuary expansion recommendation made by the Advisory Council in 2007, encompassing a total of approximately 281 square miles (approximately 728 square kilometers). This alternative includes 12 nationally significant biological and geological features within 9 discrete proposed boundary areas.
- Alternative 3 is a modified version of the 2007 Advisory Council recommendation and was the 2016 staff recommendation in the DEIS. This alternative takes into account new information gained since the 2007 Advisory Council recommendation was made, simplifying the recommended boundaries for ease of enforcement and consistency with existing regulatory regimes, and encompassing approximately 383 square miles (approximately 992 square kilometers). This alternative includes a total of 18 nationally significant biological and geological features within 11 discrete proposed boundary areas.
- Alternative 4 would add protection for high priority mesophotic and deep benthic resource areas across the north central Gulf of Mexico compared to Alternative 3, requiring additional operational capacity beyond what NOAA currently has available for FGBNMS, and encompassing approximately 634 square miles (approximately 1,642 square kilometers). This alternative includes 43 nationally significant biological and geological features (including 18 high priority mesophotic and deep benthic sites) within 29 discrete proposed boundary areas.
- Alternative 5 would provide for more comprehensive management and protection of important and vulnerable mesophotic and deep benthic habitats as well as important cultural and historic resource sites across the north central Gulf of Mexico, further expanding from Alternative 4 and encompassing approximately 935 square miles (approximately 2,422 square kilometers). This alternative includes 57 nationally significant biological and geological features and 8 nationally significant cultural and historic resource sites within 45 discrete proposed boundary areas. Alternative 5 would also require additional operational capacity beyond what is currently available for FGBNMS.

Table ES.1. Summary of expansion alternatives evaluated in this FEIS.

Alternative	Resources Present	Subregions of the Gulf of Mexico	Total Area (sq. mi.)
Final Preferred Alternative: 2018 Sanctuary Advisory Council recommendation	Coral reef/coral community; mesophotic coral habitats	NW banks	160.4
Alternative 1: No Action, retain current boundary	Coral reef/coral community; mesophotic coral habitats	NW banks	56.21
Alternative 2: 2007 Sanctuary Advisory Council recommendation	Coral reef/coral community; mesophotic coral habitats	NW banks, continental slope	281.15
Alternative 3: 2016 FGBNMS staff recommendation	Coral reef/coral community; mesophotic coral habitats	NW banks, continental slope	383.19

Alternative	Resources Present	Subregions of the Gulf of Mexico	Total Area (sq. mi.)
Alternative 4: high priority mesophotic and deep coral sites	Coral reef/coral community; mesophotic coral habitats; deep coral ecosystems	NW banks; Pinnacles; continental slope	633.76
Alternative 5: Comprehensive protection for known high value north central Gulf of Mexico benthic habitats and cultural resources	Coral reef/coral community; mesophotic coral habitats; deep coral ecosystems; shipwrecks	NW banks; Pinnacles; continental slope	935.18

Conclusions from the Environmental Consequences Analysis

NOAA's analysis of the potential environmental impacts of each alternative in this FEIS concludes that no significant adverse impacts to physical and biological resources, cultural and historic resources, or marine area use, recreation, and socioeconomics are expected under any alternative. The boundaries proposed under each of the action alternatives encompass progressively greater numbers of nationally significant biological and geological features and progressively greater areal extent. Environmental consequences are proportional to the number of features and areal extent encompassed under each alternative. As such, Alternative 5 represents the environmentally preferable alternative. NOAA identified the Final Preferred Alternative as the alternative that the agency believes would fulfill its statutory mission and responsibilities, giving consideration to economic, environmental, technical, and other factors, including minimizing user conflicts. NOAA's Final Preferred Alternative provides a great environmental benefit in a manner that can be managed within current agency resources available for FGBNMS operational capacity (Figure ES.2).

Chapter 1

Introduction and Background

1.1 Historical Context for Boundary Expansion

The proposed expansion of Flower Garden Banks National Marine Sanctuary (FGBNMS) is the outcome of decades of scientific research and growing public recognition of the need for additional protection of significant offshore marine places in the north central Gulf of Mexico (generally recognized as the area between the 87th and 95th west meridians). In the 1970s, scientists began to explore the outer continental shelf (OCS) in the north central Gulf of Mexico as interest in offshore oil and gas resources intensified. Scientists found a surprising array of underwater features that are hotspots of marine biological diversity. These features range from tropical coral reefs, like those found at the Flower Garden Banks, to mounds of deepwater branching corals in the cold, dark depths where sunlight cannot penetrate. Numerous thriving biological communities are associated with hard bottom bank features in depths where sunlight is diminished (known as “mid-light” or “mesophotic” zones). These ecosystems support fish and invertebrate populations of significant ecological and economic importance.

Various federal agencies and the public recognized early on that many of these areas are worthy of special protection because they support healthy, diverse, and thriving communities that likely qualify as sensitive biological features (e.g. Rezak et al. 1985, Sammarco et al. 2016). As a result, a stipulation to avoid and protect topographic features has been included in OCS oil and gas leases since 1973. In 1974, the Flower Garden Banks were among the first to be designated by the Bureau of Land Management (predecessor agency of the Minerals Management Service (MMS) and subsequently the Bureau of Ocean Energy Management (BOEM)) as “No Activity Zones” (NAZs), where oil and gas exploration and production activities could not occur. In subsequent years, a number of additional reefs, banks, and other features were also designated as NAZs. These NAZs included the reefs and banks of the northwestern Gulf of Mexico (generally recognized as the area from the Texas-Mexico border to the state line between Louisiana and Mississippi) off the coasts of Texas and Louisiana, and the Pinnacles area off the coasts of Mississippi and Alabama in the north central Gulf of Mexico. Stipulations providing guidance for avoidance and protection of Potentially Sensitive Biological Features (PSBFs) are contained in a Notice To Lessee date 2009 (NTL-2009-G39). This NTL also contains stipulations to avoid and protect live bottom “Pinnacle Trend” features and “Low Relief” features, which have been made part of appropriate OCS oil and gas leases since 1974 and 1982, respectively. In 1984, the Gulf of Mexico Fishery Management Council (GMFMC) designated the Flower Garden Banks as Habitat Areas of Particular Concern (HAPCs) by, in recognition of the important ecological functions they serve as Essential Fish Habitat (EFH). The interest in the Flower Garden Banks culminated in their designation as a national marine sanctuary in 1992, and the addition of Stetson Bank to the sanctuary by Congress in 1996 (Pub. L. 104–283).

Meanwhile, scientific interest in the region continued to grow. Beginning in the late 1990s, MMS (now BOEM) and the U.S. Geological Survey conducted detailed mapping and characterization studies in the Pinnacles area. In the early 2000s, the “Sustainable Seas Expedition,” led by Dr. Sylvia Earle and supported by the National Geographic Society, initiated new exploration of the reefs and banks of the northwestern Gulf of Mexico, and brought added awareness of these areas

to the American public. Since the late 1990s, FGBNMS and partners have collected high-resolution multibeam imagery of specific features throughout the region to support efforts to designate previously unknown areas containing sensitive habitat as NAZs, as well as to provide data to BOEM for reassessment of the current boundaries of NAZs. In October 2020, NOAA completed a multi-year mapping effort to characterize and evaluate the efficacy of current NAZ boundaries, in coordination with BOEM. In addition, since 2003, MMS (now BOEM), and the NOAA Office of Ocean Exploration and Research supported significant research on deepwater *Lophelia* and other coral communities, and have documented and characterized a number of historically important shipwrecks in the region.

To protect these areas, BOEM, NOAA, EPA and the GMFMC adopted a variety of regulatory and management actions to reduce potential adverse impacts on the region's coral reefs, banks and other sensitive habitat. Since 1998, as biologically sensitive areas were identified, MMS (now BOEM) implemented protective measures through mitigations attached to OCS oil and gas-related permits to minimize impacts from routine oil and gas activities by distancing such activities from sensitive habitats. In 2005, the GMFMC designated 12 additional reefs and banks of the northwestern Gulf of Mexico as HAPCs. In October 2020, the GMFMC issued a final rule designating 21 additional HAPCs in the Gulf of Mexico with a focus on protecting deep sea and mesophotic corals (85 FR 65740).

In general, the designation of an HAPC does not, in itself, carry regulations, however, it identifies areas for consideration during the implementation of management for a particular species. Some specific Coral HAPCs, however, do carry regulations that prohibit certain activities. For those banks named as Coral HAPCs (East Flower Garden Bank, West Flower Garden Bank, Stetson Bank, and McGrail Bank) the HAPC designation limits the types of fishing activities that can occur in the area and prohibits anchoring by fishing vessels. In 2007, revisions to the Magnuson-Stevens Fishery Conservation and Management Act (MSA) required NOAA to identify known locations of deep sea corals and submit that information to regional fishery management councils, due to the importance of these systems as fish habitat. This notification process is designed to support the fishery management councils' identification of target areas for data gaps and for potential designations of EFH. As part of its authority under the Clean Water Act, EPA's current National Pollutant Discharge Elimination System (NPDES) General Permits for oil and gas extraction in the Gulf of Mexico prohibit discharges from oil and gas activity within "areas of biological concern" or within national marine sanctuaries, with an exemption for facilities located within a national marine sanctuary boundary that comply with certain conditions. See Appendix G for more details.

In 2006, FGBNMS initiated a review of the 1991 sanctuary management plan. During the management plan review process, the public expressed a strong interest in expanding the sanctuary boundary to include additional reefs and banks due to the updated information reporting a diverse assemblage of habitats and biology, revealed from new high resolution multibeam maps, and ground truthing conducted by remotely operated vehicles (ROV). The FGBNMS Advisory Council (Advisory Council) also identified boundary expansion as one of the primary issues to be addressed in the revised management plan. In 2007, the Advisory Council made a specific recommendation to FGBNMS management for expansion of the sanctuary.

In 2010, the Deepwater Horizon drilling rig exploded in the north central Gulf of Mexico, resulting in the deaths of 11 people and the release of over 3.2 million barrels (135 million gallons) of oil and dispersant into surrounding waters. The oil spill impacted a wide range of habitats and biological resources across an extensive geography in the Gulf of Mexico region. Monitoring and assessment of impacts were initiated throughout the Gulf of Mexico, including selected reefs and banks in the northwestern Gulf of Mexico, the Pinnacles area, the Florida Middle Grounds, the Florida Keys, and various locations from deepwater habitats to the coastal zone of states adjacent to the Gulf of Mexico. Significant adverse environmental injury was documented at deepwater coral areas (e.g., corals with bare skeleton, broken and missing branches, biofilm) in the vicinity of the wellhead, reefs of the Pinnacles area and other seafloor habitats (Fisher et al. 2014b; Buskey et al. 2016; Etnoyer et al. 2016; Silva et al. 2016; Schwing et al. 2020). This event highlighted the need to understand these deepwater habitats, making the need for their protection more urgent and important.

The incorporation of places of national significance into the National Marine Sanctuary System supports national ocean resource management objectives articulated by many publicly vetted and expert-driven strategic planning efforts. These efforts reference the need for additional conservation protections for important habitat areas nationally and in the north central Gulf of Mexico. These recommendations incorporated the use of marine spatial planning, the establishment of marine reserves, and ability to strengthen governance structure to address environmental issues. Such reports include the Pew Oceans Commission (2003), the Interagency Ocean Policy Task Force (2010), and the National Ocean Council's 2013 National Ocean Policy Implementation Plan (GCERC 2013, NOC 2013). NOAA's 2010 "Strategic Plan for Deep-sea Coral and Sponge Ecosystems" identified a conservation and management strategy to "Enhance conservation of deep-sea coral and sponge ecosystems in National Marine Sanctuaries and Marine National Monuments" (NOAA 2010b).

Expansion of the sanctuary would also support recommendations contained within the Gulf Coast Ecosystem Restoration Task Force's Gulf of Mexico Regional Ecosystem Restoration Strategy (GCERTF 2011) to "Conserve and protect offshore environments," including unique hard bottom structures like those in the vicinity of the Pinnacles and the Flower Garden Banks. Similar recommendations have been identified in a variety of other recent studies, such as those generated by an expert working group and contained within the report entitled "A Once and Future Gulf of Mexico Ecosystem" (Peterson et al. 2011) to "establish deep-sea biological preserves to protect organisms such as coral that provide habitat structure" for fish and other valuable species. These areas have also been targeted by a variety of conservation groups for additional protection.

In 2012, NOAA published a revised FGBNMS management plan that included a Sanctuary Expansion Action Plan incorporating the Advisory Council's 2007 expansion recommendation.⁴ Section 1.5 explains the public process NOAA undertook in furtherance of this action plan to develop the proposed expansion alternatives.

⁴ The current management plan for Flower Garden Banks National Marine Sanctuary is available at: <https://flowergarden.noaa.gov/management/2012mgmtplan.html>

In general, the northwestern Gulf of Mexico is an industrialized region, and the public has expressed significant concern about impacts from bottom-disturbing activities on the sensitive biological resources and geological features associated with many reefs and banks in the area. The proposed expansion of FGBNMS would extend the comprehensive conservation and management capacities authorized by the National Marine Sanctuaries Act (NMSA) to new areas in the north central Gulf of Mexico. This would provide a mechanism for implementation of specific restoration, monitoring, and research activities for important marine resources.

1.2 Office of National Marine Sanctuaries

The Office of National Marine Sanctuaries (ONMS) is within NOAA’s National Ocean Service and serves as the trustee for a system of marine protected areas, encompassing more than 600,000 square miles of ocean and Great Lakes waters from the state of Washington to the Florida Keys, and from Lake Huron to American Samoa (Figure 1.1).

NATIONAL MARINE SANCTUARY SYSTEM



Figure 1.1. Map of the National Marine Sanctuary System. Image: NOAA

The National Marine Sanctuary System includes 14 national marine sanctuaries and two marine national monuments. NOAA manages national marine sanctuaries under the authority of the NMSA of 1972, 16 U.S.C §§ 1431 *et seq.* The regulations implementing the NMSA are codified at 15 CFR part 922.⁵ Papahānaumokuākea Marine National Monument is cooperatively managed by NOAA, the U.S. Fish and Wildlife Service (USFWS), and the State of Hawaii under the authority of Presidential Proclamation 8031 and the Antiquities Act, 16 U.S.C. §§ 431 *et seq.* (now codified at 54 U.S.C. §§ 320301 *et seq.*).⁶ The joint regulations for Papahānaumokuākea Marine National Monument are codified at 50 CFR part 404.⁷ NOAA, the USFWS, the

⁵ More information about the NMSA is available at: <https://sanctuaries.noaa.gov/about/legislation/>

⁶ In December 2014, the Antiquities Act was re-codified into 54 U.S.C. §§ 320301 *et seq.* pursuant to Pub. L. 113-287, § 3.

⁷ More information about the Papahānaumokuākea Marine National Monument is available at: <https://www.papahanaumokuakea.gov/>

Department of State, the Department of Defense, and the Government of American Samoa cooperatively manage Rose Atoll Marine National Monument under the authority of Presidential Proclamation 8337 and the Antiquities Act. The joint regulations for Rose Atoll Marine National Monument are codified at 50 CFR part 665.⁸

These national marine sanctuaries and marine national monuments include both nearshore and offshore marine areas. Their designations provide protection for sensitive marine ecosystems such as coral reefs and kelp forests, deepwater habitats and geologic features such as canyons and seamounts, migration corridors, and other habitats used by ecologically and economically important or protected marine species, and historically significant maritime archeological sites, including shipwrecks and other artifacts. In addition, these areas serve as valuable educational, recreational, scientific, and economic resources.

ONMS fosters public awareness of natural marine resources and maritime heritage through scientific research, monitoring, exploration, education and outreach, and works closely with its many partners and the public to protect and manage the National Marine Sanctuary System. ONMS is a world leader in marine management through the protection of living marine resources, environmental quality, and maritime heritage, while maintaining recreational and commercial activities that are sustainable and compatible with long-term preservation.

1.3 Flower Garden Banks National Marine Sanctuary

NOAA designated Flower Garden Banks National Marine Sanctuary (FGBNMS or sanctuary) in 1992, incorporating two areas known as East Flower Garden Bank and West Flower Garden Bank (56 FR 63634, Dec. 5, 1991). Stetson Bank was added to the sanctuary by Congress in 1996 through amendments to the NMSA (P.L. 104-283). The boundaries of Stetson Bank and West Flower Garden Bank were later amended to improve administrative efficiencies and increase the precision of all boundary coordinates based on new positioning technology (65 FR 81175, Dec. 22, 2000). Comprehensive resource protection and management for FGBNMS is described in the site's management plan, first developed in 1991 and last updated in 2012, which includes programs for science, education, outreach, regulation, enforcement, permitting, and coordination with other local, state, and federal agencies.

1.4 Project Location: North Central Gulf of Mexico

The Flower Garden and Stetson Banks are only three among dozens of reefs and banks scattered along the edge of the continental shelf of the north central Gulf of Mexico (Figure 1.2). All of these features are part of a regional ecosystem heavily influenced by current patterns within the Gulf of Mexico, the most notable of which include the Gulf Loop Current and eddies that separate from the Gulf Loop Current (Figure 1.3). Inflows from the large Gulf of Mexico watershed, which drains two-thirds of the continental United States, play a significant role in the ecological function of this region.

⁸ More information about Rose Atoll Marine National Monument is available at: <https://americansamoa.noaa.gov/>

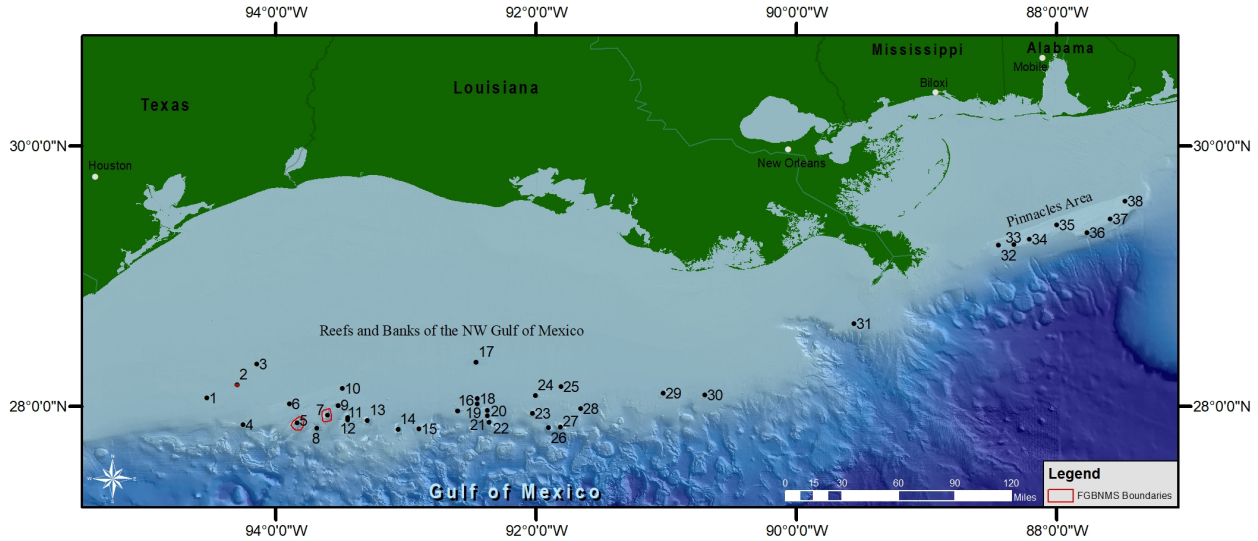


Figure 1.2. Selected Reefs and Banks of the North Central Gulf of Mexico. 1. 32 Fathom Bank, 2. Stetson Bank, 3. Claypile Bank, 4. Applebaum Bank, 5. West Flower Garden Bank, 6. Coffee Lump Bank, 7. East Flower Garden Bank, 8. Horseshoe Bank, 9. MacNeil Bank, 10. 29 Fathom Bank, 11. Rankin Bank, 12. 28 Fathom Bank, 13. Bright Bank, 14. Geyer Bank, 15. Elvers Bank, 16. McGrail Bank, 17. Sonnier Bank, 18. Bouma Bank, 19. Bryant Bank, 20. Rezak Bank, 21. Sidner Bank, 22. Tresslar Bank, 23. Parker Bank, 24. Alderdice Bank, 25. Fishnet Bank, 26. Phleger Bank, 27. Sweet Bank, 28. Jakkula Bank, 29. Ewing Bank, 30. Diaphus Bank, 31. Sackett Bank, 32. Mountain Top, 33. Alabama Alps and 36 Fathom Ridge, 34. West Addition Pinnacles, 35. Shark, Double Top, and Triple Top Reefs, 36. Ludwick-Walton and West Delta Mounds, 37. Yellowtail, Cat's Paw, Roughtongue, and Corkscrew Reefs, 38. Far Tortuga Reef. Image: NOAA

Scientists have long been aware that water circulation connects the dozens of banks along the continental shelf in the north central Gulf of Mexico. Technological advances have allowed the creation of high-resolution bathymetric maps that also reveal networks of low relief geological features (such as rock outcrops) between many of the more prominent reefs and banks in this area. These features provide much more direct connectivity between the banks than previously understood, which may play a crucial role in maintaining the health of the sanctuary's living marine resources.

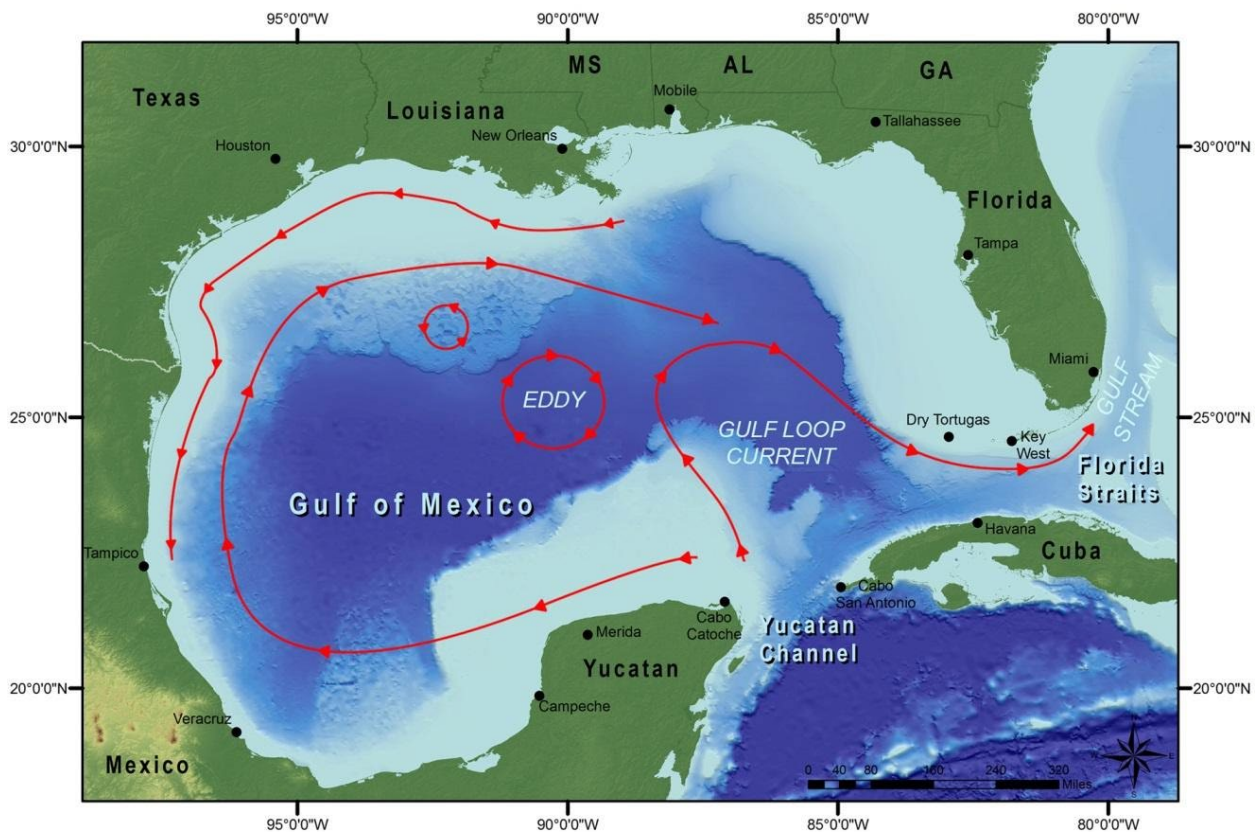


Figure 1.3. Predominant Currents and Eddies in the Gulf of Mexico. Image: NOAA

FGBNMS is located in the northwestern Gulf of Mexico approximately 70 to 115 miles (113 to 185 kilometers) off the coasts of Texas and Louisiana. These offshore areas encompass a wide range of geologic features and habitat conditions that support several distinct biological communities, including the northernmost stony coral reefs in the continental United States (Schmahl et al. 2008). The banks included within the current sanctuary boundaries, and similar formations throughout the north central Gulf of Mexico, provide the foundation for essential benthic habitats that support a wide variety of species. They are home to the most significant examples of coral and algal reefs, mesophotic and deepwater coral communities, and other biological assemblages in the Gulf of Mexico. The combination of location and geology makes FGBNMS extremely productive and diverse, and presents a unique set of challenges for managing and protecting its natural wonders. Sanctuary regulations prohibit a relatively narrow range of activities and establish requirements applicable to certain activities (see 15 CFR part 922, subpart L, or summary in Table 1.1).

Offshore areas of the Gulf of Mexico, and the resources present in these areas, are currently managed under multiple authorities by several federal agencies. BOEM and the Bureau of Safety and Environmental Enforcement (BSEE) (both formerly MMS) have historically protected topographic features (including the Flower Garden Banks) and sensitive hard bottoms from direct impacts arising from oil and gas industry activities, through stipulations on leases and case-by-case reviews of permit applications that attach mitigations/conditions of approval to

said permits, and by establishing distancing requirements for bottom-disturbing activities (including anchor placement and drilling) in order to protect those sensitive areas. NOAA's National Marine Fisheries Service (NMFS) and the GMFMC have designated many of these same topographic features as HAPCs, a designation that itself does not carry restrictive fishing regulations, except for those banks named as Coral HAPCs (East Flower Garden Bank, West Flower Garden Bank, Stetson Bank, and McGrail Bank). Coral HAPCs limit the types of fishing activities that can occur in the area and prohibit anchoring by fishing vessels. NMFS also manages endangered and threatened species through the Endangered Species Act (ESA) and marine mammals through the Marine Mammal Protection Act (MMPA). In addition, the U.S. Environmental Protection Agency (EPA) is responsible for protecting the quality of the nation's waters through the Federal Water Pollution Control Act (Clean Water Act).

Table 1.2. Summary of current FGBNMS regulations. See 15 CFR part 922, subpart L for full text of regulations.

<p>Prohibited Activity: Exploring for, developing, or producing oil, gas, or minerals within a NAZ. Exceptions: Oil, gas, or mineral exploration, development, or production is permitted outside of NAZs provided all drilling cuttings and drilling fluids are shunted to the seabed through a downpipe that terminates an appropriate distance, but no more than ten meters, from the seabed, unless such discharge injures a sanctuary resource or quality.</p>
<p>Prohibited Activity: Anchoring any vessel within the sanctuary.</p>
<p>Prohibited Activity: Mooring a vessel over 100 feet (in registered length) on a sanctuary mooring buoy.</p>
<p>Prohibited Activity: Mooring a vessel in the sanctuary without clearly displaying the blue and white International Code flag "A" ("alpha" dive flag) or the red and white "sports diver" flag whenever a scuba diver from that vessel is in the water and removing the "alpha" dive flag or "sports diver" flag after all scuba divers exit the water and return back on board the vessel.</p>
<p>Prohibited Activity: Discharging or depositing any material or other matter in or into the sanctuary. Exceptions: 1) Fish, fish parts, chumming materials or bait used while fishing with conventional hook and line gear within the sanctuary; 2) clean effluent from an operable Type I or II marine sanitation device (MSD) (vessel operators are required to lock all MSDs in a manner that prevents discharge or deposit of untreated sewage); 3) clean water generated by routine vessel operations (e.g. cooling water, deck wash down, anchor wash, and bilge water) excluding oily wastes from bilge pumping; 4) engine exhaust.</p>
<p>Prohibited Activity: Taking any marine mammal or turtle within the sanctuary.</p>
<p>Prohibited Activity: Killing, injuring, attracting, touching, or disturbing rays or whale sharks. Exceptions: Incidental catch by conventional hook and line gear.</p>
<p>Prohibited Activity: Injury to or possession of sanctuary resources: Injuring or removing, or attempting to injure or remove, any coral or other bottom formation, coralline algae or other plant, marine invertebrate (e.g., spiny lobster, queen conch, shell, sea urchin), brine-seep biota or carbonate rock; possessing within the sanctuary (regardless of where collected, caught, harvested or removed), any carbonate rock, coral or other bottom formation, coralline algae or other plant, or fish (except for fish caught by use of conventional hook and line gear); drilling into, dredging or otherwise altering the seabed of the sanctuary; or constructing, placing or abandoning any structure, material or other matter on the seabed of the sanctuary.</p>
<p>Prohibited Activity: Fishing and related activities: injuring, catching, harvesting, collecting or feeding, or attempting to injure, catch, harvest, collect or feed, any fish within the sanctuary by use of any gear, device, equipment or means (e.g. spear guns, nets); possessing (except while passing through the sanctuary without interruption) any fishing gear, device, equipment or means; possessing, or using explosives or releasing electrical charges within the sanctuary. Exceptions: Use of conventional hook and line gear.</p>
<p>General Exception: Oil or gas exploration or development. Prohibitions on anchoring within the sanctuary, drilling or altering the seabed, and using explosives do not apply to necessary activities conducted in areas of the Sanctuary outside NAZs and incidental to exploration for, development of, or production of oil or gas in those areas.</p>
<p>General Exception: Activities necessary to respond to emergencies threatening life, property, or the environment.</p>

General Exception: Activities being carried out by the Department of Defense (DoD).
General Exception: Activities executed in accordance with the scope, purpose, terms, and conditions of a National Marine Sanctuary permit or a Special Use permit.
General Exception: Activities authorized by any lease, permit, license, approval or other authorization provided that the applicant complies with ONMS requirements for notification and review and the applicant complies with any terms and conditions the ONMS deems necessary to protect sanctuary resources and qualities.

1.5 Public and Agency Involvement

According to CEQ regulations,⁹ federal agencies are required to “make diligent efforts to involve the public in preparing and implementing their NEPA procedures” (40 CFR § 1506.6(a)). This section describes the public process NOAA undertook to develop this proposal.

1.5.1 Scoping

On February 3, 2015, NOAA published a Notice of Intent to prepare a Draft Environmental Impact Statement (DEIS) for expanding FGBNMS boundaries (80 FR 5699). In that notice, NOAA solicited public input on the range and significance of issues related to sanctuary expansion. This included potential boundary configurations, resources to be protected, other issues NOAA should consider, and any information that should be included in the resource analysis in the DEIS. The public scoping period was open through April 6, 2015, during which time NOAA held three public hearings and offered interested parties an opportunity to submit both written and oral comments. In March 2015, NOAA held in-person public scoping meetings in New Orleans, Louisiana, Houston, Texas, and Galveston, Texas. Fifty-seven people participated in these meetings and provided input on the proposed expansion of the sanctuary boundaries.

During the public scoping process, NOAA accepted written comments provided in the form of letters and electronic submissions. NOAA received approximately 200 comments from or on behalf of both organizations and individuals.¹⁰ NOAA analyzed comments received during public scoping and considered them in preparation of the DEIS.¹¹

Most commenters were strongly supportive of the concept of sanctuary expansion. Other commenters recommended that NOAA consider a broader geographical area than the Sanctuary Expansion Action Plan identified, especially in light of the 2010 Deepwater Horizon oil spill and new information that became available after the 2007 FGBNMS Advisory Council recommendation. A number of comments emphasized that the proposed action was supported and justified by new scientific information, discoveries, or circumstances, and/or that it would

⁹ As previously stated, NOAA prepared this FEIS using the 1978 CEQ Regulations. NEPA reviews initiated prior to the effective date of the revised CEQ regulations may be conducted using the 1978 version of the regulations. The effective date of the 2020 CEQ Regulations was September 14, 2020. This review began on February 3, 2015 when NOAA published a Notice of Intent to prepare a draft environmental impact statement (DEIS) for expanding FGBNMS boundaries (80 FR 5699). NOAA has decided to proceed under the 1978 CEQ regulations.

¹⁰ The written comments on the public scoping notice for preparation of the DEIS are available at: <https://www.regulations.gov/docket?D=NOAA-NOS-2014-0154>

¹¹ The FGBNMS website serves as a central location for project information: <https://flowergarden.noaa.gov/management/expansiondeis.html>

align with and provide restoration for impacts to the Gulf of Mexico ecosystem. In addition to broad general support, some comments expressed conditional support while raising user concerns relating to the potential impact of sanctuary expansion on the offshore oil and gas industry and historic fishing practices.

Some scoping comments indicated evidence of the need for additional protections was lacking or cited problems with the current sanctuary management regime. Several comments indicated that additional budgetary and capacity resources were needed to support sanctuary operations, oversight, management, and enforcement, both in the current sanctuary and in potential boundary expansion areas. Finally, some comments included requests for specific analyses of environmental consequences related to the areas, uses, and regulations for inclusion in the DEIS. NOAA considered all of this information during the development of the range of alternatives in the DEIS.

NOAA also worked closely with and sought input from numerous resource agencies and researchers. In September 2015, NOAA entered into cooperating agency agreements with BOEM and BSEE for the development of the DEIS (see Appendix G). In addition, NOAA coordinated with the GMFMC since the initiation of the public scoping process and consulted with the GMFMC pursuant to Section 304(a)(5) of the NMSA as part of the rulemaking process.

1.5.2 Public Review of the DEIS

In accordance with NEPA, 42 U.S.C. §§ 4321 et seq., and the NMSA, 16 U.S.C. § 1434, in June 2016 NOAA published a DEIS for this action (81 FR 37576, June 10, 2016). The DEIS considered five alternatives to expand the network of protected areas within FGBNMS by incorporating selected reefs, banks, and other features in the north central Gulf of Mexico. Under all alternatives considered in the DEIS, NOAA proposed to apply the existing sanctuary regulations and management plan to the expanded areas. The DEIS evaluated the environmental consequences of the alternatives and provided an in-depth resource assessment.

NOAA accepted both written and oral public comments on the DEIS from June to August 2016.¹² In July 2016, NOAA held in-person public hearings in Galveston, Texas, Houston, Texas, New Orleans, Louisiana, Mobile, Alabama, and Lafayette, Louisiana. One hundred sixty-six people participated in these public hearings. Twenty-eight of those individuals provided input on issues addressed in the DEIS, and expressed support for the proposed expansion of the sanctuary boundaries.

During the comment period, NOAA received 1,421 separate comments, including three letter campaigns and one petition, each with multiple signatories, for a total of 8,491 comments. In support of expansion, 4,579 comments expressed support for Alternative 5 (the most comprehensive alternative), 1,501 for Alternative 3, and 9 for Alternative 2. Public comments identified specific geographic locations of concern within the range of alternatives, and additional areas of concern that were not included in the range of alternatives. Comments raised concerns regarding fish spawning aggregations, open water areas between banks, shipwrecks, mesophotic/deepwater coral ecosystems, artificial reefs, sea turtles, corals, commercial fish,

¹² Written public comments on the DEIS are available for review at: <https://www.regulations.gov/docket?D=NOAA-NOS-2016-0059>

sharks, rays, and whales. Comments supportive of the proposed expansion referred to ongoing industrial, environmental, and global impacts that could be reduced through sanctuary expansion. Opposing comments cited existing protections for sensitive resources; restriction to use/access; safety, budget, and management concerns; and socioeconomic consequences of the sanctuary expansion. NOAA analyzed comments received during this process and considered them in preparation of the NPRM and this FEIS.

1.5.3 Public Review of the NPRM

In accordance with the NMSA (16 U.S.C. § 1434), in May 2020 NOAA prepared and released a NPRM for the proposed expansion of FGBNMS (85 FR 25359, May 1, 2020). The NPRM presented a revised preferred alternative that was a modification of the boundaries proposed under Alternative 3 from the DEIS, that would apply the existing sanctuary regulations and management plan to this expanded area. NOAA solicited public comment on the proposed rule from May to July 2020. NOAA accepted comments in the form of letters and written comments through electronic submissions and by mail.¹³ Due to health concerns associated with the Coronavirus pandemic and resulting restrictions on public gatherings, NOAA held three virtual public hearings in June 2020. Public hearing participants had the option to participate virtually through a webinar or by telephone. NOAA conducted two public hearings on June 8, 2020, and the third public hearing on June 11, 2020. One hundred and seven people participated in the public hearings, and a few individuals provided input on the new proposed boundary configuration, potential pelagic longline and spearfishing exemptions, and expressed overall support for expansion of the sanctuary.

During the comment period on the proposed rule, NOAA received comments from 485 individual commenters, as well as four letter campaigns and four petitions, with multiple signatories, for a total of 36,111 comments. In support of expansion, 3,031 comments expressed support for Alternative 5 of the DEIS, 240 supported the largest expansion possible, 12,066 supported the revised preferred alternative in the NPRM, 18 supported Alternative 3 of the DEIS, and 9,933 expressed general support for expansion. Although supportive of the expansion of FGBNMS, 11,521 comments had concerns with the reduced size of boundaries proposed in the revised preferred alternative and advocated for greater spatial coverage. Public comments identified specific geographic locations of concern not included in the revised preferred alternative.

Comments raised concerns about boundary enforcement, essential fish habitat, preservation of biodiversity, connectivity between bank areas, mesophotic/deepwater coral ecosystems, mobula rays, whale sharks, sea turtles, sharks, marine mammals, and commercial and recreationally important fish. Many of the comments supportive of the proposed expansion referred to ongoing industrial, environmental, and global impacts that could be reduced through sanctuary expansion. NOAA received no comments in opposition to expanding FGBNMS, though 696 comments opposed the revised preferred alternative boundaries and instead expressed support for a larger alternative (e.g. Alternative 5).

¹³ Written public comments on the NPRM are available for review at: <https://www.regulations.gov/docket?D=NOAA-NOS-2019-0033>

In response to NOAA's request for public comment on fishery exemptions for pelagic longline fishing and spearfishing with sanctuary expansion, 25,641 comments opposed an exemption for pelagic longline fishing, 23,353 opposed an exemption for spearfishing, two comments supported allowing pelagic longline fishing, and eight comments indicated conditional support for spearfishing. Conditional support for spearfishing included an exemption for breath-hold only spearfishing gear, establishing an initial limited capacity fishery that could be assessed at a reduced number of banks, and an exemption for lionfish only.

NOAA analyzed all comments received during this process and considered them in preparation of this FEIS. NOAA's response to comments received on the DEIS and NPRM are included in Appendix A.¹⁴

1.5.4 Agency Consultations and Other Coordination

After publication of the DEIS on June 10, 2016, NOAA sent consultation letters to other federal agencies and stakeholders to gather input on NOAA's proposal and to inform development of the NPRM and this FEIS. In addition, NOAA received input from these agencies and stakeholders after publication of the NPRM. These consultations, combined with public comment and Advisory Council input, informed NOAA's development of this FEIS and the subsequent Final Rule. NOAA's compliance with all applicable environmental laws and regulations is described in detail in Appendix G.

1.5.4.1 Bureau of Ocean Energy Management Consultation

Pursuant to NMSA Section 304(a)(2)(B)(ii) and the cooperative agency agreement dated September 2015, FGBNMS consulted with BOEM after public release of the DEIS. In a report dated November 2, 2016, BOEM provided additional analysis of the OCS areas potentially affected by Alternative 3 and Alternative 5. In that report, BOEM provided information on: 1) discovered, contingent, and undiscovered oil and gas resource potential beneath proposed expansion areas; 2) rough cost estimates for directional drilling from outside the sanctuary; 3) potential economic loss to the federal government from a reduction in OCS leasing if affected sanctuary blocks are not leased; 4) identification of currently leased OCS blocks in the expansion area; 5) rough cost estimates to route new pipelines around the expanded sanctuary area; and 6) areas within the proposed expansion beyond what BOEM currently protects.

Pursuant to Section 4(a) of Executive Order 13795 (April 28, 2017), NOAA requested BOEM evaluate the potential impact of expanding FGBNMS on oil and gas reserves in the Gulf of Mexico. In a letter dated February 25, 2019, BOEM provided a review of offshore energy and mineral resource potential within the designated area of the proposed expansion, as well as the potential impacts that the proposed expansion could have on the development of these resources. In that report, BOEM provided information on: 1) expected impacts to offshore oil and gas, wind energy, marine minerals, and methane hydrates; 2) estimated oil and gas resources; 3) outlined restrictions to oil and gas development in the expansion boundaries; 4) identified currently leased OCS blocks in the expansion areas; 5) rough cost estimates for directional drilling from outside the sanctuary; and 6) potential economic loss to the federal

¹⁴ The FGBNMS website serves as a central location of project information: <https://flowergarden.noaa.gov/management/expansionnpr.html>

government from a reduction in OCS leasing if affected sanctuary blocks are not leased, loss of undiscovered resources, and reduction in the Nation’s available oil and gas reserves that would be stranded with sanctuary designation.

1.5.4.2 Gulf of Mexico Fishery Management Council Consultation

Pursuant to NMSA Section 304(a)(5), on June 17, 2016, NOAA initiated consultation with the GMFMC on the proposed expansion of FGBNMS. NOAA also provided multiple updates at GMFMC meetings over the course of the development of the DEIS and NPRM. The GMFMC analyzed the sites included in Alternative 3 of the DEIS and in a communication dated November 9, 2016, recommended that NOAA use a “tiered approach” for application of fishing regulations within most banks of the proposed expanded sanctuary (see recommendation 2, below). The general concept of this approach was based on utilization of areas previously designated by BOEM as NAZs and that are associated with most of the bank features included in the 2016 DEIS Alternative 3. The NAZs are defined pursuant to a Gulf of Mexico OCS lease stipulation contained in Notice to Lessees (NTL) No. 2009-G39.

The GMFMC’s November 2016 recommendations were as follows:

- 1) Maintain current fishing regulations within existing HAPCs. East and West Flower Garden, Stetson and McGrail banks are HAPCs with regulations that prohibit fishing with bottom longline, bottom trawl, buoy gear, dredge, pot or trap, and bottom anchoring by fishing vessels.
- 2) For other banks in the proposed expansion, establish a “tiered” approach for application of fishing regulations as follows: Tier One – areas within existing BOEM NAZs would be established as “no bottom tending gear” zones, in which only traditional hook and line fishing (including bandit rigs) would be allowed, and anchoring would be prohibited; Tier Two – areas outside the BOEM NAZs but inside FGBNMS boundaries where bottom tending gear and anchoring by fishing vessels with an endorsement (see 3, below) would be allowed, but bottom trawling, traps, and dredges would be prohibited; Tier Three – outside of sanctuary boundaries – no sanctuary restrictions. The GMFMC also recommended establishing a truncated “no bottom tending gear zone” for banks without an NAZ.
- 3) For those areas of soft sediment outside of the “no bottom tending gear zone,” create an endorsement program to allow anchoring by commercial vessels. This endorsement would require the use of a vessel monitoring system (VMS) and the use of anchor systems equipped with a weak link environmental safeguard. The endorsement would require an education program for operators of commercial vessels and the use of mooring buoys by recreational vessels.
- 4) Place mooring buoys within the “no bottom tending gear zones” to allow for public access.
- 5) Alter boundaries for several specific banks.

At the August 2018 GMFMC meeting, NOAA provided an update to the council on the new proposed boundary configuration, as set forth in the revised preferred alternative in the proposed rule. In a letter dated November 7, 2018, the GMFMC supported the new proposed boundary configuration, and provided a recommendation for an alternative set of fishing

regulations in light of the modifications. The GMFMC further agreed that the recommended tiered approach to fishing regulations was no longer needed if NOAA adopted the revised preferred alternative.

The GMFMC's updated November 2018 recommendations were as follows:

- 1) Maintain current FGBNMS fishing regulations; however with the exception to allow spearfishing in the expanded areas.
- 2) On those areas of soft sediment outside of the “no bottom tending gear zone,” create an endorsement program to allow anchoring by commercial vessels. This endorsement would require the use of a VMS and the use of anchor systems equipped with a weak link environmental safeguard. The endorsement would require an education program for operators of commercial vessels and the use of mooring buoys by recreational vessels.
- 3) Place mooring buoys within the “no bottom tending gear zones” to allow for public access.
- 4) Advise FGBNMS to investigate the potential impacts that weights used in bandit-rig fishing could have on coral.

Additionally, in a letter dated February 9, 2020, the GMFMC requested that NOAA provide clarification of the possession and stowage of prohibited fishing gear regulations in order to eliminate confusion by users transiting FGBNMS with prohibited fishing gear.

1.6 Revisions from the DEIS to FEIS

In preparing this FEIS, NOAA evaluated and considered all public and agency comments received on the DEIS and NPRM, which resulted in changes to the configurations of the proposed sanctuary boundaries. However, it did not result in any changes in the conclusions of the DEIS with regard to the significance of the impacts. NOAA incorporated the following changes into this FEIS, consistent with modifications made to the proposed action, and other clarifications requested by comments on the DEIS and NPRM:

- Based on public and stakeholder input, NOAA revised the DEIS preferred alternative (Alternative 3), to develop the Final Preferred Alternative which would expand the current sanctuary to include 17 banks within 19 smaller polygons. The components of this alternative are described in detail in Chapter 3, Section 3.2.
- Revisions to the descriptions of the affected environment (Chapter 4) and analysis of environmental consequences (Chapter 5) based on new data and changes to NOAA's Final Preferred Alternative.
- Clarification of NOAA's intent to and rationale for continuing the prohibition of pelagic longline fishing and spearfishing in the expanded sanctuary boundaries.
- Added discussion of military activities in the current and expanded sanctuary areas and clarification of NOAA's intent to apply existing exemptions for Department of Defense activities in proposed expansion areas.
- Revisions to NOAA's analysis of impacts on BOEM lease blocks in Chapter 5, Section 5.3-9.5 based on coordination with BOEM.
- Added information about the public involvement and agency consultation processes following publication of the DEIS and NPRM.

- Added the following appendices:
 - Appendix A, Responses to Comments on Draft EIS and Proposed Rule; and
 - Appendix H, Draft Version of Final Rule and Terms of Designation for Expansion of Flower Garden Banks National Marine Sanctuary.
- Moved discussion of the regulatory framework and interagency consultation applicable to the proposed action to Appendix G, Regulatory Framework and Consultation Documents. Added relevant correspondence in a supporting document to the FGBNMS website¹⁵.
- Incorporated minor technical corrections and clarifications throughout the FEIS to improve document readability and to respond to comments received.

1.7 Scope of FEIS

NEPA requires federal agencies to thoroughly assess the environmental impacts of major federal actions that could significantly affect the environment. NOAA developed the proposal for expanding FGBNMS to facilitate improved management and protection of publicly-identified priority resources. Therefore, incorporation of new areas into the sanctuary is intended to protect resources and generally to reduce the impacts of human activities on the environment. Even so, it is necessary to fully disclose and document the potential adverse and beneficial environmental effects of the proposed regulatory actions in a public process, consistent with NEPA and CEQ regulations implementing NEPA.

When FGBNMS was under consideration for designation under the NMSA, NOAA prepared an environmental impact statement as required by the NMSA. Under the NMSA (16 U.S.C. § 1434(a)(4)), modifications to the terms of designation may only be made by the same procedures through which the original designation is made. The sanctuary designation process includes preparation of an EIS, regardless of the significance of the impacts of the action. Therefore, NOAA prepared an environmental impact statement to evaluate the proposed boundary changes at FGBNMS because they involve changes to the sanctuary's terms of designation that describe the geographic area included within the sanctuary. This FEIS also serves as a resource assessment under the NMSA (16 U.S.C. § 1434(a)(2)(B)), documenting (i) present and potential uses of the areas considered in the alternatives; (ii) commercial, governmental, or recreational resource uses in the areas that are subject to the primary jurisdiction of the Department of the Interior; and (iii) any past, present, or proposed future disposal or discharge of materials in the vicinity of the proposed sanctuary.

This FEIS evaluates the environmental impacts associated with the range of alternatives under consideration for the proposed expansion of FGBNMS. The range of alternatives, including a No Action Alternative, are described in detail in Chapter 3, and the impacts associated with each alternative are analyzed in Chapter 5. This FEIS further evaluates how the boundary alternatives and implementation of sanctuary regulations and existing management plan in new areas could affect the environment. The implementation of management strategies and actions that sanctuary staff and their partners will use to fulfill other action plans from the 2012 FGBNMS

¹⁵ See: <https://flowergarden.noaa.gov/management/expansionnpr.html>

Management Plan in the expansion area include targeted research, monitoring, education, outreach, resource protection, managing visitor use, and operations and administration.

1.8 Organization of the FEIS

Chapter 1: Provides background on the National Marine Sanctuary System, agency consultations, and the public process leading up to the publication of the FEIS. In addition, this chapter provides context regarding the relevant missions of NOAA and ONMS, the provisions of the NMSA, and summarizes the current boundaries and regulations for FGBNMS.

Chapter 2: Outlines the purpose and need for the proposed expansion of FGBNMS.

Chapter 3: Provides a description of the range of alternatives under consideration, and the process used to develop each alternative.

Chapter 4: Describes the environment affected by the proposed action, including an overview of the physical environment, living marine resources, marine use and socioeconomics, and cultural and historic resources within the proposed sanctuary expansion areas.

Chapter 5: Provides an analysis of the potential environmental impacts of the range of alternatives.

Chapter 6: Acknowledgements, literature cited, and index.

Chapter 2

Purpose and Need

2.1 Purpose of Action

NOAA's proposed action is to expand, as appropriate, the network of protected areas within the sanctuary (i.e., those areas in which existing sanctuary regulations and management actions would apply). The purpose of the proposed action is summarized in one of the pillars of NOAA's mission, to conserve and manage coastal and marine ecosystems and resources (NOAA 2010a). The NMSA authorizes the Secretary of Commerce to designate and manage discrete areas of the marine environment as national marine sanctuaries (16 U.S.C. § 1433). Such designation is based on attributes of special national significance, including conservation, recreational, ecological, historical, scientific, cultural, archaeological, education, or aesthetic qualities. The NMSA recognizes that "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" (16 U.S.C. § 1431(a)(3)). Therefore, the NMSA promotes a broad and comprehensive, ecosystem-based approach to marine resource protection and management.

The purpose of the proposed action is also to further the FGBNMS mission to "identify, protect, conserve, and enhance the natural and cultural resources, values, and qualities of FGBNMS and its regional environment for this and future generations" (NOAA 2012a). Implementing the Sanctuary Expansion Action Plan described in the 2012 FGBNMS Management Plan (NOAA 2012a) will advance the FGBNMS Goal 6 ("promote ecosystem-based management of the FGBNMS regional environment") and Objective 6C ("evaluate and implement management actions that enhance ecosystem-based management").

NOAA's Final Preferred Alternative and Alternatives 2-5 in this FEIS would expand the network of protected areas within FGBNMS by incorporating selected reefs and banks in the northwestern Gulf of Mexico for their long-term protection and management. These alternatives would provide protection for nationally significant benthic habitats with biological, ecological, and/or structural links to the existing sanctuary, including vulnerable habitats and living resources in the region.

2.2 Need for Action

NOAA's proposed action would provide additional protection for sensitive underwater features and marine habitats associated with continental shelf-edge reefs and banks in the northwestern Gulf of Mexico. The current jurisdictional regime divides authority among several governmental entities that regulate offshore energy exploration (BOEM), fishing (GMFMC), and water quality (EPA). This current jurisdictional regime does not provide comprehensive and effective management for the full range of activities that impact the sensitive reefs and banks in the region. For example, BOEM's prohibitions in the NAZs apply only to anchoring by vessels engaged in oil and gas development activities and platform services, while anchoring by other vessels remains unregulated. Further, anchoring regulations in the NAZs apply only on a lease-by-lease basis, which means that non-leaseholders are not subject to anchoring regulations.

Other vessel ground tackle (including anchors, chains, and cables) and marine salvage activities are currently unregulated and have caused significant injury to sensitive biological communities.

The areas proposed for sanctuary expansion are recognized as hotspots of marine biodiversity providing vital habitat for many important species in the Gulf of Mexico region. They are home to the most significant examples of coral and algal reefs, mesophotic and deepwater coral communities, and other biological assemblages in the north central Gulf of Mexico.

Furthermore, these areas provide important habitat for notable species such as mobula rays, sea turtles, and whale sharks, while serving as nurseries for numerous fish species of commercial and recreational importance. As such, most of these areas have also been identified as nationally significant through their designation as HAPCs by the GMFMC and as NAZs by BOEM. These habitats are vulnerable to a variety of known and potential impacts, including large vessel anchoring, marine salvage operations, fishing techniques that may injure benthic habitat (e.g., trawling, bottom-tending gear), and certain oil and gas exploration and development activities. These impacts can more effectively be addressed within the expanded areas through the comprehensive habitat conservation and management authorities under the NMSA. The protection of these ecologically significant sites would increase the resilience of marine ecosystems, and enhance the sustainability of the region's thriving recreational, tourism, and commercial economies. Ultimately, expanding FGBNMS would help ensure valuable marine resources remain available for the use and enjoyment of future generations of Americans.

The need for sanctuary expansion has been strongly supported in public involvement processes for both the sanctuary management plan review and development of this FEIS. The evaluation of important marine resources and the incorporation of places of national significance into the National Marine Sanctuary System further national ocean resource management objectives articulated by many publicly vetted and expert-driven strategic planning efforts. These efforts reference the need for additional conservation protections for important habitat areas nationally and in the north central Gulf of Mexico (e.g., Brown et al. 2011; Peterson et al. 2011). Sanctuary expansion would provide a mechanism for implementation of specific restoration, monitoring, and research activities for important marine resources. These types of activities could overlap with potential restoration activities associated with the Deepwater Horizon oil spill. For example, protecting and managing mesophotic and deep benthic coral communities were identified as a restoration approach in the Final Programmatic Damage Assessment and Restoration Plan for the Deepwater Horizon Oil Spill (2016).

One of the most obvious risks associated with the oil and gas industry is related to catastrophic, uncontrolled releases resulting from factors such as extreme weather events or human error (see Section 4.4.3). For example, the Deepwater Horizon oil spill in 2010 resulted in the release of 134 million gallons of oil and 1.84 million gallons of chemical dispersant into the ocean, creating an oil surface slick covering 43,300 square miles at its cumulative extent (Deepwater Horizon NRDA Trustees 2016; see Figure 2.1). The oil spill and related response activities affected the sites considered in Alternatives 4 and 5, but did not directly affect the existing sanctuary (No Action Alternative) or sites considered for expansion in NOAA's Final Preferred Alternative, or Alternatives 2 and 3. Nevertheless, based on what is currently known about the spill and the planning for restoration in its aftermath, Alternatives 4 and 5 may represent important opportunities for research into and recovery from observed impacts, and their inclusion in this

FEIS acknowledges the importance and regional nature of both the Deepwater Horizon oil spill and the proposed sanctuary expansion.

Other potential threats include the physical impact of drilling, placement of structures on the seafloor (e.g., platforms, anchors, pipelines, cables), discharges from rock-cutting during the drilling process, and intentional or accidental well discharges or release of drilling fluids. The use of anchors, pipelines and cables for oil exploration or extraction can be destructive to sensitive benthic habitats (Lumsden et al. 2007, Heifetz et al. 2009, Gass and Roberts 2006, NOAA 2015c) and can cause localized physical damage to corals. Current sanctuary regulations at 15 CFR part 922, subpart L allow for the exploration and production of oil and gas inside sanctuary boundaries subject to the restrictions imposed by BOEM for the protection of topographic features, Potentially Sensitive Biological Features (PSBFs).

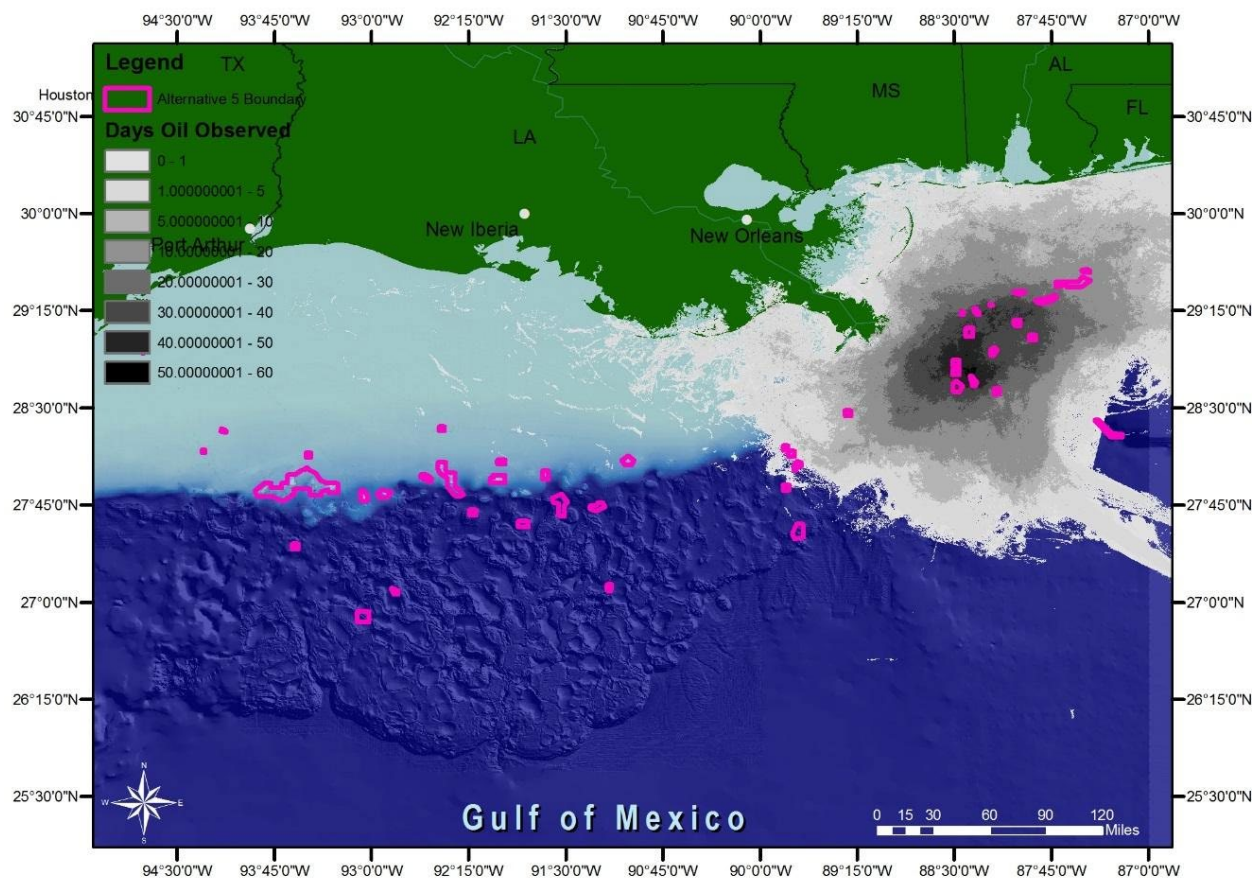


Figure 2.1. Cumulative surface oiling footprint from the Deepwater Horizon oil spill in relation to the most comprehensive boundary expansion alternative evaluated in this FEIS (Alternative 5). Image: NOAA

Disturbances to coral ecosystems from bottom-tending fishing gear, especially bottom trawl gear, have been well documented where they have been studied in U.S. waters and in other regions around the world. Bottom trawling is widespread and considered a major threat to corals in most U.S. regions where such fishing is allowed (Reed et al. 2007, Yoklavich et al. 2018). The area of seafloor contacted by bottom trawls is relatively large, the force against the seafloor from the trawl gear is substantial, and the spatial distribution of bottom trawling is extensive. Although not as destructive as bottom trawls and dredges, other types of fishing gear

can also have detrimental effects on deepwater corals. Bottom-set gillnets, bottom-set longlines, pots, and traps all impact the seafloor. Vertical hook and line fishing, used in both recreational and commercial fishing, has the potential for some damage to fragile corals by the weights used, but such damage is minimal compared to other bottom-tending gear (Lumsden et al. 2007, Heifetz et al. 2009, Gass and Roberts 2006, NOAA 2015c). FGBNMS staff have documented fishing gear impacts to 28 Fathom, Alderdice, Bouma, Bryant, Bright, East Flower Garden, Elvers, Geyer, Horseshoe, McGrail, Parker, Rankin, Rezak, Sidner, Sonnier, Stetson, and West Flower Garden banks.

In addition, certain areas, such as Sonnier Bank, have already been injured as a result of anchoring. Several areas, such as Sonnier, Bright, and Geyer banks, are also becoming popular sites for recreational diving, especially as technical diving technologies become more widely available. The proposed sanctuary expansion could allow for the installation of mooring buoys to eliminate the need for anchoring and provide safe access to these areas for divers. Some areas also contain special features that require higher levels of protection. These areas include McGrail Bank, where a unique mesophotic coral ecosystem is located, and Alderdice Bank, where prominent basalt spires arise from the seafloor, a feature of significant geological interest as they originated in the Late Cretaceous (approximately 77 million years ago). Alderdice Bank represents the oldest known exposed rock on the continental shelf off Texas and Louisiana, and is unique for this region. Other areas, such as Bright Bank, have sustained significant damage as a result of poorly regulated excavation activities.

At the same time, the opportunities for research, exploration, and education related to these significant ocean resources are critical for understanding changes occurring in the environment, as well as fostering a stewardship ethic and an understanding of the ecosystem services these resources provide for communities throughout the Gulf of Mexico region. For these and other reasons, a comprehensive management approach offered by designation as a national marine sanctuary is needed.

Chapter 3

Description of Alternatives

3.1 Development of Alternatives

NOAA developed a reasonable range of spatial alternatives for rigorous exploration and objective evaluation in this FEIS, as required by NEPA and CEQ's regulations implementing NEPA. NOAA's starting point for the development of the range of alternatives was the 2007 Advisory Council recommendation, as outlined in the FGBNMS 2012 Management Plan. The development of the alternatives was further informed by input from the public during scoping, and during comment periods following the publication of the DEIS and NPRM (see Section 1.5). NOAA also received input from the research community and from agency personnel which informed the development of the alternatives (see Section 6.1.2).

NOAA determined all of the sites evaluated in the alternatives described below possess conservation, recreational, ecological, historical, scientific, educational, cultural, archaeological or aesthetic resources or qualities that give them special national, and in some instances, international, significance. In the early development of the proposed sanctuary expansion, NOAA's emphasis was on the areas and resources in the immediate vicinity of the existing FGBNMS; however, NOAA also recognized that the sanctuary is part of a larger ecological system: the north central Gulf of Mexico. Accordingly, NOAA considered resources throughout that system in development of the alternatives. Under this approach, NOAA is better able to evaluate the nationally significant features in the region, taking into account the multiple ecological and human use benefits of sanctuary expansion within the larger ecosystem.

In determining the scope of alternatives to be considered, NOAA focused on alternatives that could reasonably meet the purpose and need for the proposed action, what is reasonable rather than on whether NOAA is capable of carrying out a particular alternative. Reasonable alternatives include those that are practical or feasible from the technical and economic standpoint and using common sense, rather than simply desirable from the standpoint of the agency (46 FR 18026). NOAA still evaluated alternatives outside the scope of what has been previously approved or funded if they were reasonable and fulfilled the stated purpose and need for the proposed federal action, in light of NEPA's goals and policies (40 FR 18026 and 40 CFR 1500.1(a)). Regulatory alternatives and a number of spatial alternatives were also considered but eliminated from detailed study, as described in Section 3.1.2.

3.1.1 Revision to NOAA's Preferred Alternative

As explained in Section 1.5, in response to public comments and recommendations received, NOAA revised DEIS Alternative 3 to develop the Final Preferred Alternative (referred to as the Revised Preferred Alternative in the proposed rule). NOAA's Final Preferred Alternative is described in detail in Section 3.2. While DEIS Alternative 3 proposed to increase the size of the sanctuary from approximately 56 square miles to approximately 383 square miles, NOAA's Final Preferred Alternative would increase the area of the sanctuary to approximately 160 square miles and include 17 of the 18 banks included in Alternative 3. Under NOAA's Final Preferred Alternative, the sanctuary boundaries would be drawn more tightly around the shallowest

portions of the geological features identified in Alternative 3, primarily following BOEM’s NAZs. The new polygons would include all of the same reefs and banks represented in the DEIS Alternative 3, with one exception, Bryant Bank, which is not included in the Final Preferred Alternative. Bryant Bank is a small area in the Bouma-Bryant-Rezak-Sidner Bank complex. The BEWG did not recommend inclusion of Bryant Bank in its May 2018 recommendation. The BEWG recommendation was subsequently approved by the full Advisory Council. Refer to NOAA’s response to comments on the DEIS and NPRM in Appendix A, for more detail.

As part of the development of the NPRM, NOAA prepared a Supplemental Information Report that evaluated the changes included in the revised preferred alternative as well as new circumstances and information related to fishing and oil and gas activities. NOAA’s analysis in the Supplemental Information Report concluded that the Final Preferred Alternative remains within the range of alternatives and impacts analyzed in the DEIS.¹⁶ Ultimately, NOAA determined the changes reflected in the revised preferred alternative are not “substantial changes in the proposed action that are relevant to environmental concerns” (40 C.F.R. 1502.9(c)(1)(i)). NOAA further found that the comments received on the DEIS do not “constitute significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts” (40 C.F.R. 1502.9(c)(1)(ii)). As such, NOAA determined that preparing a supplement to the DEIS is neither required, nor necessary under NEPA.

3.1.2 Alternatives Considered but Rejected

The types of alternatives NOAA considered but eliminated from detailed study in this FEIS are: 1) the inclusion of additional topographic features within the proposed expansion alternatives; and 2) proposed modifications to regulations within the current sanctuary boundaries or in the proposed expanded sanctuary.

During public scoping, there was strong support for the inclusion of additional topographic features within the range of alternatives to be considered in the EIS. Based on this input, NOAA developed Alternatives 3, 4, and 5 in the DEIS, which include topographic features beyond both the current sanctuary boundaries (Alternative 1, No Action Alternative) and the 2007 Advisory Council recommendation (Alternative 2). NOAA eliminated from further consideration the inclusion of additional topographic features beyond those alternatives, because NOAA determined that insufficient data are available to adequately characterize the sites or available data does not indicate sufficiently unique, diverse, productive or otherwise nationally significant biological communities or geologic features. These include 32 Fathom Bank, Applebaum Bank, Coffee Lump Bank, Fishnet Bank, Phleger Bank, Sweet Bank, Diaphus Bank, and Sackett Bank. When NOAA was developing alternatives, an unnamed site in Federal waters off the coast of Orange Beach, Alabama containing the preserved remains of a 50,000+ year-old submerged cypress forest was also examined and eliminated from consideration for inclusion due to insufficient data. This Alabama site is being considered under separate action by Congress for possible designation as a national marine sanctuary (See Alabama Underwater Forest National Marine Sanctuary and Protection Act, H.R. 8684, 116th Congress (introduced Oct. 27, 2020)).

¹⁶ NOAA’s Supplemental Information Report is available at: <https://flowergarden.noaa.gov/doc/expansion/deissupplementalinforeport.pdf>

NOAA also eliminated from further consideration the inclusion of sites in biogeographic regions other than the north central Gulf of Mexico. This is because these areas to both the east and west of the 87th and 95th west meridians reflect geologic/sedimentary and hydrologic/oceanographic settings, and biological communities, distinctly different from those of the north central Gulf of Mexico. These sites and the resources found at these sites are faced with distinctly different threats or other conservation issues. Features eliminated from further consideration based on this distinction include Big Dunn Bar, Small Dunn Bar, Blackfish Ridge, Mysterious Bank, the South Texas Banks (Dream Bank, Southern Bank, Hospital Bank, North Hospital Bank, Aransas Bank, Baker Bank, and South Baker Bank), Madison-Swanson, the Florida Middle Grounds, and Pulley Ridge. Although these additional areas were rejected for consideration in the current FEIS, FGBNMS will consider extending sanctuary protection and management to these additional biogeographic regions and habitat types during the next management plan review.

NOAA also considered but eliminated from further evaluation some alternatives that would involve changes to the current sanctuary regulations and their application to the proposed expansion areas. Regulatory alternatives were considered but eliminated from further evaluation pursuant to the Advisory Council recommendation that the current regulatory regime in place in the existing sanctuary should be extended to any expanded sanctuary boundaries. These possible regulatory alternatives include fishery closures or permit requirements, greater restrictions on oil and gas development, policies related to decommissioned platforms and artificial reefs, and establishment of anchorages, among others.

Based on recommendations provided by the GMFMC and resulting coordination, NOAA considered the council's recommendation to create a new regulatory endorsement program to allow anchoring by commercial vessels on those areas of soft sediment outside of the "no bottom tending gear zone". NOAA ultimately eliminated this regulatory alternative from further study because NOAA made modifications to the proposed boundaries of areas included in NOAA's Final Preferred Alternative to closely follow the boundaries of BOEM's NAZs, which contain minimal soft sediment.

NOAA specifically considered fishery exemptions for pelagic longlining and spearfishing in the expansion areas, and solicited public comment on those exemptions in the proposed rule. NOAA ultimately rejected both fishery exemptions because these fishing practices are not aligned with the FGBNMS mission to protect vulnerable ecological resources. Pursuant to a NMFS ESA Section 7 consultation on the northern Gulf of Mexico pelagic longline fishery, NMFS issued a biological opinion, dated May 15, 2020, which determined the fishery was likely to adversely affect several protected species.

Current sanctuary regulations include restrictions on exploration for, or development or production of, oil, gas or minerals; anchoring or otherwise mooring; discharging or depositing materials or other matter; alteration of the seabed; possessing various marine resources; injuring or taking or attempting to injure or take sanctuary resources; possessing or using explosives or releasing electrical charges; feeding fish; and possessing (except while passing without interruption through the sanctuary) or using fishing gear other than conventional hook and line gear. The regulations are summarized in Table 1.1, and the full text of the regulations is found in Appendix H. NOAA does not intend to make any change to the regulations that would

be applied within the expanded sanctuary boundaries without further deliberation by the Advisory Council, public involvement, and the possible issuance of a future NEPA analysis, likely in the context of the next FGBNMS management plan review.

3.2 NOAA's Final Preferred Alternative

NOAA's Final Preferred Alternative would add 14 banks, for a total of 17 banks, represented in 19 polygons (including 3 banks with multi-polygons) (see Figure 3.1 and Table 3.1). This would increase the current sanctuary area from approximately 56 square miles to approximately 160 square miles. This alternative generally follows the same areas identified in Alternative 3. Here, NOAA has reduced the size of the expansion areas proposed in the original preferred alternative, based on the 2018 Advisory Council recommendation to promote compatibility with users and reduce potential economic impacts to the offshore energy and fisheries industries.

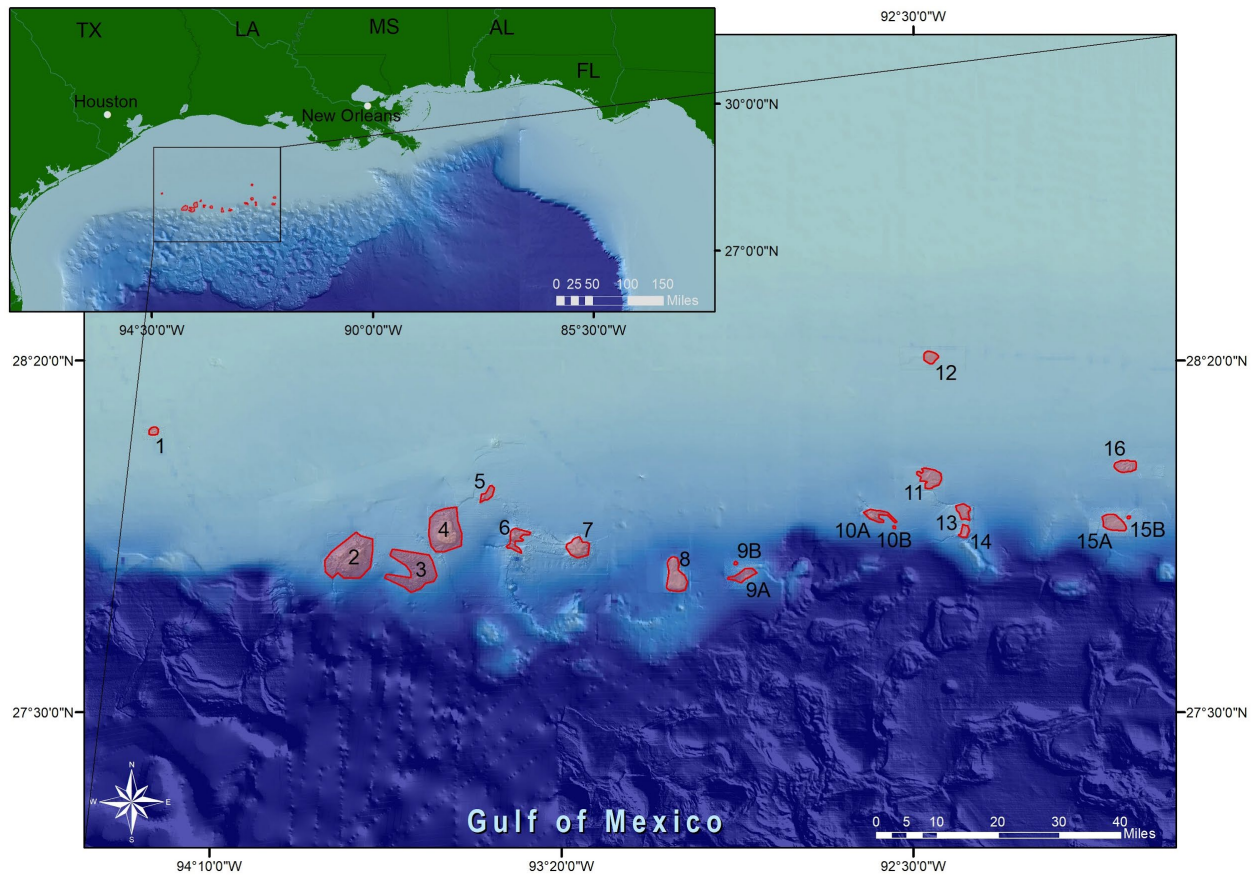


Figure 3.1. Proposed sanctuary boundaries for NOAA's Final Preferred Alternative. Boundary polygons are numbered as shown in Table 3.1. Image: NOAA.

Table 3.1. Nationally Significant Biological and Geological Features included in NOAA's Final Preferred Alternative

	Nationally Significant Biological and Geological Features	Area (square miles)
1	Stetson Bank	1.4
2	West Flower Garden Bank	37.2
3	Horseshoe Bank	28.7
4	East Flower Garden Bank	27.8
5	MacNeil Bank	2.7
6	Rankin Bank, 28 Fathom Bank	5.6
7	Bright Bank	7.7
8	Geyer Bank	11.5
9 A,B	Elvers Bank	4.6
10 A,B	McGrail Bank	4.7
11	Bouma Bank	7.7
12	Sonnier Bank	3.1
13	Rezak Bank	3.7
14	Sidner Bank	2.0
15 A,B	Parker Bank	7.0
16	Alderdice Bank	5.0
	Net Increase in Area Over Current Sanctuary	104.2
	Final Preferred Alternative Total Area	160.4

Similar to the process of developing the 2007 recommendation, the Advisory Council created a new Boundary Expansion Working Group (BEWG) that included industry representatives (i.e. oil and gas, commercial and recreational fishing, diving operations), science, and conservation members. The BEWG evaluated the boundaries proposed in DEIS Alternative 3 and provided NOAA with a revised recommendation for boundary configuration. Between July 2016 and May 2018, the BEWG met 21 times, and considered a variety of topics related to the proposed sanctuary boundary and regulatory issues.

Beginning in April 2017 and in consultation with the BEWG, NOAA's National Centers for Coastal and Ocean Science (NCCOS) developed an analysis tool to assist the BEWG in their boundary discussions. As part of this analysis, NCCOS synthesized available information on biology, ecology, human use, and management designations for the study area. NCCOS created a geodatabase that helped the BEWG visualize and evaluate various boundary expansion options. The analysis used a geospatial planning software tool known as Marxan, which is designed to help decision makers find solutions to conservation planning issues. The analysis included a variety of geospatial datasets, including commercial fishing vessel activity, oil and gas infrastructure, known locations of sensitive biological communities, shipping activity, and existing management zones.

At the request of the BEWG, the Marxan analysis focused on the locations of the BOEM-designated NAZs. The NAZs were developed in the 1970-1980's to protect the shallowest portion of the reefs and banks (i.e., "topographic features") under consideration for oil and gas development. These areas were developed based on the best available information at the time,

prior to the acquisition of high-resolution multibeam bathymetry, and subsequent ground truthing efforts, which have revealed biological habitats beyond NAZs. The BEWG's focus on the NAZs was in response to concerns raised primarily by the oil and gas industry regarding potential impacts of the proposed FGBNMS expansion on offshore energy operations in this portion of the Gulf of Mexico. Ultimately, the BEWG considered the NAZs as the primary geographically-bound characteristic by which to develop recommendations for revisions to the proposed sanctuary expansion boundaries. In April and May 2018, the BEWG adopted a series of recommendations for expansion of 14 of the 15 additional banks proposed in the original preferred alternative (DEIS Alternative 3). The BEWG presented its revised FGBNMS expansion recommendation to the full FGBNMS Advisory Council on May 9, 2018, and the recommendation was accepted by the Advisory Council.

NOAA submits that this Final Preferred Alternative minimizes the impact to offshore energy exploration and production and fishing, while providing substantial protection to sensitive marine habitats of national significance and meeting the expansion objectives as identified in the 2012 FGBNMS Management Plan and 2016 DEIS.

3.3 Alternative 1 – No Action

As required by Section 1502.14(d) of NEPA, NOAA included the evaluation of a No Action Alternative in this FEIS (see Figure 3.2 and Table 3.2). The No Action Alternative in this case means that NOAA would not expand the sanctuary or change the sanctuary regulations and management plan. The current sanctuary boundaries encompass three distinct geologic features and associated benthic biological communities at East Flower Garden Bank, West Flower Garden Bank, and Stetson Bank, and include an area of approximately 56 square miles.

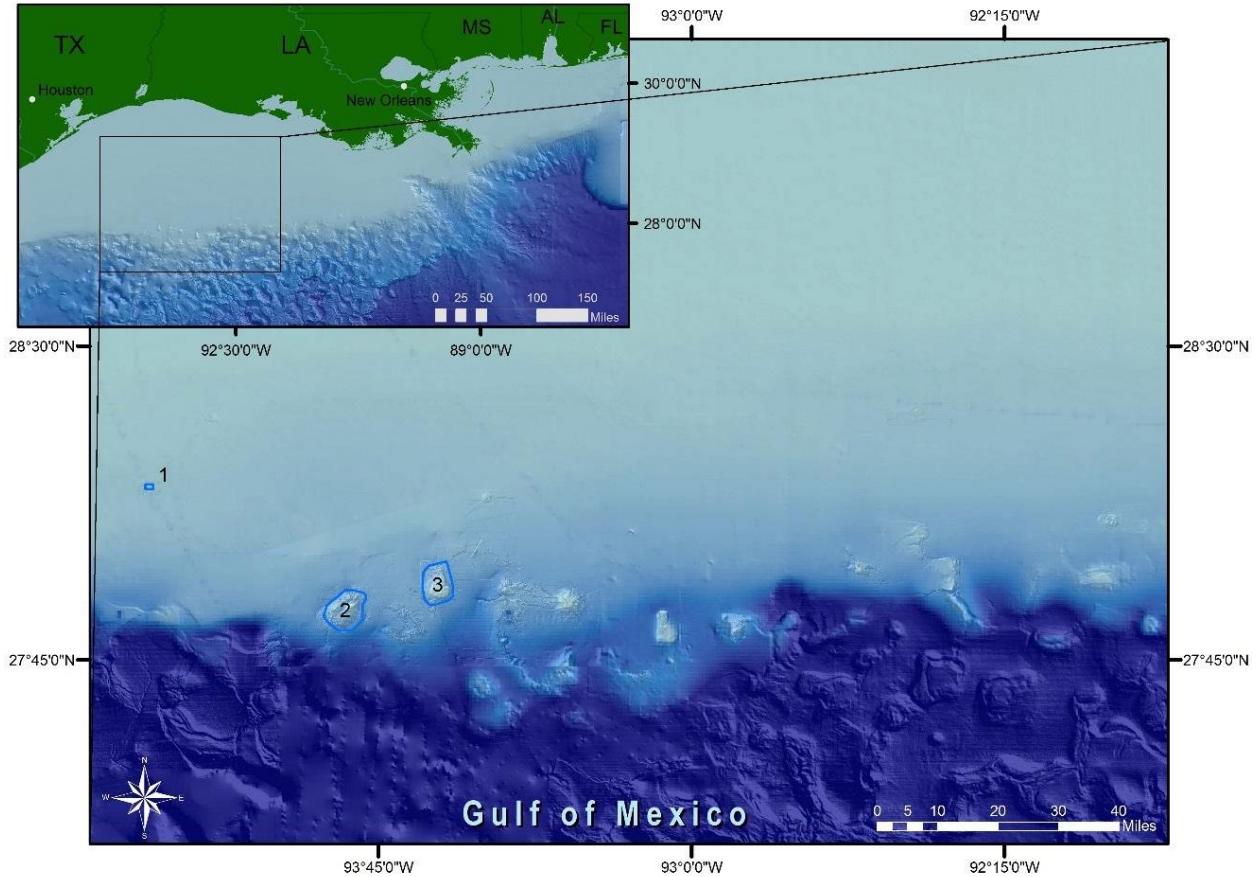


Figure 3.2. Current sanctuary boundaries (Alternative 1, No Action). Boundary polygons are numbered as shown in Table 3.2. Image: NOAA

Table 3.2. Nationally Significant Biological and Geological Features included in Alternative 1 (No Action)

	Nationally Significant Biological and Geological Features	Area (square miles)
1	Stetson Bank	0.84
2	West Flower Garden Bank	29.94
3	East Flower Garden Bank	25.43
	Net Increase in Area Over Current Sanctuary	0.00
	Alternative 1 Total Area	56.21

3.4 Alternative 2 – 2007 Advisory Council Recommendation

In 2007, the FGBNMS Advisory Council submitted a recommendation to the sanctuary superintendent for boundary expansion. Alternative 2, the 2007 Advisory Council recommendation, encompasses 12 nationally significant natural features (including the three banks encompassed in the current sanctuary boundaries) over an area of approximately 281 square miles, within 9 discrete proposed boundary polygons. See Figure 3.3 and Table 3.3. This

recommendation is documented in the 2012 FGBNMS Management Plan, which provides additional detail about the process used to arrive at the recommendation.¹⁷

The 2007 Advisory Council recommendation for sanctuary expansion was based on the work of a BEWG, consisting of representatives from the Advisory Council, NOAA, and other federal agencies. The BEWG evaluated an initial list of potential sanctuary expansion sites compiled from public scoping comments, Advisory Council and sanctuary staff recommendations, and information collected and compiled from scientific literature available at the time (Rezak et al. 1981). The BEWG developed and presented seven sanctuary expansion alternatives to the Advisory Council, recommending 9 sites be included in the expansion proposal, based on a ranking process evaluating factors including a “zone priority index,” structural connectivity, biological connectivity, a threat index, and public and FGBNMS prioritization (see Appendix B1).

Based on additional input from the full Advisory Council and the public, the Advisory Council augmented the BEWG recommendation, adopting a final recommendation for an expansion incorporating 12 of the sites initially evaluated by the BEWG within 9 discrete recommended boundary polygons. Two of these polygons encompass multiple features: the East Flower Garden Bank/Horseshoe Bank complex and the Bright Bank/Rankin Bank/28-Fathom Bank complex.

The Advisory Council recommended irregularly shaped polygons be developed and submitted for consideration so as to reduce conflicts with oil and gas infrastructure and activities. “Core biological zones” were identified based on visual interpretation of seafloor topography, as well as previous scuba and submersible investigations demonstrating the presence of high-diversity coral reefs, coralline algal reefs, and deep coral. These core biological zones were intended to include the main topographic feature supported by the underlying salt dome, and deepwater carbonate mounds associated with faults and ridges. The boundaries of the core biological zones were developed by identifying the outermost series of prominent features as landmarks, forming the vertices of an irregular polygon. Prominent features are defined as carbonate mounds greater than 3 meters (10 feet) in vertical relief and 25 meters (82 feet) in diameter.

¹⁷ See the following presentations for additional information on the 2007 Advisory Council recommendation: <https://flowergarden.noaa.gov/doc/expansion/expansionsiteratingelh.pdf>, <https://flowergarden.noaa.gov/doc/expansion/2007sacrecommendation.pdf>

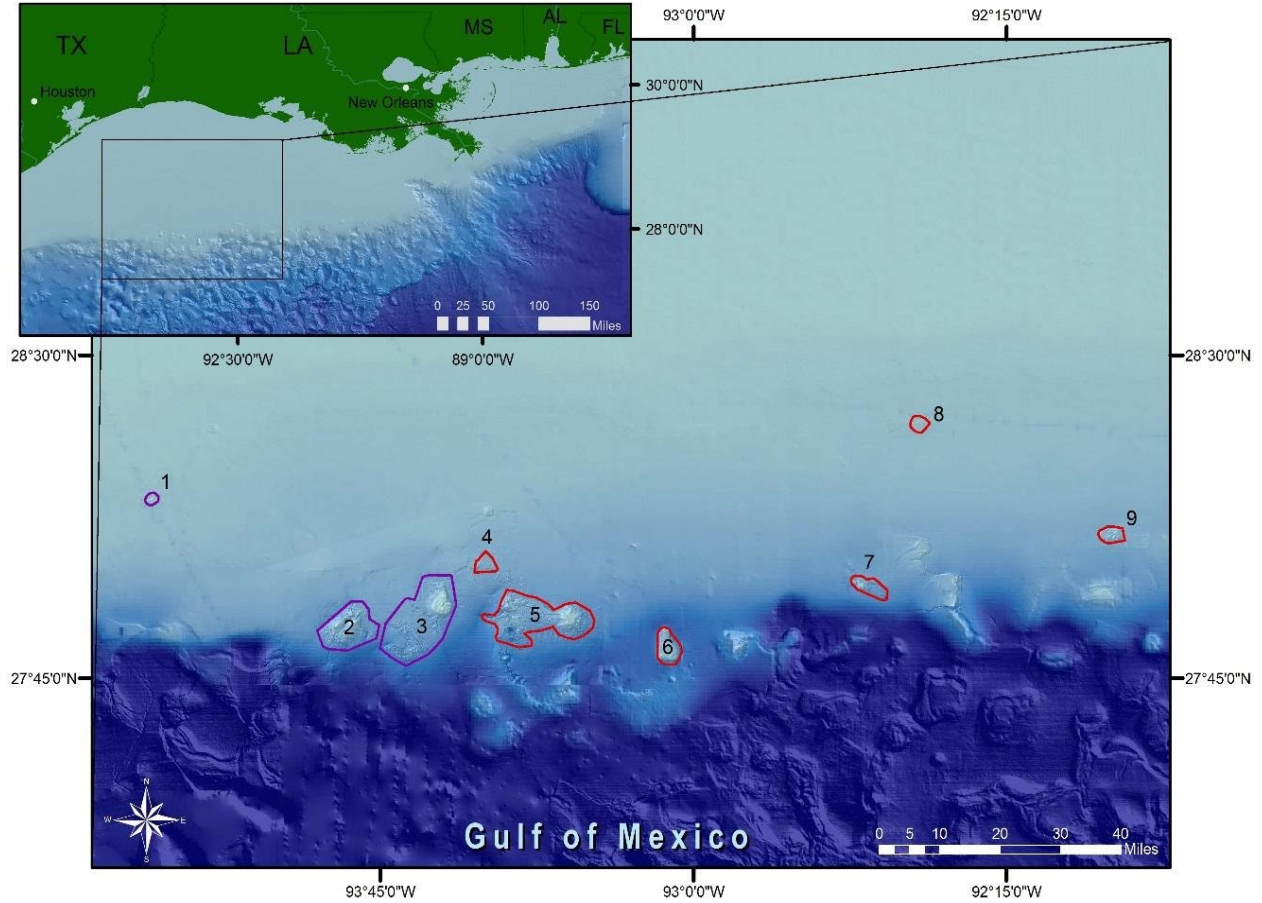


Figure 3.3. Proposed sanctuary boundaries for Alternative 2 (2007 Advisory Council recommendation). Boundaries modified from Alternative 1 are shown in purple; additional proposed areas are shown in red. Boundary polygons are numbered as shown in Table 3.3. Image: NOAA

Table 3.3. Nationally significant biological and geological features included in Alternative 2

	Nationally Significant Biological and Geological Features	Area (square miles)
1	Stetson Bank	2.90
2	West Flower Garden Bank	46.60
3	East Flower Garden Bank and Horseshoe Bank	99.84
4	MacNeil Bank	7.40
5	Rankin Bank, 28 Fathom Bank, and Bright Bank	83.20
6	Geyer Bank	15.96
7	McGrail Bank	11.90
8	Sonnier Bank	5.24
9	Alderdice Bank	8.12
	Net Increase in Area Over Current Sanctuary	224.94
	Alternative 2 Total Area	281.15

Buffer zones of various widths (250-1000 meters; 820-3,280 feet) were considered from the outer landmarks of the core polygon, radiating from an approximate midpoint of the bank. The BEWG proposed, and the full Advisory Council adopted, irregularly shaped boundary proposals

for each of the sites reflecting a 500 meter (1,640 foot) buffer zone, based on literature detailing effects of pollutants associated with shunted drilling muds resulting from oil and gas drilling activities. Oil and gas infrastructure was considered, and recommendations were made to either include existing platforms (3) or exclude existing platforms, dependent upon the distance from the core biological area. Additional detailed descriptions of each of the features included in Alternative 2 can be found in Appendix D.

3.5 Alternative 3 – 2016 DEIS Preferred Alternative

NOAA developed Alternative 3, which incorporates additional input from other federal agencies, the research community, and the public. It encompasses 18 nationally significant natural features over an area of approximately 383 square miles, within 11 discrete proposed boundary polygons. See Figure 3.4 and Table 3.4. In developing this alternative, NOAA applied the same principle as the Advisory Council in evaluating features separately with discrete potential boundaries, rather than a single all-encompassing boundary, to minimize conflicts with user groups and result in a network of protected areas.

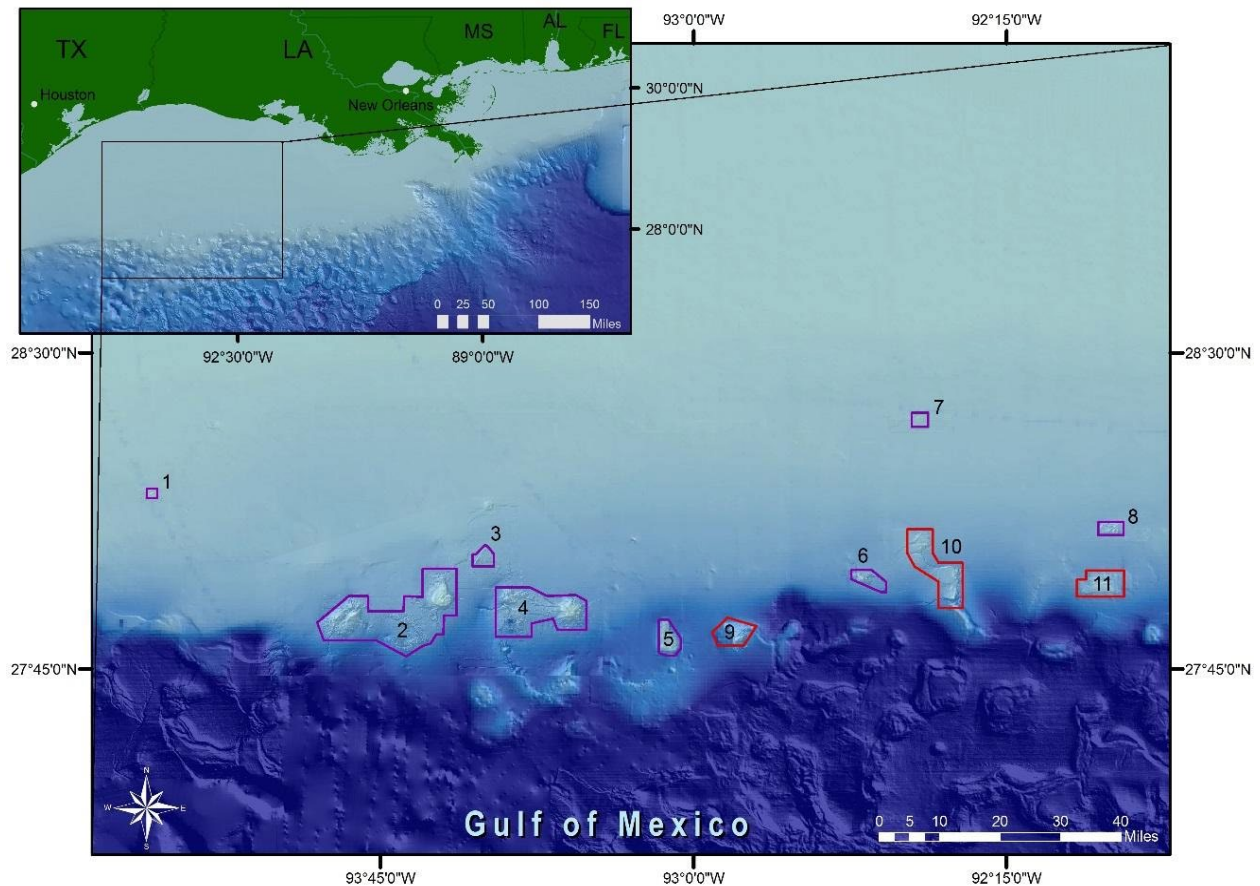


Figure 3.4. Proposed sanctuary boundaries for Alternative 3 (2016 DEIS Preferred Alternative). Boundaries modified from Alternative 2 are shown in purple; additional proposed areas are shown in red. Boundary polygons are numbered as shown in Table 3.4. Image: NOAA

Table 3.4. Nationally significant biological and geological features included in Alternative 3

	Nationally Significant Biological and Geological Features	Area (square miles)
1	Stetson Bank	2.33
2	West Flower Garden Bank, East Flower Garden Bank, and Horseshoe Bank	147.41
3	MacNeil Bank	8.31
4	Rankin Bank, 28 Fathom Bank, and Bright Bank	82.94
5	Geyer Bank	15.27
6	McGrail Bank	12.02
7	Sonnier Bank	5.58
8	Alderdice Bank	7.98
9	Elvers Bank	20.10
10	Bouma Bank, Bryant Bank, Rezak Bank, and Sidner Bank	53.56
11	Parker Bank	27.69
	Net Increase in Area Over Current Sanctuary	326.98
	Alternative 3 Total Area	383.19

NOAA developed the proposed boundary polygons presented in Alternative 3 using a rigorous, replicable process, and by applying the same objective, algorithmic approach (i.e., a standardized, stepwise process) to each site in a Geographic Information System (GIS). In particular, NOAA expanded upon the process used by the BEWG to identify core biological zones by automated identification of areas of high local relief, termed “core sensitivity zones,” from the highest resolution bathymetric data available (e.g., Gardner et al. 2002, Gardner and Beaudoin 2005, Brooks et al. 2013, and NOAA 2015d). This approach was NOAA’s initial step in the development of boundaries proposed in Alternatives 3, 4, and 5 (see Appendix B2 for an overview of this process).

Alternative 3 modifies and augments the 2007 Advisory Council recommendation, using substantially the same evaluation criteria applied by the BEWG. Alternative 3 takes into account additional scientific information about the areas under consideration that was generated in the time since the Advisory Council made its recommendation in 2007. NOAA proposed simplifying the recommended boundaries for ease of enforcement and consistency with existing regulatory regimes. For example, the proposed expansion boundaries were aligned, where possible, with BOEM lease block boundaries, which overlay the entire study area, and HAPC boundaries (14 of the 18 features encompassed by this alternative overlap HAPC boundaries). Refer to BOEM 2015b, BOEM 2015d, NOAA 2015a and NOAA 2015b, and see Appendices B1, B2, D, and E for specific details.

The acquisition of additional high-resolution multibeam bathymetric data and additional site surveys by scuba or remotely operated vehicle (ROV), made both opportunistically and in the context of formal study designs, provide a basis for revision of the site rankings determined by the BEWG and the 2007 recommendation made by the Advisory Council. Since 2002, NOAA and partners have conducted over 200 ROV surveys during 17 research cruises to characterize the biological communities of the reefs and banks in the northwestern Gulf of Mexico outside of the current sanctuary boundaries. A cooperative study (BOEM 2015a) characterizing the

biological communities of PSBFs, funded by BOEM and undertaken by the Louisiana Universities Marine Consortium and NOAA, is informative regarding the ecology of low-relief areas surrounding high-relief banks. That study explored five of the features added to the 2007 Advisory Council recommendation in Alternative 3 (Bouma, Rezak, Sidner, Elvers, and Parker Banks). Detailed descriptions of each of the features included in Alternative 3 can be found in Appendix D.

3.6 Alternative 4 – High Priority Mesophotic and Deep Coral Sites

Alternative 4 incorporates additional mesophotic and deep coral ecosystem sites across the north central Gulf of Mexico. This alternative encompasses 43 nationally significant natural features over an area of approximately 634 square miles, within 29 discrete proposed boundary polygons (see Figure 3.5 and Table 3.5). Some of these sites, such as those in the Pinnacles area (also referred to in BOEM documents as the “pinnacle trend”; see Appendix D for full description) off the coast of Louisiana, Mississippi and Alabama, were considered by the Advisory Council but not included in its 2007 recommendation. Alternative 4 also includes some sites not considered by the Advisory Council in the development of the 2007 recommendation.

Alternative 4 is included in this analysis despite being outside the scope of NOAA’s current operational capacity and budgetary resources for FGBNMS. NOAA determined this alternative to be reasonable due to these sites’ presence within the distinct biogeographic region of the north central Gulf of Mexico (i.e., their relatively consistent geologic/sedimentary and hydrologic/oceanographic settings, as well as biological communities) and due to the significant advances in understanding and heightened awareness of the importance of these sites that have developed in the last decade. NOAA evaluated sites for inclusion in Alternative 4 using substantially the same evaluation criteria applied by the BEWG. NOAA supplemented this analysis using the factors for evaluating new sanctuary nominations that were implemented in 2014 (79 FR 33851; June 13, 2014). NOAA developed the proposed boundaries for each site included in Alternative 4 using the same GIS algorithm applied to sites in Alternative 3 (see Appendix B2). Similarly, NOAA proposed simplifying the recommended boundaries of sites in Alternative 4 for ease of enforcement and consistency with existing regulatory regimes.

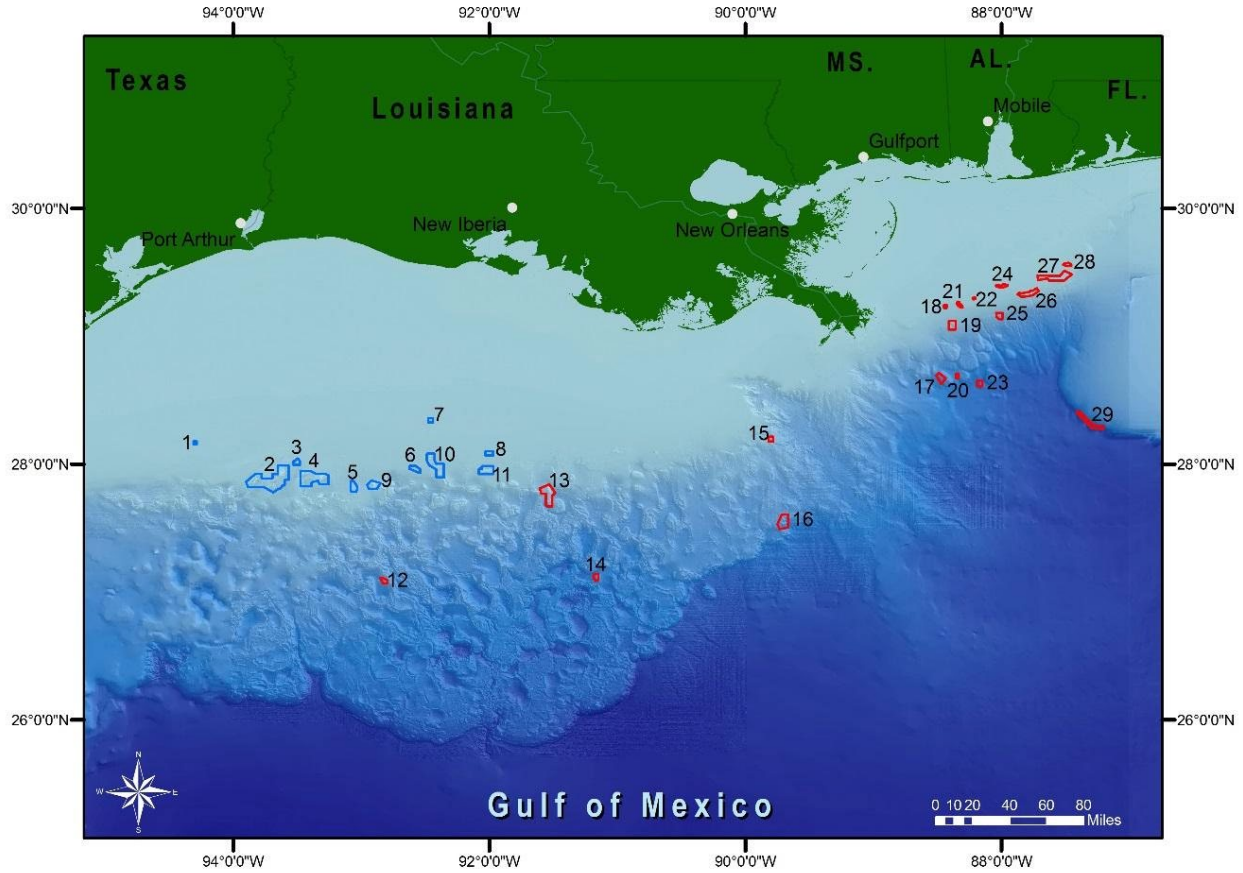


Figure 3.5. Proposed sanctuary boundaries for Alternative 4 (High Priority Mesophotic and Deep Coral Sites). Boundaries carried forward from Alternative 3 are shown in blue; additional proposed areas are shown in red. Boundary polygons are numbered as shown in Table 3.5. Image: NOAA

Table 3.5. Nationally significant biological and geological features included in Alternative 4

	Nationally Significant Biological and Geological Features	Area (square miles)
1	Stetson Bank	2.33
2	West Flower Garden Bank, East Flower Garden Bank, and Horseshoe Bank	147.41
3	MacNeil Bank	8.31
4	Rankin Bank, 28 Fathom Bank, and Bright Bank	82.94
5	Geyer Bank	15.27
6	McGrail Bank	12.02
7	Sonnier Bank	5.58
8	Alderdice Bank	7.98
9	Elvers Bank	20.10
10	Bouma Bank, Bryant Bank, Rezak Bank, and Sidner Bank	53.56
11	Parker Bank	27.69
12	Hidalgo Basin Rim	6.98
13	Assumption Dome	45.63
14	St. Tammany Basin Rim	7.23
15	Henderson Ridge North	5.85

	Nationally Significant Biological and Geological Features	Area (square miles)
16	Henderson Ridge South	31.36
17	Biloxi Dome	12.82
18	Mountain Top	2.03
19	Viosca Knolls West	15.92
20	Gloria Dome	3.01
21	Alabama Alps, 36 Fathom Ridge	4.04
22	West Addition Pinnacles	1.03
23	Dauphin Dome	7.61
24	Shark Reef, Double Top, Triple Top	6.26
25	Viosca Knolls East	9.36
26	Ludwick-Walton and West Delta Mounds	19.06
27	Yellowtail, Cat's Paw, Roughtongue, Corkscrew	42.05
28	Far Tortuga	5.01
29	Desoto Canyon/West Florida Escarpment	25.30
	Net Increase in Area Over Current Sanctuary	577.55
	Alternative 4 Total Area	633.76

The 11 deep coral sites included in Alternative 4 represent important known deep benthic habitat sites in the Gulf of Mexico. These sites were discovered through dozens of cruises to several different sites, and years of laboratory analyses of coral diversity, coral population genetics, macrofaunal diversity, geological analysis, water chemistry, and other information. NOAA identified these sites for inclusion in Alternative 4 based on information primarily collected during the 2008-2011 “*Lophelia* II” study (Brooks et al. 2013) funded by BOEM and NOAA’s Office of Exploration and Research. The final report from this research project includes much of the raw data supporting the evaluations in Chapter 5 and the site descriptions included in Appendix D. In addition, many of these sites were discovered prior to that project as part of the earlier BOEM (then MMS) funded “Chemo I,” “Chemo II,” “Chemo III,” and “*Lophelia* I” studies (MacDonald et al. 1995, MacDonald et al. 2002, CSA 2007, Brooks et al. 2014), and through other National Science Foundation and NOAA Office of Exploration and Research work. These investigations date to the early 1990s when researchers began to have access to the expanding MMS 3D seismic database and developed conceptual models for the location and exploration of hardbottom associated with hydrocarbon seepage (MacDonald et al. 1995). These studies were accompanied by historical records of coral occurrence from trawls, and early observations from the Johnson Sea-Link and Navy NR-1 submersibles. More recently, this information has been extended to predict and map suitable habitat for deepwater corals throughout the Gulf of Mexico, providing habitat suitability maps (Kinlan et al. 2013) against which NOAA compared the proposed boundaries of Alternative 5.

Following the 2010 Deepwater Horizon spill, intensive surveys revealed more coral communities in the immediate vicinity of the well-head; several of these sites are also included in Alternative 4. More detailed descriptions of these sites can be found in White et al. 2012, Fisher et al. 2014a, and Fisher et al. 2014b. More recently, multiple visits by the NOAA Ship *Okeanos Explorer* (NOAA 2014) led to the discovery of a few additional sites (most significantly the Hidalgo Basin

Rim site). Similarly, observations of mesophotic zone habitats in the Pinnacles area found an unexpected abundance and diversity of sub-tropical fish and corals in these areas. The seven additional sites identified for inclusion in Alternative 4 were first mapped with single-beam echosounder by Ludwick and Walton in 1957. Successive mapping efforts by BOEM (formerly MMS; Thompson et al. 1999), NOAA (NOAA 2014), and U. S. Geological Survey (Gardner et al. 2002) have incrementally improved the spatial extent and resolution of bathymetric profiles of the area. High-resolution multibeam bathymetric surveys¹⁸ from 2000 (Gardner et al. 2002), combined with ROV and submersible surveys that have occurred in the area since the mid-1980s, have allowed accurate characterization of the geomorphology of mesophotic reefs (Nash and Randall 2015) and low-relief hard substrates (Nash and Sulak 2015) throughout the tract, as well as documentation of their importance as benthic habitats for fisheries (Weaver et al. 2001). Nine significant features were characterized in the high-resolution multibeam bathymetric map surveys from 2000 (Gardner et al. 2002), though further surveying is needed to characterize the full extent of hard bottom reefs and low-relief features and substrates in the area.

The results of recent research are summarized in Appendix D as the basis for inclusion of Pinnacles area sites in Alternative 4 and evaluated for potential inclusion in the sanctuary expansion of FGBNMS.

3.7 Alternative 5 – High Value Habitats and Cultural Resources

Alternative 5 incorporates additional mesophotic and deep coral ecosystem sites, as well as important shipwreck sites, across the north central Gulf of Mexico. This alternative encompasses 57 nationally significant natural features and 8 nationally significant cultural and historic resource sites over an area of approximately 935 square miles, within 45 discrete proposed boundary polygons. See Figure 3.6 and Table 3.6. Some of these sites, such as 29 Fathom Bank and Jakkula Bank were considered by the Advisory Council but not included in its 2007 recommendation for sanctuary expansion. Alternative 5 also includes some other sites not considered by the Advisory Council in developing the 2007 recommendation, such as Claypile Bank, Ewing Bank, and the mesophotic and deep benthic sites and shipwrecks.

Alternative 5 is included in this analysis despite being outside the scope of NOAA's current operational capacity and budgetary resources for FGBNMS. NOAA determined this alternative to be reasonable due to these sites' presence within the distinct biogeographic region of the north central Gulf of Mexico (i.e., their relatively consistent geologic/sedimentary and hydrologic/oceanographic settings, as well as biological communities) and due to advances in understanding and heightened awareness of the importance of these sites that have developed in the last decade. Shipwrecks are included in this alternative because the NMSA identifies the need to protect nationally significant historical, cultural, and archaeological sites. Public involvement for this FEIS, as well as NOAA's internal and cooperating agency consultations, identified the included sites as nationally significant.

¹⁸ <https://cmgds.marine.usgs.gov/data/pacmaps/index.html>

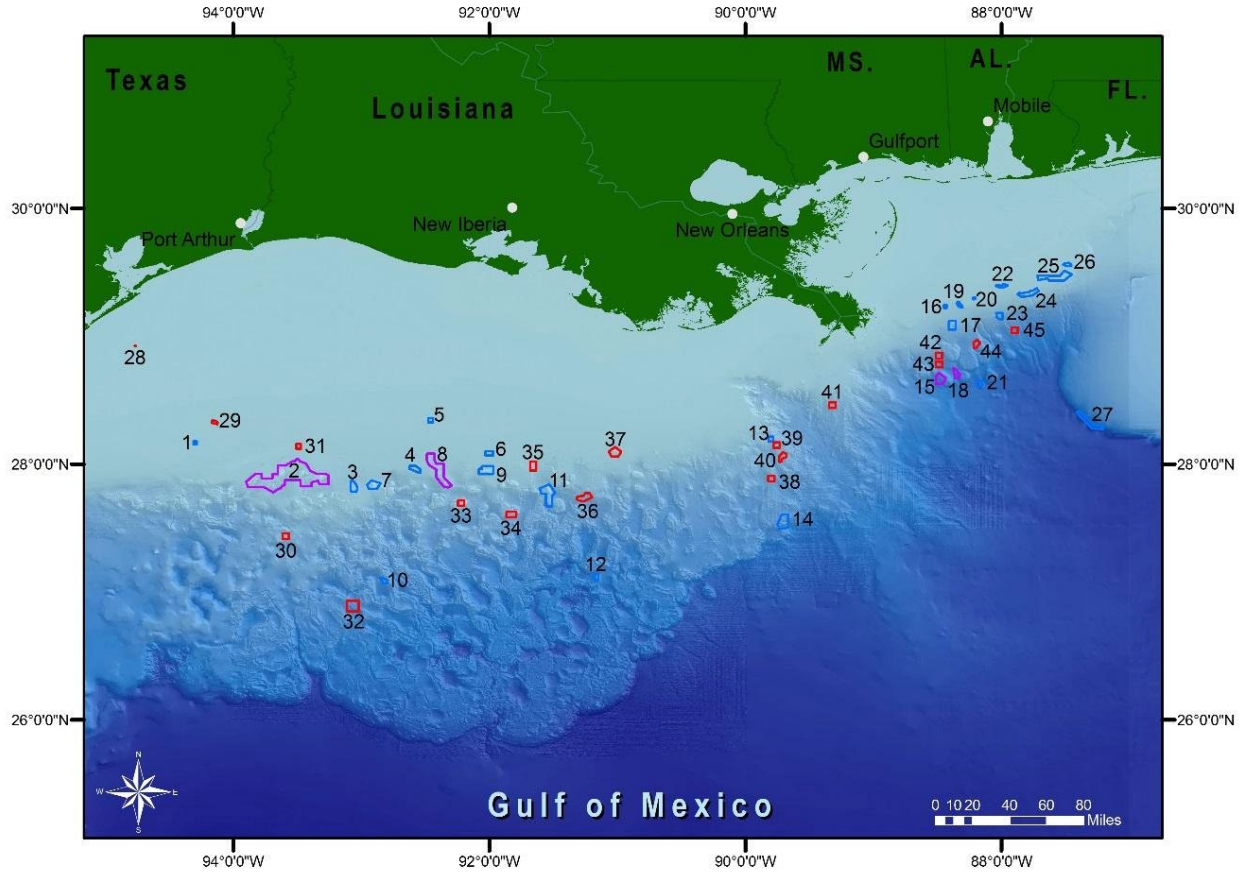


Figure 3.6. Proposed sanctuary boundaries for Alternative 5 (High Value Habitats and Cultural Resources). Boundaries carried forward from Alternative 4 are shown in blue; boundaries modified from Alternative 4 are shown in purple; additional proposed areas are shown in red. Boundary polygons are numbered as shown in Table 3.6. Image: NOAA

Table 3.6. Nationally significant biological and geological features and/or cultural and historic resources included in Alternative 5

	Nationally Significant Biological and Geological Features and/or Cultural and Historic Resources (* = Shipwreck Sites)	Area (square miles)
1	Stetson Bank	2.33
2	West Flower Garden Bank, East Flower Garden Bank, Horseshoe Bank, MacNeil Bank, Rankin Bank, 28 Fathom Bank, and Bright Bank	306.65
3	Geyer Bank	15.27
4	McGrail Bank	12.02
5	Sonnier Bank	5.58
6	Alderdice Bank	7.98
7	Elvers Bank	20.10
8	Bouma Bank, Bryant Bank, Rezak Bank, Sidner Bank, Tresslar Bank, and Antoine Bank	73.68
9	Parker Bank	27.69
10	Hidalgo Basin Rim	6.98
11	Assumption Dome	45.63
12	St. Tammany Basin Rim	7.23
13	Henderson Ridge North	5.85
14	Henderson Ridge South	31.36

	Nationally Significant Biological and Geological Features and/or Cultural and Historic Resources (* = Shipwreck Sites)	Area (square miles)
15	Biloxi Dome, <i>R. E. Lee*</i> and <i>U-166*</i>	19.12
16	Mountain Top	2.03
17	Viosca Knolls West	15.92
18	Gloria Dome and <i>Deepwater Horizon*</i>	10.02
19	Alabama Alps, 36 Fathom Ridge	4.04
20	West Addition Pinnacles	1.03
21	Dauphin Dome	7.61
22	Shark Reef, Double Top, Triple Top	6.26
23	Viosca Knolls East	9.36
24	Ludwick-Walton and West Delta Mounds	19.06
25	Yellowtail, Cat's Paw, Roughtongue, Corkscrew	42.05
26	Far Tortuga	5.01
27	Desoto Canyon/West Florida Escarpment	25.30
28	USS <i>Hatteras*</i>	0.17
29	Claypile Bank	3.76
30	Galvez/Frye Basins Ridge	9.00
31	29 Fathom Bank	5.71
32	"Monterrey" Wrecks*	32.25
33	Tunica Mound	9.00
34	Jeanerette Dome	14.15
35	Jakkula Bank	13.72
36	Penchant Basin Rim	18.98
37	Ewing Bank	19.52
38	Henderson Ridge Mid-South	9.00
39	<i>GulfOil*</i>	9.00
40	Henderson Ridge Mid-North	10.73
41	<i>GulfPenn*</i>	9.00
42	Whiting Dome	9.67
43	"Mardi Gras" Wreck*	9.00
44	Horn Dome	8.34
45	<i>Anona*</i>	9.00
	Net Increase in Area Over Current Sanctuary	878.97
	Alternative 5 Total Area	935.18

NOAA evaluated sites for inclusion in Alternative 5 using substantially the same evaluation criteria applied by the BEWG. NOAA supplemented this analysis using the factors for evaluating new sanctuary nominations that were implemented in 2014 (79 FR 33851; June 13, 2014). NOAA developed the proposed boundaries for each site included in Alternative 5 using the same GIS algorithm applied to sites in Alternatives 3 and 4 (see Appendix B2). Similarly, NOAA proposed simplifying the recommended boundaries of sites in Alternative 5 for ease of enforcement and consistency with existing regulatory regimes. Additional detail on the features

included in Alternative 5 is found in Appendix D. In total, the 45 proposed boundaries included in Alternative 5 would protect the most comprehensive suite of known high-value benthic habitats and cultural resources across the north central Gulf of Mexico region of all of the proposed alternatives.

Alternative 5 combines three of the proposed boundaries included in Alternative 4 into a single large complex of seven significant features extending east from West Flower Garden Bank to Bright Bank in recognition of the substantial structural and functional connectivity among these features, as demonstrated by the extent of the “core sensitivity zone” mapped between these features using the GIS algorithm applied to develop proposed boundaries under Alternatives 3, 4, and 5.

This alternative modifies one of the other proposed boundaries included in Alternative 4 in the northwestern banks subregion, extending the proposed boundary around the Bouma-Bryant-Rezak-Sidner complex to the south to encompass Tresslar and Antoine banks. Two of the proposed deep coral site boundaries from Alternative 4 are also modified in Alternative 5; the Biloxi Dome site boundary is extended to the southwest to incorporate the historically important wrecks of the S.S. *Robert E. Lee* and the *U-166*; and the Gloria Dome site is extended to the northeast to incorporate the culturally significant and scientifically important wreck of the *Deepwater Horizon* oil platform and wellhead (i.e., as a memorial to the tragic and nationally significant event, which was the first oil spill in U. S. history to be officially designated a “Spill of National Significance” by the U. S. Coast Guard, and for long-term study of recovery, conservation and management benefits (Deepwater Horizon NRDA Trustees 2016)).

Advances in understanding of the maritime archeological resources present in the Gulf of Mexico over the last decade (Church et al. 2007, Ford et al. 2008, NOAA 2012b, Brooks et al. 2013, Evans et al. 2013, NOAA 2014) support the inclusion and evaluation of such resources in Alternative 5. In addition to the two shipwrecks identified above, Alternative 5 would include six discontinuous boundaries to encompass eight additional historically significant shipwrecks: the USS *Hatteras* on the continental shelf and the three “Monterrey” wrecks, the *GulfOil*, the *GulfPenn*, the “Mardi Gras” wreck, and the wreck of the *Anona* on the continental slope.

Additional discontinuous boundaries are also proposed under Alternative 5 to encompass four biologically and geologically significant sites in the northwest banks subregion on the continental shelf: Claypile Bank, 29 Fathom Bank, Jakkula Bank, and Ewing Bank. Jakkula Bank and 29 Fathom Bank were considered by the Advisory Council but not included in their 2007 recommendation for sanctuary expansion. Their inclusion in this analysis is warranted by the advances in scientific understanding of these sites that have been made in the intervening time since that recommendation. Similarly, Claypile Bank and Ewing Banks were not considered by the Advisory Council, but are included and evaluated here due to the significant advances in understanding and heightened awareness of the significance of these sites that have developed in the last decade.

Finally, eight additional discontinuous boundaries are proposed under Alternative 5 to incorporate additional mesophotic and deep coral ecosystem sites across the north central Gulf of Mexico. Proposed boundaries around the Galvez/Frye Basins Rim site, Tunica Mound site, Jeanerette Dome site, Penchant Basin Rim site, Henderson Ridge Mid-South and Mid-North

sites, Whiting Dome site, and Horn Dome site would extend protections around additional high value mesophotic and deep benthic habitats. These eight additional sites were discovered, characterized, and evaluated in the course of the same studies described above that identified the 11 deep coral sites included in Alternative 4 (MacDonald et al. 1995, MacDonald et al. 2002, CSA 2007, White et al. 2012, Brooks et al. 2013, Brooks et al. 2014, Fisher et al. 2014a, Fisher et al. 2014b, and NOAA 2014).

3.8 Common to All Alternatives: Implementing Routine Sanctuary Field Activities

As part of NOAA’s management responsibilities for FGBNMS, NOAA conducts routine field activities in sanctuary waters and in vessel transit routes to the sanctuary. Field activities aim to further resource protection goals, promote stewardship among local stakeholders, and educate the public and research community on the sanctuary. The typical activities conducted at FGBNMS are: operating and maintaining sanctuary vessels, scuba operations, deployment of equipment on the seafloor, and deployment of ROVs and other uncrewed systems. Deployment of equipment on the seafloor includes the deployment and maintenance of mooring buoy systems. As part of applying the existing sanctuary regulations and management actions to the expansion areas, under all action alternatives NOAA would place mooring buoys at certain banks to facilitate access and to provide alternatives to anchoring.

NOAA expects the type and intensity of activities that would be conducted at individual banks would be the same under all alternatives. The estimated annual activity level of field operations at FGBNMS in a given year can be reviewed in NOAA’s Draft Programmatic Environmental Assessment of Field Operations in the Southeast and Gulf of Mexico National Marine Sanctuaries¹⁹. When conducting field activities, NOAA operates all small boats in accordance with all NOAA Small Boat Program guidelines²⁰ and complies with all NMFS regulations regarding interactions with protected species and habitats. NOAA also implements self-imposed best management practices and standing orders to minimize impacts on sanctuary resources, including living marine resources, seafloor habitat, and cultural and historical resources.²¹

¹⁹ See: <https://sanctuaries.noaa.gov/media/docs/20180807-pea-of-field-opsse-gom-nms.pdf>

²⁰ See: <https://www.oma.noaa.gov/find/media/documents/small-boat-standards-and-procedures-manual-41-edition>

²¹ See: <https://floridakeys.noaa.gov/media/blueprint/onms-best-management-practices-pea.pdf>

Chapter 4

Description of Affected Environment

4.1 Introduction

This chapter provides a narrative description of the resources and uses of the study area that could be affected by the alternatives presented in Chapter 3. The information in this section provides the basis for NOAA's evaluation of the potential environmental impacts of the range of alternatives, as described in Chapter 5. The scope of the affected environment is:

- the physical environment (air quality and climate, noise, scenic and visual resources, geology and substrates, water),
- the biological environment (living marine resources and protected species and habitats),
- marine area use, recreation, and socioeconomics, and
- cultural and historic resources.

The geographic study area is the north central Gulf of Mexico - generally defined as the area between 87° and 95° W longitude. This study area recognizes that the sanctuary is part of a larger ecological system. Accordingly, NOAA evaluated resources throughout that ecological system, in order to better evaluate the nationally significant features in the region, and to take into account the multiple potential ecological and human use impacts of sanctuary expansion within the larger ecosystem.

NOAA considered the 2010 Deepwater Horizon oil spill when characterizing the environment affected by the proposed sanctuary expansion alternatives. The oil spill affected the north central Gulf of Mexico and sites considered under Alternatives 4 and 5. Based on the current information about the spill and the ensuing restoration plan²², Alternatives 4 and 5 may represent important opportunities for research into and recovery from observed impacts, and their inclusion in this FEIS acknowledges the importance and regional nature of the Deepwater Horizon oil spill and its connectivity to the proposed sanctuary expansion.

4.2 Physical Environment

The Gulf of Mexico encompasses over 615,000 square miles of coastal and open ocean, making it the ninth largest body of water in the world. It is one of the most ecologically and economically productive ecosystems in North America. U.S. Federal waters in the Gulf of Mexico encompass approximately 243,926 square miles. Of this, approximately 5%, or 12,131 square miles, is estimated to have hard bottom substrate (Jenkins 2011).

The study area for this FEIS is the north central Gulf of Mexico, generally between 87° and 95° W longitude. U.S. federal waters in this area encompass approximately 122,820 square miles, with approximately 2%, or 2,532 square miles, comprising hard bottom substrate (Jenkins 2011). The offshore environment of the north central Gulf of Mexico is characterized by a wide, shallow sloping continental shelf extending over 100 miles offshore from the Texas-Louisiana border,

²² See: https://www.gulfspillrestoration.noaa.gov/sites/default/files/2019-12%2000%20TIG_RP2EA_PublicFinal_2019_signatures.pdf

narrowing to a width of between 40 and 60 miles offshore of eastern Louisiana, Mississippi, and Alabama. The continental shelf and slope of this area are geologically complex and contain a variety of offshore features that support diverse biological communities and numerous submerged cultural resources.

For purposes of this description of the physical environment, the study area is comprised of three general geographical components:

- 1) reefs and banks of the Texas–Louisiana shelf (including the Flower Garden Banks and other banks of the northwestern Gulf of Mexico);
- 2) hard bottom features of the Mississippi–Alabama shelf (also known as the Pinnacles area); and
- 3) deep coral ecosystems of the continental slope.

In the north central Gulf of Mexico, 50 to 100 miles (80 to 160 kilometers) off the coasts of Texas, Louisiana, Mississippi, and Alabama, dozens of underwater features rise from the seafloor near the edge of the continental shelf to form a complex of reefs and banks (also known as topographic features) (Rezak et al. 1983, Rezak et al. 1985). While the crests of most of these features lie more than 150 feet (46 meters) deep, a small number of them are shallow enough for coral reefs to have become established. Two of these features, East and West Flower Garden banks, reach within 54 feet (16 meters) of the surface and contain well-developed coral reefs (Bright 1977). West of the Mississippi River delta, numerous other features in this region contain a mix of coral reefs, coral communities, and mesophotic coral habitats (Rezak et al. 1985). East of the Mississippi, off the coasts of Mississippi and Alabama, is the Pinnacles area, also harboring mesophotic coral habitats. There are dozens of reefs and banks along the edge of the continental shelf between the current sanctuary and the Pinnacles area that form significant hard bottom features (Rezak et al. 1985, Gardner et al. 2002, Gardner and Beaudoin 2005, Chowdhury and Turco 2006). Deep coral ecosystems are present off the shelf edge on the continental slope from 755 to 8,530 feet (230 to 2,600 meters) deep. Some of these sites feature both mesophotic and deep coral communities (Brooke and Schroeder 2007). Details about each of the banks and features found in each of these subregions can be found in Appendix D.

In addition to these natural features, a number of maritime archeological sites are present in the region, with many shipwrecks identified as important cultural and historic resources spanning almost half a millennium from the early European colonial period to today. Details about the cultural and historic resources found in the region can be found in Section 4.5 and Appendix E.

4.2.1 Air Quality and Climate

The federal Clean Air Act requires the EPA to set National Ambient Air Quality Standards (NAAQS) for six common air pollutants. These common air pollutants are: particulate matter, ground-level ozone, carbon monoxide, sulfur oxides, nitrogen oxides, and lead. These pollutants are called "criteria" air pollutants because they are regulated by developing human health-based and/or environmentally-based criteria (science-based guidelines) for setting permissible levels of pollutants.

The primary sources of air pollution in the study area are oil and gas industry operations, diesel exhaust from ship engines, and incineration of garbage on vessels. Vessel traffic within the study

area contributes to the degradation of air quality. Diesel combustion in vessel engines produces carbon monoxide, carbon dioxide, and hydrocarbons. Diesel engine exhaust has a high sulfur content and produces sulfur dioxide, nitrogen dioxide, and particulate matter.

Air emission potential from offshore oil and gas sector operations on the OCS can vary considerably, depending on the specifics of the physical setting and technologies. For example, mobile offshore drilling units involved in deepwater drilling in the Gulf of Mexico may emit considerably more emissions than a rig anchored to the sea floor in shallow water. The construction and operation of facilities on the OCS emit a significant amount of air pollution which adversely affects coastal air quality in the United States. Operational emissions from an OCS platform and marine vessels transiting to and from the platform can routinely exceed 500 tons of nitrogen and 100 tons of reactive hydrocarbons annually. A single exploratory drilling operation could emit approximately as much air pollution on a daily basis as a large state-of-the-art oil refinery (Ramseur 2012).

During the exploration stage of oil and gas operations, non-platform emissions sources are combustion from the equipment on the drilling rig or combustion of fuel on support vessels. During the oil and gas production stage, platform emission sources include boilers, diesel engines, combustion flares, fugitives, glycol dehydrators, natural gas engines, pneumatic pumps, pressure/level controllers, storage tanks, and cold vents. During the oil and gas development stage, non-platform emissions sources are combustion of fuel on support or survey vessels to lay pipelines, install facilities, or map geologic formations and seismic properties (Wilson et al. 2017). Air pollutants released by these OCS sources include: carbon monoxide, nitrogen, particulate matter, sulfur dioxide, and volatile organic compounds (VOCs). Nitrogen and VOCs are precursors to ozone, which is formed by photochemical reactions in the atmosphere. These OCS sources also release greenhouse gas (GHG) emissions into the atmosphere, such as carbon dioxide, methane, and nitrous oxide (Wilson et al. 2017).

The 2014 Gulfwide Emissions Inventory Study (Wilson et al. 2017) indicates that, for calendar year 2014, commercial marine vessels emitted the majority of air criteria pollutants in the Gulf of Mexico on the OCS, with the exception of carbon monoxide and VOCs. Carbon monoxide and VOCs are primarily emitted from oil and gas production platforms and non-platform sources. Commercial marine vessels emitted the majority of the carbon dioxide emissions in the study area, representing 42% of total carbon dioxide emissions on the OCS (Wilson et al. 2017). Oil and gas production platforms and non-platform sources emitted the majority of methane. Biogenic and geogenic sources emitted the majority of nitrous oxide.

According to the 2014 Gulfwide Emissions Inventory Study, oil and gas production platform and non-platform sources on the OCS accounted for:

- 72% of total carbon monoxide emissions,
- 36% of total nitrogen oxide emissions,
- 57% of total VOC emissions,
- 99% of total methane emissions,
- 30% of total particulate matter emissions, and
- 12% of total sulfur dioxide emissions.

Natural gas engines on oil and gas platforms represented the largest carbon monoxide emission source, accounting for 90% of the total estimated oil- and gas-related carbon monoxide emissions. Platform vents and fugitive sources account for the highest percentage of VOC (29% and 27%, respectively) and methane (38% and 33%, respectively) emissions.

The 2014 estimates for emissions from oil and gas production platform and non-platform sources represent an overall decrease in all emission estimates since the 2011 Inventory Study. Over the same time period, estimated emissions from commercial marine vessels increased due to the use of AIS data which provided a more complete assessment of vessels transiting the Gulf of Mexico (Wilson et al. 2017).

Accidental events could impact air quality by releasing criteria air pollutants into the air at rates above the EPA-regulated permissible levels of pollutants. Such accidental events could include: spills of oil, natural gas, condensate, refined hydrocarbons, hydrogen sulfide release, and fires. Accidents resulting in release of high concentrations of hydrogen sulfide could result in deaths as well as environmental damage. BOEM and BSEE regulations and Notices to Lessees are in place to protect workers from hydrogen sulfide releases. Emergency response activities could also impact air quality by releasing criteria air pollutants. These emergency response activities include in-situ burning, use of flares to burn gas and oil, and use of dispersants applied from aircraft. Measurements taken during an in-situ burning event show a major portion of compounds were consumed in the burn; therefore, pollutant concentrations would be expected to be within the NAAQS air quality standards.

These offshore emissions are not expected to change onshore air quality classifications due to their concentrations, the prevailing atmospheric conditions, emissions height, emission rates, and the distance of these emissions from the coastline. However, the potential impacts of catastrophic accidental events on onshore air quality are still uncertain.

During the Deepwater Horizon event, a number of air samples were collected, and EPA found air pollutants in coastal communities were at levels well below those that would cause short-term health problems. Air monitoring conducted in the north central Gulf of Mexico to date has not found pollutants at levels expected to cause long-term harm to human health. However, questions have been raised about the effects of the Deepwater Horizon event on public health and the workers due to the releases of particles and toxic chemicals through evaporation from the oil spill, flaring, oil burning, and the applications of dispersants. More recent assessments of worker health found exposure levels were generally below occupational exposure limits. Air quality impacts include the emission of pollutants from the oil that are hazardous to human health and have had the potential to occur during this accidental event. The effects of some of the pollutants accumulate over a lifetime and can contribute to diseases that can possibly be fatal years after the exposure. However, extensive personal air sampling to ensure worker safety, and onshore air monitoring to ensure public safety, showed levels of pollutants remained within acceptable ranges.

Climate is defined as the average statistics of weather, which include temperature, precipitation, and seasonal patterns such as storms and wind, in a particular region (EPA 2020). Global climate change refers to the long-term and irrevocable shift in these weather related patterns, including the rise in the Earth's temperature due to an increase in heat-trapping or GHGs in the

atmosphere. Ice cores, or cylinders of ice drilled from an ice sheet or glacier, contain information about past temperatures that are enclosed within bubbles of air. These air bubbles contain a sample of the past concentration of gases (including carbon dioxide and methane) in the atmosphere, which can be directly measured (BAS 2014). Using ice cores and geological records, baseline temperature and carbon dioxide data extend back thousands of years (e.g. 123,000 years in Greenland and 800,000 years in Antarctica). Over the last 10,000 years, the rate of temperature change has typically been incremental, with warming and cooling occurring over the course of thousands of years. However, scientists have observed an unprecedented increase in the rate of warming over the past 150 years, roughly coinciding with the global industrial revolution and deforestation, which introduced tremendous amounts of GHGs into the atmosphere (BAS 2014).

Unlike emissions of criteria air pollutants, which have local or regional impacts, emissions of GHGs have a broader, global impact and contribute to global warming or global climate change. Global warming is a process whereby GHGs accumulating in the atmosphere contribute to an increase in the temperature of the earth's atmosphere. The principal GHGs contributing to global warming are carbon dioxide, methane, nitrous oxide, and fluorinated compounds. These gases allow visible and ultraviolet light from the sun to pass through the atmosphere, but they prevent heat from escaping back into space.

Among the potential implications of global warming are rising sea levels, and adverse impacts on water supply, water quality, agriculture, forestry, and habitats. In addition, global warming may increase electricity demand for cooling, decrease the availability of hydroelectric power, and affect regional air quality and public health. Like most criteria and toxic air contaminants, much of the GHG production comes from motor vehicles and to a lesser extent motorized marine vessels. Climate change affects public health because higher temperatures result in more air pollutant emissions, increased smog, and associated respiratory disease and heart-related illnesses. Climate change also affects ocean acidity, causing a decrease in the pH of the ocean, as a result of uptake of carbon dioxide from the atmosphere. This condition is called ocean acidification. Ocean acidification has potentially devastating ramifications for all ocean life, from the smallest, single celled algae to the largest whales.

In coastal areas adjacent to the study area, coastal wetlands are undergoing the highest rates of loss anywhere in the U. S., are threatened by sea level rise, and, in many areas, cannot naturally move inland due to existing coastal development. This condition has the potential to threaten the region's estuarine-dependent fish species and may allow non-native species to thrive.

4.2.2 Noise Environment

Noise in the offshore Gulf of Mexico environment, both above and below the water, can come from natural and anthropogenic sources. Natural noise sources include sources at the ocean surface (e.g. ocean surface waves), physical sources (e.g. pressure fluctuations associated with thermal agitation of ocean medium), atmospheric sources (e.g. thunder, lightening), geologic sources (e.g. seismic energy volcanic activity), marine mammal sound production (e.g. calls, whistles, echolocation), and fish and invertebrate sound production (e.g. snapping shrimp, fish feeding) (National Research Council 2003).

Anthropogenic noise sources include oil and gas industry operations, commercial shipping and other general vessel traffic (e.g. cruise ships, fishing vessels, charter/head boats, tour boats), aircraft, research, energy and mineral exploration, construction, seismic devices, pingers, and military activities (e.g. use of sonar and explosives). Noise generated from these activities can be transmitted through both air and water, and may be long-term or temporary. The intensity level and frequency of the noise emissions are highly variable, both between and among the types of sources (National Research Council 2003). The rest of this section and the analysis in Chapter 5 focuses on the impacts of anthropogenic sources of noise on marine organisms.

Noise associated with oil and gas development results from seismic surveys, operation of offshore platforms and drilling rigs, and helicopter and service-vessel traffic to and from platforms or rigs. Noise from these activities may affect marine organisms in the proposed expansion areas. Whether a sound is detected by marine organisms depends both on the acoustic properties of the source (spectral characteristics, intensity, and transmission patterns) and the sensitivity of the hearing system in the marine organism. Noise can cause harassment, physical damage, or death to an exposed animal and may constitute a “take” of endangered and threatened species as defined under the ESA or MMPA. Source levels well above hearing thresholds can damage hearing or induce behavioral changes (Richardson et al., 1995).

Potential impacts of sound on marine organisms can range from no or very little effect to various levels of behavioral reactions, physiological stress, threshold shifts, auditory masking, and direct trauma. Responses to sound generally fall into three categories: behavioral, acoustic, and physiological (Nowacek et al. 2007). Noise pollution can be intense and acute or less intense and chronic (Hildebrand 2004). Hildebrand (2004) states that estimates suggest noise levels in the ocean were at least ten times higher in the early 2000s than a few decades prior.

Commercial shipping is considered to be the major contributor to low frequency noise in the world’s oceans (Hildebrand 2004). Pirotta et al. (2012) investigated the effects of vessel noise on beaked whales (Ziphiidae) and found that broadband ship noise caused a significant change in beaked whale behavior up to at least 3.2 miles (5.2 kilometers) away from the vessel. Rolland et al. (2012) found that reduction in shipping noise in the Bay of Fundy led to a significant reduction in stress-related fecal metabolites in North Atlantic right whales (*Eubalaena glacialis*). Visual observations of bowhead and other baleen whales (Balaenidae) indicate that individuals can be displaced when exposed to continuous industrial sound that exceeds approximately 120 dB or 1 μ Pa (microPascal: a unit of pressure; Richardson et al. 1995). In addition to commercial shipping, smaller commercial vessels and recreational watercraft add noise to the ocean environment.

Active sonar, as is used by the Navy in Gulf of Mexico waters, emits high-intensity acoustic energy and can be categorized as low-frequency (<1000Hz), mid-frequency (1-20kHz) and high frequency (>20kHz) (Hildebrand 2004). Hildebrand (2004) suggests that low-frequency active sonars have long ping lengths and nearly continuous duty cycles that increase the likelihood they will impact marine mammal populations. Humpback whales (*Megaptera novaeangliae*) in the Atlantic have been found to sing longer songs during low frequency active sonar transmissions by the Navy, and it has been suggested this indicates whales are compensating for acoustic interference (Miller et al. 2000). Frstrup et al. (2003) found a similar result and

documented a delayed response to low frequency active sonar, with humpback whales showing effects up to two hours after the final sonar signal. Humpback whales near the Hawaiian Islands displayed avoidance behavior in playback experiments to assess the effects of low-frequency sonar on whales (Maybaum 1993). There is growing evidence of a potential link between military sonar exercises and cetacean strandings, particularly with respect to beaked whales (Ziphiidae). Reports of such strandings include events in the Canary Islands, Bahamas, and Greece (Simmonds and Lopez-Jurado 1991, Frantzis 1998, Cox et al. 2006). Jepson et al. (2003) suggested behavioral reactions to sonar may contribute to strandings and decompression-like symptoms found in stranded cetaceans. Nowacek et al. (2007) provides an extensive overview of research on the effects of sounds on marine mammals.

Numerous managed fish species that occur in the proposed expansion areas are considered soniferous, or sound sensitive (Normandeau Associates, Inc. 2012). These species use natural sound (producing sound, or feeling/listening to sound) for navigation, spawning, seasonal migrations, feeding, etc. There is also growing evidence that settlement stage reef fish, crustaceans (Montgomery et al. 2006), and coral larvae (Vermeij et al. 2010) use reef noise as a cue for orientation for suitable settlement substrate – a strategy that could be compromised by masking from noisy marine landscapes. This warrants consideration as part of the need for continued successful recruitment to the habitats presented in the alternatives.

4.2.3 Scenic and Visual Resources

Visual resources refer to the characteristics and elements that make a specific environment distinctive and cohesive (i.e. visual character), while scenic resources are primarily used to refer to natural features (i.e. scenic quality). Scenic and visual resources have direct economic impact, such as the devaluation of marine use (e.g. tourism) with degradation of visual quality, because visual quality is tied to perceptions of worth, care, and economic stability. Research verifies the importance of the quality and preservation of scenic and visual resources (ASLA, n.d.).

The striking visual characteristics of the Flower Garden Banks and similar features in the proposed expansion areas are among the primary aspects of the underwater environment of the region of interest to the general public. For most citizens, the depths of the Gulf of Mexico are personally inaccessible. Therefore, underwater video and photography are valuable tools to bring the seafloor to the general population. Underwater photography is a popular activity among divers visiting the shallower portions of these areas. It is also a crucial element of the sanctuary's education and outreach efforts in increasing awareness and sharing the beauty of the resources. Live streaming events through remote video equipment, e.g. the *Okeanos* and the *Nautilus*, can attract large audiences and help to communicate the beauty and significance of these areas.

In 2019, the Global Foundation for Ocean Exploration conducted ROV deployments at FGBNMS and deepwater coral ecosystems of other reefs and banks on the continental shelf, and transmitted a live video feed to viewers on land. These satellite transmitted videos of the explorations enabled live interaction between the research teams, the public, and experts on land. Alternatively, the live stream of oil flowing from the Deepwater Horizon wellhead, and footage of oil slicks at the surface during that event was likely among the most-watched video

footage from the Gulf of Mexico region, emphasizing the value of the scenic and visual resources of healthy marine ecosystems in the region.

The presence of visible drilling and production platforms, as well as heavy vessel and air traffic, all affect the scenic and visual environment in the offshore Gulf of Mexico. The aesthetic qualities of visible industrialized infrastructure are subjective, but are generally regarded as negative, particularly in landscape/seascape settings such as National Parks or national marine sanctuaries, where the purpose of designation is often associated with an area's defining natural features. Visibility of industrial structures on an open horizon that may be frequented by people precisely for the open horizon is a net negative aesthetic and a conflict in space use (Brody et al. 2006).

The greatest visual impact from industry on the environment in the offshore Gulf of Mexico results from the presence of extensive oil and gas industry infrastructure, with thousands of platforms installed in the U.S. Exclusive Economic Zone. A number of structures are visible from a vessel within the current sanctuary boundaries, and additional structures are visible from the proposed expansion areas. The thousands of vessel transits annually in shipping lanes in the Gulf of Mexico also produce significant visual impacts. Oil spills and marine debris also contribute to adverse impacts on scenic and visual resources in the region. These issues are widely recognized as major threats to the aesthetics of coastal areas, especially recreational beaches, but they also individually and collectively affect the fishing industry, tourism, and recreation in the offshore environment. The effects of an oil spill on aesthetics depend on factors such as season, extent of pollution, location, condition and type of oil, tides and currents, the type of cleanup methods used, as well as the effectiveness of any cleanup methods used.

4.2.4 Geology and Substrates

The OCS and continental slope off the coasts of Texas, Louisiana, Mississippi, and Alabama are geologically complex. The continental shelf in this region slopes gradually from the shoreline to depths from 325-650 feet (99-198 meters), and is characterized primarily by sediments of terrigenous origin. This region is punctuated by a series of topographic features scattered along an area parallel to the edge of the shelf. Most of these features were formed as the result of the movement of underlying salt deposits (also called salt domes or diapirs).

About 190 million years ago, during the Jurassic Period, the Gulf of Mexico was very shallow. The hot dry climate at the time caused intense evaporation, depositing thick layers of salt on the seafloor. As the Gulf of Mexico deepened, rivers deposited mud, silt, and sand on top of the salt layers, forming layers of mudstone, siltstone, and sandstone. Over time, the weight of these accumulating deposits caused the underlying salt to flow to areas where the overlying rocks were weak or faulted. The salt rose, bowing up or breaking through the overlying rock layers. This movement of the salt created outcrops of rock and relief on the seafloor of 165 feet (50 meters) or more. These features are the foundation on which the coral reef and bank biological communities of the north central Gulf of Mexico have established.

The Pinnacles area includes features thought to be related to sea level still-stands during the last glaciation (peak of last glacial maximum approximately 18,000 years before present time).

Surficial sediments are largely related to three late Pleistocene deltas, composed of thousands of carbonate hard bottom mounds of varying sizes, formed in varying sea level episodes.

Regional topography of the continental slope consists of basins, knolls, ridges, and mounds derived from the dynamic adjustments of salt to the introduction of large volumes of sediment over long time scales. Superimposed on this underlying topography is a smaller class of mounds, flows, and hard bottoms that are the products of the transport of fluidized sediment, mineral-rich formation fluids, and hydrocarbons to the present sediment-water interface. The geologic response to the expulsion process is related both to the products being transported and the rate at which they arrive at the seafloor. Mud volcanoes and mudflows are typical of rapid flux settings where fluidized sediment is involved. Carbonate mounds formed by chemical precipitation, hard bottoms, crusts, and nodules are common to settings where hydrocarbons are involved (Brooks et al. 2013).

Activities that could affect geology and substrates, including dredge and fill activities and mineral extraction, are regulated by the U.S. Army Corps of Engineers (USACE) under the Rivers and Harbors Act of 1899 and by BOEM and BSEE under the Outer Continental Shelf Lands Act, as described in Appendix G.

4.2.5 Water Resources

Moving along the coast, near-shore currents tend to flow from east to west. Beyond the coastal zone, water movement on the continental shelf off Texas, Louisiana, Mississippi, and Alabama can be variable depending upon forcing mechanisms including tides, wind, heating, river runoff, and interaction with shallow flow of the deep basin (Rezak et al. 1983). While these local conditions influence the current patterns in the northwestern Gulf of Mexico, it is the Gulf Loop Current and its associated “spin-off” eddies and gyres that are the main drivers of water circulation in the Gulf of Mexico (Sturges and Lugo-Fernandez 2005).

The Gulf Loop Current enters the Gulf of Mexico through the Yucatan Channel between Cuba and Mexico as a massive river of warm water, reaching speeds up to 6.5 feet per second (almost 4 knots) (Badan et al. 2005). The Gulf Loop Current flows northward, at times reaching as far as 28° N before looping clockwise along the west Florida shelf to exit through the Florida Straits (see Figure 4.1). The waters of the Gulf Loop Current then join the waters of the Caribbean Current and the Antilles Current to flow northward along the southeastern U.S. coast and become the Gulf Stream. As the Gulf Loop Current reaches its maximum northern position in the Gulf of Mexico, it often becomes unstable, shedding large eddies (or gyres) that spin primarily clockwise as they drift westward at speeds of 0.6-5 miles/day (0.97-8 kilometers/day). These eddies can have a diameter of 125-250 miles (201-402 kilometers), and last for intervals of 0.5-18.5 months (Schmitz et al. 2005). Before they dissipate, these eddies can have a significant influence on current patterns in the northwestern Gulf of Mexico.

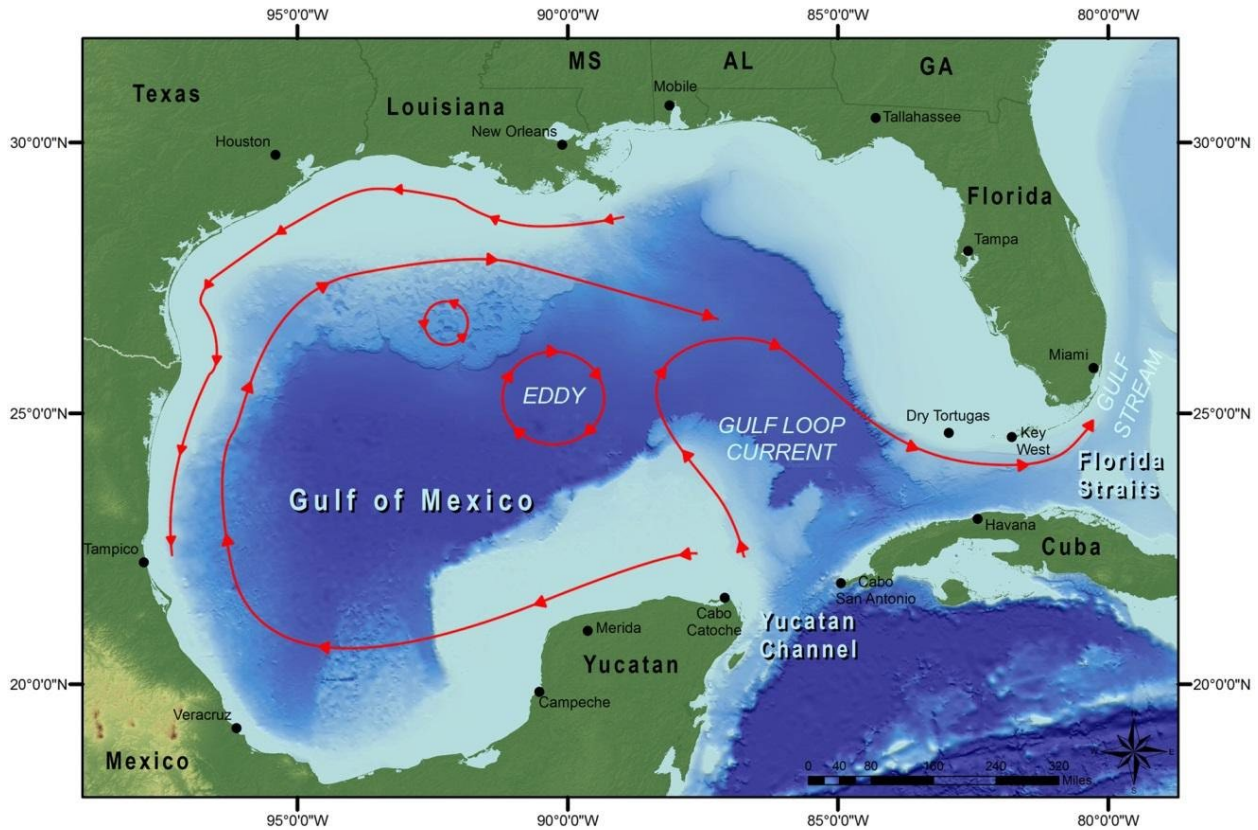


Figure 4.1. Predominant Currents and Eddies in the Gulf of Mexico. Image: NOAA

Runoff from precipitation on almost two-thirds of the land area of the continental U.S. eventually drains into the Gulf of Mexico primarily via the Mississippi River and other waterways leading to the Gulf of Mexico. The combined discharge of the Mississippi and Atchafalaya Rivers alone accounts for more than half the freshwater flow into the Gulf of Mexico and is a major influence on salinity levels in coastal waters on the Louisiana/Texas continental shelf. The annual freshwater discharge of the Mississippi/Atchafalaya River system represents approximately 10% of the water volume of the entire Louisiana/Texas shelf to a depth of 295 feet (90 meters) (GMFMC 1998), with a discharge of 600,000 cubic feet per second, or 1.5 billion cubic meters per day, at New Orleans (NPS 2015). Riverine flows and the sediment they contain have determined the geologic composition of much of the continental shelf as sea levels have risen over the last 100,000 years. This process has drowned river valleys and deltas that previously extended to the edge of the continental shelf and left behind deposits such as the sand banks at Ship Shoal, Sabine Bank, and Heald Bank at prior shoreline or barrier island locations (Anderson and McBride 1996).

Freshwater and sediment mix with the salt water of the north central Gulf of Mexico to create extensive areas of biologically rich estuarine and offshore habitats. Freshwater and sediment inflows also carry pollution from upstream agriculture, stormwater runoff, industrial activities, and wastewater discharges into the Gulf of Mexico. In bottom water (the lowermost layer of ocean water), low oxygen availability (a condition known as hypoxia) is a major water quality

problem in portions of the north central Gulf of Mexico and its estuaries. This is caused in large part by nutrient loading from river inflows. The input of nutrient-rich fresh water to the coastal area fuels phytoplankton blooms in the water column. Following the eventual transportation of dead and decaying plant material to the ocean floor, this organic-rich biomass undergoes decomposition by bacteria and results in the depletion of oxygen (eutrophication) at depth (Deepwater Horizon NRDA Trustees 2016). The Gulf Loop Current and Mississippi/Atchafalaya River system, as well as a semi-permanent, anticyclonic gyre in the western Gulf of Mexico, significantly affect oceanographic conditions throughout the Gulf of Mexico.

The reefs and banks of the northwestern Gulf of Mexico are located from 60-115 miles (97-185 kilometers) from the shore, so they are positioned well away from the normal influence of coastal runoff and nearshore eutrophication. Chlorophyll and nutrient levels are typically low in these areas, and indicative of oligotrophic oceanic conditions. Water temperatures in the region of FGBNMS typically range from 64°F (February) to 86°F (August), and salinity ranges from 34 to 36 parts per thousand. These values are well within the range of that necessary for coral reef growth, although winter temperatures approach the lower limit of some coral species' tolerance.

The Pinnacles area is closer to shore than the reefs and banks of the northwestern Gulf of Mexico. Water properties in the lower half of the water column in the Pinnacles area appear to be determined by the presence of Gulf of Mexico waters with salinity typically 36 to 36.5 parts per thousand. Upper portions of the water column in the Pinnacles area appear to be determined by coastal processes and with salinity ranging from 30 to 35.5 parts per thousand (Weaver et al. 2001). Mississippi River plume water is typically present in the surface layer during the summer months. This general trend can be influenced by intrusion of Gulf Loop Current water or Gulf Loop Current eddies. Water temperatures in the Pinnacles Area can range annually from around 64°F to 79°F on the seafloor. A highly turbid or “nepheloid” layer is present near the sea floor throughout the Pinnacles area and is associated with lower bottom water temperatures.

The deep coral sites off the shelf edge are exposed to conditions much colder than those on top of the shelf. The deepwater coral species *Lophelia pertusa* is typically associated with water temperatures of 39°F to 54°F (Frederiksen et al. 1992, Freiwald et al. 1996), dissolved oxygen concentrations from 3 to 5 milliliters per liter, and a relatively constant salinity of 35 to 37 parts per thousand (Roberts et al. 2003).

As elsewhere globally, the climate change driven phenomena of ocean acidification, increasing ocean temperatures, and altered ocean salinities are affecting the north central Gulf of Mexico, representing threats to the habitats and species present in the region (Guinotte et al. 2006, Thresher et al. 2015). Ocean pH and calcium carbonate saturation are decreasing due to an influx of anthropogenic carbon dioxide to the atmosphere, which may inhibit the ability of marine organisms to build calcium carbonate skeletons, shells, and tests (Guinotte et al. 2006). Several of the deep coral ecosystem sites in the proposed expansion areas have been documented to have low concentrations of aragonite (a form of calcium carbonate used by scleractinian corals to build their skeletons) while harboring populations of corals, making these sites important as climate change sentinels for monitoring the effects of changing seawater chemistry on deep coral ecosystems.

Recent research has shown natural hydrocarbon seeps in the Gulf of Mexico release approximately 159,000 to 596,000 barrels of hydrocarbons annually into the water column (Macdonald et al. 2015). This is considered minimal relative to the 3.19 million barrels released over the course of the 87-day Deepwater Horizon oil spill, and approximately 44,000 barrels of dispersant applied in response to that event (Deepwater Horizon NRDA Trustees 2016). Studies have documented low-level chronic effects of pollutant releases (e.g. solid wastes, chemical contaminants, sewage) from platforms (Kennicutt 1995), ships (Copeland 2008), and land-based sources (NOAA 1998). Produced water discharges, for example, are estimated at roughly 1 billion barrels per year. While concentrations of hydrocarbons contained in this discharge are low (e.g., limited to 29 milligrams per liter monthly average or 42 milligrams per liter daily maximum under EPA's Region 6 National Pollution Discharge Elimination System (NPDES) general permit for offshore oil and gas activities), the total volume is quite large (Veil et al. 2004, Veil 2008).

Discharges to the waters of the U.S. Gulf of Mexico inside and outside the sanctuary boundary are regulated by EPA under the Clean Water Act, USACE under the Rivers and Harbors Act of 1899, and BOEM and BSEE under the Outer Continental Shelf Lands Act, as described in Appendix G. Discharges inside the FGBNMS boundary are also regulated under the NMSA and implementing regulations.

4.3 Biological Environment

In this section, NOAA characterizes the resources and communities comprising the biological environment of the north central Gulf of Mexico. These communities are grouped by the depth zone they inhabit, as described below.

4.3.1 Living Marine Resources

4.3.1.1 Coral Reef Zone

The coral reef zone includes the actively accreting reef-building (stony) coral assemblages of the coral reef crest (cap) of East and West Flower Garden banks (Figure 4.2)). The substrate in this zone is derived from the corals that comprise it. The coral reef zone can occur at depths from 54 to 150 feet (16 to 46 meters). Major habitats within this zone are described by the dominant coral species that characterize the assemblage.



Figure 4.2. Example of high coral cover in the coral reef zones on the crests of East and West Flower Garden banks. Photo: G.P. Schmahl/NOAA

The primary habitat of the coral reef zone of the Flower Garden Banks is *Orbicella* spp. (formerly *Montastraea*). The Flower Garden Banks habitat includes at least 24 species of stony corals and is interspersed by sand channels composed of coral sand (coral debris with molluscan and algal components). *Madracis* spp. habitat occurs on the peripheral parts of the primary reef structure at East and West Flower Garden banks in depths ranging from 90 to 140 feet (27 to 43 meters) where large knolls are characterized by almost monospecific stands of the small branching coral *Madracis auretenra* (Figure 4.3). *Stephanocoenia* sp. habitat is a lower diversity coral community occurring in water depths primarily below 118 feet (36 meters). This habitat occurs in areas surrounding the Flower Garden Banks, and is the primary coral reef habitat at McGrail Bank. The deeper depth ranges of these reefs are considered mesophotic coral habitat. The coral reef zone is present in the reefs and banks of the northwestern Gulf of Mexico (all alternatives).



Figure 4.3. Example of *Madracis* habitat found primarily on the flanks of East and West Flower Garden banks. Photo: Emma Hickerson/NOAA

4.3.1.2 Coral Community Zone

The coral community zone consists of areas containing reef-building coral species at lower densities than coral reef zones, or containing other coral reef-associated organisms, such as the hydrozoan *Millepora* sp., sponges, and tropical macroalgae. The coral community zone is found in depth ranges similar to those that contain coral reefs (54 to 150 feet; 16 to 46 meters) where other environmental factors have not allowed full development of reef building species to occur. The most distinctive habitat type in this zone is the *Millepora* sponge community that characterizes the shallowest peaks of the mid-shelf reefs at Stetson and Sonnier banks (Figure 4.4). The coral community zone also includes habitats characterized by scattered occurrences of stony corals or *Millepora* sp. at relatively low densities and includes a mix of other components including leafy algae, coralline algae, and sponges. Geyer and Bright banks are examples of these types of communities. The greater depth ranges of these reefs are considered mesophotic coral habitat. The coral community zone is present in the reefs and banks of the northwestern Gulf of Mexico (all alternatives).



Figure 4.4. Example of a coral community at Stetson Bank. While not classified as a true coral reef, this habitat harbors some reef-building corals, like this brain coral, as well as sponges and a variety of invertebrates. Corals this large are rare on Stetson Bank. Photo: G.P. Schmahl/NOAA

4.3.1.3 Mesophotic Coral Habitats

Mesophotic coral habitats are characterized by the presence of light-dependent corals and associated communities found at water depths where light penetration is low. The term mesophotic literally translates to 'meso' for middle and 'photic' for light. The dominant communities providing structural habitat in the mesophotic depth zone can be made up of coral, sponge, and algal species (NOAA 2011a). The fact they contain zooxanthellae and require light distinguishes these corals from true deepwater corals, though their depth ranges may overlap. Mesophotic coral habitats may include both light-dependent and non-light-dependent coral species and associated plant, invertebrate, and fish communities. Mesophotic coral habitats are typically found at depths of approximately 100 feet (30 meters) and can extend to over 500 feet (approximately 150 meters) in tropical and subtropical regions (Puglise et al. 2009, NOAA 2011a, Hourigan et al. 2015, Sulak and Dixon 2015, Deepwater Horizon NRDA Trustees 2016). For the purpose of this FEIS, the term mesophotic coral habitat is used to refer to biological communities associated with hard bottom features existing between approximately 165 feet (50 meters) and 980 feet (300 meters) deep. The use of 980 feet (300 meters) as the lower limit of this zone is consistent with other regulatory regimes (MMS 2009). This depth range has also been referred to as the "twilight zone" (Pyle 1996, Kahng et al. 2010).

Mesophotic reefs with horizontal summits harbor large populations of sponges, black corals (antipatharians), sea fans, sea whips (Alcyonacea, formerly gorgonians), and feather stars

(crinoids). Variation between biological communities on features is attributable, in many cases, to differences in a variety of environmental parameters, especially the potential for sedimentation (Gittings et al. 1992). Mesophotic corals and small, bottom-dwelling reef fish are common and conspicuous components of the mesophotic zone in the Pinnacles area at approximately 165 to 500 feet (50 to 152 meters) deep (Rezak et al. 1990, Gittings et al. 1992, Weaver et al. 2001).

Mesophotic communities also comprise the majority of hard bottom habitats in the deeper areas of the reefs and banks in the northwestern Gulf of Mexico. Most mesophotic corals are non-reef-building, though they include reef-building corals in the deeper areas of the coral caps at East and West Flower Garden banks and discrete areas on McGrail Bank. White stony branching corals (*Madracis* and *Oculina* spp.) and branching hydrocorals occur in patches, as well as the clustering solitary cup coral (*Rhizopsammia*). The stony corals can utilize photosynthetic symbionts when ambient light is sufficient, or live without symbionts, feeding upon plankton. The branches of corals form habitat for reef fishes and build new, though limited, calcareous reefs.

Octocorals (Alcyonacea) and black corals (Antipatharia) are also common and conspicuous on reefs in the north central Gulf of Mexico mesophotic zone (Figure 4.5). Octocorals are closely related to reef-building corals and sea anemones. Black corals are often mistaken for Alcyonacea corals, but unlike Alcyonacea, do not produce any type of calcium carbonate skeletal structures. The skeleton is organic and made of protein and chitin.



Figure 4.5. Typical mesophotic habitat in the northwestern Gulf of Mexico includes a variety of black corals, sea fans, octocorals, encrusting sponges, coralline algae, soft coral, and invertebrates. Also shown here are bank butterflyfish, rough tongue and threadnose basses. Photo: NOAA/UNCW-UVP

Collectively, octocorals and black corals comprise a diverse assemblage of sessile, benthic suspension feeders that occur on hard bottom and soft bottom habitats from the sublittoral to the abyssal zone in the Gulf of Mexico (Bayer 1954, Cairns and Bayer 2002). Colonies of both types on rocky outcrops and promontories provide habitat to demersal fish and small invertebrates. These colonies are vulnerable to surface-originated water pollution because they rely partly upon surface-originated organic matter for sustenance (Ribes et al. 1999, Sulak et al. 2008).

Mesophotic coral communities are found in depth ranges and habitats both with and without coralline algae. These habitats are present at sites on the continental shelf, edge, and slope (all alternatives).

4.3.1.3.1 Mesophotic Coral Habitats Within the Coralline Algae Zone

The coralline algae zone extends from approximately 148 to 320 feet deep (45 to 98 meters). It is characterized by crustose coralline algae and includes both algal nodule habitat and rocky outcrops where coralline algal crusts cover a substantial percentage of the hard substrate. Leafy algae are abundant in this zone to depths of at least 230 feet (70 meters). Algal nodules, or rhodoliths, are formed by coralline algae that lay down successive, concentric layers of carbonate around an initial “nucleus” (e.g., a rock fragment) to form irregular spheres 0.4 inches

to over 8 inches (1 to 20 cm) in diameter. Between 165 and 250 feet (50 to 76 meters), the nodules cover 60 to 100% of the bottom at the Flower Garden Banks (Minnery 1984). Several species of reef-building corals are scattered throughout the algal nodule zone, and can be locally abundant, including saucer shaped specimens of *Agaricia* spp. and *Leptoseris cucullata*. Leafy algae and sponges, most notably the toxic sponge *Neofibularia nolitangere*, are also common in this habitat.

The coralline algae zone also includes coralline algal reefs, which are typically low-relief (3 to 6 feet or 0.9 to 1.8 meters high), flat-topped rocky outcrops, ridges, and patch reefs. While coralline algae are the dominant benthic group on these reefs, rocky outcrops provide habitat for a variety of octocorals, black corals, sponges, and other organisms (Figure 4.6). The coralline algae zone is present at sites on the continental shelf, edge, and slope (all alternatives).

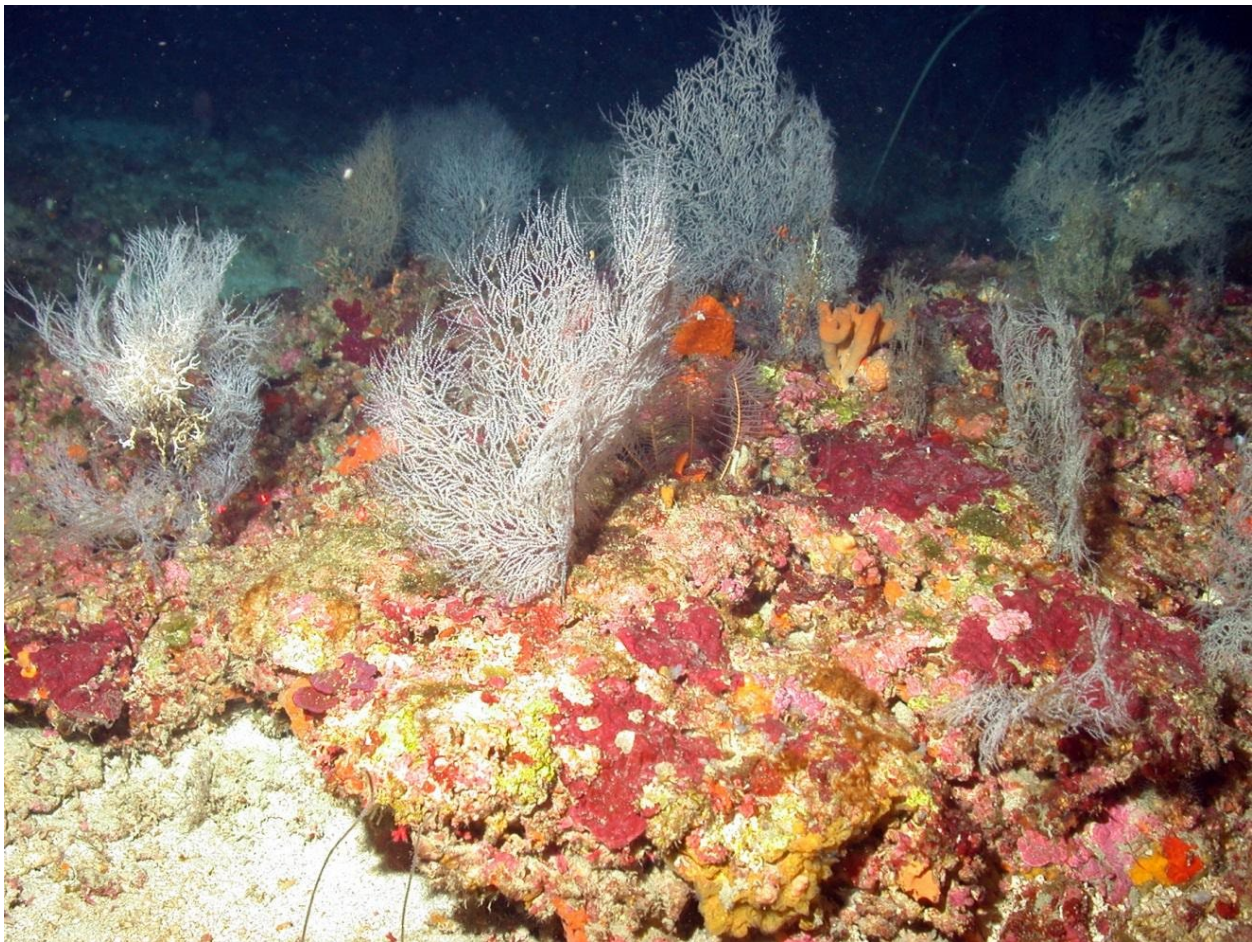


Figure 4.6. Typical coralline algae mesophotic reef colonized by a variety of black coral sea fans and whips, crinoids, encrusting and branching sponges, coralline algae, and leafy algae. Photo: NOAA/UNCW-UVP

4.3.1.3.2 Mesophotic Coral Habitats Beyond the Coralline Algae Zone

This zone occurs in water depths below where light levels are less than 1% of surface levels and/or in conditions where active photosynthesis by algae is not possible. This generally occurs below 295 feet (90 meters), but can be as shallow as 165 feet (50 meters) in turbid conditions. Solitary corals and deepwater branching corals, such as *Madrepora* spp. and *Oculina* spp., are also found here. This zone has a diverse assemblage of black corals, octocorals, soft corals,

crinoids, bryozoans, sponges, azooxanthellate branching corals and small, solitary hard corals (Figure 4.7). It includes both low and high relief rock outcroppings of various origins. Rock outcrops are often highly eroded, and lack coralline algal growth. Reef outcrops may be covered with a thin layer of silt in areas subject to frequent resuspension of sediments. This area of high sediment resuspension and turbid water was called the “nepheloid” zone by Bright et al. (1985) and Rezak et al. (1985).

Mesophotic coral habitats beyond the coralline algal zone are present in the reefs and banks of the northwestern Gulf of Mexico (all alternatives), the Pinnacles area (Alternatives 4 and 5), and the deep coral ecosystems on the continental slope (Alternatives 4 and 5).



Figure 4.7. Typical mesophotic coral habitat beyond the coralline algae zone in the northwestern Gulf of Mexico. Shown here are a variety of black corals, octocorals, branching stony corals, and roughtongue and threadnose basses. Photo: NOAA/UNCW-UVP

4.3.1.3.3 Soft Bottom Community

Deeper areas of the reefs and banks are characterized by a soft, level bottom community. This zone is composed of both land-based sediments, originating from coastal rivers, and carbonate sediments, composed of calcareous plankton remains or resulting from erosion of rocky outcrops and shallower coral and coral reef communities. Lower densities of conspicuous fishes and invertebrates occur in soft bottom communities compared to coral reef or rocky zones. Soft bottom communities are often characterized by sand waves, burrows, and mounds. Transitional zones between soft bottom communities and hard bottom features are characterized by exposed

rubble, isolated patch reefs, or exposed hard bottom. Areas with buried or exposed rubble are often colonized by black corals, octocorals, or solitary hard corals (Figure 4.8). These areas provide crucial habitat for infaunal populations. These habitats are present at sites on the continental shelf, edge, and slope (all alternatives).

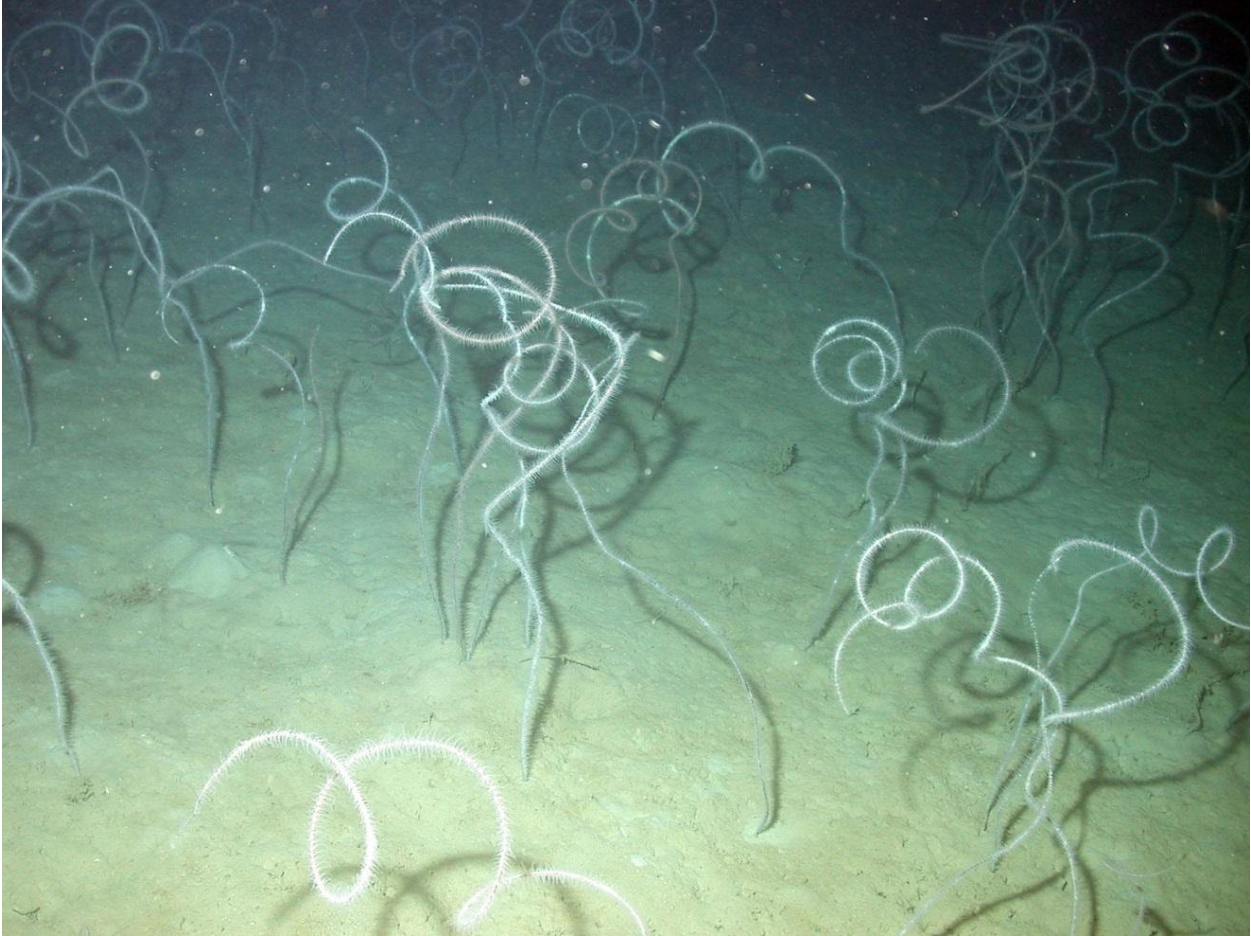


Figure 4.8. Example of soft bottom habitat colonized by black coral sea whips, indicating hard substrate beneath the sediment serving as attachment points. Photo: NOAA/UNCW-UVP

4.3.1.4 Deep Coral Ecosystems

Deep hard bottom coral ecosystems of the Gulf of Mexico typically inhabit natural carbonate substrates, below 980 feet (300 meters) deep. These communities consist of foundation species, those species that form large complex habitats at these sites, and their associated fauna ranging in size from large mobile fishes to microscopic organisms. The most prominent foundation species in deep coral ecosystems are the deepwater corals. The term “deepwater corals” includes relatives of the tropical reef-building corals, but also refer to a variety of other cnidarian taxa including black corals, octocorals (including bamboo corals), soft corals, and hydrocorals. Anemones and sponges are also significant contributors to the framework of these deepwater reef systems.

In the north central Gulf of Mexico, deepwater corals are commonly found on seep-related carbonate formations. These are areas of hard bottom formed by microbially driven anaerobic oxidation of methane. This process increases pore water alkalinity by the production of

bicarbonate, thus favoring the precipitation of authigenic carbonate minerals in the shallow subsurface (Naehr et al. 2007). The most common species of structure-forming deepwater coral in the Gulf of Mexico is *Lophelia pertusa* (Figure 4.9). Individuals of this species were first collected in the late 1800s by the U.S. Coast Survey Steamer Blake (Cairns 1978). *Lophelia pertusa* reefs in the Gulf of Mexico were first reported from a deepwater trawl taken by the M/V *Oregon* in 1955 (Moore and Bullis, 1960). Recently, submersible observations have located high densities of *L. pertusa* in numerous additional locations on the upper slope of the north central Gulf of Mexico (Schroeder 2002, Schroeder et al. 2005, Cordes et al. 2006, Cordes et al. 2008, CSA 2007).



Figure 4.9. An orange basket star on a large *Lophelia pertusa* reef at 1,476 feet (450 m) on Viosca Knoll 826. *Beryx* fish are swimming over the top of the reef. Photo: Brooks et al. (2013)

Deepwater corals can inhabit waters ranging from 165 feet to over 9,850 feet deep (50 to 3,002 meters). However, researchers often define deepwater organisms (including deepwater corals) as organisms that live deeper than the continental shelf greater than 650 feet deep (198 meters; Hourigan et al. 2007). Depth ranges for deep coral ecosystems may overlap with other mesophotic and shallow water corals. However, deepwater coral communities are distinctly different from shallow coral communities because they do not require sunlight for their energy needs since they lack symbiotic algae (i.e., zooxanthellae; Hourigan et al. 2007). Deepwater coral species include stony, reef-building corals, black corals and soft corals such as sea fans and sea whips (Hourigan et al. 2007).

Deepwater corals can be locally abundant, but their distribution is highly restricted in the ocean; their existence relies on hard bottom substrate, which comprises less than 1% of the global ocean

floor, and specific underwater conditions (Roberts et al. 2006). These corals colonize rocky outcroppings located in the path of underwater currents that bring suspended, particulate, organic matter or zooplankton to the corals as a food source (Roberts et al. 2006). Corals may exist as a single colony on a small boulder on the seafloor (Figure 4.10), or in groups of up to hundreds of individual colonies on larger rocky outcroppings (Hourigan et al. 2007). Only a few documented sites with more than a thousand coral colonies are in the north central Gulf of Mexico (Doughty et al. 2014, Fisher et al. 2014a).

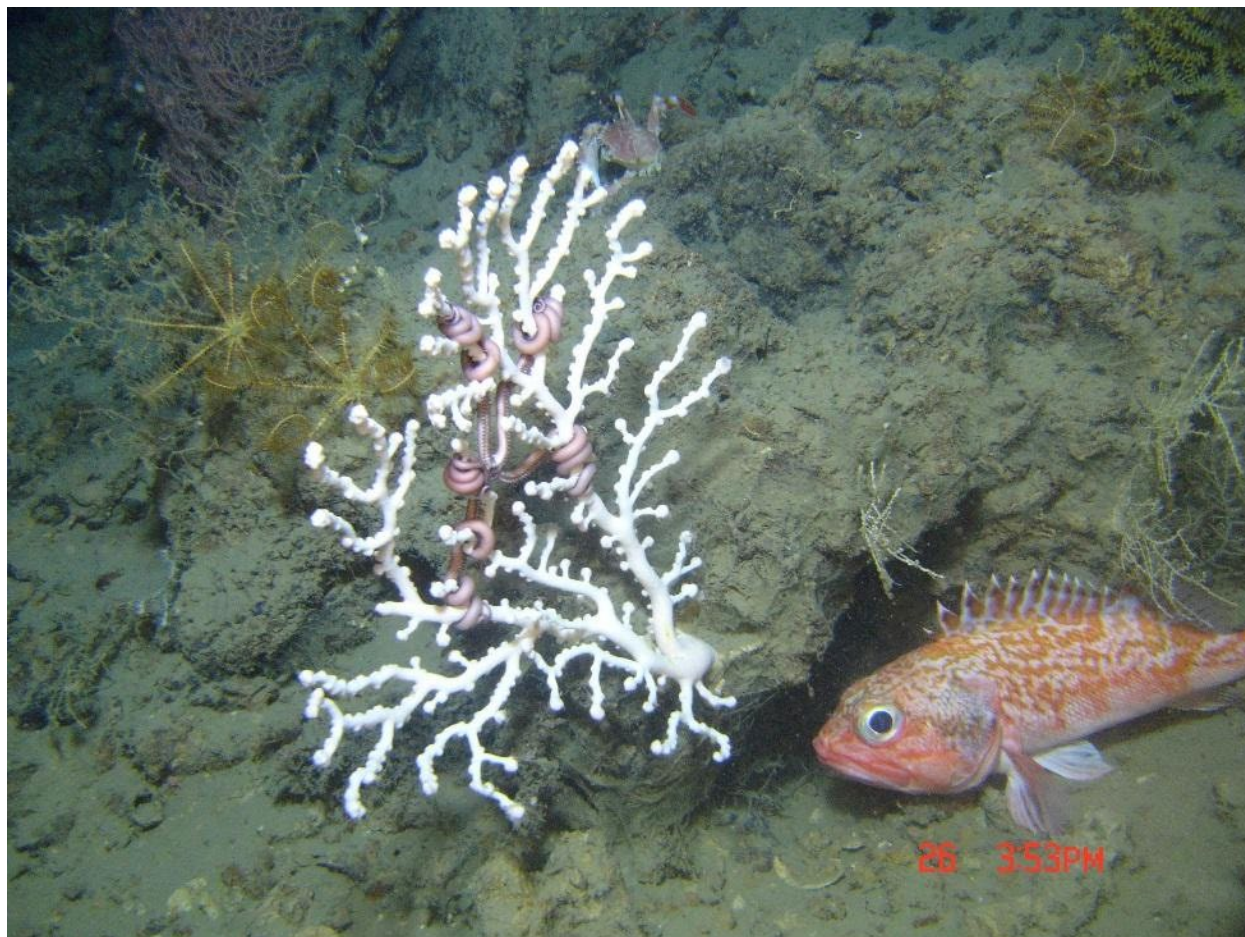


Figure 4.10. Bubble gum coral is found in a number of deepwater coral sites in the north central Gulf of Mexico. Photo: Brooks et al. (2013)

Hard bottom in the Gulf of Mexico is typically created from carbonate precipitation that results indirectly from the activity of microbes at active hydrocarbon seeps (Thiel et al. 2001, Formolo et al. 2004). If the natural hydrocarbon seeps are still active, hard bottom corals may be co-located with high-density chemosynthetic communities (characterized by tubeworms, mussels, clams, bacterial mats, and other associated organisms; Hourigan et al. 2007, Cordes et al. 2008). Corals do not rely on natural hydrocarbons as a source of energy, but consume plankton or surface-derived particulate matter from the water column.

Hard bottom corals are ecologically significant components of the deep benthic habitat. They create a three-dimensional structure in the deep ocean, which provides protective cover for large brittle stars, crabs, and fish (Buhl-Mortensen et al. 2010, Brooks et al. 2013). Corals may also

play a unique role in the reproduction of some fish species (Reed 2002, Baillon et al. 2012) and, due to their rarity, are important reservoirs of deepwater biodiversity (Buhl-Mortensen et al. 2010). Unfortunately, the full ecological benefits and ecosystem services of hard bottom coral communities are poorly understood due to the difficulty of researching corals in deepwater environments. To date, researchers have only visited a small fraction of the potential number of these ecologically significant deep coral ecosystem sites with an ROV or submersible.

Deepwater corals are often extremely slow-growing and long-lived. For example, radiocarbon dating of a Gulf of Mexico *Leiopathes* sp. indicated the animal has been continuously growing for at least two thousand years (Prouty et al. 2011, Doughty et al. 2014). Researchers dated *Paramuricea* sp. at 600 years old with radial growth rates of less than 14 microns (μm) per year. Studies of deepwater coral suggest that radial growth rates decrease over a coral's lifespan (Prouty et al. 2011).

This zone is present in the deep coral ecosystem sites on the continental slope (Alternatives 4 and 5).

4.3.2 Fish Communities

Depth, location, and structure of underwater banks are significant determinants of reef fish community structure and diversity (Simmons et al. 2014). Hard bottom habitats in the north central Gulf of Mexico provide important habitat for structure-dependent fish such as groupers (Serranidae), damselfish (Pomacentridae), snapper (Lutjanidae), angelfish (Pomacanthidae), and wrasse (Labridae; Bryan et al. 2013). Many of these species support important recreational and commercial fisheries throughout the north central Gulf of Mexico. Baker et al. (2016) hypothesized mesophotic regions act as refugia for shallow reef fish that seek these areas because of the reduced physiological stressors of weather events, as well as to escape anthropogenic influences. Deepwater regions tend to provide critical habitat for planktivorous fish as opposed to herbivores, due to differences in food availability and coral formations, as these areas lack macroalgae preferred by herbivorous species (Dennis and Bright, 1998; Minnery 1990; Evans et al. 2014).

Coral and associated invertebrate communities in the north central Gulf of Mexico have created oases, in areas otherwise devoid of structure, that support multiple species of reef fish. The number of reef fish reported to occur on banks within the proposed expansion areas ranges from 76 to 95 species (Simmons et al. 2014). The structural connectivity between hard bottom reefs and banks supports refuge for reproduction of transiting species, as well as provides source populations for larval recruits (Simmons et al. 2014). The north central Gulf of Mexico has been reported to have lower reef fish diversity than tropical and subtropical reef counterparts in the southern Gulf of Mexico. This is attributed to reduced habitat diversity and area, and increased distance from source populations (Dennis and Bright 1988). However, fish abundance does not necessarily follow this same trend, as the north central Gulf of Mexico has supported commercial and recreational fisheries for centuries (Simmons et al. 2014).

4.3.3 Essential Fish Habitat and Habitat Areas of Particular Concern

This section identifies the EFH and HAPCs that overlap with the proposed expansion areas. The Magnuson-Stevens Fishery Conservation and Management Act (MSA) establishes procedures

for identifying EFH and requires interagency coordination on any adverse impacts to EFH in order to further the conservation of federally managed fisheries. Regulations published by NOAA's National Marine Fisheries Service (50 C.F.R. §600.805-600.930) specify that any federal agency that authorizes, funds or undertakes, or proposes to authorize, fund or undertake an activity which could adversely affect EFH is subject to the consultation provisions of the MSA.

EFH is defined as “those waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity” (GMFMC 1998, GMFMC 2005, NOAA 2009). The EFH regulations encourage regional Fishery Management Councils to designate HAPCs within areas identified as EFH to focus conservation priorities on specific habitat areas that play a particularly important role in life cycles of federally managed fish species. HAPCs help focus research and conservation efforts on localized areas that are especially important ecologically or are vulnerable to degradation. HAPCs are subsets of the total area necessary to support healthy stocks of fish throughout all of their life stages.

The GMFMC is responsible for developing fishery management plans (FMPs) in the Gulf of Mexico, which include plans for: coastal migratory pelagic resources; coral and coral reefs; red drum fishery; reef fish resources; regulating offshore marine aquaculture; shrimp fishery; and the spiny lobster fishery. The South Atlantic Fishery Management Council (SAFMC) is responsible for FMPs in the Mid-Atlantic, which include plans for coastal migratory pelagic resources; and the South-Atlantic, which include plans for: coastal migratory pelagic resources; coral, coral reefs, and live/hard bottom habitats; dolphin and wahoo fishery; golden crab fishery; pelagic sargassum habitat; shrimp fishery; and the spiny lobster fishery.

Detailed information on EFH for federally managed coral, shrimp, reef fish, and coastal migratory pelagic species is provided in the 1998 and 2005 Generic Amendments of the Fishery Management Plans (FMPs) for the Gulf of Mexico and the 2018 Final Amendment 9 of the FMPs for the Coral and Coral Reefs of the Gulf of Mexico prepared by the GMFMC. Information on EFH for most highly migratory species (tuna, billfish, and sharks) is contained in the 2009 Amendment 1 to the Consolidated Atlantic Highly Migratory Species Fishery Management Plan prepared by NMFS. EFH found in the north central Gulf of Mexico for species managed by the GMFMC and SAFMC is as follows:

Red Drum FMP: all estuaries; Vermilion Bay, Louisiana, to the eastern edge of Mobile Bay, Alabama, out to depths of 25 fathoms (46 meters); Crystal River, Florida, to Naples, Florida, between depths of 5 and 10 fathoms (9 to 18 meters); and Cape Sable, Florida, to the boundary between the areas covered by the GMFMC (Gulf of Mexico) and the SAFMC (Mid- to South Atlantic) between depths of 5 and 10 fathoms (9 to 18 meters).

Reef Fish and Coastal Migratory Pelagics FMPs: all estuaries; the U.S. and Mexico border to the boundary between the areas covered by the GMFMC (Gulf of Mexico) and the SAFMC (Mid- to South Atlantic) from estuarine waters out to depths of 100 fathoms (183 meters).

Shrimp FMP: all estuaries; the U.S. and Mexico border to Fort Walton Beach, Florida, from estuarine waters out to depths of 100 fathoms; Grand Isle, Louisiana, to Pensacola Bay, Florida,

between depths of 100 and 325 fathoms (183 to 594 meters); Pensacola Bay, Florida, to the boundary between the areas covered by the GMFMC (Gulf of Mexico) and the SAFMC (Mid- to South Atlantic) out to depths of 35 fathoms (64 meters), with the exception of waters extending from Crystal River, Florida, to Naples, Florida, between depths of 10 and 25 fathoms (18 to 46 meters) and in Florida Bay between depths of 5 and 10 fathoms (9 to 18 meters).

Coral and Coral Reef FMP: the total distribution of coral species and life stages throughout the Gulf of Mexico including: coral reefs in the North and South Tortugas Ecological Reserves, East and West Flower Garden banks, McGrail Bank, the southern portion of Pulley Ridge and adjacent Pulley Ridge South Portion A, West Florida Wall, Alabama Alps Reef, L & W Pinnacles and Scamp Reef, Mississippi Canyon 118, Roughtongue Reef, Viosca Knoll 826, Viosca Knoll 862/906, AT 047, AT 357, Green Canyon 852, Southern Bank, and Harte Bank; hard bottom areas scattered along the pinnacles and banks from Texas to Mississippi, at the shelf edge and at the Florida Middle Grounds, the southwest tip of the Florida reef tract, and predominant patchy hard bottom offshore of Florida from approximately Crystal River south to the Florida Keys.

HAPCs have been designated at individual reefs and banks of the proposed expansion areas (Figure 4.11): East and West Flower Garden banks, Stetson Bank, Sonnier Bank, MacNeil Bank, 29 Fathom Bank, Rankin/Bright banks, Geyer Bank, McGrail Bank, Bouma Bank, Rezak/Sidner banks, Alderdice Bank, and Jakkula Bank. Coral HAPCs have been designated at East Flower Garden Bank, West Flower Garden Bank, Stetson Bank, McGrail Bank, Alabama Alps Reef, Ludwick-Walton Pinnacles, and Roughtongue Reef. Designation as a Coral HAPC carries with it restrictions on anchoring and gear type (e.g., pots, traps, and bottom-tending gear types are prohibited).

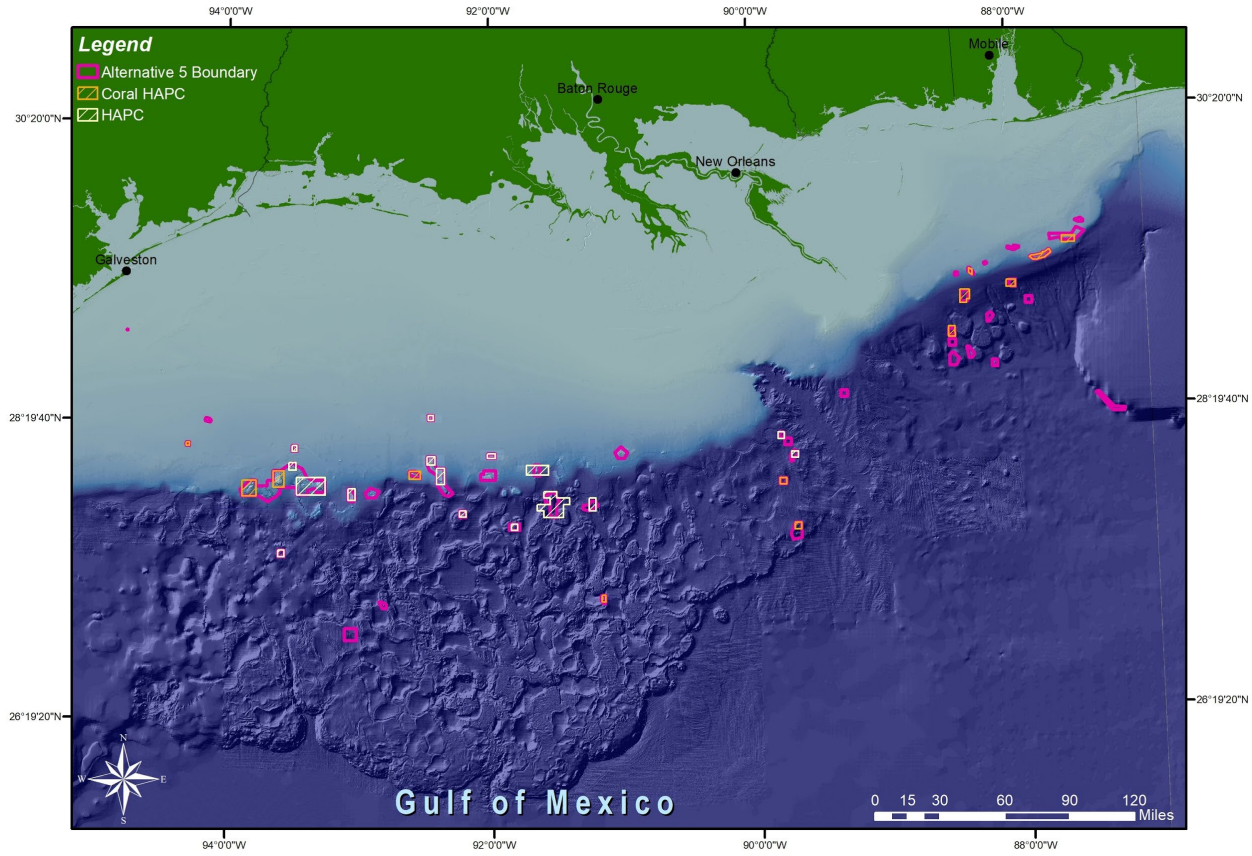


Figure 4.11. Designated HAPCs and Coral HAPCs in relation to the most comprehensive boundary expansion alternative evaluated in this FEIS (Alternative 5). Image: NOAA

As described above, the proposed expansion areas includes EFH and HAPCs for reef fish, shrimp, coastal migratory pelagic fish, corals, and highly migratory species (NOAA 2015a, NOAA 2015b). Categories of EFH in the proposed expansion areas include non-vegetated marine mud, sand, shell, rock substrates, live hard bottoms, corals and coral reefs, continental shelf and geologic features, and the marine water column. In addition, the proposed expansion areas provide nursery and forage habitats supporting various life stages of ecologically and recreationally important marine fish species that serve as prey for other fish managed under the MSA by the GMFMC (e.g., mackerels, snappers, and groupers) and for highly migratory species managed by NMFS (e.g., billfishes and sharks).

Habitats within the proposed expansion areas also provide important fishery support functions, such as a physically recognizable structure and substrate for refuge and attachment above and/or below the sediment surface. Moreover, the proposed expansion areas provide habitat for benthic animals, including marine worms and crustaceans, which are consumed by higher trophic level predators. Benthic organisms play a key role in the food web because they (1) mineralize organic matter, releasing important nutrients to be reused by primary producers; (2) act as trophic links between primary producers and primary consumers; and (3) aggregate dissolved organics within marine waters, which are another source of particulate matter for primary consumers.

4.3.4 Protected Species and Habitats

This section describes the protected species and habitats that may be found in the proposed expansion areas.

The ESA of 1973 (16 U.S.C. §§ 1531, et seq.) requires federal agencies to conserve endangered and threatened species and the habitats upon which these species depend. Table 4.1 provides a list of endangered or threatened species under NMFS jurisdiction, and species using designated critical habitat, that may reside in or migrate through Federal waters of the north central Gulf of Mexico. The habitats in the proposed expansion areas provide ecosystem services supporting threatened and endangered species migrating through or utilizing these areas. Listed species occurring regularly in the vicinity of the proposed expansion areas include sperm whales, fin whales, giant manta (*Mobula*) ray, and five species of sea turtles (green, hawksbill, Kemp’s ridley, leatherback, and loggerhead). Listed species that occur rarely in the expansion areas and are believed to be strays include North Atlantic right whales, blue whales, sei whales, Gulf of Mexico Bryde’s whale, humpback whales, oceanic whitetip sharks, and Nassau grouper.

Four threatened coral species are found within the current sanctuary boundaries – Lobed star coral, Mountainous star coral, Boulder star coral, and Elkhorn coral. The three star coral species comprise approximately 64% of coral cover at East and West Flower Garden banks (Johnston et al. 2020). There is one colony of Elkhorn coral known to occur on each bank. Threatened coral species also occur at Bright, McGrail, Geyer, and Rezak banks, which are included in all of the action alternatives.

Table 4.1. ESA listed species under NMFS jurisdiction found in federal waters of the north central Gulf of Mexico.

Common Name	Scientific Name	ESA Listing Status
Sperm Whale	<i>Physeter macrocephalus</i>	Endangered
Fin Whale	<i>Balaenoptera physalus</i>	Endangered
North Atlantic Right Whale	<i>Eubalaena glacialis</i>	Endangered
Blue Whale	<i>Balaenoptera musculus</i>	Endangered
Sei Whale	<i>Balaenoptera borealis</i>	Endangered
Humpback Whale	<i>Megaptera novaeangliae</i>	Endangered
Gulf of Mexico Bryde’s Whale	<i>Balaenoptera edeni</i>	Endangered
Giant Manta Ray	<i>Manta (Mobula) birostris</i>	Threatened
Oceanic Whitetip Shark	<i>Carcharhinus longimanus</i>	Threatened
Nassau Grouper	<i>Epinephelus striatus</i>	Threatened
Green Sea Turtle	<i>Chelonia mydas</i>	Threatened
Loggerhead Sea Turtle	<i>Caretta caretta</i>	Threatened
Hawksbill Sea Turtle	<i>Eretmochelys imbricata</i>	Endangered
Kemp’s Ridley Sea Turtle	<i>Lepidochelys kempii</i>	Endangered
Leatherback Sea Turtle	<i>Dermodochelys coriacea</i>	Endangered
Lobed Star Coral	<i>Orbicella annularis</i>	Threatened
Mountainous Star Coral	<i>Orbicella faveolata</i>	Threatened
Boulder Star Coral	<i>Orbicella franksi</i>	Threatened
Elkhorn Coral	<i>Acropora palmata</i>	Threatened

NOAA used the USFWS’s Environmental Conservation Online System (ECOS) Information for Planning and Conservation (IPaC) tool to search for endangered or threatened species, or designated critical habitat, under USFWS jurisdiction that may be present in the action area. The ECOS IPaC tool identified nine listed species under USFWS jurisdiction that could occur in

the action area and designated critical habitat for Piping Plover (Table 4.2; November 12, 2020; Consultation Code: 02ETTX00-2021-SLI-0386).²³

Table 4.2. ESA listed species under USFWS jurisdiction identified in IPaC tool as potentially present in the north central Gulf of Mexico

Common Name	Scientific Name	ESA Listing Status
West Indian Manatee	<i>Trichechus manatus</i>	Threatened
Attwater's Greater Prairie-chicken	<i>Tympanuchus cupido attwateri</i>	Endangered
Piping Plover	<i>Charadrius melodus</i>	Threatened
Red Knot	<i>Calidris canutus rufa</i>	Threatened
Green Sea Turtle	<i>Chelonia mydas</i>	Threatened
Hawksbill Sea Turtle	<i>Eretmochelys imbricata</i>	Endangered
Kemp's Ridley Sea Turtle	<i>Lepidochelys kempii</i>	Endangered
Leatherback Sea Turtle	<i>Dermodochelys coriacea</i>	Endangered
Loggerhead Sea Turtle	<i>Caretta caretta</i>	Threatened

4.4 Marine Area Use, Recreation, and Socioeconomics

This section describes the primary user groups and industries that use the resources of FGBNMS and/or the proposed expansion areas. These interests include commercial fishing, recreational fishing, scuba diving, oil and gas exploration, development and production, commercial shipping, military and homeland security activities, and the passive economic use value for protection and restoration of the natural and cultural resources of the region.

4.4.1 Fisheries

Disturbances to coral ecosystems from bottom-tending fishing gear, especially bottom trawl gear, have been well documented where they have been studied in U.S. waters. Bottom trawling is widespread and considered a major threat to corals in most U.S. regions where such fishing is allowed and overlaps with areas where corals are present (Reed et al. 2007, Yoklavich et al. 2018). The area of seafloor contacted by bottom trawls is relatively large, the force against the seafloor from the trawl gear is substantial, and the spatial distribution of habitat impacts of bottom trawling is extensive. Although not as destructive as bottom trawls and dredges, other types of fishing gear can also have detrimental effects on deepwater corals. Bottom-set gillnets, bottom-set longlines, pots, and traps all impact the seafloor. Vertical hook and line fishing, used in both recreational and commercial fishing, has the potential to damage fragile corals by the weights used, but such damage is minimal compared to other bottom-tending gear (Gass and Roberts 2006, Lumsden et al. 2007, Heifetz et al. 2009, and NOAA 2015c). FGBNMS staff have documented fishing gear impacts to habitats at 28 Fathom, Alderdice, Bouma, Bryant, Bright, East Flower Garden, Elvers, Geyer, Horseshoe, McGrail, Parker, Rezak, Sidner, Sonnier, Stetson, and West Flower Garden banks.

The entire Gulf of Mexico supports a wide variety of commercial and recreational fisheries including reef fish, tuna, mackerel, shark, grouper/snapper, tilefish, menhaden, oysters, shrimp, lobster, stone crab, blue crab, and red crab. Some of these fisheries are concentrated in areas influenced by seafloor features (e.g., the Pinnacles area and shelf-edge banks). Methods of

²³ NOAA's action area for evaluation of impacts to listed species includes possible transit routes for NOAA vessels to and from the sanctuary to homeport in Galveston, Texas.

harvest include trawling, longlining, hook and line (including vertical longlines/bandit reels), and spearfishing. In the area potentially affected by the proposed action, the primary fisheries targeted include: reef fish (snapper, grouper, triggerfish, jack, tilefish), coastal migratory pelagics (mackerels, cobia), and highly migratory species (sharks, tuna, billfish, swordfish). Current sanctuary regulations do not allow bottom longlining, traps, nets, bottom trawls, spearfishing, or any other gear, device, equipment, or means except conventional hook and line gear (inclusive of vertical longlines/bandit reels) within the sanctuary. Anchoring within the sanctuary is also prohibited under current sanctuary regulations.

4.4.1.1 Primary Data Sources and Methodology

NOAA's fisheries catch statistics data (e.g., dockside landings reports) are not collected on a scale fine enough to discern fishing effort specifically for each of the proposed expansion areas, rather these data are available on a regional scale (i.e., Gulf of Mexico). Vessel Monitoring System (VMS) data are collected at finer resolution and can provide an indication of the use of proposed expansion areas by commercial and recreational fishery permit holders. VMS requirements apply only to those vessels with Federal reef fish permits and permits to fish with pelagic longline, bottom longline, or shark gillnet for highly migratory species. VMS data for charter/headboats and other limited access fisheries nevertheless provides the best available information on locations where commercial and recreational fishing vessels spend their time in the Gulf of Mexico. Due to the proprietary and sensitive nature of fisheries spatial use information (i.e., VMS), data may be provided with varying characteristics that can be used to classify the type of fishery impacted (e.g. permit type, gear type). However, this does not forestall a comparative analysis which can be used to evaluate the level of fishing effort within a given spatial area.

To assess the potential impacts of the proposed action on commercial fishing user groups, NOAA evaluated VMS data from the years 2008-2014 by permit type for the areas included in Alternatives 1-5. NOAA supplemented this analysis with VMS data from the years 2017-2020 by gear type for the areas included in the Final Preferred Alternative. To put this analysis in the context of the commercial fishing sector in the region, NOAA compared VMS data to data presented in the NMFS Coral Amendment 9 which captured information for the north central Gulf of Mexico from 2010-2016 (NOAA 2018).

Recreational fisheries of the Gulf of Mexico includes private individuals, rental boats, charter vessels, head boats, and party boats. In the Gulf of Mexico, the private recreational fishing sector is surveyed through NOAA's Marine Recreational Information Program (previously NOAA's Marine Recreational Fisheries Statistics Survey), except for the state of Texas, where the Texas Parks and Wildlife Department uses a statistical area system with large grid cells similar to NOAA's statistical areas. Between state and federal data sets, effort data are available for most of the Gulf of Mexico. However, this data and the charter/headboat catch data collected by NOAA provide insufficient spatial resolution to determine catch or understand recreational fishing activity in the FGBNMS or the proposed expansion areas.

To assess the potential impacts of the proposed action on recreational fishing activity, NOAA evaluated VMS data from the years 2008-2014 by permit type for the areas included in Alternatives 1 to 5. NOAA supplemented this analysis with Automatic Identification System

(AIS) data for the years 2017-2020 for the areas included in the Final Preferred Alternative. AIS data from July 2017 to July 2020²⁴ were used in this analysis, and were restricted to vessels identified as “fishing”. To assess the level of impacts to the recreational fishing sector, VMS and AIS data were compared.

4.4.1.2 Additional Relevant Studies

Several studies performed earlier in the FGBNMS expansion process are useful for evaluating the 2007 FGBNMS Advisory Council recommendation for expansion (Alternative 2), but are too limited in their geographic scope or in their coverage of fishing sectors to provide a complete quantitative basis for evaluating the range of alternatives presented in this FEIS. Nevertheless, these studies do provide ancillary support to the characterization of the commercial and recreational fishing sections below and to the analysis in Chapter 5.

In 2009, FGBNMS entered a contract with Geo-Marine, Inc. to analyze all available commercial and recreational fishing data on catch and effort with the objective of determining trends and the “best” estimate of catch or effort that could be considered “sustainable in the future” (Levesque and Richardson 2009, 2011). Levesque and Richardson (2009, 2011) analyzed commercial fishing data from three federal data collection programs: NMFS General Canvass Landings Reporting System, Trip Interview Program, and NMFS Historical Landings Program. Geo-Marine, Inc. reported that types of fish landed commercially within the vicinity of FGBNMS were snapper, jacks, tuna/mackerel, shark, grouper, and a variety of reef fish. To evaluate recreational fishing activity, Levesque and Richardson (2009, 2011) analyzed NMFS head-boat catch data for statistical areas 25 (Freeport-Galveston) and 26 (Port Aransas) for the years 1986-2006, and charter boat data from 2006 to 2008 from “The Daily News Reel Report”²⁵, which provides self-reporting by the larger vessels operating out of Galveston, Texas. For private household boats and party boats (charter boats by most definitions), they analyzed Texas Parks and Wildlife Department catch and effort data for the years 2003-2008. This analysis focused on the areas included in Alternative 2.

In 2013, Dr. Will Heyman (Texas A&M University), on contract to the National Marine Sanctuary Foundation, conducted surveys of commercial fishing operations, for-hire recreational fishing operations, and for-hire diving operations operating in the northwestern Gulf of Mexico on various banks, including the existing banks in the sanctuary (Leeworthy et al. 2016). In June 2010, NOAA identified 76 commercial fishing vessels observed in the vicinity of Alternative 2 from VMS data and provided this information to Dr. Heyman for the purpose of conducting surveys of the commercial fishing interests operating in that area (Leeworthy et al. 2016). In 2013, Dr. Heyman contacted all 76 vessel owners, representing 40 different operations from Texas to Florida. Operators were contacted by both mail and telephone and asked if they fished on any of the banks in the vicinity of Alternative 2 (maps of the study area were sent via mail). Six commercial fishing operators responded to the survey and identified they utilized

²⁴ AIS data were requested for a three year period to report an annual mean and observe a range of fishers' use of the expansion areas. Data were requested in July 2020; therefore, data were provided to NOAA from July 2017 to July 2020.

²⁵ https://www.galvnews.com/sports/fishing_report/

banks in the areas included in Alternative 2 (Leeworthy et al. 2016).²⁶ Eight recreational fishing operators responded to the survey and identified they utilized the same areas. For the purposes of the study, interests of the fishers surveyed were considered as close to a census as practical of fishing operations targeting the banks recommended for inclusion in Alternative 2 (Leeworthy et al. 2016).

4.4.1.3 Commercial Fishing Data

In the U.S. in 2019, the Gulf of Mexico generated over 1.4 billion pounds in commercial finfish and shellfish fishery landings, yielding a value of \$800 million (NOAA Fishery Catch Statistics 2020). According to VMS data for the areas included in Alternative 5, for the period of 2008 to 2014, an annual average of 238 vessels operated with reef fish permits, 128 vessels operated with permits to fish for king mackerel,²⁷ 155 vessels operated with permits to fish for tunas, swordfish, or sharks, and 28 vessels operated with permits to fish for shrimp. Many vessels carried more than one permit type so each permit does not necessarily equate to one vessel.

According to VMS data for the areas included in the Final Preferred Alternative, for the period of 2017 to 2020, an annual average of 6 vessels operated with bottom longline gear, 7 vessels operated with rod and reel/handgear, 3 vessels operated with pelagic longline gear, and 17 vessels operated with bandit rig gear. According to data provided in NMFS Coral Amendment 9 for the north central Gulf of Mexico, for the period of 2010 to 2016, an annual average of 554 vessels landed reef fish, approximately 124 vessels landed tunas, swordfish, or sharks, and approximately 1,912 vessels harvested shrimp (NOAA 2018). These data are characterized for the expansion alternatives and north central Gulf of Mexico in Chapter 5.

According to VMS data for the areas included in the Final Preferred Alternative, for the period from 2017 to 2020, an annual average of 41 commercial fishing vessels (ranging from 39 to 45 vessels) were observed in the vicinity of those areas. For the same time period, an annual average of 181 vessel trips (ranging from 144 to 226 trips) occurred in the vicinity of the areas included in the Final Preferred Alternative. In contrast, 110 vessels were observed in the vicinity of the areas included in Alternative 3,²⁸ according to VMS data for the period from 2008 to 2014.

4.4.1.4 Recreational Fishing Data

In 2019, recreational fisheries in the Gulf of Mexico region landed 160 million pounds of fish (NOAA Fisheries Statistics Database, 2020). In 2016, recreational anglers contributed billions of dollars (\$2 billion in Texas and \$1.6 billion in Louisiana) to the Gulf of Mexico region's economy and supported tens of thousands of jobs (16,000 in Texas and 14,000 in Louisiana) (NMFS 2018). The remoteness and difficulty of accessing the proposed expansion areas result in much lower use of these areas for recreational fishing than the Gulf of Mexico as a whole; however,

²⁶ Three other commercial fishing operations refused the survey and indicated they did not feel the expansion (as proposed in Alternative 2) would significantly impact them and it was not worth their effort to complete the survey.

²⁷ King mackerel permits are the only limited access coastal migratory pelagic permit type and are not required to carry VMS but give an indication of the fishery for coastal migratory pelagic species.

²⁸ For purposes of comparison over time, we use Alternative 3 as a reference because it encompasses many of the same banks as the Final Preferred Alternative.

concerted fishing efforts are still made by recreational anglers throughout the year. Results from Levesque and Richardson (2009, 2011) indicated recreational landings from 2003 to 2007 in the vicinity of Alternative 2 were dominated by red snapper, vermilion snapper, and gray triggerfish, varying by month and location. In 2016, seatrouts and red drum were the most frequently caught fish by recreational anglers (NMFS 2018).

VMS data for the period from 2008 to 2014 revealed an annual average of 60 charter/headboats operating within the areas included in Alternative 5, with an average of 10 charter/headboat fishing vessels operating within Alternative 3. For the period 2017 to 2020, AIS data showed an annual average of 20 total fishing vessels²⁹ operating within the areas included in the Final Preferred Alternative.

In 2013, Dr. Heyman (Texas A&M University) surveyed recreational fishers, focusing on all Texas ports and harbors that would access the area in the vicinity of Alternative 2 (Leeworthy et al. 2016). Approximately 2,600 person days of for-hire recreational fishing were reported for 2013 in areas included in Alternative 2. Of those 2,600 person days of for-hire recreational fishing, 127 person days were for spearfishing, while the remainder were for hook-and-line fishing (Leeworthy et al. 2016). From the period 2011 to 2015, headboat angler days for the north central Gulf of Mexico averaged 1.3 million (excluding Texas, data unavailable) days (NOAA 2018).

4.4.1.5 Recreational Spearfishing

Spearfishing by recreational anglers has been reported to occur in the proposed expansion areas. Dr. Heyman's 2013 survey addresses spearfishing by directly asking fishers about their gear use. Otherwise, this data is not directly collected, and therefore, cannot readily be accessed to measure spearfishing effort in the proposed expansion areas or the north central Gulf of Mexico. In general, spearfishing results in less bycatch than other recreational fishing practices, and its direct effects are consequently focused on targeted species (Tran et al. 2016). Fish species that are commonly harvested by spearfishers in the expansion areas include wahoo, amberjack, grouper, and snapper.

Spearfishing or the taking of invertebrates could also occur during recreational scuba diving ("consumptive" scuba diving). Spearfishing is prohibited at FGBNMS, but is known to occur on artificial reef sites, such as oil and gas platforms, in the vicinity of the sanctuary. Currently, there are no estimates available of the amount of consumptive scuba diving activity occurring in the expansion areas.

4.4.2 Recreational Scuba Diving

A limited number of natural features within the current sanctuary or proposed expansion areas are accessible to recreational scuba divers because of the depth limitations of this activity. These are: East Flower Garden, West Flower Garden, Stetson, Bright, Geyer, and Sonnier banks. Other

²⁹ The 2017-2020 AIS data contains any vessel that was identified as fishing, which can include charter/headboats as well as other types of fishing boats. The 2008-2014 VMS data reported only charter/headboats.

possible dive destinations are oil and gas platforms within the boundaries of Alternatives 4 and 5, as well as outside of the proposed expansion areas.

Very little information is available on scuba diving off Texas or Louisiana, as no institutions regularly gather this information. In 1999-2000, the National Survey on Recreation and the Environment estimated the number of scuba diving participants (aged 16 or older) to be approximately 70,000 departing from Texas and approximately 11,000 departing from Louisiana.

The only scuba diving data available for Texas and FGBNMS was produced by Ditton and Baker (1999) for the year 1996. The study documented Texas scuba divers who accessed offshore waters through dive charter or for-hire recreational dive operations. In 1996, dive charters ran a total of 360 trips to offshore Texas accounting for 4,335 dive trip days. About 21% of the boat trips and 54% of the dive trip days were spent at FGBNMS. Current estimates put the number of dive trip days per year between 1,500 and 2,000 for FGBNMS.

Currently, one dive operator conducts trips to the sanctuary. Private vessels visit FGBNMS to conduct scuba diving operations on rare occasions, primarily for the specific event of the annual coral spawning. A small number of private vessels also likely conduct scuba trips to Sonnier and Geyer banks. Refer to Section 4.4.1.3 for a description of consumptive scuba diving and spearfishing.

4.4.3 Oil and Gas

Offshore oil and gas in the Gulf of Mexico is a major source of oil and natural gas production in the United States. The Western and Central Planning Areas in the Gulf of Mexico, which include offshore Texas, Louisiana, Mississippi, and Alabama, comprise one of the major petroleum-producing areas of the U.S.. The Gulf of Mexico OCS region contributed 15.5 % of total U.S. crude oil production and 3% of total U.S. natural gas production in 2019 (EIA 2020a, EIA 2020b). Gulf of Mexico oil production was at an all-time high with over 650 million barrels produced in 2019 (BSEE 2020a, EIA 2020a). This number can be expected to be somewhat lower for 2020, due to depressed oil prices and COVID-19 effects. Gas production in the Gulf of Mexico has declined significantly since 2001, back to levels similar to 1963 (BSEE 2020a). These changes are largely due to changes in oil and gas fields. Almost 90% of Gulf of Mexico oil and 65% of gas is now produced from deep water (over 1000 ft deep) (BSEE 2020b). The U.S. Energy Information Administration, however, reports U.S. crude oil production in the U.S. Federal Gulf of Mexico (GOM) averaged 1.8 million barrels per day (b/d) in 2018, setting a new annual record and expects oil production in the GOM to set new production records in 2019 and in 2020 (<https://www.eia.gov/todayinenergy>). Over 45% of total U.S. petroleum refining capacity is located along the Gulf of Mexico coast, as well as 51% of total U.S. natural gas processing plant capacity (EIA 2020c).

The oil and gas industry is a significant component of the regional economy, supporting 345,000 jobs in 2019 and contributing \$28.7 billion dollars to the U.S. Gross Domestic Product in the same year (EIA 2020). These economic benefits come with risks associated with the industry, most obviously related to catastrophic, uncontrolled releases (e.g., due to extreme weather events or human error). In 2004, Hurricane Ivan destroyed seven platforms,

significantly damaged 24 additional platforms, and damaged 102 pipelines in the Gulf of Mexico. In 2005, Hurricanes Katrina and Rita destroyed more than 100 platforms and damaged 558 pipelines (NOAA 2011b). In 2008, Hurricane Ike destroyed 49 production platforms and damaged 5 gas pipeline systems (BSEE 2008). In 2005, after striking the submerged remains of a pipeline service platform that collapsed during Hurricane Rita, the tank-barge DBL 152 discharged approximately 1.9 million gallons of heavy fuel oil, which sank to the bottom in approximately 50 feet (15 meters) of water on the continental shelf, approximately 40 miles (64 kilometers) southeast of Sabine Pass, Texas and approximately 75 miles (121 kilometers) inshore from the proposed sanctuary expansion alternatives. To date, the Deepwater Horizon oil spill in 2010 remains one of the worst environmental disasters in U.S. history (NOAA 2016).

Other potential threats include the physical impact of drilling, placement of structures on the seafloor (e.g., platforms, anchors, pipelines or cables), discharges from rock-cutting during the drilling process, and intentional or accidental well discharges or release of drilling fluids. Deployment of oil and gas pipelines can cause localized physical damage to corals. The use of anchors, pipelines, and cables for oil exploration/extraction can be destructive to sensitive benthic habitats as well (Gass and Roberts 2006, Lumsden et al. 2007, Heifetz et al. 2009, and NOAA 2015c). Routine oil and gas activities are distanced from topographic features, pinnacles, live bottoms, PSBFs, and deepwater benthic communities through leasing stipulations and mitigations placed on permits. Refer to Chapter 5, Table 5.6 for information on oil and gas leases and pipelines in the sanctuary expansion areas.

Nevertheless, NOAA and others have documented oil and gas industry-related impacts (other than the simple presence of infrastructure) to habitats during ROV surveys at:

- East Flower Garden Bank (first leased in 1977, coral injury resulted from seismic cables, occurred prior to sanctuary designation, FGBNMS personal observation),
- West Flower Garden Bank (first leased in 1980, coral injury results from seismic cables, occurred prior to sanctuary designation, FGBNMS personal observation),
- Henderson Ridge South (coral injury resulted from the 2010 Deepwater Horizon oil spill (Fisher et al. 2014b)),
- Alabama Alps (coral injury resulted from the 2010 Deepwater Horizon oil spill (Silva et al. 2015; Etnoyer et al. 2016)),
- Yellowtail Reef (coral injury resulted from the 2010 Deepwater Horizon oil spill (Etnoyer et al. 2016)),
- Roughtongue Reef (coral injury resulted from the 2010 Deepwater Horizon oil spill (Silva et al. 2015)),
- Biloxi Dome (coral injury resulted from the 2010 Deepwater Horizon oil spill (White et al. 2012; Fisher et al. 2014a, 2014b)),
- Gloria Dome (meiofauna abundance decreased and coral injury resulted from the 2010 Deepwater Horizon oil spill (Baguley et al. 2015; Fisher et al. 2014a, 2014b)),
- Whiting Dome (coral injury resulted from the 2010 Deepwater Horizon oil spill (Fisher et al. 2014b)),
- Horn Dome (coral injury resulted from the 2010 Deepwater Horizon oil spill (Fisher et al. 2014b)), and
- Dauphin Dome (coral injury resulted from the 2010 Deepwater Horizon oil spill (Fisher et al. 2014a, 2014b)).

In 2010, Dr. Eric Wolfe, Chief Economist for NOAA's National Ocean Service, conducted an analysis of the impact of boundary expansion of the FGBNMS on the oil and gas industry (Wolfe 2010). Current sanctuary regulations allow for the exploration and production of oil and gas inside sanctuary boundaries, subject to the restrictions imposed by BOEM for the protection of topographic features (e.g. NAZs), PSBFs, and live bottom as described in Appendix H, and provided all drilling cuttings and drilling fluids are shunted to the seabed through a downpipe that terminates an appropriate distance, but no more than ten meters, from the seabed. Wolfe (2010) focused on the costs associated with that shunting requirement within boundaries proposed in Alternative 2. Drilling platform shunting costs are dependent on a variety of variables, including: the physical distance between the production platform and sensitive aquatic formations, the type of drilling fluid employed, depth of the seabed from the platform, type of hole drilled, and depth of the hole from the seabed to the end of the drill string (Wolfe 2010). In his analysis, Wolfe (2010) assumed oil and gas platforms within Alternative 2 boundaries would already be required to shunt drilling materials within 10 meters of the seafloor owing to their proximity to sensitive aquatic formations, therefore no additional costs would be incurred. Additional costs could be incurred if additional pipe construction were needed, to which Wolfe concluded such costs would represent "only a *de minimis* one-time addition to development drilling costs" (2010).

BOEM divides the Gulf of Mexico into three planning areas: (1) Western, (2) Central, and (3) Eastern. The alternatives presented in this FEIS fall within all three planning areas. There were approximately 1,862 oil and gas platforms in the Gulf of Mexico in April 2019 (BSEE 2019). The most comprehensive sanctuary expansion alternative (Alternative 5) encompasses fourteen oil and gas structures: thirteen platforms, of which eleven are active and two have been reefed onsite, and one deepwater drilling unit, the Deepwater Horizon, wrecked onsite. NOAA's Final Preferred Alternative encompasses only one retired platform, (designated HI-A-389-A) which was established as an artificial reef with the removal of the upper deck in 2018 (see Table 5.6).

Deepwater Gulf of Mexico discoveries account for an increasing proportion of U.S. total reserves of oil and gas. BOEM provides estimates for oil and gas reserves, contingent resources, and undiscovered resources. Reserves are those quantities of petroleum anticipated to be commercially recoverable by application of development projects to known accumulations from a given date forward under defined conditions. Contingent resources are those quantities of petroleum estimated, as of a given date, to be potentially recoverable from known accumulations by application of development projects but which are not currently considered to be commercially recoverable due to one or more contingencies. Undiscovered resources are resources postulated, on the basis of geologic knowledge and theory, to exist outside of known fields or accumulations. Finally, industry-announced discoveries are those made by operators and are evaluated by BOEM in support of lease sale Fair Market Value determinations, Worst Case Discharge analysis, and field studies. The number of reserve additions from shallow waters peaked in 1967 and has declined every decade thereafter. In contrast, the number of deepwater reserves has increased significantly since 1975 (Covington et al. 2000).

BOEM delineates projects in less than 984 feet (300 meters) water depths as shallow-water projects and those in greater than 984 feet (300 meters) as deepwater projects. For gas production, the shallow water is further subdivided according to the True Vertical Depth (TVD)

of the producing zones and the water depth. The “shallow-water deep” zone refers to gas production from well completions at or below 15,000 feet (4,572 meters) TVD subsea and in water depths less than 656 feet (200 meters). All other shallow-water completions are referred to as part of the “shallow-water shallow” zone. In 1999, oil production from deepwater wells surpassed that produced from shallow wells for the first time in the history of oil production in the Gulf of Mexico (Covington et al. 2000).

Oil and gas exploration and production in the Gulf of Mexico are regulated by BOEM and BSEE under the Outer Continental Shelf Lands Act as described in Appendix G.

4.4.4 Commercial Shipping

In 2009, the Gulf Coast region contained 13 of the top 20 U.S. ports by tonnage, and 50% of all U.S. international trade tonnage passed through Gulf Coast ports (NOAA 2011b). The Ports of Houston, Galveston, and New Orleans are among the world’s busiest ports. Shipping fairways running close to, and in six instances through, the proposed expansion areas, carry thousands of ships to the ports annually (Figure 4.11). For example, using AIS data, NOAA found that approximately 839 unique vessels, totaling 1,506 trips, were observed from July 2017 to July 2020 transiting the boundaries of the Final Preferred Alternative. These included vessels identified as towing, dredging, pilot vessel, tug, cargo, or tanker.

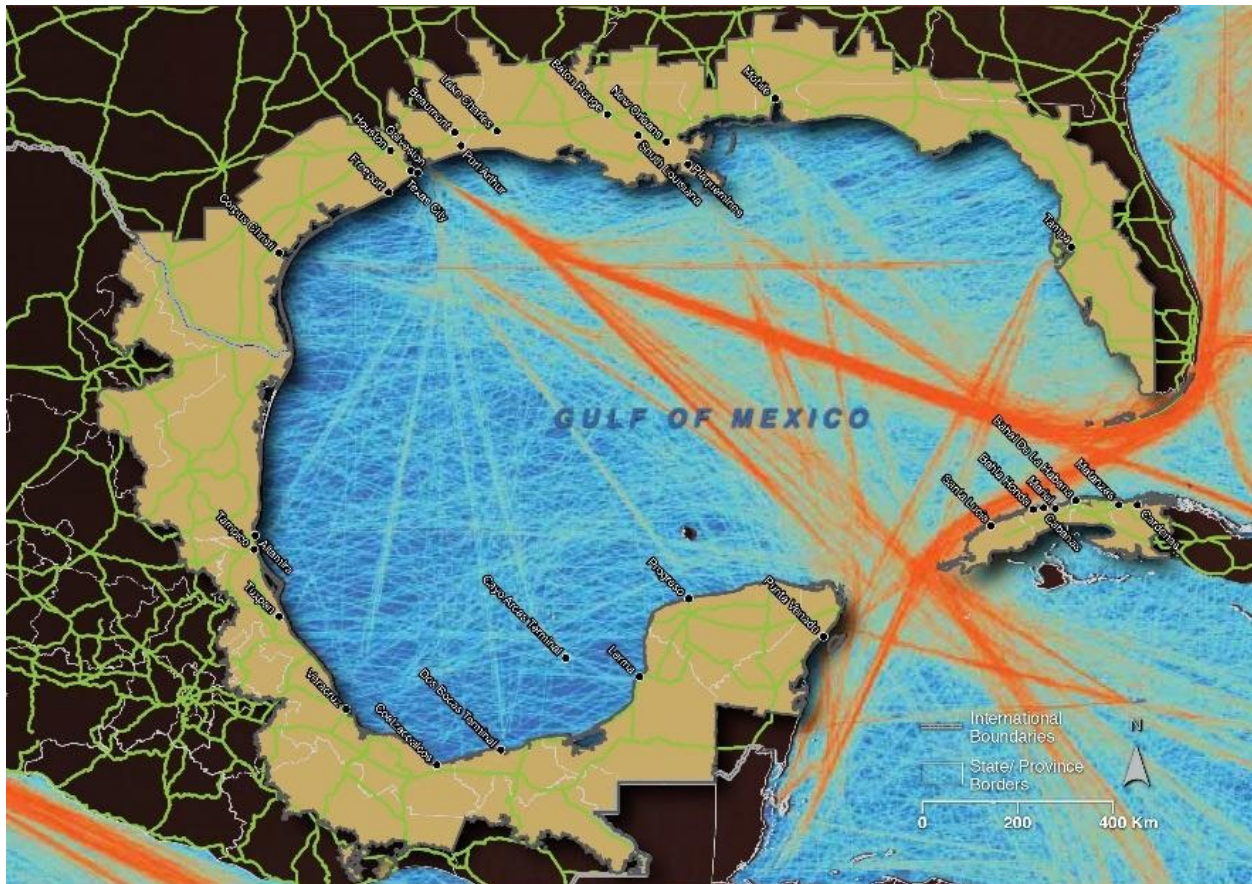


Figure 4.12. Commercial shipping routes in the Gulf of Mexico. Image: Yoskowitz et al. (2013)

Each year, more than 247 million tons of cargo move through the Port of Houston, carried by more than 8,200 vessels and 215,000 barge calls (Port of Houston 2020). A 2015 study by Martin Associates indicated that Houston channel-related businesses contributed 1,174,567 jobs throughout Texas, and helped generate more than \$264.9 billion in statewide economic impact. Additionally, more than \$5 billion in state and local tax revenues are generated by business activities related to the Port of Houston (Martin Associates 2015). In 2018, the Port of Galveston docked 840 ships, including 268 cruise ship calls. Over 1.9 million cruise passengers passed through the port, generating over \$43 million in revenue. Close to 4.1 million tons of cargo were moved through Galveston that same year (Port of Galveston 2020). In 2014, over 31 million tons of cargo were moved through the Port of New Orleans, and over 1 million cruise passengers embarked on cruises (Port of New Orleans 2015).

4.4.5 Department of Defense Activities

At present, military activities occurring in the current sanctuary and proposed expansion areas consist of the free passage of vessels, as well as the U.S. Navy's training and testing operations.

Under the current sanctuary regulations at 15 C.F.R. § 922.122(e), the regulatory prohibitions do not apply to activities being carried out by the Department of Defense (DoD) as of the effective date of Sanctuary designation (January 18, 1994), provided that the activities are carried out in a manner that minimizes any adverse impact on sanctuary resources and qualities. The prohibitions also do not apply to any new activities carried out by the DoD that do not have the potential for any significant adverse impacts on sanctuary resources or qualities. New activities with the potential for significant adverse impacts on sanctuary resources or qualities may be exempted from the regulatory prohibitions after consultation between the ONMS Director and the DoD.

Prior to sanctuary designation, the military conducted activities in Warning Area W-602, located just southwest of the original sanctuary. As documented in the 1991 sanctuary designation FEIS/FMP, military activities in the Warning Areas included carrier maneuvers, missile testing, rocket firing, pilot training, air-to-air gunnery, air-to-surface gunnery, minesweeping operations, submarine operations, air combat maneuvers, aerobatic training, missile testing and development, and instrument training.³⁰ The 2012 FGBNMS Management Plan did not alter the existing DoD regulatory exemption.

Under all action alternatives, NOAA would extend the current exemption at 15 C.F.R. § 922.122(e) for DoD activities to the expansion areas. NOAA would update the text of the exemption to reflect the effective date of the revised terms of sanctuary designation (see Appendix H for full draft regulations). Through this exemption, DoD activities occurring in the expansion areas prior to the effective date of the revised terms of sanctuary designation would be exempt from sanctuary regulatory prohibitions, provided they are carried out in a manner that minimizes any adverse impact on sanctuary resources and qualities. New DoD activities would be allowed as long as they do not have the potential for significant adverse impact on sanctuary resources. Any new activities with the potential for significant adverse impact on

³⁰ See: https://flowergarden.noaa.gov/doc/expansion/fgbnms_eis_mgmtplan_1991.pdf

sanctuary resources may be exempted from sanctuary regulatory prohibitions through consultation between the Director of ONMS and the DoD.

In 2018, in accordance with NEPA, the U.S. Navy described and analyzed the environmental impacts of its ongoing training and testing activities in the western Atlantic Ocean and Gulf of Mexico in its Atlantic Fleet Training and Testing (AFTT) Final Environmental Impact Statement (EIS)/Overseas Environmental Impact Statement (OEIS) (U.S. Navy 2018). These activities are necessary to support U.S. Navy military readiness requirements beginning in 2018 and continuing into the reasonably foreseeable future (approximately 5-10 years). As a part of that process, the Navy considered and evaluated all proposed testing and training activities that could occur within the current boundary of FGBNMS to ensure compliance with NEPA and the NMSA's interagency consultation requirements. The Navy concluded that their activities conducted in or near the existing FGBNMS fall into the following categories:

- 1) Activities that may occur within the sanctuary because they (1) do not have the potential for any significant adverse impacts on sanctuary resources or qualities, and (2) are carried out in a manner that minimizes any adverse impact on sanctuary resources and qualities:
 - a) Aircraft and aerial targets;
 - b) Vessels and in-water devices;
 - c) Sonar and other non-impulsive acoustic sources; and
 - d) Electromagnetic devices.
- 2) Activities that are not planned to be used within the current boundary of FGBNMS, including a 2.7 nautical mile buffer:
 - a) Explosives detonated in-air, at surface, or underwater;
 - b) Military expended materials; and
 - c) Seafloor devices.

In the 2018 Sanctuary Resource Statement and FEIS prepared to evaluate the impacts of AFTT activities on sanctuary resources and qualities, the Navy ultimately concluded that all activities associated with the proposed action that could potentially impact sanctuary resources do not occur within close enough proximity to the sanctuary to injure sanctuary resources. The Navy stated that activities proposed under AFTT were consistent with the activities exempted when FGBNMS was designated and did not propose to conduct any new activities that could have significant adverse impacts on sanctuary resources or qualities. Further, the Navy did not propose to increase the level of existing activities within the sanctuary from what was previously considered at the time of sanctuary designation. Therefore, in 2018, since the Navy concluded that none of its training and testing activities proposed to be conducted within or in the vicinity of the existing FGBNMS would result in likely injury to sanctuary resources, the Navy determined that it was not necessary to engage in 304(d) consultation under the NMSA at that time for FGBNMS.

Through correspondence between NOAA and Navy on November 2, 2020, the Navy confirmed that the above categories of activities, which were detailed in the 2018 AFTT EIS, may also occur in or near the proposed FGBNMS expansion areas. The Navy also restated its previous

conclusion that implementing these training and testing activities are not likely to cause injury to any sanctuary resources in the current or expanded sanctuary.

4.4.6 Department of Homeland Security Activities

The U.S. Coast Guard operates in the waters of the proposed expansion area under District 8, which has oversight of operational U.S. Coast Guard missions in the north central Gulf of Mexico. The primary U.S. Coast Guard missions in this sector include search and rescue, marine safety, ports and waterways coastal security, marine environmental protection, aids to navigation, maritime law enforcement, and recreational boating safety. These operations are conducted off U.S. Coast Guard cutters, buoy tenders, and a variety of smaller law enforcement and search and rescue vessels. The U.S. Coast Guard also assists NOAA with surveillance efforts and actions related to enforcing regulations at FGBNMS. U.S. Coast Guard units conduct surveillance activities during their routine operations in the vicinity of the sanctuary and also schedule periodic site inspections. Both air and surface craft are involved in these activities.

4.4.7 Passive Economic Use

National marine sanctuaries are national resources that sometimes are recognized and designated internationally. Many people place economic value (a willingness to pay) on natural and cultural resources to ensure they are protected in a certain condition. Passive economic value is a term used to describe this source of value. In the past, this concept was more commonly referred to as non-use value and was described as being motivated by desires to protect resources for future generations (bequeath value) or a sense of well-being arising from the simple knowledge that the resources would remain protected throughout the future (existence value). People can learn about the conditions of resources and the threats against their future conditions through various media sources (e.g., newspapers, magazines, television, radio, books, Internet).

A Duke University Ph.D. candidate mentored by ONMS Chief Economist Bob Leeworthy studied the passive economic use value of the FGBNMS boundary expansion. The results of this study were ultimately incorporated into a dissertation and a peer-reviewed publication in the *Marine Resources Economics* journal (Stefanski and Shimshack 2016). The study is based on a national survey of 1,526 households in the U.S., that was disseminated from June 2011 to May 2012. The study estimated passive economic use value associated with implementing Alternative 3 to expand FGBNMS. It found the average household was willing to pay between \$35 and \$107 per year to add the current protections in FGBNMS to the proposed expansion areas under Alternative 3. Using the lower bound estimate of \$35 per household per year and extrapolating this to 114 million U.S. households, and applying discount rates of 3%, 5%, and 7% (recommended by the U.S. Office of Management and Budget for water projects), the authors calculated a total passive economic use estimate of \$16.4 to \$18.3 billion over a five-year period (Stefanski and Shimshack 2016).

4.5 Cultural and Historic Resources

At the end of the 18th century and beginning of the 19th century, the Gulf of Mexico was an arena of commerce, political unrest, war and piracy, each one intertwined with the other. A

variety of Spanish, English, and French vessels from merchants, slavers, smugglers, privateers or pirates ended up on the bottom of the Gulf of Mexico as a result of conflict, weather, or shipworm damage. In the 20th century, during World War II, 56 German U-boats operated in the Gulf of Mexico using shipping lanes and navigational beacons to locate and torpedo unsuspecting prey (Brooks et al. 2013). More recently, a wreckage associated with the Deepwater Horizon disaster marks the graves of eleven workers who died aboard the drilling rig in 2010, as it sank to the sea floor 45 miles (72 kilometers) from the Louisiana coast in water depths of nearly one mile (1.6 kilometers).

Historical records show over 3,200 shipwrecks found in the Gulf of Mexico. Just over 700 shipwrecks or likely shipwrecks have been located, mostly from sonar imaging. About 35 of these have been positively identified as actual historic wrecks that would be eligible for listing on the National Register of Historic Places. The ten shipwrecks included in Alternative 5 have been evaluated as the most historically important and nationally significant. Additional information about these shipwrecks is presented in Appendix E. NOAA did not identify any historic properties within the proposed boundary of the Final Preferred Alternative. Should any such resources be discovered within the expanded sanctuary boundaries in the future, the comprehensive management approach afforded by the NMSA would provide important protections and research capacities allowing for their appropriate conservation and documentation.

Sunken vessels may contain hazardous cargo, abandoned fuel, and unexploded ordnance. Those sunken vessels included in proposed boundaries of Alternative 5 are slowly deteriorating in a corrosive marine environment. For instance, the *GulfPenn* and *GulfOil* shipwrecks were both carrying petrochemical loads when they were sunk during World War II, and the *U-166* was armed with 22 torpedoes, among other armaments. NOAA would follow internal guidance on leak prevention and mitigation if any leak were detected on these sunken vessels.

Activities that may affect historic resources are regulated by the National Historic Preservation Act (NHPA), as described in Appendix G.

4.6 Regulatory Context for the Proposed Action

A number of federal agencies provide regulatory oversight to the resources within or near the current sanctuary or proposed expansion areas. Several of these are particularly relevant to the proposed expansion of FGBNMS, as they provide the primary current regulatory framework for resources found in the proposed expansion areas. For example:

- EPA oversees discharges under the Clean Water Act (see Appendix G.6);
- NMFS establishes EFHs and HAPCs under the MSA (see Appendix G.1);
- NMFS and the Fishery Management Councils manage fisheries in federal waters of the Gulf of Mexico under the MSA (see Appendix G.1); and
- BOEM protects topographic features within NAZs, live bottom (pinnacle trend and low relief features), PSBFs located outside of NAZs surrounding topographic features, hard bottoms, deepwater corals, and chemosynthetic communities through stipulations attached to OCS leases and mitigations/conditions of approval applied to permits after case-by-case reviews of permit applications (see Appendix G.4).

See Appendix G for additional information on these Federal laws and policies, how they intersect with management of FGBNMS, and NOAA's compliance with all applicable environmental laws and regulations associated with the proposed action.

Chapter 5

Analysis of Environmental Consequences

5.1 Introduction

This chapter describes the anticipated environmental impacts of implementing each of the action alternatives, and the No Action Alternative, as presented in Chapter 3. These potential impacts apply to the affected environment described in Chapter 4. This impact analysis includes a discussion of potential cumulative impacts, any unavoidable adverse impacts, the relationship between short-term uses and long-term productivity, and the irreversible and irretrievable commitment of resources. As described in Chapter 3, the action alternatives are exclusively spatial in nature. Each of the alternatives assumes the current sanctuary regulations and management plan would be extended to areas encompassed in any expanded boundaries.

All potential impacts, both beneficial and adverse, are described by their characteristics:

- type (direct, indirect, or cumulative),
- duration (short-term, long-term, or permanent),
- geographic extent (localized or beyond proposed boundaries), and
- magnitude/intensity (minor, moderate, major).

NOAA organized the environmental consequences analysis by those impacts unique to the No Action Alternative (Section 5.2) and those impacts common to all of the action alternatives (Section 5.3). NOAA described impacts to cultural and historical resources separately in Section 5.4. NOAA found the intensity and extent of impacts under each expansion alternative would be proportional to the number of sites included in the proposed boundaries and the total areal extent of each expansion alternative. Section 5.6 summarizes the environmental consequences analysis and compares the impacts of all alternatives.

5.1.1 Affected Resources

NOAA evaluated the impacts of the proposed action and alternatives on each of the following resource types, as detailed in Chapter 4:

- Air quality and climate
- Noise environment
- Scenic and visual resources
- Geology and substrates
- Water resources
- Living marine resources
- Essential Fish Habitat and Habitat Areas of Particular Concern
- Protected species and habitats
- Marine area use, recreation, and socioeconomics
- Cultural and historic resources

This chapter also includes NOAA's effect determinations for impacts to protected species, habitats, and historic properties. See Appendix G for additional details related to NOAA's compliance with applicable laws and regulations that intersect with management of FGBNMS.

5.1.2 Types of Potential Impacts

NOAA applied the following definitions of types of potential impacts, consistent with CEQ's regulations at 40 C.F.R. § 1508.7 and § 1508.8 (1978). NOAA uses these categories to describe the nature, timing, and proximity of impacts on the affected resource area:

- **Direct Impact:** A known or potential impact caused by the proposed action or project that occurs at the time and place of the action.
- **Indirect Impact:** A known or potential impact caused or induced by the proposed action or project that occurs later than the action or is removed in distance from it, but is still reasonably expected to occur.
- **Cumulative Impact:** A known or potential impact resulting from the incremental effect of the proposed action added to other past, present, or reasonably foreseeable future actions. NOAA's timeframe for the cumulative impacts analysis is the next 5 to 10 years.

5.1.3 Duration of Potential Impacts

NOAA describes the duration of potential impacts as either short-term, long-term, or permanent. This indicates the period of time during which the resource would be impacted. Duration takes into account the permanence of an impact and is defined as:

- **Short-Term Impact:** A known or potential impact of limited duration, relative to the proposed action and the environmental resource. For the purpose of this analysis, short-term impacts may be instantaneous or may last minutes, hours, days, or up to 5 years.
- **Long-Term Impact:** A known or potential impact of extended duration, relative to the proposed action and the environmental resource. For the purpose of this analysis, long-term impacts would last longer than 5 years.
- **Permanent Impact:** A known or potential impact that is likely to remain unchanged indefinitely.

5.1.4 Geographic Extent of Potential Impacts

NOAA defines the geographic extent of potential impacts as follows:

- **Localized:** Impacts that are site-specific and generally limited to the area within the proposed boundaries.
- **Beyond Proposed Boundaries:** Impacts that are unconfined or unrestricted to the proposed boundaries. These impacts may extend only in the immediate vicinity of a proposed boundary or throughout the north central Gulf of Mexico.

5.1.5 Magnitude of Potential Impacts

To determine the proposed action's magnitude or intensity, NOAA qualitatively assessed the degree to which each alternative would impact a particular resource. NOAA's qualitative assessment is based on a review of the available and relevant reference material, and is based on professional judgment using standards that include consideration of:

- permanence of an impact;
- potential for natural attenuation of an impact;
- uniqueness or irreplaceability of the resource;
- abundance or scarcity of the resource;
- geographic, ecological, or other context of the impact; and
- potential mitigation measures to offset the anticipated impact.

For the **physical and biological environment**, NOAA categorized the magnitude of potential impacts as either minor, moderate, or major, defined as:

- **Minor** impacts to the structure or function of a resource might be perceptible but are typically not amenable to measurement. These are typically localized but may in certain circumstances extend beyond a proposed boundary. Generally, minor impacts are those that, in their context and due to their low level of severity, do not have the potential to meet the considerations of 'significance' set forth in CEQ regulations (40 C.F.R. § 1508.27) and NOAA policy (NOAA Administrative Order (NAO) 216-6A).
- **Moderate** impacts to the structure or function of these resources are more perceptible and, typically, more amenable to quantification or measurement. These can be both localized, or may extend beyond a proposed boundary. Generally, moderate impacts are those that, in their context and due to their low level of severity, do not have the potential to meet the considerations of 'significance' set forth in CEQ regulations (40 C.F.R. § 1508.27) and NOAA policy (NAO 216-6A).
- **Major** impacts to these resources are typically obvious, amenable to quantification or measurement, and result in substantial structural or functional changes to the resource. These can be localized, or may extend beyond a proposed boundary. Generally, major impacts are those that in their context and due to their severity, have the potential to meet the considerations of 'significance' set forth in CEQ regulations (40 C.F.R. § 1508.27) and NOAA policy (NAO 216-6A).

For **marine area use, recreation, and socioeconomics** and **cultural and historic resources**, NOAA categorized the magnitude of potential impacts as either minor, moderate, or major, defined as:

- **Minor** impacts might be perceptible but, in their context, are not amenable to measurement and do not alter the overall, fundamental condition of the resource from status quo. Such impacts generally would be isolated to that resource alone and would not have any meaningful influence on other resource categories. Generally, minor impacts are those that, in their context and due to their low level of severity, do not have the potential to meet the considerations of 'significance' set forth in CEQ regulations (40 C.F.R. § 1508.27) and NOAA policy (NAO 216-6A).

- **Moderate** impacts to these resources are more perceptible and, typically, more amenable to quantification or measurement and would likely alter the overall, fundamental condition of the resource from status quo. These may be so impactful as to meaningfully alter or affect another resource category in the proposed boundary. Generally, minor impacts are those that, in their context and due to their low level of severity, do not have the potential to meet the considerations of ‘significance’ set forth in CEQ regulations (40 C.F.R. § 1508.27) and NOAA policy (NAO 216-6A).
- **Major** impacts to these resource categories are obvious, amenable to quantification or measurement, and result in substantial changes to the fundamental condition of the resource from status quo. Such impacts may be so severe or profound as to substantially alter or affect more than one other resource category in the proposed boundary. Generally, major impacts are those that in their context and due to their severity, have the potential to meet the considerations of ‘significance’ set forth in CEQ regulations (40 C.F.R. § 1508.27) and NOAA policy (NAO 216-6A).

5.2 Impacts of the No Action Alternative (Alternative 1)

Under the No Action Alternative, the current boundaries of FGBNMS and the regulations and management plan applied within the sanctuary would remain the same as the status quo (Figure 5.1). NOAA anticipates that implementing the No Action Alternative would leave the existing environment in the vicinity of FGBNMS unchanged except for the continuation of existing impacts, including ongoing impacts of climate change, as described in Chapter 4.

No direct changes to air quality and climate, the noise environment, scenic and visual resources, geology and substrates, water resources (e.g., circulation patterns, oceanographic conditions or water quality parameters such as temperature, dissolved oxygen levels, salinity or potential contaminant levels), living marine resources, EFH and HAPCs, protected species, marine area use and recreation or socioeconomics, and cultural and historic resources are expected to result from the No Action Alternative.

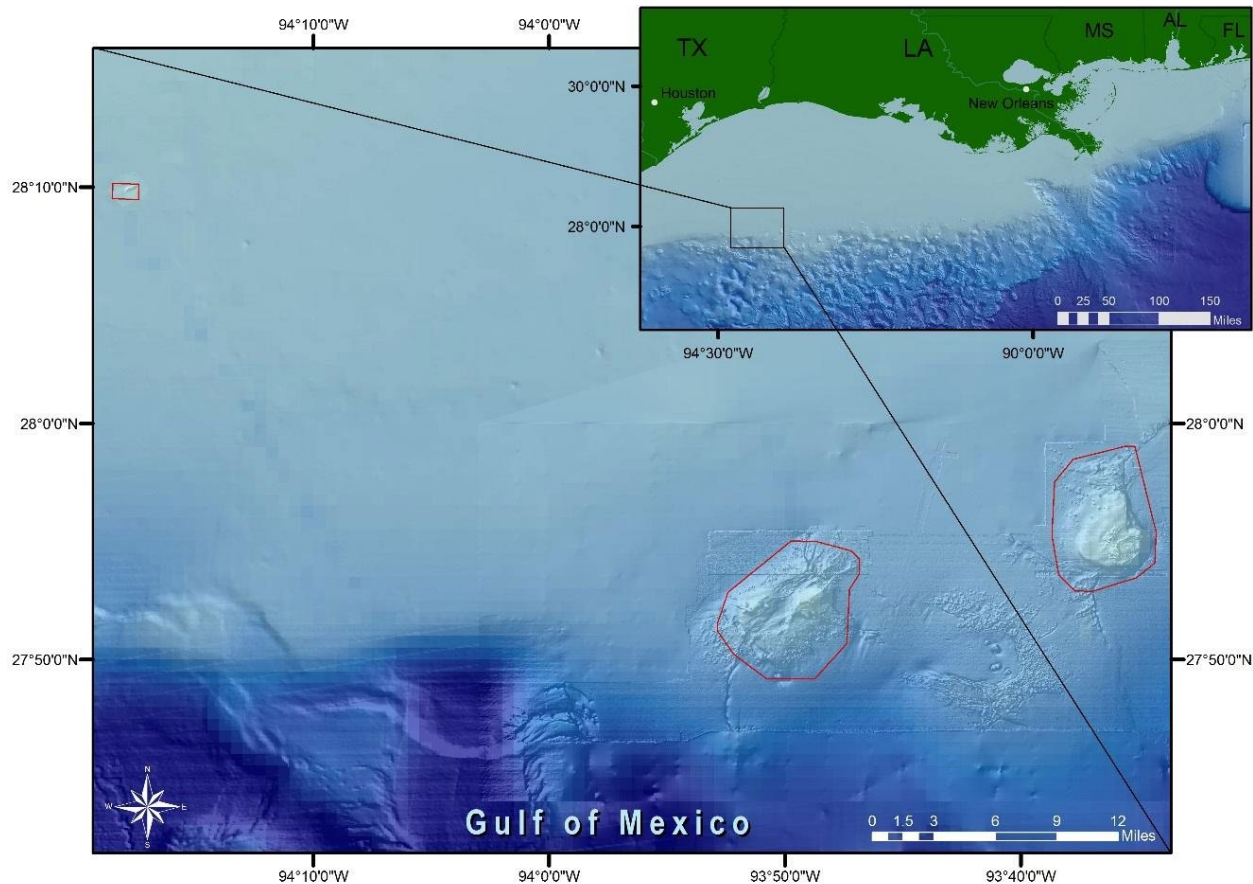


Figure 5.1. Current sanctuary boundaries (Alternative 1, No Action). Image: NOAA

The failure to implement the regulatory protections and management actions in the proposed expansion areas would indirectly allow ongoing deleterious changes to the physical and biological environment to continue in those areas from certain current uses. Specifically, habitat and seafloor damage from anchoring and use of bottom-tending fishing gear, reductions in fish biomass from all currently allowed types of fishing, and unmitigated recruitment of invasive species would continue to occur in the proposed expansion areas. This would result in indirect, long-term, localized, moderate adverse impacts to geology and substrates and living marine resources. In addition, ongoing vessel activity and resulting discharges and emissions in the current sanctuary and expansion areas would continue to have indirect, long-term, minor adverse impacts on air quality and climate beyond the current or proposed boundaries. Indirect adverse impacts from these ongoing uses on the noise environment, scenic and visual resources, water resources, marine area use, recreation, and socioeconomics, and cultural and historic resources would be minor and localized.

Economic incentives that drive extractive activities in the north central Gulf of Mexico region will continue to exist with or without sanctuary expansion. However, implementing the No Action Alternative would avoid some of the minor adverse impacts to living marine resources and socioeconomic resources associated with the action alternatives, as described in further detail in Section 5.3. For example, spatial substitution of fishing effort would likely not occur under the No Action Alternative because fishing gear restrictions under current sanctuary

regulations would not be applied to the proposed expansion areas. Similarly, economic activity occurring in the proposed expansion areas would continue unimpeded by the implementation of sanctuary protections in those areas providing minor beneficial impacts to socioeconomic resources.

There is a greater likelihood of loss or degradation of habitat and other environmental resources under the No Action Alternative than under any of the action alternatives. The No Action Alternative leaves nationally significant marine habitat resources at risk of loss or degradation, and would not fulfill the mission of ONMS and FGBNMS, or the purpose and need for sanctuary expansion identified in this FEIS.

With or without sanctuary expansion, implementation of fishery management activities by NMFS pursuant to the MSA, including consultations on federal actions that might negatively affect EFH (e.g., dredge and fill, mining, OCS activities, coastal development), would continue to afford protections to habitat and living marine resources in the current sanctuary and the proposed expansion areas. Additionally, past actions by NMFS and the GMFMC that protect biogenic structures such as coral reefs, siltstone or claystone banks, and other marine habitats would be maintained and provide protection to habitats functionally important to one or more managed species. These include prohibitions on the use of explosives, chemicals, and anchoring in sensitive areas; designation of no trawl zones and other marine protected areas such as at FGBNMS; and some fishing gear restrictions. The protection of topographic features in NAZs, live bottoms, hard bottoms, PSBFs, and deepwater benthic communities (deepwater coral and chemosynthetic communities) from oil and gas activities in the Gulf of Mexico would continue under the jurisdiction of BOEM. In addition, EPA and USACE would continue to regulate discharges and other offshore activities under authorities such as Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act.

Overall, NOAA determined that the **beneficial** and **adverse** impacts on all resource areas from implementing the No Action Alternative would be **less than significant** due to the low level of intensity of expected impacts in the context of the total use of the north central Gulf of Mexico. NOAA anticipates that under the No Action Alternative, current uses within the sanctuary would remain the same for the foreseeable future, therefore, NOAA does not expect any significant impacts.

Table 5.1 provides the legend for the color codes used in Table 5.2 to describe the impact expected to each resource. Table 5.2 presents the analysis of environmental consequences expected for each of the affected resources based on the criteria defined in Section 5.1.

Table 5.1. Color coding legend for Table 5.2.

Minor beneficial impact
Moderate beneficial impact
Major beneficial impact
Minor adverse impact
Moderate adverse impact
Major adverse impact

Table 5.2. Summary of the environmental consequences of Alternative 1 (No Action). For certain resources, the geographic extent, magnitude/intensity, or quality of impacts expected to be incurred may vary. As such some affected resources contain more than one entry in this table.

Resource	Type of Impact	Duration of Impact	Geographic Extent	Magnitude/Intensity	Quality
Air Quality and Climate	Indirect	Long-term	Beyond proposed boundaries	Minor	Adverse
Noise Environment	Indirect	Long-term	Localized	Minor	Adverse
Scenic and Visual Resources	Indirect	Long-term	Localized	Minor	Adverse
Geology and Substrates	Indirect	Long-term	Localized	Moderate	Adverse
Water Resources	Indirect	Long-term	Localized	Minor	Adverse
Living Marine Resources	Indirect	Long-term	Localized	Moderate	Adverse
	Indirect	Long-term	Beyond proposed boundaries	Minor	Beneficial
Essential Fish Habitat and Habitat Areas of Particular Concern	Indirect	Long-term	Beyond proposed boundaries	Minor	Beneficial
Protected Species and Habitats	Indirect	Long-term	Localized	Minor	Adverse
Marine Area Use, Recreation, and Socioeconomics	Indirect	Long-term	Localized	Minor	Beneficial
	Indirect	Long-term	Localized	Minor	Adverse
Cultural and Historic Resources	Indirect	Long-term	Localized	Minor	Adverse

5.3 Impacts Common to All Action Alternatives

This section describes the potential impacts to resource areas that are common to all action alternatives (Final Preferred Alternative, and Alternatives 2, 3, 4 and 5). NOAA determined that these potential impacts are proportional to the number of features included in the proposed boundary and the total areal extent of each action alternative. See Chapter 3 for a detailed description of the areas included in each action alternative.

5.3.1 Impacts on Air Quality and Climate (Common to All Action Alternatives)

Under existing regulations, exhausts from vessels and oil and gas infrastructure are permitted to be released inside current sanctuary boundaries because they are exempted from the sanctuary's discharge prohibitions. Under all action alternatives, this exemption from discharge prohibitions would be applied to any sanctuary expansion areas. However, the application of regulations on use of certain fishing gear, anchoring, bottom disturbance, and other discharges to the proposed expansion areas could result in reduced vessel traffic or oil and gas activity in these areas.

This reduction in vessel activity would result in direct, long-term, localized, minor beneficial impacts to air quality from avoided vessel emissions. In addition, any avoided oil and gas production resulting from application of sanctuary regulations in proposed expansion areas would result in indirect, long-term, minor beneficial impacts on air emissions and climate beyond the proposed boundaries from decreased air emissions. Similar beneficial impacts on air

emissions would result from any increase in the uptake of atmospheric contaminant loads (e.g. carbon dioxide, mercury) due to increased biological productivity resulting from sanctuary protections.

Any increase in vessel traffic related to enforcement, research and education, recreation, or other similar activities in the expansion areas resulting from the proposed sanctuary expansion would have direct, long-term, localized minor adverse impacts on air quality from increased vessel emissions.

These beneficial and adverse impacts on air quality and climate would be proportional to the number of features and areal extent encompassed under each alternative. Overall, NOAA determined that the **beneficial** and **adverse** impacts on air quality and climate from implementing any of the action alternatives would be **less than significant** due to low level of intensity of potential impacts in the context of the existing total vessel traffic and industrial use of the north central Gulf of Mexico.

5.3.2 Impacts on the Noise Environment (Common to All Action Alternatives)

Current sanctuary regulations do not directly restrict noise from occurring within the sanctuary boundaries. However, sanctuary regulations prohibit disturbance or injury to sanctuary resources, which may include noise disturbance. Under all action alternatives, this existing prohibition would be applied to the proposed expansion areas. In addition, the application of sanctuary regulations on use of certain fishing gear, anchoring, bottom disturbance, and discharges to the expansion areas could reduce vessel traffic or oil and gas activity in these areas. Moreover, because of the EPA general permit, new construction would be prohibited in the expanded sanctuary boundaries, which would further reduce noise impacts.³¹

This potential reduction in vessel traffic or oil and gas activity in the expansion areas could similarly result in reductions in noise generation, which may achieve an indirect, long-term, localized, minor beneficial impact on the noise environment.

Any increase in vessel traffic related to enforcement, research and education, recreation, or other similar activities in the expansion areas resulting from the proposed sanctuary expansion would have direct, long-term, localized minor adverse impacts on the noise environment from noise disturbance associated with vessel transits.

These beneficial and adverse impacts to the noise environment would be proportional to the number of features and areal extent encompassed under each alternative. Overall, NOAA determined that the **beneficial** and **adverse** impacts on the noise environment from implementing any of the action alternatives would be **less than significant** due to the small level of anticipated change in vessel traffic and other activities producing noise disturbance in the context of the existing total vessel traffic and industrial uses of the north central Gulf of Mexico.

³¹ See: https://www.epa.gov/sites/production/files/2017-09/documents/2017_final_gp_for_fr_091817.pdf

5.3.3 Impacts on Scenic and Visual Resources (Common to All Action Alternatives)

Under all of the action alternatives, NOAA anticipates applying regulations on certain fishing gear, anchoring, bottom disturbance, and discharges to the expansion areas would reduce the amount of marine debris (e.g. derelict fishing gear), vessel traffic, and industrial infrastructure that detract from the aesthetic values of the current sanctuary and the expansion areas. New infrastructure development within the expansion areas would also be restricted under EPA's NPDES General Permit, which would indirectly decrease impacts to scenic and visual resources.³² The potential reduction in these activities would have indirect, long-term, localized, minor beneficial impacts on the scenic and visual resources of the proposed expansion areas. In addition, under all of the action alternatives, the proposed expansion would foster more thorough exploration and research in the expansion areas allowing the public to visualize previously unknown, unobserved areas and resources, even if visiting them is not possible.

These beneficial impacts to the scenic and visual resources would be proportional to the number of features and areal extent encompassed under each alternative. Overall, NOAA determined that the **beneficial** impacts on scenic and visual resources from implementing any of the action alternatives would be **less than significant** due to the small level of anticipated change in vessel traffic and other activities producing marine debris or other visual disturbance, and the small expected increase in exploration and research in the expanded sanctuary in the context of the total north central Gulf of Mexico ocean exploration and research enterprise.

5.3.4 Impacts on Geology and Substrates (Common to All Action Alternatives)

The geological and substrate resources of the features encompassed by the various sanctuary expansion alternatives are less vulnerable to disruptions than are the biogenic features. Nevertheless, adverse impacts on these geological structures and substrates in the north central Gulf of Mexico have been observed from fishing involving bottom-tending gears, dredging, scraping, sand and mineral mining, oil and gas exploration and extraction activities, laying pipelines, modifying deposition, and coastal development (Turner and Cahoon 1987, Louisiana Coastal Wetlands Conservation and Restoration Task Force and Wetlands Conservation and Restoration Authority 1998). Some of these actions could homogenize the seabed surface, causing sedimentation to cover surface features or causing subsidence.

There is evidence of historical damage to the substrates of FGBNMS from anchoring of large ships (66 FR 58370; Nov 21, 2001), damage to substrates from indiscriminate anchoring at proposed expansion areas such as Sonnier Bank (NOAA 2012a), and damage to geological and substrate resources from salvage activities at proposed expansion areas such as Bright Bank (Coleman 2004). Anchoring by smaller vessels leaves scars if anchors drag or snag hard bottom. Scars or tracks of pulverized coral have been documented by studies conducted by submersibles and divers.

³² See: https://www.epa.gov/sites/production/files/2017-09/documents/2017_final_gp_for_fr_091817.pdf

Of these potential impacts, anchoring, fishing, oil and gas exploration and extraction, and laying pipelines are most common and likely to continue in the region of the proposed expansion areas. Under all of the action alternatives, NOAA would apply current sanctuary regulations on certain fishing gear, anchoring, abandonment, bottom disturbance, and dredging or otherwise altering the seabed for any purpose, to the expansion areas. This would reduce the amount of activities that could adversely affect geological features and substrate within the expansion areas. The regulations would provide an exemption to these prohibitions for necessary activities conducted in areas outside the NAZs and incidental to exploration. Any potential reduction in these activities would provide direct, long-term, localized, moderate benefits to geological and substrate resources.

In addition, applying sanctuary regulations to the expansion areas that require shunting of drilling muds to the seafloor would concentrate the area in which drilling muds and associated contaminants are released into the environment. This would have both beneficial and adverse direct, long-term, localized, minor impacts on geological and substrate resources. This requirement would also avoid potential impacts to biological resources within the sanctuary that could be affected by disposal of this material at the sea surface and its transport through the water column by ocean currents to the seafloor. Similar benefits may derive to geological and substrate resources at greater distance from the production infrastructure from which it is disposed. This requirement has been documented to result in a “halo effect” or gradient of contaminated sediments in the immediate vicinity of shunt pipe discharge points that decreases rapidly with distance from platforms (Kennicutt 1995), and differences in substrate grain size can persist where smothering occurs (Boland et al. 2004, Roberts and Nguyen 2006). This requirement is already in place within buffer zones around NAZs under the BOEM stipulations attached to leases, and therefore would not represent a change for most areas proposed for inclusion under the expansion alternatives.

These beneficial and adverse impacts to the geology and substrates would be proportional to the number of features and areal extent encompassed under each alternative. Overall, NOAA determined that the **beneficial** and **adverse** impacts on the geology and substrates from implementing any of the action alternatives would be **less than significant** due to their low level of intensity in the context of all existing bottom disturbing activities occurring and of all drilling operations for which shunting is required in the north central Gulf of Mexico.

5.3.5 Impacts on Water Resources (Common to All Action Alternatives)

Under all action alternatives, NOAA would apply the current sanctuary regulations prohibiting discharge and deposit of material within the sanctuary to the proposed expansion areas, with some exceptions. This would likely reduce the amount of discharges from vessels or other activities occurring in the expansion areas, providing direct and indirect, long-term, minor benefits to water resources. These benefits would be both localized and extended beyond the proposed boundaries, to the extent that such prevented discharges and deposits could be carried by currents, animals, vessels, etc. outside those proposed boundaries.

Under all action alternatives, exceptions to discharge prohibitions would allow for the following discharges:

- discharge of fish, fish parts, chumming materials or bait used in, or resulting from, fishing with conventional hook and line gear in the sanctuary;
- biodegradable effluents incidental to vessel use and generated by marine sanitation devices approved in accordance with Section 312 of the Clean Water Act;
- water generated by routine vessel operations (e.g., cooling water, deck wash down and graywater as defined by Section 312 of the Clean Water Act) excluding oily wastes from bilge pumping, and drilling cuttings and fluids incidental to oil and gas operations (outside of NAZs and buffer zones).

BOEM's Oil Spill Modeling Program analyzed the risks posed by potential oil spills in the Gulf of Mexico through its Oil Spill Risk Analysis model, and identified both the likelihood of spill occurrence and the probability a given spill will result in contact with environmental receptors, including the areas considered in each of the expansion alternatives (Ji et al. 2004, Ji et al. 2012, Ji et al. 2013). While oil spills and spills of chemicals and compounds used operationally in the oil and gas industry could seriously impact water quality in expansion areas and beyond, the likelihood of such contact for the various alternatives is low (Ji et al. 2004, Ji et al. 2012, Ji et al. 2013), and it is further reduced to the extent that the sanctuary expansion alternatives could result in reductions in oil and gas infrastructure in or near the expansion areas. Such reductions would yield both indirect, long-term, localized minor benefits and indirect, long-term benefits beyond the proposed boundaries.

These beneficial impacts on water resources would be proportional to the number of features and areal extent encompassed under each alternative. Overall, NOAA determined that the **beneficial** impacts on water resources from implementing any of the action alternatives would be **less than significant** due to the low level of intensity of potential impacts in the context of:

- 1) the many factors influencing water quality, including oceanographic conditions and contaminant loads, such as Mississippi River nutrient loads contributing to the hypoxic zone on the continental shelf;
- 2) the extensive vessel traffic and industrial use of the north central Gulf of Mexico; and
- 3) the potential for oil spill impacts across the north central Gulf of Mexico.

NOAA anticipates that for these reasons, none of the action alternatives would affect the oceanographic characteristics of the north central Gulf of Mexico.

5.3.6 Impacts on Living Marine Resources (Common to All Action Alternatives)

The primary environmental consequences of the proposed sanctuary expansion would result from applying the current sanctuary regulations in expansion areas. Under all action alternatives, NOAA would apply the current sanctuary regulations on certain activities, with certain exceptions, such as, use of certain fishing gear, anchoring or other bottom disturbance, and discharges. Application of these regulations to the expansion areas could reduce vessel

traffic or other activities occurring in these locations. See Appendix H for the proposed regulatory prohibitions that would apply in the expanded sanctuary.

Implementing regulatory prohibitions in expansion areas could result in increased biological productivity in these areas and have indirect, long-term, moderate, beneficial impacts on living marine resources beyond the proposed expansion boundaries due to the spillover from fishing restrictions and habitat protections inside the sanctuary boundary to areas outside it.

Direct, long-term, localized major benefits to living marine resources in the proposed expansion areas would result from sanctuary expansion and the imposition of protections concomitant with such designation. The paragraphs that follow in this section identify the sources of these benefits.

The sessile benthic communities targeted for protection under the proposed expansion alternatives would benefit because they are highly susceptible to bottom-disturbing activities like anchoring, oil and gas development, fishing activities and marine debris. Sanctuary expansion may result in increases in coral cover or density over time (Selig and Bruno 2010), as well as increases in fish biomass (Edgar et al. 2011, Harborne et al. 2008) or abundance (Jeffrey et al. 2012), particularly where fishing pressure is reduced (Edgar et al. 2011, Kramer and Heck 2007). Although benefits to corals may require as many as 10 years after the designation of expanded sanctuary boundaries (Selig and Bruno 2010), the beneficial effects of designation of the proposed expansion areas are anticipated to be long-term, if not permanent.

Other potential direct benefits to living marine resources include reducing impacts due to limitations on fishing that can otherwise alter predator-prey relationships, disturb bottom habitats, and increase loss of fish biomass. Management actions could reduce marine debris and impacts of debris on corals and other organisms, such as entanglement of sea turtles in derelict fishing gear and incidental catch of fish in “ghost” fishing gears. Management actions also include prohibition of bottom-tending fishing gear, limits on anchoring and the discharge of pollutants, removal of marine debris such as derelict fishing gear, and invasive species removal, all of which would improve habitat for benthic coral communities and fish communities. Sanctuary protections and management provide important opportunities for research and recovery of living marine resources from observed impacts.

Additionally, localized, minor, adverse impacts to living marine resources could result from disturbances recreational divers could generate by:

- accidentally or intentionally damaging or altering the corals, sponges, or other components of the habitats present in the sanctuary (e.g., with fins);
- increased interaction with protected and key species;
- lack of proper buoyancy control;
- collecting souvenirs; and
- fish feeding.

The recreational diving impacts identified above may have a greater impact on protected corals due to their threatened status. Sanctuary regulations would advance recovery plan strategies for these species. For example, FGBNMS regulations applied to the proposed expansion areas

would prohibit injury and removal (or attempts to remove), or possession (regardless of where collected, caught, harvested, or removed) of any coral or other bottom formation, coralline algae or other plant, marine invertebrate, brine-seep biota or carbonate rock, or fish (except for fish caught by use of conventional hook and line gear) within the sanctuary. Fish feeding (except by use of conventional hook and line gear) would be prohibited within the expanded sanctuary because it is believed to significantly alter the behavior of fish by disrupting normal feeding patterns.

This type of impact could be especially acute without sanctuary management activities promoting best practices for divers within the sanctuary³³ or regular rotation of mooring buoys among preferred dive sites to avoid major degradation on a limited area. Once the expansion is finalized, FGBNMS intends to promote best diving practices³⁴ and to install mooring buoys in proposed sanctuary expansion areas as part of its management activities for the protection of the resources at these sites, particularly in areas accessible to recreational divers.

Use of bottom trawls, traps, and pots are prohibited in some parts of the Gulf of Mexico Exclusive Economic Zone (EEZ), including the current sanctuary boundaries. Bottom longlines are prohibited shallower than the 50 fathom (300 foot) isobaths. These regulations implement the GMFMC's Fishery Management Plans, HAPC designations, and FGBNMS regulations. In areas considered for inclusion in the expanded sanctuary but outside the current sanctuary, bottom longlines are not currently prohibited seaward of the prescribed 50 fathom (300 foot) line. Shrimp trawls are a prohibited gear within the sanctuary by sanctuary regulations, as are other commercial fishing gears except conventional hook and line gear.

Currently, impacts on living marine resources from fishing are mitigated by fishery management regulations in place throughout the Gulf of Mexico. Commercial and recreational fishing of reef fish (mostly snapper and grouper) in FGBNMS is conducted with conventional hook and line gear. The effort is mostly directed towards the fringe of the coral banks and in deep reef areas. These may also be the preferred areas frequented by schooling snappers and groupers, especially in or around spawning season when aggregations start to form. Prohibitions on certain types of fishing gear and on anchoring in the expanded sanctuary areas would reduce fishing pressure and impacts on vulnerable aggregating reef fish species and bottom habitats, benefiting critical nursery and feeding sites for reef fish juveniles and adults and for live bottom.

To the extent restrictions on fishing activity inside the sanctuary boundary increase fishing pressure and associated impacts outside the expanded boundaries (i.e., to the extent sanctuary regulations result in "spatial substitution"³⁵ of fishing effort to areas outside the expanded

³³ See FGBNMS website for details: <https://flowergarden.noaa.gov/visiting/reefetiquette.html>

³⁴ See FGBNMS website for details: <https://flowergarden.noaa.gov/visiting/reefetiquette.html>

³⁵ Spatial substitution is a strategy that has been employed by the fishing community in response to zoning changes or area closures (Lédée et al. 2012, De Freitas et al. 2013). Potential implications of spatial substitution in fishing efforts include changes in fishing frequency and satisfaction, reduced fishing quality, restricted access to areas considered to be high quality, increased crowding in new areas, and increased likelihood of localized depletions in new fishing areas (De Freitas et al. 2013). Despite impacts fishers may experience, evidence suggests these impacts might be short-term and decline over time as fishers learn to adapt to the newly protected areas (Lédée et al. 2012).

boundaries), NOAA anticipates indirect, long-term, minor adverse impacts may occur in those areas outside of the proposed expanded boundaries.

The beneficial and adverse impacts on living marine resources would be proportional to the number of features and areal extent encompassed under each alternative. Overall, NOAA determined that the **beneficial** impacts on living marine resources from implementing any of the action alternatives would be **less than significant** due to the low level of intensity in the context of total biological productivity, the extensive hard bottom areas available (see Section 5.3.9.1), and total fishing effort applied across the north central Gulf of Mexico. The anticipated **adverse** impacts on living marine resources would be **less than significant** due to the low level of anticipated change in intensity of fishing effort through spatial substitution occurring in areas outside the proposed boundaries in the context of total fishing effort applied across the north central Gulf of Mexico.

5.3.7 Impacts on Essential Fish Habitat and Habitats of Particular Concern (Common to All Action Alternatives)

As detailed above, implementing regulatory prohibitions in the expansion areas would protect coral communities and geology and substrate from adverse impacts associated with use of certain fishing gear, anchoring, and other bottom disturbances. These protections would have beneficial impacts on areas within the proposed expansion areas that provide waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. This includes areas designated as EFH and subsets of EFH designated as HAPCs.

Congress enacted the MSA to provide the Secretary of Commerce, by and through NMFS, authority to regulate domestic marine fisheries in need of conservation and management (16 U.S.C. §§ 1801 *et seq.*). Federal fisheries management is accomplished through Fishery Management Plans (FMPs) developed and prepared by regional Fishery Management Councils (or the Secretary through NMFS where appropriate) (16 U.S.C. §§ 1851 and 1852). FMPs are approved, implemented, and enforced by NMFS. Each FMP must identify EFH for the fishery and must minimize adverse fishing impacts to the extent practicable. In addition, Federal agencies must consult with NMFS on any action that may adversely impact EFH.

In 2016, ONMS consulted with NMFS on the impacts on EFH from implementing routine field operations in national marine sanctuaries in the Southeast and Gulf of Mexico region, including FGBNMS. ONMS determined that implementing routine field operations in FGBNMS, and other ONMS sites, would have **no more than minimal adverse effects** on EFH. On September 28, 2016, NMFS provided a General Concurrence with this determination, with the following exceptions which would require consultations on a project-by-project basis:

- Activities requiring an individual permit or letter of permission, and an associated EFH consultation, from the USACE.
- Coral restoration activities proposed to harvest healthy (undamaged) or non-nursery corals.
- Seagrass restoration activities proposing the harvest and relocation of seagrass from non-nursery donor sites.

- Non-emergency removal of grounded vessels and large debris requiring motorized equipment that may alter the surrounding environment or may further adversely impact the substrate upon which the vessel or marine debris was originally found during the removal process. Emergency removal of grounded vessels and large debris, causing further damage, will be addressed on a case-by-case basis pursuant to 50 C.F.R. § 600.920.

In the DEIS and by letter dated July 7, 2016, ONMS determined that the proposed action to expand FGBNMS would protect EFH and would contribute to conservation and management of species managed by NMFS and the GMFMC. At that time, ONMS determined that consultation with NMFS under the EFH provisions of the MSA was not required because the proposed action would not adversely affect EFH. In this FEIS, ONMS evaluated potential impacts to EFH from implementing the Final Preferred Alternative and concluded the proposed action would **not adversely affect** designated EFH. Any impacts to EFH from implementing field operations as part of the proposed sanctuary expansion would be within the bounds of the General Concurrence for field operations supporting research and management activities in national marine sanctuaries in the Southeast and Gulf of Mexico Region.

5.3.8 Impacts on Protected Species and Habitats (Common to All Action Alternatives)

Sea turtles, *Orbicella* star coral, and acroporid corals are protected by the ESA, and marine mammals are protected by the MMPA. In addition, sanctuary regulations prohibit the take of any ESA-listed species or marine mammal. However, accidental catch (bycatch) or injury to these species is still possible during fishing activities or due to interactions with both large (> 100 feet long) and small (< 100 feet long) vessels. Individual marine mammals, sea turtles, and fish species are often found entangled in fishing gear. This fishing gear may also be ingested by protected vertebrate species. Release of various discharges or marine debris from vessels is also a potential adverse impact and has been found to be a contributing factor in many protected vertebrate species mortalities due to ingestion. Vessel collisions could impact marine mammal and sea turtle species. However, based on NOAA's experience, the level of vessel interactions with marine mammals and sea turtles in the proposed expansion areas is very low. Potential interactions resulting from NOAA field activities in the proposed expansion areas would be mitigated by the sanctuary's standard operating procedures for vessel and diving operations. Interactions with marine mammals and other protected species could still occur outside the expansion areas during vessel transits. Threatened and protected fish species could be less affected by some recreational and commercial fishing activities in expansion areas, as no gear but conventional hook and line would be allowed.

Under all action alternatives, implementing prohibitions on use of certain fishing gear, anchoring, bottom disturbance, and discharges in the expansion areas would provide further protections to threatened and endangered species that make use of habitats yielding direct, long-term, localized, minor beneficial impacts.

The beneficial impacts on protected species and habitat would be proportional to the number of features and areal extent encompassed under each alternative. Overall, NOAA determined the

beneficial impacts on protected species and habitat from implementing any of the action alternatives would be **less than significant** due to the low level of intensity in the context of the extensive ongoing uses of the north central Gulf of Mexico that affect these species. See below for ONMS's effect determinations under ESA, MMPA, and the Migratory Bird Treaty Act (MBTA). Additional consultation documentation, as appropriate, is included as a supporting document on the FGBNMS website.³⁶

5.3.8.1 Effect Determinations for Endangered Species Act Listed Species and Designated Critical Habitat

Section 7 of the ESA requires all federal agencies, in consultation with the Departments of the Interior (USFWS) and Commerce (NMFS), to ensure their actions are not likely to jeopardize the continued existence of endangered or threatened species, or result in the destruction or adverse modification of the critical habitat of such species. As described in Section 4.3.4, ONMS identified species of ESA-listed corals, whales, sea turtles, sharks, and rays that may occur in the proposed expansion areas.

ONMS's analysis considered the increased protections that would be extended to federally listed species and their habitats by applying sanctuary regulations in the proposed expansion areas. This would include prohibitions on anchoring and bottom-disturbing activities (including some types of fishing), as well as prohibitions on certain discharges. ONMS found that the proposed expansion would have the following impacts on listed species:

- The expected reduction in large vessel traffic and other noise-generating activities related to oil and gas exploration and production resulting from sanctuary expansion may reduce man-made noise, resulting in **beneficial** effects on listed species.
- Corals can be damaged or destroyed by bottom-tending fishing gears, possessing various marine resources, injuring or taking or attempting to injure or take sanctuary resources, anchoring, dredging, scraping, mining, oil and gas extraction, and construction/operation of pipelines. The proposed expansion of the sanctuary (where these activities would be prohibited) may result in **beneficial** effects on listed corals in these areas.
- Sea turtles, fish, and whales are known to become entangled in derelict fishing gear such as long-lines and nets. The proposed expansion of the sanctuary (where the use of these types of gear would be prohibited) may result in a **beneficial** reduction in entanglement of listed sea turtles and whales in these areas.
- Discharges of toxins and marine debris from vessels are known to impact fish, whales, and sea turtles due to ingestion. The proposed expansion of the sanctuary (where discharge of any material would be prohibited) may have **beneficial** impacts on listed species by reducing the likelihood of ingestion of toxic/foreign materials.
- Sea turtles and whales may be injured or killed by vessel strikes in open water. There is the potential for sanctuary expansion to result in a small increase in vessel traffic related to regulatory enforcement, research, education, and recreation. Due to the extreme remoteness of the proposed expansion areas and the minor increase in vessel traffic

³⁶ See: <https://flowergarden.noaa.gov/management/expansionpr.html>

expected from sanctuary expansion, the potential for the proposed action to result in an increase in vessel strikes of listed species is **discountable**.

On July 7, 2016, upon publication of the DEIS, ONMS initiated informal ESA Section 7 consultation for impacts to species and critical habitat under NMFS jurisdiction. NMFS provided concurrence with ONMS's **may affect, but not likely to adversely affect** determination on December 20, 2016 (Consultation Code: SER-2016-18086). Based on changes to the original preferred alternative and new species listings, NOAA ONMS re-initiated informal consultation with NMFS on November 17, 2020. NMFS provided concurrence with ONMS's revised effect determination on December 3, 2020 (Consultation Code: SERO-2020-03175).

As described in Section 4.3.4, NOAA used USFWS's IPaC tool to identify ESA-listed species under USFWS jurisdiction that may occur in the expansion areas. NOAA evaluated the habitat requirements and habitat availability for these species listed in Table 4.2 within the action area and determined none would be affected by the proposed action. NOAA made this **no effect** determination because:

- The proposed action would not involve any on-shore or nearshore activities that could interact with birds, seabirds, shorebirds, sea turtle nesting, or critical habitat for the piping plover,
- Sea turtles occurring in the proposed expansion areas would be far offshore and therefore outside USFWS jurisdiction³⁷, and,
- While the Texas coastline is within the historical range of West Indian Manatees, individuals only occasionally range as far west as Texas, therefore it is highly unlikely they would occur in the action area while NOAA vessel activities were occurring.³⁸

5.3.8.2 Effect Determination for Marine Mammals

The MMPA prohibits, with certain exceptions, the take of marine mammals in U.S. waters and by U.S. citizens on the high seas, and the importation of marine mammals and marine mammal products into the U.S. (16 U.S.C. § 1372). Take is defined under the MMPA as "to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal" (16 U.S.C. § 1362(13)) and is further defined by regulation (50 C.F.R. § 216.3) as "to harass, hunt, capture, collect, or kill, or attempt to harass, hunt, capture, collect, or kill any marine mammal." The Secretary of Commerce is responsible for the conservation and management of pinnipeds (other than walruses) and cetaceans (16 U.S.C. § 1362 (12)(A)(i)). The Secretary of Commerce delegated MMPA authority to NOAA's NMFS.³⁹

Section 101(a)(5) of the MMPA provides a mechanism for allowing, upon request, the "incidental," but not intentional, taking, of small numbers of marine mammals by U.S. citizens

³⁷ While sea turtles would be found in the proposed expansion areas, they are only under the jurisdiction of USFWS when on-shore or nesting. Impacts to sea turtles under NMFS jurisdiction are described in the preceding paragraphs.

³⁸ <https://ecos.fws.gov/ecp/species/4469>

³⁹ The Secretary of the Interior (through USFWS) is responsible for walruses, sea and marine otters, polar bears, manatees, and dugongs (16 U.S.C. § 1362(12)(A)(ii)). The regulations governing incidental take authorizations issued by the USFWS are codified at 50 C.F.R. 18,27, and do not apply to this proposed action due to the absence of such species in the sanctuary expansion area.

who engage in a specified activity (other than commercial fishing or directed research on marine mammals) within a specified geographic region (16 U.S.C. § 1371(a)(5)). The NMFS Office of Protected Resources processes applications for incidental takes of small numbers of marine mammals. Section 101(a)(5) of the MMPA and the implementing regulations at 50 C.F.R. part 216, subpart I provides the legal basis and procedures for issuing this authorization.

Authorization for incidental takes may be granted if NMFS finds that the taking would be of small numbers, have no more than a negligible impact on those marine mammal species or stocks, and not have an unmitigable adverse impact on the availability of the species or stock for subsistence uses (50 C.F.R. 216.102). In order for NOAA's NMFS to consider authorizing an incidental take or make a finding that an incidental take is unlikely to occur, a written request must be submitted in accordance with 50 C.F.R. 216.104.

ONMS determined that implementing any of the action alternatives does not have the potential to result in the take, injury, or harassment of any species protected under the MMPA, and would result in minor **benefits** to marine mammals as described in Section 5.3.6 and 5.3.8.1.

5.3.8.3 Effect Determination for Migratory Birds

The MBTA authorized federal protection for migratory birds in the United States, and made it unlawful without a permit from USFWS to pursue, hunt, take, capture, kill or sell birds listed therein ("migratory birds") (16 U.S.C. § 703). The statute does not discriminate between live or dead birds, and gives full protection to any bird parts including feathers, eggs and nests. Over 800 listed migratory bird species are protected under the MBTA (50 C.F.R. 10.13). The sanctuary is located offshore, more than 50 miles from land, and activities authorized by the sanctuary are not expected to involve interaction with migratory birds. Therefore, NOAA determined sanctuary expansion will have **no impact** on migratory birds.

5.3.9 Impacts on Marine Area Uses, Recreation, and Socioeconomics (Common to All Action Alternatives)

This section describes the anticipated impacts of sanctuary expansion on the marine area uses, recreation, and socioeconomics in the expansion areas and north central Gulf of Mexico region. The primary industries with interests in the expansion areas are commercial fishing, recreational fishing, scuba diving, oil and gas exploration, development and production, commercial shipping, and military and homeland security activities. All of these activities contribute to marine use, recreation, and socioeconomics of the coastal economy in the north central Gulf of Mexico region. In addition, passive economic use value for protection and restoration of the natural and cultural resources of the region is also an important contributor to this sector.

Generally, under all action alternatives, implementing sanctuary prohibitions in the expansion areas on bottom disturbing activities will reduce or eliminate opportunities to engage in some activities. This includes anchoring, use of certain fishing gear, and some oil and gas related activities. A reduction in these activities would provide indirect, long-term benefits to marine area use, recreation, and socioeconomics both inside and beyond the proposed boundaries as an outcome of increased biological production that results from reduced fishing pressure or habitat protections inside the proposed sanctuary boundaries. At the same time, extending sanctuary

management into the expansion areas would enhance passive economic use value by conserving natural resources and yielding direct, long-term, major benefits beyond the proposed boundaries.

Proposed sanctuary expansion would also enhance opportunities for research, education, tourism, and recreation (e.g., recreational fishing and diving) within and beyond the proposed boundaries. For example, installing mooring buoys at some banks in the expansion areas would improve safe access and serve to protect the important coral communities of the sanctuary. Increased visitation to the sanctuary for recreation or tourism could in turn result in positive, long-term, regional economic impacts due to increased visitor spending in coastal communities from which the sanctuary is accessed. This would yield direct, long-term, localized benefits to marine area use, recreation, and socioeconomics.

Application of sanctuary regulations and associated reductions in activities involving bottom disturbance in the expansion areas (i.e. anchoring, use of certain fishing gear, and some oil and gas related activities) could have direct, long-term, localized, minor adverse impacts on certain existing marine uses. For example, sanctuary regulations may make some oil and gas and fishing activities more difficult or costly, such as the need for directional drilling or inability to anchor in the sanctuary boundaries.

The following subsections describe in further detail the potential beneficial and adverse impacts anticipated for specific user groups.

5.3.9.1 Impacts on Commercial Fishing (Common to All Action Alternatives)

Commercial fishers may realize an indirect, long-term, minor benefit in areas within and outside of the proposed boundaries as a result of increased biological productivity that would result from applying habitat protections in the expansion areas.

In addition to these minor beneficial impacts on commercial fishing activity, the proposed sanctuary expansion would restrict certain types of fishing on a small fraction of the hard bottom fish habitat areas. These restrictions on certain types of fishing would have direct, long-term, localized, minor, adverse impacts on the commercial fishing sector. As described in Chapter 4, approximately 2,532 square miles of hard substrate exists in the north central Gulf of Mexico (Jenkins 2011). The percentage of hard bottom incorporated in each alternative varies, as shown in Table 5.3.

Table 5.3. Hard bottom areas affected under each alternative. The total study area encompasses 122,820 square miles of the north central Gulf of Mexico. The total area of hardbottom contained within the study area is 2,532 square miles.

Alternative	Alternative total area (sq. miles)	Hard bottom affected by alternative (sq. miles)	Hard bottom area as % of alternative total area	Alternative hard bottom area as % of total study area	Existing Coral HAPCs Intersected	Hard bottom in Coral HAPC & Alternative (sq. miles)	Other Existing HAPCs Intersected
1	56.2	14.85	26.42%	0.59%	3	14.85	0
2	281.15	74.14	26.37%	2.93%	4	20.88	5
3	383.19	101.56	26.50%	4.01%	4	21.52	7
4	633.75	145.59	22.97%	5.75%	4	21.52	7

Alternative	Alternative total area (sq. miles)	Hard bottom affected by alternative (sq. miles)	Hard bottom area as % of alternative total area	Alternative hard bottom area as % of total study area hard bottom	Existing Coral HAPCs Intersected	Hard bottom in Coral HAPC & Alternative (sq. miles)	Other Existing HAPCs Intersected
5	935.18	181.13	19.37%	7.15%	4	21.52	9

*NOAA's Final Preferred Alternative totals 160.4 square miles, intersects 4 existing coral HAPCs, and intersects 7 other existing HAPCs. Hard-bottom estimates for the Final Preferred Alternative were not attained. However, NOAA concludes the hard-bottom area is not expected to exceed the areas estimated for Alternative 3, as the Final Preferred Alternative includes the same banks, excluding Bryant Bank, with more constricted boundaries.

Under the range of alternatives included in this FEIS, between 14.85 and 181.13 square miles of hard bottom would be protected by an expanded sanctuary designation. This represents between 0.59% and 7.15% of the 2,532 square miles of hard bottom areas in the north central Gulf of Mexico (Gardner et al. 2002, Gardner and Beaudoin 2005, BOEM 2015d). Alternative 3 would protect 101.56 square miles of hard bottom habitat, or 4.01% of the total hard bottom areas in the north central Gulf of Mexico. The amount of hard bottom habitat protected under NOAA's Final Preferred Alternative is expected to be less than this, as it includes the same banks as Alternative 3 (except for Bryant Bank) but with constricted boundaries. This estimate does not include artificial hard bottoms, which are heavily targeted by commercial fishers.

Table 5.3 also identifies overlap between the proposed expansion areas and existing designated coral HAPCs. This overlap of the proposed expansion areas and designated coral HAPCs further reduces any potential impact from sanctuary expansion on commercial fishing because anchoring and fishing with bottom-tending gear is already prohibited within coral HAPCs. Coral HAPCs overlap with 100% of the hard bottom area included in Alternative 1, approximately 28% of the hard bottom area included in Alternative 2, approximately 21% of the hard bottom area included in Alternative 3, approximately 15% of the hard bottom area included in Alternative 4, and approximately 12% of the hard bottom area included in Alternative 5.

For example, on average approximately 37 vessels carrying bottom longline gear operated annually in the study area encompassed by the 2008-2014 VMS analysis (DEIS Study Area; Figure 5.2). Over the same time period, approximately 11 vessels carrying bottom longline gear operated annually within the proposed boundaries of Alternative 3. Based on the 2017-2020 VMS analysis, NOAA observed that approximately 6 vessels carrying bottom longline gear operated annually in the proposed boundaries of the Final Preferred Alternative (FEIS Study Area; Figure 5.2). This type of commercial fishing activity would be impacted by the proposed sanctuary expansion as the use of this gear type is currently prohibited by sanctuary regulations, which would be applied to the expansion areas. NOAA proposes to prohibit fishing with bottom-tending gear types in the expanded sanctuary because this activity can be damaging to benthic communities.

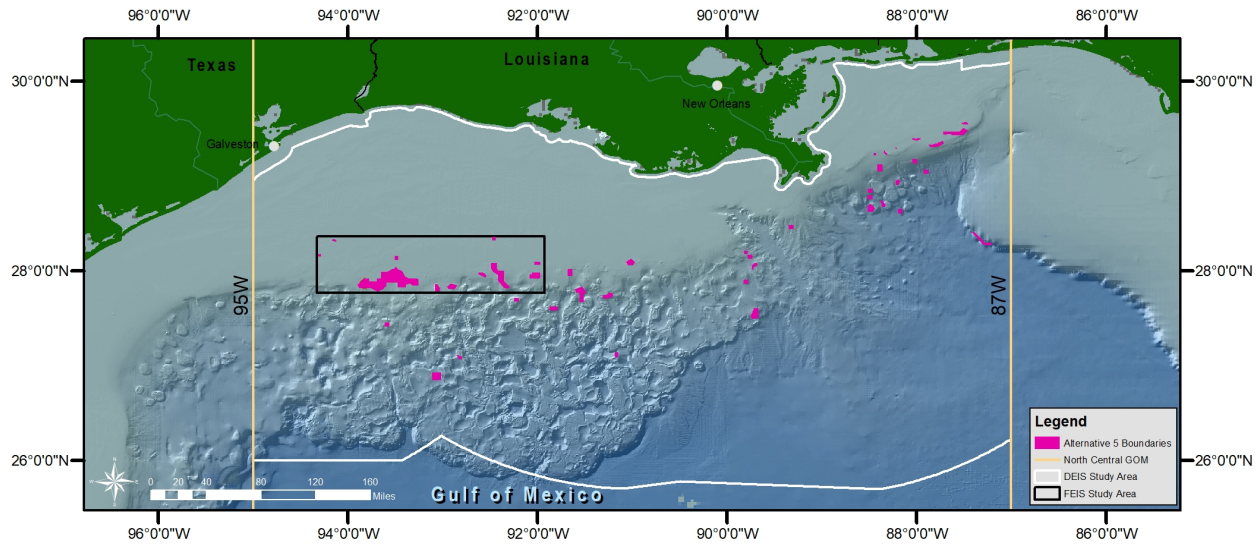


Figure 5.2. Map of study areas used for analysis of commercial and recreational fisheries data. The DEIS study area incorporates the data analyzed from 2008-2014, FEIS study area incorporates data analyzed from 2017-2020, and the north central Gulf of Mexico study area incorporates data analyzed in the NMFS Coral Amendment 9 FEIS (NMFS 2018). Image: NOAA

Commercial fishing effort by vessels fishing with bandit reel or hand gear would be affected to a lesser degree than effort by bottom longliners. Use of bandit reels is not prohibited under current sanctuary regulations and would not be prohibited in the expansion areas. However, the prohibition on anchoring that would apply in the expanded sanctuary may make this activity more difficult due to the requirement to live-boat to target fish aggregations. Fishing from mooring buoys, where available, would be allowed. Sanctuary management actions in proposed expansion areas, such as the installation of mooring buoys at certain banks, would reduce the potential impacts of this regulatory provision on commercial fishers. Based on the data analyzed from July 2017 to July 2020, approximately 17 vessels annually (range 16-21 vessels) carrying bandit reel gear spent some part of their time inside the proposed boundaries of the Final Preferred Alternative. Over the same time period, approximately 7 vessels annually (range 6-7 vessels) carrying rod and reel or handgear spent some part of their time inside the proposed boundaries of the Final Preferred Alternative (Table 5.4; FEIS Study Area Figure 5.2).

Table 5.4. Number of commercial fishing vessels present in the Final Preferred Alternative for 2017-2020 by gear type used

Gear Type	2017	2018	2019	2020	Annual Average Number of Vessels
Unknown	6	8	8	11	4
Bottom Longline	7	5	6	7	6
Rod/Reel/Handgear	6	6	7	7	7
Pelagic Longline	4	4	3	2	3
Bandit Rig	18	16	21	12	17

To assess the potential impacts of sanctuary expansion on the commercial fishing sector, NOAA compared the average number of fishing vessels observed within the proposed boundaries of each alternative to those observed in the north central Gulf of Mexico region (Figure 5.2). As

shown in Table 5.5, an annual average of 120 commercial fishing vessels carrying reef fish permits were observed within the proposed boundaries of Alternative 5, the largest action alternative. In comparison, an annual average of 554 vessels carrying reef fish permits landed catch throughout the north central Gulf of Mexico region. Those 120 observations represent 21.6% of the commercial fishing vessels that carried a reef fish permit, operated in the north central Gulf of Mexico, and successfully landed catch.

Table 5.5. Annual average (mean) numbers of commercial fishing vessels present in proposed sanctuary expansion areas under each alternative for 2008-2014 from VMS data. Annual average numbers of commercial fishing vessels for the north Central Gulf of Mexico were retrieved from the NMFS Coral Amendment 9 FEIS (NOAA 2018).*

Alternative	Average Number of Reef Fishing Vessels Accessing Alternative Areas per year	Estimate of Average Number of King Mackerel Fishing Vessels Accessing Alternative Areas per year (only those w/VMS)	Average Number of Highly Migratory Species Fishing Vessels Accessing Alternative Areas per year	Estimate of Average Number of Shrimp Fishing Vessels Accessing Alternative Areas per year (only those w/VMS)	Average Number of Bottom-Longline Gear Users Accessing Alternative Areas per year
No Action (Alternative 1)	20	12	10	0	5
Alternative 2	36	22	22	2	10
Alternative 3	38	24	34	3	11
Alternative 4	113	61	112	9	25
Alternative 5	120	65	118	10	26
Study Area	238	128	155	29	37
North central Gulf of Mexico	554	N/A	124	1,912	N/A

*Data for the Final Preferred Alternative is not included in this table, as the data collected from NMFS for 2017-2020 did not include vessel permit types. Instead, the data was provided by gear type, as presented in Table 5.4. It is evident, when comparing the values between Alternative 3 and the Final Preferred Alternative, which consists of the same banks excluding Bryant Bank, that fewer commercial fishers are impacted with the constricted boundaries of the Final Preferred Alternative, as fewer fishing vessels were observed overall.

As described in Chapter 4, fishing boats can carry multiple permit types. Therefore, the total numbers of vessels identified in Table 5.5 does not necessarily represent a count of all unique vessels operating in the region. These data also do not specify which gear type the fisher uses to harvest reef fish. Because the sanctuary regulations would only prohibit certain fishing gear types, NOAA expects the amount of commercial fishing vessels affected by the proposed sanctuary expansion would be less than the approximately 120 vessels observed. In addition, the VMS data for observations within the proposed boundaries of each alternative show that the vessel transited or stopped within the proposed boundaries, but were not necessarily fishing within the proposed boundaries.

As commercial fishers can carry more than one permit type, it is not expected that the level of impact to their overall annual catch landings would be significant under the proposed sanctuary expansion. Additionally, the current sanctuary regulations do not prohibit commercial fishing activities directly, rather indirectly by prohibiting certain types of fishing gears. Commercial

fishers who harvest reef fish with gear types allowed in the sanctuary are expected to only sustain minor impacts from the expansion of the sanctuary.

Applying gear prohibitions to the expansion areas is expected to have direct, short-term, localized, minor, adverse impacts on commercial fishing. Because of the availability of additional hard bottom areas outside of the expansion alternatives (Table 5.3), fishers can move to areas outside of proposed boundaries and continue fishing practices through spatial substitution. Previous research has shown that spatial substitution is a strategy used by fishers in response to fishing area changes or closures that typically have short-term economic impacts, which decline over time, as fishers learn to adapt (Lédée et al. 2012, De Freitas et al. 2013).

The beneficial and adverse impacts on commercial fishing would be proportional to the number of features and areal extent encompassed under each alternative. NOAA determined the **beneficial** impacts on commercial fishing from implementing any of the action alternatives would be **less than significant** due to the low level of intensity in the context of total fish production supporting commercial fishing in the north central Gulf of Mexico. Overall, NOAA determined that any **adverse** impacts on commercial fishing from implementing any of the action alternatives would be **less than significant** due to the low level of intensity in the context of the total commercial fishing industry activity in the north central Gulf of Mexico as well as mitigating factors such as potential for spatial substitution, gear substitution, and mooring buoy installations made possible by sanctuary designation.

5.3.9.2 Impacts on Recreational Fishing (Common to All Action Alternatives)

Under existing regulations, recreational fishing is allowed within the current sanctuary boundaries. Under the action alternatives, recreational fishing would continue to be allowed in the expansion areas. Recreational fisheries operating in the proposed sanctuary expansion areas generally do not employ fishing techniques that would be prohibited under sanctuary regulations. Similar to commercial fishers, recreational fishers may realize an indirect, long-term, minor benefit from sanctuary expansion in areas both in and outside of the proposed boundaries as a result of increased biological productivity that results from applying habitat protections in the expansion areas.

Impacts from the anchoring of smaller vessels (< 100 feet long) for recreational fishing do occur in proposed expansion areas. As part of implementing the expanded sanctuary, NOAA would install mooring buoys at certain banks in order to provide opportunities for recreational fishing and minimize adverse impacts to habitat. Access to mooring buoys would provide direct, long-term, localized, minor benefits to recreational fishers, while reducing anchoring associated impacts.

The beneficial impacts on recreational fishing would be proportional to the number of features and areal extent encompassed under each alternative. Overall, NOAA determined that the **beneficial** impacts on recreational fishing from implementing any of the action alternatives would be **less than significant** due to the low level of intensity in the context of total fish production supporting recreational fishing and of all anchoring activity performed by recreational fishers in the north central Gulf of Mexico.

5.3.9.3 Impacts on Recreational Spearfishing (Common to All Action Alternatives)

Under existing regulations, spearfishing is prohibited within the current sanctuary boundaries. Under the action alternatives, this prohibition would be applied to the expansion areas. In general, the incidence of spearfishing is very limited and targets artificial structure to a greater degree than natural hard bottoms. To the extent that access to natural hard bottoms is restricted for spearfishing, the above analysis (Table 5.3) of the small fraction of hard bottom in the region to be affected by the action alternatives applies. It would have direct, long-term, localized, minor, adverse impacts on this sector for spearfishing activity targeted at natural hard bottom sites in the expansion areas that would no longer be allowed.

NOAA determined that the **adverse** impacts on recreational spearfishing from implementing any of the action alternatives would be **less than significant** due to the low level of intensity in the context of total spearfishing activity in the north central Gulf of Mexico and availability of artificial structure for the targeted fishery. In addition, the proposed sanctuary boundaries are relatively small and the regulations would not impact the areas outside of the proposed new boundaries. This means there are opportunities and locations for fishers to substitute in place of the specific proposed sanctuary banks.

5.3.9.4 Impacts on Recreational Scuba Diving (Common to All Action Alternatives)

Under existing regulations, anchoring is prohibited within the current sanctuary boundaries, however NOAA installs mooring buoys at certain banks to provide access to these sites. Mooring buoys can support vessels up to 100 feet in length. Under the action alternatives, NOAA aims to enhance access to sites within the proposed sanctuary for recreational scuba diving activity. NOAA would do this by installing mooring buoys at certain banks. Encouraging vessels to use mooring buoys instead of anchoring within the proposed boundaries will prevent impacts to live bottom habitats and facilitate increased opportunities for recreational scuba diving. This would have direct, long-term, localized, minor, beneficial impacts on recreational divers.

The beneficial impacts on recreational scuba diving would be proportional to the number of features and areal extent encompassed under each alternative. Overall, NOAA determined that the **beneficial** impacts on recreational scuba diving from implementing any of the action alternatives would be **less than significant** due to the low level of intensity in the context of all diving activity in the north central Gulf of Mexico.

5.3.9.5 Impacts on Oil and Gas Exploration and Production (Common to All Action Alternatives)

While sanctuary regulations would not preclude new leasing or oil and gas production within the expanded sanctuary boundaries, they may impose requirements making oil and gas production more difficult or costly in these areas which would have direct, long-term, localized, minor, adverse impacts on the industry. Under the various sanctuary expansion alternatives, potential expansion areas overlap existing oil and gas lease blocks, infrastructure (platforms and pipelines), and reserve fields, as indicated in Table 5.6 and Appendix D.

Specifically, two additional requirements would apply to oil and gas activities pursuant to sanctuary designation in the expansion areas: 1) directional drilling and shunting requirements inside sanctuary boundaries and outside NAZs and buffer zones; and 2) extension of NPDES permit prohibitions on discharges within national marine sanctuaries (an EPA regulation that would be triggered by national marine sanctuary designation). NOAA's Final Preferred Alternative contains no active oil and gas platforms although there are active platforms in other action alternatives. Of the platforms currently in place inside the proposed boundaries under Alternatives 2 and 3, none are outside oil and gas buffer zones (NAZs plus other relevant buffer areas). Of the platforms currently in place inside the proposed boundaries under Alternatives 4 and 5, four are outside oil and gas buffer zones (see Table 5.6 and Appendix D).

In 2019, BOEM provided a review of the potential impacts on offshore energy and mineral resources expected to occur with expansion of FGBNMS in accordance with EO 13795 - Implementing an America-First Offshore Energy Strategy. BOEM's report is included in Appendix G. BOEM's 2019 analysis stated that areas within NOAA's Final Preferred Alternative boundaries contain approximately 0.11 million barrels of oil equivalent (MMBOE) reserves, 3.86 MMBOE of contingent resources, and 4.50 MMBOE of undiscovered resources. The oil reserves estimated in BOEM's analysis represent approximately 0.002% of known oil and gas reserves, 0.07% of the contingent resources, and 0.008% of undiscovered resources in the OCS Gulf of Mexico. This is well below the impacts expressed in the 2016 FGBNMS DEIS, in which NOAA estimated the proposed expansion had the potential to overlap with approximately 0.25% of known oil and gas reserves.

Expansion Alternatives 2 and 3, and the Final Preferred Alternative would not impose additional shunting requirements on existing platforms, while additional shunting would be required under Alternatives 4 and 5, as four existing platforms occur outside the oil and gas buffer zones. BOEM also analyzed the potential cost of directional drilling and shunting requirements for new platforms inside sanctuary boundaries (but still outside NAZs). BOEM reported that if technically and economically feasible, access to the affected reserves and contingent resources could be obtained through directional drilling technology, at a potential total increase in costs of \$3.24 million to the oil and gas industry for all future wells impacted by NOAA's Final Preferred Alternative. Considering average offshore well costs range from \$10 to \$50 million in water depth between 50 and 500 ft (15.2 to 152 m), with drill depths between 5,000 and 20,000 ft (1,524 to 6,096 m), the additional costs related to directional drilling for all future wells that could be impacted by sanctuary expansion would be **less than significant**. Average one time incremental costs imposed by shunting requirements of just over \$220,000 per platform were shown by Wolfe (2010) to be recoverable from the profit of a single well within 4 days of operation at 2010 prices (as noted in Chapter 4, multiple wells are typically drilled from individual platforms); given 2015-2016 oil prices, that recovery period is likely closer to 10 days. Should a potential oil or gas development interest seek to recover the small fraction of the Gulf of Mexico reserves to which access is made more difficult or costly by sanctuary expansion, sanctuary regulation would not preclude that possibility.

In their 2019 analysis, BOEM indicated that implementing Alternative 1 would affect 19 OCS oil and gas blocks, implementing Alternative 3 would affect 105 OCS blocks, and implementing Alternative 5 would affect 253 OCS blocks. For NOAA's Final Preferred Alternative, BOEM

analyzed expected impacts on development of offshore wind, oil, natural gas, methane hydrates, and marine minerals. BOEM’s analysis found that implementing NOAA’s Final Preferred Alternative would wholly or partially affect 84 OCS blocks (19 existing and 65 new blocks), due to restrictions imposed on seafloor disturbance and discharge and additional costs to develop resources from outside of the sanctuary. As a result of their analysis, BOEM determined that the Final Preferred Alternative would likely negatively impact the development of oil and gas resources on existing leases, may negatively impact future lease sales within the new expansion areas, and could lead to a reduction in revenue to the federal government.

BOEM also reported portions of 65 unleased OCS blocks affected by the Final Preferred Alternative that would experience more restrictive oil and gas activity conditions if they were leased following expansion of FGBNMS. In the event these blocks become unavailable for leasing, or if operators choose not to lease them because of sanctuary designation (e.g. due to prohibitions on discharge in a national marine sanctuary required by current NPDES restrictions which could result in the need for directional drilling or well relocation), BOEM estimates a potential loss of revenue to the Federal Government. Under this scenario and, based on a minimum bid amount for the entire unleased acreage, BOEM calculated a conservative potential future value of \$12 million in lost bonuses for leases that could be associated with FGBNMS expansion under the Final Preferred Alternative. For example, in the previous 10 years prior to this analysis, approximately \$7.7 billion in bonus bids have been collected for offshore oil and gas leases in the Gulf of Mexico. The \$7.7 billion in bonus bids, however, was an actual value that included high bids used to obtain leases and was not calculated using minimum bid amounts. The \$12 million potential bonus, on the other hand, was calculated using minimum bid amounts. Therefore, there is potential for losses greater than \$12 million. NOAA finds that this impact of lost revenue would be less than significant in the context of potential revenues associated with oil and gas production in the North Central Gulf of Mexico and the threshold for economically significant impacts applied to this analysis.

Table 5.6. Oil and gas industry resources intersected by each alternative (BOEM 2015b, BOEM Report 2019 (Appendix G)).

Alternative	Lease Blocks Intersected	Active Leased Blocks	Lease-holders	Active Platforms	Active Platforms Outside Oil and Gas Buffer Zones	Platforms Reefed or Wrecked Onsite	Pipeline Miles	All Incidents 1964 to 2012
1	19	4	2	1	0	0	0.68	0
Final Preferred Alternative	85	13*	9	0	0	1	4.22**	0
2	91	19	8	4	0	0	33.64	0
3	108	25	11	5	0	2	73.23	0
4	192	51	24	8	3	2	157.47	0
5	256	76	30	11	3	3	270.07	2

* In 2019, BOEM reported 13 active leases, and two leases were released in August 2020.

** The 4.22 miles of pipeline reported includes abandoned segments. There is only one segment at McGrail Bank, totaling 0.34 miles in length, that is active.

In 2020, NOAA conducted an internal review of BOEM OCS lease blocks that had an active lease contained within the boundaries of the Final Preferred Alternative. This differed from BOEM’s

2019 analysis, as NOAA investigated blocks already leased for oil and gas production, where BOEM evaluated any lease block in the vicinity of the proposed expansion areas. NOAA's analysis identified 13 active OCS lease blocks that were partially contained within the proposed boundaries of the Final Preferred Alternative, with a total area of 6.7 square miles (17.4 square kilometers). The total area impacted within each lease block ranged from 0.2-43.1%. All areas in the Final Preferred Alternative (including the 6.7 square mile area of leased blocks overlapping with this expansion area and the unleased blocks), except for part of Horseshoe Bank and part of McGrail Bank, are encompassed by the 1-Mile or 4-Mile oil and gas buffer zones, which already require shunting of all drilling (BOEM 2010). The McGrail Bank expanded area, outside the 1-Mile zone, is in the 3-Mile zone, requiring shunting for most drilling (BOEM 2010).

The current NPDES General Permits for oil and gas extraction in the Gulf of Mexico do not allow discharges from oil and gas activity within “areas of biological concern” or within national marine sanctuaries. An exception to this prohibition states that facilities located within a national marine sanctuary boundary are authorized to discharge in accordance with these permits if all of the following conditions are met:

- the platform was installed prior to the designation of the national marine sanctuary;
- the platform is located outside of the NAZ defined by BOEM;
- all materials are discharged through a shunt pipe that terminates within 33 feet (10 meters) of the sea floor;
- sanitary waste is treated with an approved marine sanitation device that complies with pollution control standards and regulations under Section 312 of the Clean Water Act; and
- the materials discharged are associated with and incidental to oil and gas exploration, development, or production and originate from wells located within the boundaries of the national marine sanctuary and outside the NAZ.⁴⁰

The language of the current NPDES General Permits would thus “grandfather” existing oil and gas platforms if they are in place prior to designation, resulting in continuation of discharges within new sanctuary boundaries. It would, however, preclude discharges from new infrastructure built in any expanded sanctuary boundaries after designation. Though benefits to the water quality and living marine resources in proposed expansion areas will result from the regulation of discharges from oil and gas infrastructure in the expanded sanctuary, this regulation may impose additional costs on the oil and gas industry (e.g., by requiring individual permit applications or by requiring operators to directionally drill from outside the sanctuary to oil and gas resources within the sanctuary).

The adverse impacts on oil and gas exploration and production would be proportional to the number of features and areal extent encompassed under each alternative. Overall, NOAA determined that the **adverse** impacts on oil and gas exploration and production from lost revenue or additional costs from implementing any of the action alternatives would be **less than significant** due to the low level of intensity of potential impacts in the context of the

⁴⁰ See: https://www.epa.gov/sites/production/files/2017-09/documents/2017_final_gp_for_fr_091817.pdf

extensive oil and gas industry activity in the north central Gulf of Mexico and the factors that mitigate and minimize impacts as identified above.

Pursuant to interagency consultation, BOEM concluded that NOAA’s Final Preferred Alternative would have adverse impacts to BOEM’s OCS Program; however, BOEM concurred with NOAA’s conclusion that these impacts do not appear to rise to the level of “economically significant” as defined in E.O. 12866 (i.e. at least \$100 million dollars per year). Please refer to Appendix G for additional information and relevant links to NOAA’s consultation with BOEM.

5.3.9.6 Impacts on Commercial Shipping (Common to All Action Alternatives)

The greatest impact on coral (hard and soft), sponges, and other live bottom within 150 feet (46 meters) deep results from anchoring and mooring of large vessels (> 100 feet long) (Davis 1977, Dustan and Halas 1987, Wilkinson 2002). The regeneration of the reef after anchor damage may never occur or, even if optimal conditions for regeneration exist, could still take hundreds and perhaps thousands of years for the reef to return to its pre-damage condition (Rogers and Garrison 2001).

Under all action alternatives, anchoring would be prohibited within the sanctuary expansion areas. This would prevent anchor damage to reef habitat but may also affect commercial shipping operations by limiting opportunities for anchoring on shallow features near fairways at the edge of the continental shelf. This could have a direct, long-term, localized, minor adverse impact on this user group. Shipping fairways running close to, and in some instances through the proposed expansion areas, funnel thousands of ships to ports on the Gulf of Mexico coast annually (Table 5.7; Figure 5.3). Commercial ships transiting through the proposed expanded sanctuary would also be subject to certain sanctuary prohibitions on discharges. These regulations may require commercial shippers to anchor or discharge at locations outside the expansion areas, potentially imposing costs on the shipping industry. However, because each of the proposed sanctuary boundaries are relatively small and the regulations would not impact the areas outside of the proposed boundaries, commercial shippers would be able to find suitable locations for anchoring or discharge outside the proposed expansion areas.

Table 5.7. Shipping fairways intersected by each alternative (BOEM 2015b, NOAA 2020b).

Alternative	1	Final Preferred Alternative	2	3	4	5
Fairway Intersections	0	3	2	3	5	6

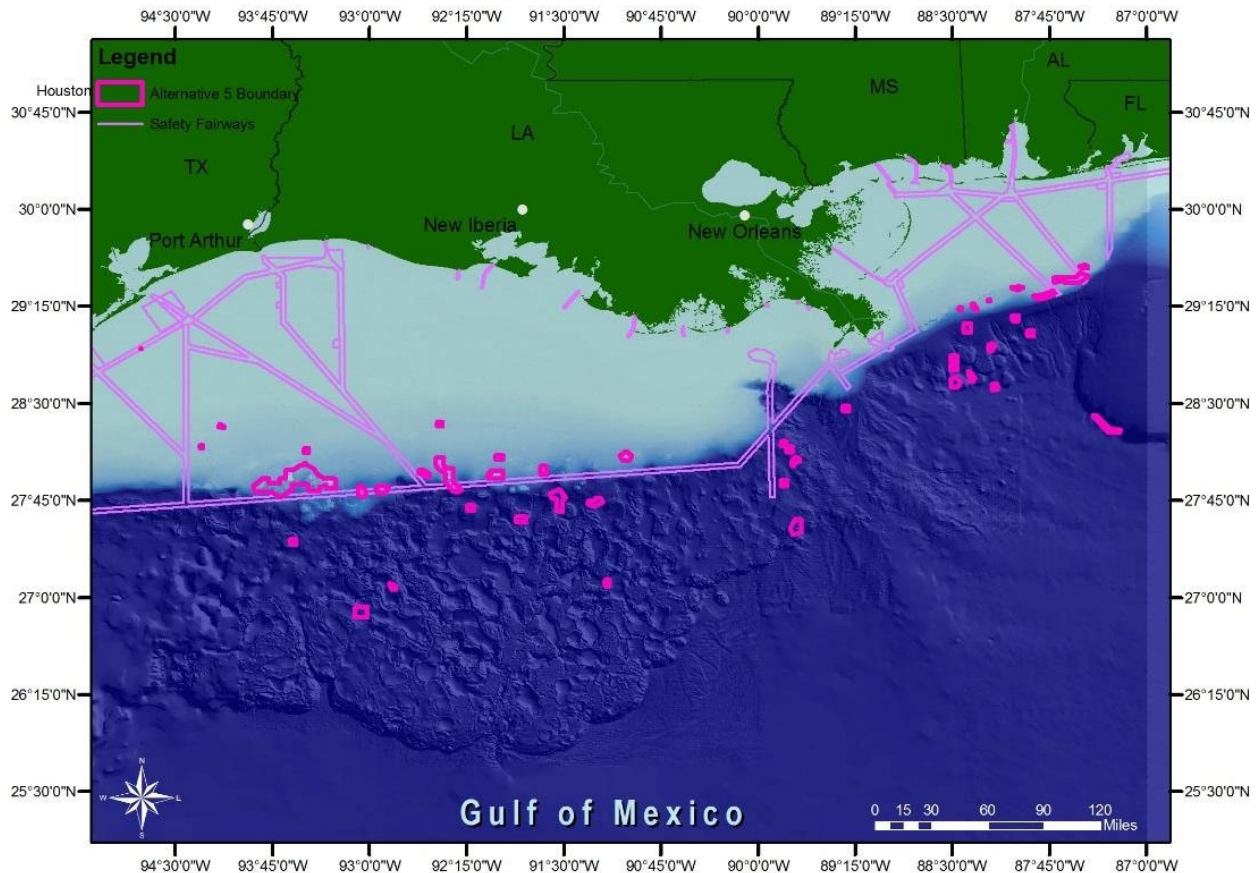


Figure 13. Shipping safety fairways in relation to the most comprehensive boundary expansion alternative evaluated in this FEIS (Alternative 5). Image: NOAA

The adverse impacts on commercial shipping would be proportional to the number of features and areal extent encompassed under each alternative. Overall, NOAA determined that the **adverse** impacts on commercial shipping from implementing any of the action alternatives would be **less than significant** due to the small geographic extent of the expansion areas relative to the geographic context across which anchoring activities can occur along the edge of the continental shelf, and the limited time ships in transit would be subject to sanctuary regulations, given the discrete nature of the proposed boundaries around protected features in the north central Gulf of Mexico.

5.3.9.7 Impacts on Department of Defense Activities (Common to All Action Alternatives)

At present, military activities occurring in the proposed expansion areas consist of the free passage of vessels, as well as the U.S. Navy's training and testing operations that are necessary to support military readiness compliance. Under the current sanctuary regulations at 15 C.F.R. § 922.122(e), the regulatory prohibitions do not apply to activities being carried out by the DoD as of the effective date of Sanctuary designation (January 18, 1994), provided that the activities are carried out in a manner that minimizes any adverse impact on sanctuary resources and qualities. The prohibitions also do not apply to any new activities carried out by the DoD that do not have the potential for any significant adverse impacts on sanctuary resources or qualities.

New activities with the potential for significant adverse impacts on sanctuary resources or qualities may be exempted from the regulatory prohibitions after consultation between the ONMS Director and the DoD.

Under all of the action alternatives, NOAA would apply this exemption to the proposed expansion areas and would revise the date from January 18, 1994 to the effective date of the revised terms of designation. Additional discussion of military activities is above in Chapter 4, Section 4.4.5.

Based on this proposed exemption to sanctuary regulatory prohibitions, and Navy's previous conclusion, through the 2018 AFTT consultation as described in Section 4.4.5, that none of its training and testing activities would likely cause injury to any sanctuary resources in the current or expanded sanctuary, NOAA determined that implementing any of the action alternatives would have **no impact** on the DoD's ability to conduct activities in the study area.

5.3.9.8 Impacts on Department of Homeland Security Activities (Common to All Action Alternatives)

As described in Section 4.4.6, the U.S. Coast Guard conducts operations in the north central Gulf of Mexico on the sea and in the air. The proposed sanctuary expansion would not impact the freedom of navigation of U.S. Coast Guard vessels operating within the expansion areas. Sanctuary resources and planned subsurface moorings would be too deep to pose a navigational threat to U.S. Coast Guard vessels. NOAA does not anticipate that enforcement activities conducted by the U.S. Coast Guard, as a result of the proposed expansion, would require a significant change in the U.S. Coast Guard resources, as the agency already patrols the area for fisheries enforcement. Therefore, NOAA has determined there would be no impact to Homeland Security activities under any action alternative.

5.3.9.9 Impacts on Passive Economic Use (Common to All Action Alternatives)

Under the action alternatives, the added protections for habitat and species from direct harm provided to proposed expansion areas would increase the benefits to passive economic use for the entire nation. For the protection of the additional nine banks in Alternative 2, one study estimated passive economic use benefits ranging from \$16.4 to \$18.3 billion over a five-year period using lower bound estimates (Stefanski and Shimshack 2016). Stefanski and Shimshack (2016) concluded the increase in passive economic use value from the proposed expansion would have net beneficial impacts to the nation. This underestimates the benefits for implementing any of the action alternatives that would protect more banks than Alternative 2, for which these estimates were calculated.

This direct, long-term, major, beneficial impact extends beyond the proposed boundaries and is proportional to the number of features and areal extent encompassed under each alternative. Overall, NOAA determined that the **beneficial** impacts on passive economic use from implementing any of the action alternatives would be **less than significant** despite its magnitude given the context of the much larger economy of the U. S. to which this benefit accrues.

5.3.9.10 Summary of Impacts on Marine Area Use, Recreation, and Socioeconomics (Common to All Action Alternatives)

As described in detail in Sections 5.3.9.1 to 5.3.9.9, NOAA's analysis finds **beneficial** impacts on marine area uses, recreation, and socioeconomics from implementing any of the action alternatives that would be **less than significant** due to the low level of intensity in the context of:

- total biological production in the north central Gulf of Mexico (as a result of reduced fishing pressure);
- total research, education, and tourism enterprises in the north central Gulf of Mexico (in terms of enhancing opportunities for research, education, tourism, and recreation); and
- the total U.S. economy (with regards to passive economic use value).

Any **adverse** impacts to these resource areas from implementing any of the action alternatives would also be **less than significant** due to their low level of intensity in the context of:

- the total ongoing marine area uses, recreation, and socioeconomic activity occurring in the north central Gulf of Mexico;
- opportunities and locations available for these uses to be conducted outside of the proposed expansion areas; and
- mitigating factors like potential for spatial substitution, gear substitution, and mooring buoy installations made possible by sanctuary designation.

For further details on potential socioeconomic impacts of the proposed expansion, see Leeworthy et al. (2016) and Stefanski and Shimshack (2016).

5.4 Impacts on Cultural and Historic Resources

5.4.1 Impacts on Cultural and Historic Resources (Common to Final Preferred Alternative, and Alternatives 2, 3, and 4)

NOAA determined that implementing the Final Preferred Alternative or Alternatives 2, 3, and 4 would have direct, long-term, localized, minor, adverse impacts on cultural or historic resources within the boundaries of Alternative 5. Under any of these alternatives, cultural and historic resources would not be protected by sanctuary prohibitions, continuing the potential for them to be impacted by anchoring or other bottom disturbing activities. NOAA determined the **adverse** impacts on the cultural and historical resources from implementing the Final Preferred Alternative or Alternatives 2, 3, and 4 (essentially the forgone benefits of implementing Alternative 5) would be **less than significant** given the context of the dozens of known and suspected important cultural and historic resource sites in the north central Gulf of Mexico.

5.4.2 Impacts on Cultural and Historic Resources (Unique to Alternative 5)

Under Alternative 5, application of current sanctuary regulations to the expansion areas would prohibit drilling, dredging, altering, constructing, placing or abandoning any structure material or matter on or in the submerged lands within the proposed boundaries. Implementing these

prohibitions would protect any cultural or historical resources within the proposed boundaries from potential disturbance, injury, or damage. Section 110 of the NHPA states that each federal agency shall establish a preservation program for the protection of historic properties. As described in Section 4.5 and Appendix E, NOAA has conducted research to identify nationally significant submerged cultural resources in the north central Gulf of Mexico.

Direct, long-term, localized, major, beneficial impacts to cultural and historic resources would be generated by the resource protection and management activities directed at nationally significant shipwreck sites under Alternative 5 (the USS *Hatteras*, the “Monterrey” wrecks, the *GulfOil*, the *GulfPenn*, the S.S. *Robert E. Lee*, the *U-166*, the Deepwater Horizon, the “Mardi Gras” wreck, and the *Anona*). NOAA finds this **beneficial** impact would be unique to expansion Alternative 5, and would be **less than significant** because dozens of known and suspected important cultural and historic resource sites in the north central Gulf of Mexico would remain unprotected.

5.4.3 Effect Determination for Historic Properties

The National Historic Preservation Act, amended in 1992, requires that responsible agencies taking action that potentially affects any property with historic, architectural, archeological, or cultural value listed on or eligible for listing on the National Register of Historic Places comply with the procedures for consultation and comment issued by the Advisory Council on Historic Preservation. The responsible agency also must identify properties affected by the action that are listed on or potentially eligible for listing on the National Register of Historic Places, usually through consultation with the State Historic Preservation Officer. Section 106 of the NHPA defines requirements and policy for the preservation, restoration, and maintenance of the historic and cultural environment of the United States. As part of the NEPA process for this action, NOAA identified any historic properties in the area of potential effects for the alternatives. Appendix E details site profiles of nationally significant cultural and historic resources within the proposed boundaries of Alternative 5. NOAA identified one shipwreck listed in the National Register of Historic Places and six additional sites within the proposed boundary of Alternative 5 eligible for listing and which therefore meet NHPA Section 106 definition of “historic properties.” No known historic properties are within the boundaries of the Final Preferred Alternative. NOAA determined **no historic properties would be affected** by implementing the Final Preferred Alternative for the following reasons:

- no historic properties are found within the proposed boundary of the Final Preferred Alternative, and
- no activities to implement the Final Preferred Alternative would interact with the historic properties identified within the boundaries of Alternative 5.

5.5 Cumulative Impacts

The CEQ regulations implementing NEPA define cumulative impacts as “the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions” (40 C.F.R. § 1508.7). For the purpose of this analysis, NOAA defines the reasonably foreseeable future as the next 5 to 10 years. The CEQ

regulations further define cumulative impacts as those that can result from, individually minor but collectively significant, actions that take place over a period of time. The CEQ guidance for considering cumulative effects states that NEPA documents “should compare the cumulative effects of multiple actions with appropriate national, regional, state, or community goals to determine whether the total effect is significant” (CEQ 1997).

Under the No Action Alternative, NOAA would continue to implement sanctuary protections and management activities within the existing sanctuary boundaries. Under any of the action alternatives, NOAA would expand the boundaries of FGBNMS substantially and implement regulatory protections and management activities in those expanded areas. To date, similar designations and boundary expansions in the National Marine Sanctuary System have included 14 national marine sanctuaries and two marine national monuments spread throughout the U.S. EEZ. None of the proposed alternatives for FGBNMS would result in an addition of more than 0.5% of the area encompassed by the current National Marine Sanctuary System.

5.5.1 Cumulative Impact Assessment Methods

In general, past, present, and future foreseeable actions are assessed by topic area. Cumulative effects may arise from single or multiple actions and may result in additive or interactive effects. Interactive effects may be countervailing, where the adverse cumulative effect is less than the sum of the individual effects, or synergistic, where the net adverse effect is greater than the sum of the individual effects (CEQ 1997).

The actions in Table 5.8 have occurred, are currently occurring, or are anticipated to occur in the reasonably foreseeable future within the study area. NOAA selected these past, present, and reasonably foreseeable future actions because they are likely to have similar types of impacts within the north central Gulf of Mexico, affect similar resources, or are large enough to have far-reaching effects on a resource. NOAA determined these activities could contribute to cumulative impacts on the resource areas assessed in Chapter 4. NOAA considered the effects of these actions in combination with the impacts of the proposed action to determine the overall cumulative impact on the resources in the north central Gulf of Mexico.

NOAA compiled Table 5.8 based on input from NOAA staff and other partner agencies. NOAA took this approach in order to include both actions for which detailed descriptions and expected impacts are known, as well as actions that have less defined impacts but may contribute to regional impacts. For purposes of this analysis, NOAA assumed any future actions in Table 5.8 would be approved and implemented within the next 5 to 10 years.

As described in detail below, NOAA’s cumulative effects analysis concluded that the combination of implementing any of the alternatives with those actions listed in Table 5.8 would result in:

- cumulatively **beneficial** effects on physical and biological resources, and cultural and historic resources, and
- cumulatively minor **adverse** effects on marine area use, recreation, and socioeconomics.

All of these **beneficial** or **adverse** cumulative effects would be **less than significant** because of the relatively low level of anticipated impacts from NOAA’s proposed action in the context of

the wide array of ongoing activities and regulatory framework affecting the resources of the Gulf of Mexico region.

Table 5.8. Past, Present, or Reasonably Foreseeable Future Actions with Potential to Contribute to Cumulative Impacts

Action	Action Location	Action Agency	Action Description	Projected Completion
BOEM Lease Sales	Gulf-wide	BOEM	BOEM is responsible for all OCS leasing policy and program development issues for oil, gas and other marine minerals, including development of the 5-year plan for permitting geologic and geophysical activities.	Ongoing
EFH and HAPC Designations	Gulf-wide	NMFS/GMFMC	GMFMC is mandated to identify, describe, map and protect EFH. None proposed at this moment.	Ongoing
Critical Habitat Designation for ESA-Listed Coral Species	East and West Flower Garden Banks	NMFS	Proposed designation of critical habitat for threatened coral species at East and West Flower Garden Banks (85 FR 76302; Nov 27, 2020)	Ongoing
NPDES Permit Reviews	Gulf-wide	EPA	5-year review cycle for general permit re-issuance. Most recently completed for 2018 to 2022.	Ongoing
Deepwater Horizon Natural Resource Damage Assessment (NRDA), RESTORE, NFWF-GEBF projects	Gulf-wide	NRDA Trustees, RESTORE Council, NFWF, Gulf states, NGO partners	Comprehensive ecosystem restoration for the Gulf of Mexico region.	Ongoing

5.5.2 Cumulative Impacts on Physical and Biological Resources

The proposed sanctuary expansion would not contribute to any major adverse impacts on air quality and climate, the noise environment, scenic and visual resources, geology and substrates, water, living marine resources, protected species, or cultural and historic resources, as described in Sections 5.3 and 5.4 above. The proposed alternatives, combined with ongoing BOEM lease sales, potential future critical habitat, EFH and HAPC designations, future NPDES permit reviews, Deepwater Horizon NRDA restoration projects⁴¹, RESTORE Act projects, NFWF-GEBF projects and other national marine sanctuary designations, expansions and management

⁴¹ See additional information on the proposed restoration projects involved in the Fish, Sea Turtles, Marine Mammals, and Mesophotic and Deep Benthic Communities Final Restoration Plan prepared by the Open Ocean Trustee Implementation Group:

https://www.gulfspillrestoration.noaa.gov/sites/default/files/2019-12%20OO%20TIG_RP2EA_PublicFinal_2019_signatures.pdf

activities would have an overall beneficial cumulative effect on physical and biological resources in the region.

The combined resource protections and restoration provided by these actions would result in positive influences on marine habitats and resources (i.e., long-term, moderate beneficial impacts both localized and beyond the proposed boundaries). These cumulative **beneficial** impacts are common to all of the alternatives and proportional to the number of features and areal extent encompassed under each alternative. They would be **less than significant** under any of the alternatives due to their low level of intensity in the context of the wide array of ongoing activities and human uses affecting the physical and biological resources in the Gulf of Mexico region.

5.5.3 Cumulative Impacts on Marine Area Use, Recreation, and Socioeconomics

As described in Section 5.3, the proposed sanctuary expansion would result in minor beneficial impacts on tourism, recreation, local economics, research, education, and passive economic use, as well as minor adverse impacts on marine area use, recreation, and socioeconomics as a result of prohibitions on bottom-disturbing activities, discharges, and certain types of fishing. The actions listed in Table 5.8 are analyzed for significant impacts individually and are not anticipated to cause adverse impacts on socioeconomic resources or human uses in the study area. Their cumulative impacts in combination with any of the alternatives evaluated individually above would not be greater than what was identified for the proposed alternatives. These cumulative **beneficial** and **adverse** impacts would be **less than significant** under any of the alternatives due to their low level of intensity in the context of the total marine area use, recreation, and socioeconomic activity in the north central Gulf of Mexico. None of the alternatives or the cumulative actions would contribute to adverse effects on environmental justice (see Executive Order 12898, Appendix G). NOAA evaluated the anticipated cumulative impacts of the proposed action on specific marine area uses, as described below.

5.5.3.1 Cumulative Impacts on Commercial Fishing

The proposed sanctuary expansion would limit some types of commercial fishing, but would not establish regional closures of fishing grounds or impact other fishery management activities conducted by NMFS and the GMFMC. The proposed FGBNMS expansion would have minor beneficial impacts on commercial fisheries and minor adverse impacts on commercial fishing operations, as a result of the proposed fishing, anchoring, and discharge regulations. NOAA considered existing HAPCs in developing the alternatives presented in this FEIS. The combination of proposed sanctuary expansion alternatives and proposed or future HAPC designations may have some adverse cumulative impacts on commercial fishing operators.

Specifically, the combined expansion of the sanctuary and the HAPC designations would result in a larger area where commercial fishing vessels would be prohibited from using bottom-tending gear or anchoring. However, the overlap between proposed sanctuary expansion boundaries and proposed HAPC areas would partially mitigate or minimize this effect. NOAA found the impacts on commercial fishing from proposed sanctuary expansion would be minor (see Section 5.3.9.1). NOAA further finds that the cumulative effects to commercial fishing

would also be minor because the proposed FGBNMS expansion areas and proposed HAPC areas are relatively small and predominantly overlapping. The nature of this cumulative **adverse** impact is common to all of the alternatives and proportional to the number of features and areal extent encompassed under each alternative. It would be **less than significant** under any of the alternatives due to its low level of intensity in the context of total commercial fishing activity in the north central Gulf of Mexico and the factors that minimize and mitigate the impact as identified in this paragraph and in the individual impact analysis in Section 5.3.9.1.

5.5.3.2 Cumulative Impacts on Oil and Gas Exploration and Production

The proposed sanctuary expansion would not result in the prohibition of offshore oil and gas development in the expansion areas, but could make oil and gas exploration more difficult or costly in these areas. NOAA found this effect on oil and gas exploration and production to be minor (see Section 5.3.9.5). The potential additional burden associated with accessing the small fraction of oil and gas reserves in the proposed expansion areas would have a minor impact on offshore energy development in the context of all Gulf of Mexico OCS oil and gas industry operations. NOAA further finds the cumulative impacts on oil and gas development would be minor due to the fact that BOEM lease sales and the associated leasing stipulations and mitigations attached to permits protect topographic features, PSBFs, and live bottoms in the region and will continue to do so for the foreseeable future. The nature of this cumulative **adverse** impact is common to all of the alternatives and proportional to the number of features and areal extent encompassed under each alternative. It would be **less than significant** under any of the alternatives due to its low level of intensity in the context of total oil and gas exploration and production activity in the north central Gulf of Mexico.

5.5.3.3 Cumulative Impacts on Commercial Shipping

There is the potential for some minor adverse impacts on marine transportation from the combination of the anchoring and discharge regulations in the proposed expansion areas and anchoring restrictions derived from the new deep coral HAPC designations by the GMFMC (85 FR 65740). Because of the proposed application of anchoring and discharge prohibitions in the expansion areas, NOAA finds the proposed sanctuary expansion would have minor adverse effects on marine transportation (see Section 5.3.9.6). NOAA further finds that the incremental increase in impacts associated with the cumulative scenario is also considered minor because of the extensive overlap in the areas under consideration for each action and because the discontinuous nature of the areas affected does not preclude ship traffic from anchoring safely or discharging sewage as needed in areas not protected by NMSA or HAPC designations. The nature of this cumulative **adverse** impact is common to all of the alternatives and proportional to the number of features and areal extent encompassed under each alternative. It would be **less than significant** under any of the alternatives due to its low level of intensity in the context of the extensive geography over which the commercial shipping industry operates in the north central Gulf of Mexico.

5.6 Summary of Environmental Consequences Analysis

This section briefly summarizes the environmental consequences analysis and compares the anticipated impacts of all of the alternatives.

5.6.1 Summary of Impacts of All Action Alternatives

Table 5.9 shows the color codes used in Table 5.10. Table 5.10 provides a brief summary and comparison of the impacts on each resource area expected to occur under each of the action alternatives, including the Final Preferred Alternative.

Table 5.9. Color coding legend for Table 5.10.

Minor beneficial impact
Moderate beneficial impact
Major beneficial impact
Minor adverse impact
Moderate adverse impact
Major adverse impact

Table 5.10. Summary of the environmental consequences comment to all action alternatives. For certain resources, the geographic extent, magnitude/intensity, or quality of impacts expected to be incurred may vary. As such, some affected resources contain more than one entry in this table.

Alternative (s)	Resource Area	Type of Impact	Duration of Impact	Geographic Extent	Magnitude/ Intensity	Quality
Final Preferred Alternative and Alternatives 2, 3, 4 & 5	<i>Air Quality and Climate</i>	Direct	Long-term	Localized	Minor	Beneficial
		Direct	Long-term	Localized	Minor	Adverse
		Indirect	Long-term	Localized	Minor	Beneficial
	<i>Noise Environment</i>	Indirect	Long-term	Localized	Minor	Beneficial
		Direct	Long-term	Localized	Minor	Adverse
	<i>Scenic and Visual Resources</i>	Indirect	Long-term	Localized	Minor	Beneficial
		Direct	Long-term	Localized	Minor	Beneficial
	<i>Geology and Substrates</i>	Direct	Long-term	Localized	Minor	Beneficial
		Direct	Long-term	Localized	Minor	Adverse
		Direct	Long-term	Localized	Moderate	Beneficial
	<i>Water Resources</i>	Direct	Long-term	Localized	Minor	Beneficial
		Indirect	Long-term	Localized	Minor	Beneficial
		Direct	Long-term	Beyond proposed boundaries	Minor	Beneficial
		Indirect	Long-term	Beyond proposed boundaries	Minor	Beneficial

Alternative (s)	Resource Area	Type of Impact	Duration of Impact	Geographic Extent	Magnitude/ Intensity	Quality
	<i>Living Marine Resources</i>	Indirect	Long-term	Beyond proposed boundaries	Moderate	Beneficial
		Indirect	Long-term	Beyond proposed boundaries	Minor	Adverse
		Direct	Long-term	Localized	Major	Beneficial
	<i>Essential Fish Habitat and Habitat Areas of Particular Concern</i>	Indirect	Long-term	Beyond proposed boundaries	Minor	Beneficial
	<i>Protected Species and Habitats</i>	Direct	Long-term	Localized	Minor	Beneficial
	<i>Marine Area Use, Recreation, and Socioeconomics</i>	Direct	Long-term	Localized	Minor	Beneficial
		Direct	Long-term	Beyond proposed boundaries	Major	Beneficial
		Indirect	Long-term	Localized	Minor	Beneficial
		Indirect	Long-term	Beyond proposed boundaries	Minor	Beneficial
		Indirect	Short-term	Beyond proposed boundaries	Minor	Adverse
		Direct	Short-term	Localized	Minor	Adverse
		Direct	Long-term	Localized	Minor	Adverse

Alternative (s)	Resource Area	Type of Impact	Duration of Impact	Geographic Extent	Magnitude/ Intensity	Quality
	<i>Cultural and Historic Resources</i>	Direct	Long-term	Localized	Minor	Adverse
5	<i>Cultural and Historic Resources</i>	Direct	Long-term	Localized	Major	Beneficial

5.6.2 Comparison of Impacts of All Alternatives

While the application of comprehensive sanctuary management activities, regulations, and resource protection programs to nationally significant biological and geological features constitutes the primary and most direct benefit of the proposed action and the alternatives, several other anticipated benefits and minor adverse impacts would occur both within and beyond the proposed boundaries.

Based on the analysis of the potential impacts of implementing the No Action Alternative (see Section 5.2), NOAA concluded the No Action Alternative would not fulfill the purpose or need of the proposed action, as described in Chapter 2. The Final Preferred Alternative and Alternatives 2 and 3 would limit the area of expansion to fit within the sanctuary’s current operational range and capacity (i.e., using existing staff, facilities, and vessels to conduct management activities). Additional resources beyond the current capacity of the FGBNMS would be required to support the more comprehensive Alternatives 4 and 5 described in this FEIS.

NOAA’s analysis found **no significant adverse impacts** to any resource areas under any alternative evaluated to accomplish the proposed action, either individually or cumulatively. NOAA expects the environmental consequences of each action alternative to be proportional to the number of features and areal extent encompassed under each alternative. As such, Alternative 5 represents the environmentally preferable alternative because it would protect the largest areal extent and the greatest number of banks.

However, NOAA identified the Final Preferred Alternative as the agency’s preferred alternative for this FEIS. NOAA believes this alternative would fulfill the agency’s statutory mission and responsibilities, giving consideration to economic, environmental, technical, and other factors. The Final Preferred Alternative would provide the greatest environmental benefit and protection of nationally significant biological and geological features that can be managed within NOAA’s current operational capacity and budgetary resources (i.e., using existing staff, facilities, and vessels to conduct management activities in a funding-neutral, or only slightly funding-positive, scenario). NOAA anticipates that implementing the Final Preferred Alternative, as well as other action alternatives, would have long-term beneficial impacts.

Realizing the progressively greater environmental benefits anticipated from each alternative, proportional to the areas and resources encompassed by the various expansion alternatives, depends upon sustaining the effective partnership-based management approach FGBNMS has implemented in the existing sanctuary. While FGBNMS recognizes the significant additional environmental and conservation benefits that could be realized under Alternatives 4 and 5, as compared to the Final Preferred Alternative, those alternatives cannot be identified as preferred under the relatively funding-neutral, or only slightly funding-positive, scenario that is anticipated. This matches the purpose for the proposed action described in Chapter 2 of this FEIS to limit the area of expansion to fit within the sanctuary's current operational range and resources (i.e., using existing staff, facilities, and vessels to conduct management activities).

Should additional resources beyond the current capacity of the FGBNMS be made available, further consideration for the inclusion of additional resources included in Alternatives 4 and 5 may be warranted. Specifically, the management and protection of important and vulnerable mesophotic and deep benthic habitat sites and cultural resources across the north central Gulf of Mexico would likely require a sanctuary presence across a larger coastal geography (e.g., additional offices in Louisiana, Mississippi, Alabama, or Florida). This would entail additional support for vessel operations, research and monitoring equipment, and lab space; additional staff support for sanctuary education and outreach programs; additional support for enforcement of sanctuary regulations, resource protection, management of visitor use across a much larger geographic range, and additional operations and administrative support. Each of the action plans identified in the 2012 FGBNMS Management Plan would have to be scaled up proportionally to the increased geography included under those alternatives.

Ensuring effective and well-planned operations, human resources, and adequate physical infrastructure to support effective management of the sanctuary requires a strong operational foundation to support management goals throughout the areas included in the sanctuary boundaries and the Gulf coast communities with which sanctuary staff engage. Support of on-site management and day-to-day operations requires highly trained and experienced staff to be recruited and supported to implement the activities described in the 2012 FGBNMS Management Plan throughout the current sanctuary and any expanded boundaries. In addition, the appropriate physical infrastructure must be in place to support operations. The sanctuary has offices and facilities, including the sanctuary's research vessel, R/V *Manta*, in Galveston, Texas. The function of these facilities is to provide an effective means to coordinate and communicate with communities, partners, and other stakeholders. Adequate staff and infrastructure are critical to successful sanctuary management, providing for research and monitoring, resource protection, and education and outreach programs.

5.6.3 Relationship of Short-Term Uses and Long-Term Productivity

NEPA requires consideration of the relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity. The short-term uses of the environment relating to each of the alternatives would improve the health and quality of the marine environment by protecting living marine resources and habitats through:

- regulations prohibiting bottom-disturbing activities, discharges into sanctuary waters, certain types of fishing, and other activities;

- providing a mechanism through the NMSA to respond to groundings and hazardous spills and the introduction and spread of invasive species;
- monitoring human activities through regulations and non-regulatory programs that incorporate community involvement in the stewardship of sanctuary resources.

Long-term productivity derived from the alternatives is based on the goals of the sanctuary and the suite of Action Plans structured to achieve these goals as identified in the 2012 FGBNMS Management Plan. These include action plans related to the proposed sanctuary expansion, education and outreach, research and monitoring, resource protection, visitor use, and operations and administration. Benefits to both short-term uses and long-term productivity based on implementation of sanctuary protections and management actions are proportional to the number of features and areal extent encompassed under each alternative.

5.6.4 Irreversible and Irretrievable Commitments of Resources

NEPA requires an analysis of the extent to which the proposed project's primary and secondary effects would commit nonrenewable resources to uses that future generations would be unable to reverse. The alternatives presented in this FEIS would require minor commitments of both renewable and nonrenewable energy and material resources for the management and research activities associated with the sanctuary. The sanctuary would also commit substantial resources, staff time, and funds for conservation and management activities. Nonrenewable resources that would be used during management and research activities include fuel, water, power, and other resources necessary to maintain and operate the sanctuary's research vessel and the sanctuary office. Electricity to power sanctuary facilities would be an irreversible use of resources, if derived from a non-renewable electrical power source.

Chapter 6

Acknowledgements and Literature Cited

6.1 Acknowledgements

Several staff members of NOAA's Flower Garden Banks National Marine Sanctuary prepared this document with significant assistance from headquarters staff in NOAA's Office of National Marine Sanctuaries. The Bureau of Ocean Energy Management and the Bureau of Safety and Environmental Enforcement provided cooperating agency support. A proposal for an expanded Flower Garden Banks National Marine Sanctuary was developed over many years by the Flower Garden Banks National Marine Sanctuary Advisory Council. This dedicated group consists of representatives of diving, fishing, oil and gas industry, conservation, education, research, and governmental interests.⁴²

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⁴² More information on the Advisory Council is available at: <https://flowergarden.noaa.gov/advisorycouncil/council.html>

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