NOAA is submitting this information in support of the interagency review of the final rule to designate the Wisconsin Shipwreck Coast National Marine Sanctuary (WSCNMS). The final rule has been classified as "Other Significant" under E.O. 12866. Section 6 (a)(3)(B) of E.O. 12866 requires that agencies provide "an assessment of the potential costs and benefits of the regulatory action." NOAA is providing this information to meet that requirement. All of the information provided below was taken from the final Environmental Impact Statement for the action, in accordance with the requirements under the National Environmental Policy Act but has been modified to meet the requirements under E.O. 12866.

The complete final EIS can be found at https://sanctuaries.noaa.gov/media/docs/2020-wisconsin-shipwreck-coast-national-marine-sanctuary-designation-final-eis.pdf

ANALYSIS OF ENVIRONMENTAL CONSEQUENCES OF ALTERNATIVES

5.1 Introduction

This chapter evaluates the anticipated direct, indirect, and cumulative environmental effects on underwater cultural resources, human uses and socioeconomic resources, physical resources, and biological resources associated with the proposed action and alternatives to the proposed action, including the no-action alternative, presented in Chapter 3. Under E.O. 12866 we do not find this to be an economically significant action. While we cannot quantify the benefits or costs they are expected to be well below the $100 million per year threshold that would trigger economic significance.

Potential impacts fall under three types: direct, indirect, and cumulative. These types of impacts are defined in regulations issued by CEQ as follows:

Direct impact: A known or potential impact caused by the proposed action or project that occurs at the time and place of the action (40 C.F.R. § 1508.8).

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 (40 C.F.R. § 1508.8).

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 (40 C.F.R. § 1508.7).

The potential direct and indirect impacts associated with the proposed action and alternatives are described by their level of impact (negligible, minor, or substantial). The impact analysis considers the beneficial (benefits) and adverse (costs) impacts of each alternative. The affected resources and types of use examined for the proposed action and alternatives are as follows:

1. Underwater cultural resources
2. Human uses and socioeconomic resources
3. Physical resources
4. Biological resources

Cumulative impacts from other past, present, and reasonably foreseeable activities are described in Section 5.6.

5.1.1 Determination of Potential Impacts

To determine the extent of an impact, the CEQ regulations (40 C.F.R. § 1508.27) and NOAA guidance (NAO 216-6A) require the consideration of context and intensity of potential impacts.

Context is the setting within which an impact is analyzed, such as the affected region or locality and the affected interests. In this FEIS, the direct and indirect impacts are evaluated within a local context, primarily examining how each alternative would affect the human environment within the sanctuary, and whether those effects would be short-term or long-term. The geographic area of interest for cumulative impacts is a slightly broader regional context in order to consider overlapping and compound effects with other past, present, or reasonably foreseeable future actions.

Level of intensity refers to the severity of the impact. The various levels of impact used in this analysis are:

- **Negligible:** Impacts to a resource can barely be detected (whether beneficial or adverse) and are therefore discountable.
- **Minor:** Impacts that do not rise to the level of impact as defined below. • **Substantial:** Impact resulting in an alteration in the state of an underwater cultural, human use and socioeconomic, physical, or biological resource. Long-term or permanent impacts or impacts with a high intensity or frequency of alteration to a resource, whether beneficial or adverse, would be considered substantial. The substantial threshold is evaluated on a case-by-case basis, taking into consideration the context and intensity of each action.

5.1.2 Quality of Potential Impacts

Potential impacts are described as either beneficial or adverse as follows:

- **Beneficial impact:** Beneficial impacts are believed to promote favorable conditions for the resource. Beneficial impacts reflect the change in benefits resulting from the proposed action.
- **Adverse impact:** Adverse impacts are considered contrary to the goals, objectives, management policies, and practices of NOAA and the public interest or welfare. These impacts are likely to be damaging, harmful, or unfavorable to one or more of the resources. Adverse impacts reflect the change in costs resulting from the proposed action.

5.1.2.1 Resources Not Analyzed

Of the resources commonly analyzed during the NEPA process, Table 5.1 provides a list of those not addressed in this FEIS and the rationale as to why the action would not affect these resources.

Table 5.1. Resources Not Analyzed in this FEIS

Resource	Rationale
Land use	With the exception of the impacts that some land use practices have on water quality (and are covered in cumulative impacts below), no significant land use activities, including land used for utilities, are included in the proposed action or alternatives.
Visual resources	None of the alternatives include activities that will impact visual resources.

5.1.3 Overview of the Environmental Consequences Analysis

Sections 5.2 through 5.6 evaluate the impacts of the alternatives on the resource areas described in Chapter 4. NOAA evaluated the impacts within the context of each of the following alternative components:

- **Sanctuary boundary:** How does the amount of area within the sanctuary affect the human and natural environment?
- **Sanctuary-wide regulations:** How do the type and amount of regulations to protect sanctuary resources affect the human and natural environment?
- **Management plan and associate field activities:** How do the activities to manage and operate the proposed sanctuary, such as operating boats to conduct research, monitoring, or outreach, affect the human and natural environment?

To efficiently evaluate the potential impacts of the alternatives, NOAA first evaluated the impacts of the no-action alternative, and then considered the impacts specific to the preferred alternative (Alternative 2). Lastly, NOAA analyzed the impacts of the other action alternatives (alternatives 1, 3, and 4), as summarized below:

Impacts from the No-Action Alternative*:* Section 5.2 describes the impacts from the no action alternative whereby NOAA would not designate a sanctuary.

Impacts from the Preferred Alternative (Alternative 2): Section 5.3 describes the impacts specific to the preferred alternative, which would include:

- Designating a national marine sanctuary within Boundary A (Section 3.3.2.1); ● Implementing Regulatory Option B (Section 3.3.3.2) and regulatory provisions that apply to all action alternatives (Section 3.3.3.3); and
- Implementing the proposed management plan (Section 3.3.4.1) and the associated field activities (Section 3.3.4.2).

Impacts from Other Action Alternatives (Alternatives 1, 3, and 4): Section 5.4

describes the impacts specific to the other action alternatives, other than the preferred alternative, including

- Alternative 1 (Boundary A, Regulatory Option A, and the management plan);
- Alternative 3 (Boundary B, Regulatory Option A, and the management plan); and
- Alternative 4 (Boundary B, Regulatory Option B, and the management plan).

Because many of the impacts would be the same for alternatives 1 through 4, Section 5.4 focuses on the differences among the four action alternatives.

Cumulative Impacts: Section 5.6 analyzes the cumulative effects from other past, present, and reasonably foreseeable activities on each of the alternatives.

5.2 Characterizing the No-Action Alternative

Under the no-action alternative (also known as the baseline), NOAA would not designate a national marine sanctuary in Wisconsin's Lake Michigan waters. The no-action alternative is characterized by no changes to existing management of the resources or other activities taking place in this area described above in Chapter 4. The no-action alternative provides a baseline to which environmental consequences of the national marine sanctuary designation alternatives can be compared.

5.2.1 Characterizing the Underwater Cultural Resources under the No Action Alternative

Under the no-action alternative, the level of recreational activities and research, which could disturb underwater cultural resources, would likely remain similar to the status quo.

As described in Chapter 2, underwater cultural resources within the proposed sanctuary face a number of threats at baseline, such as

- Anchor and grappling damage to shipwreck structures and debris fields from visiting dive boats;
- Damage due to unpermitted and poorly attached mooring lines;
- Artifacts being looted, artifacts being moved within a shipwreck site, and remotely operated vehicle tethers entangled within a shipwreck;
- Fishing gear entangled within a shipwreck; and
- The disturbance of newly discovered shipwrecks and artifacts in debris fields.

These behaviors threaten the long term sustainability of historic shipwrecks and other underwater cultural resources, and degrade their recreational and archaeological value over time.

5.2.2 Characterizing the Human Uses and Socioeconomic Resources under the No-Action Alternative

Under the no-action alternative, NOAA staff expect that local visitation and human use of the area would likely remain similar to the status quo. Local and state-level efforts to promote the

recreational opportunities along the Wisconsin coast would continue to attract tourists.

Diving and snorkeling activities would continue. Currently, dive boats will employ one of two methods when visiting a shipwreck site: 1) anchor or grapple in the shipwreck, which is common at deeper sites where dive times are limited, with a decent/accent line directly attached to the wreck; and 2) anchor near a shipwreck, which is more likely to be employed at shallow sites where precise positioning over the dive site is less critical.

Baseline archaeological documentation has been completed at several sanctuary shipwreck sites. Other sites require this documentation before a resource monitoring program can be initiated. There is currently no resource monitoring program for shipwrecks within the sanctuary.

5.2.3 Characterizing the Physical Resources under the No-Action Alternative

Under the no-action alternative, effects to physical resources would remain constant. Anchoring can damage the lakebed if the anchor is dropped in a soft location and creates impressions in the lakebed. If the anchor is dragged along the lakebed, it could create ditches or other physical changes to the lakebed. In addition to disturbing the geology of the lakebed, the physical interaction between the anchor and the lakebed could stir up sediments and degrade water quality by increasing turbidity. Under the no-action alternative, this anchoring damage would continue at current levels. Under the no action alternative no long term monitoring would be conducted to help evaluate negative impacts at sites.

5.2.4 Characterizing the Biological Resources under the No-Action Alternative

Under the no-action alternative, anchoring damage to benthic habitat is expected to continue at current levels. If the anchor is dropped in benthic habitat it may crush, smother, or otherwise physically disturbed the habitat. The physical interaction between the anchor and the lakebed could also stir up sediments and degrade water quality by increasing turbidity. Under the no action alternative, these adverse impacts would continue. Under the no-action alternative we do not expect any outreach and education efforts to promote the responsible use of this area's resources that would protect biological resources and reduce the risk of direct disturbance of benthic habitat and degradation of water quality.

5.3 Impacts of the Preferred Alternative (Alternative 2)

This section describes the beneficial and adverse impacts from NOAA's preferred alternative, which includes the following components, described in detail in Chapter 3:

- Boundary A:
    - 962-square mile area of Lake Michigan waters off Ozaukee, Sheboygan, Manitowoc, and Kewaunee counties (see Figure 3.1).
    - Western (shoreline) sanctuary boundary at the low water datum (LWD).
- Regulatory Option B:
    - Regulations similar to those used in other sanctuaries to protect underwater

cultural resources.

- Underwater cultural resources would include all prehistoric, historic, archaeological, and cultural sites and artifacts within the sanctuary boundary, including all shipwreck sites.
- Prohibitions would include:
    1. Moving, removing, recovering, altering, destroying, possessing, or otherwise injuring, or attempting to move, remove, recover, alter, destroy, possess, or otherwise injure a sanctuary resource.
    2. Grappling into or anchoring on all shipwreck sites.
    3. Interfering with, obstructing, delaying, or preventing an investigation, search, seizure, or disposition of seized property in connection with enforcement of the National Marine Sanctuaries Act or any regulation or any permit issued under the National Marine Sanctuaries Act.

● *Additional regulatory provisions and definitions common to all action alternatives.*

● *Implementation of the proposed management plan and associated field activities.* In total, under the preferred alternative, NOAA would implement regulations and a management plan to achieve the following:

- A federally-supported, comprehensive management framework for cultural resources that have been determined to be nationally significant;
- Protection for potential undiscovered historic shipwrecks and additional underwater cultural resources, such as submerged aircraft, docks, piers, prehistoric sites, and artifacts;
- NOAA-led activities to support research, resource protection, education and outreach, and enhanced public access of the National Marine Sanctuary System;
- Complementary permitting and law enforcement with the state of Wisconsin; and
- Expanded education and outreach efforts directed at long term preservation of shipwrecks, responsible use of sanctuary resources, and reduced negative human effects to these resources.

5.3.1 Impacts to Underwater Cultural Resources (Preferred Alternative)

5.3.1.1 Beneficial Impacts to Underwater Cultural Resources

Below describes the indirect and direct benefits from implementing the preferred alternative, including:

- Direct protection of sanctuary resources through a regulation and components of the management plan that would directly protect underwater cultural resources from disturbance and physical damage;
- Enhanced management of underwater cultural resources from the information gained through research and monitoring activities; and
- Increased stewardship of underwater cultural resources by conducting community outreach activities that help foster awareness and stewardship of these resources.

5.3.1.1.1 Direct Protection of Underwater Cultural Resources Under the preferred alternative, NOAA would directly protect underwater cultural resources in the sanctuary from injury and disturbances by developing a regulation and implementing a long-term, comprehensive management plan. The final regulation would protect underwater cultural resources by prohibiting moving, removing, recovering, altering, destroying, possessing, or otherwise injuring, or attempting to move, remove, recover, alter, destroy, possess, or otherwise injure a sanctuary resource. NOAA's regulation would complement the existing federal and state regulations to provide uniform protection over the entire collection of nationally significant historic shipwrecks within the designated sanctuary. These regulations enforce the principles of in-situ preservation of underwater cultural resources in the sanctuary to maintain their long-term integrity.

NOAA would also directly protect underwater cultural resources by developing a mooring buoy program to prevent potential damage that may be caused by anchoring into or grappling directly into the shipwreck structure. Under the no action alternative the use of anchors and grappling hooks would continue to damage shipwrecks due to tearing, breaking, crushing, or other physical disturbances of the shipwrecks. The mooring buoy program would prevent such damage by installing USCG-approved moorings that provide a secure and convenient anchoring point for users. This would eliminate the need for grappling to locate sites and for anchoring directly into a shipwreck site. In addition, moorings would provide clear notice to boaters of the presence of a known shipwreck site.

Under the preferred alternative, the prohibition to prevent grappling and anchoring would apply to all shipwrecks, even those without mooring buoys. To help prevent damage and ensure compliance with the prohibition in areas where moorings are not yet present, NOAA would publish guidelines to promote the use of best practices for anchoring near shipwrecks sites. An example of a best practice could include instructions on using a weighted line and surface float ("shot line") to mark a wreck for divers to descend and ascend that is removed before the dive boat leaves the area.

During the delay on the anchoring/grappling prohibition until October 1, 2023, NOAA will also consider developing a permitting process to allow for mooring line attachment to shipwrecks in places where a mooring buoy is not installed. Through the sanctuary permitting process, approved users would be able to tie a semi-permanent mooring line into certain shipwrecks sites. This permitting process would allow divers to access these shipwrecks in a more sustainable manner than grappling by attaching a semi-permanent mooring line directly to a shipwreck site. NOAA would further minimize any direct damage by issuing permits for a limited duration and by working with the permittee to ensure that the attachment point would be in an area of the shipwreck that would be the least susceptible to physical damage. NOAA would adopt a streamlined permitting system to ensure it is not overly burdensome on the user. Consequently, while we are unable to quantify these benefits due to data limitations, NOAA determined that the preferred alternative would result in **substantial beneficial impacts** on underwater cultural resources based on the direct and permanent protections to underwater cultural resources that would be provided by implementing the regulation to

prohibit harm or injury to shipwrecks, including a prohibition on grappling and anchoring at all shipwreck sites.

5.3.1.1.2 Enhanced Management of Underwater Cultural Resources Through Research and Monitoring

NOAA's designation of a sanctuary would enhance the management of underwater cultural resources through additional data and information to support informed management decisions. For example, NOAA would provide research and monitoring programs that would fill important gaps in archaeological knowledge and historical context of these shipwrecks. Under the preferred alternative, as part of its resource protection action plan, NOAA would conduct research to assess and collate baseline data on the 36 known shipwrecks and their associated artifacts. NOAA or its partners may also survey for the 59 unknown shipwrecks. NOAA would also gain information about the character and location of shipwrecks using such activities as scuba dive surveys, ROV surveys, and towed instrument or remote sensing activities. Sanctuary management would use this information to identify shipwrecks for protection efforts such as installing mooring buoys to prevent anchor damage. In order to assess their condition over time, NOAA would develop and implement a monitoring program for the underwater cultural resources in the sanctuary. While we cannot quantify the benefit due to data limitations, NOAA's research and monitoring activities would have **substantial beneficial impacts** on underwater cultural resources by broadening the research community's knowledge of what lies within Lake Michigan and informing management strategies that would improve the long-term preservation of these resources.

5.3.1.1.3 Enhanced Stewardship Through Education and Outreach Activities

Education, outreach, and community engagement supported by federal resources would enhance protection of underwater cultural resources in the sanctuary by fostering awareness and stewardship of these resources. The Sanctuary management plan would include strategies for promoting public education about sustainable and responsible use of the resources. For example, NOAA would develop outreach programs that endorse sanctuary resource protection, such as publicizing best management practices for scuba divers to minimize their impacts while wreck diving. NOAA anticipates that under the preferred alternative, its education and outreach efforts would have **substantial beneficial impacts** on the underwater cultural resources by enhancing public appreciation of the historical significance of these resources and encouraging public stewardship of the area.

5.3.1.1.4 Summary of Beneficial Impacts to Underwater Cultural Resources

The preferred alternative would directly protect underwater cultural resources in the sanctuary from injury and disturbance by developing long-term sanctuary-wide regulations, including a prohibition on grappling and anchoring at all sites. In addition, implementing the management plan would have beneficial impacts on underwater cultural resources by broadening the research community's knowledge of what lies within Lake Michigan and informing management strategies that would improve the long-term preservation of these resources. Similarly, education and outreach efforts would have long-term, beneficial impacts on the underwater cultural resources by enhancing public appreciation of the historical significance of these resources and encouraging public stewardship of the area. Based on these actions that would

reduce continuing degradation of these resources that would have occurred under the no-action alternative, improve decision making from long-term management planning, and increase knowledge about the shipwrecks, NOAA determined that the preferred alternative would result in **substantial beneficial impacts** to underwater cultural resources within the proposed sanctuary. However, we are unable to quantify these benefits given data limitation.

5.3.1.2 Adverse Impacts to Underwater Cultural Resources

Under the preferred alternative, damage to underwater cultural resources may occur during NOAA field operations and from increased tourism. Field operations that would take place to support management of the proposed sanctuary include vessel operations and maintenance; scuba operations; deployment of AUVs, ROVs, gliders, and drifters; and deployment of equipment on the lakebed (e.g., installing mooring buoys).

Scuba diving during field operations can injure underwater cultural resources if divers use improper diving techniques and make physical contact with a wreck. Under the preferred alternative, NOAA scuba diving operations would increase as part of research efforts to study the known and unknown shipwrecks within the proposed sanctuary. However, NOAA divers are highly trained, follow best management practices, and generally conduct non-invasive activities, such as recording (photo-video documentation and measurements), when conducting field work.

Recreational or other non-NOAA divers could also damage underwater cultural resources by using improper diving techniques. Designating the national marine sanctuary may increase non NOAA dive traffic on the wrecks, and installing mooring buoys at wreck sites may concentrate use on those wrecks. However, the regulatory prohibitions, the mooring buoy program, and the permitting system would help ensure sustainable diving practices to minimize any direct impacts to the shipwrecks. Similarly, education and outreach efforts would help promote responsible use of the sanctuary and increase public appreciation and stewardship of these resources.

Deploying AUVs, ROVs, and remote sensing equipment to better document underwater cultural resources within the proposed sanctuary carries a slight risk of entanglement or accidental contact with a wreck. However, NOAA operators are highly trained, deploy these types of vehicles regularly, and follow NHPA protocols that describe how to avoid harm to historic artifacts. In addition, research efforts would be of relatively low intensity and frequency.

5.3.1.2.1 Summary of Adverse Impacts to Underwater Cultural Resources

Based on the mooring buoy program that would limit direct interactions with the shipwrecks, best management practices that NOAA would follow during research activities and other field operations, the protections afforded to underwater cultural resources within the proposed sanctuary, and the education and outreach activities that would encourage public stewardship, NOAA determined that the preferred alternative could result in **negligible adverse impacts** on underwater cultural resources.

5.3.2 Impacts to Human Uses and Socioeconomic Resources (Preferred Alternative)

Under the preferred alternative, NOAA would bring resources and national visibility to provide coordinated promotion of regional recreational activities and human uses within the designated sanctuary area.

5.3.2.1 Beneficial Impacts to Human Uses and Socioeconomic Resources

5.3.2.1.1 Enhanced Promotion of Shipwreck Tourism and Improved Recreational Experiences

National visibility and regional coordination of sanctuary messaging and promotion of regional visitor opportunities would likely attract more tourists, especially divers interested in viewing shipwrecks. NOAA anticipates that the research, education, interpretation, and outreach activities associated with the preferred alternative would have a positive impact on tourism by heightening public awareness of, and interest in, the underwater cultural resources found in Lake Michigan. This increase in tourism would be driven by name recognition associated with the significance of becoming a national marine sanctuary and NOAA's own outreach and advertising activities for the sanctuary and region.

NOAA would work with state and local partners to create more public exhibits, improve outreach, and raise awareness and knowledge to enhance the visitor experience. For example, designating the sanctuary would complement and enhance the state of Wisconsin's Maritime Trails initiative, which encourages divers, snorkelers, boaters, and maritime enthusiasts to visit maritime resources while following best management practices to reduce adverse impacts to these resources. While the specific efforts and partners would be determined as part of the implementation of the sanctuary management plan, NOAA's top priority would be creating opportunities for people to learn about and visit the proposed sanctuary. NOAA would likely partner with existing institutions, such as the Wisconsin Maritime Museum, Port Exploreum, and Rogers Street Fishing Village, among others, to develop exhibits and programs. NOAA anticipates that this involvement would increase visitation at these locations.

The preferred alternative would result in improved recreational experiences for the public through the distribution of maps that would help users to locate the shipwrecks and the implementation of a mooring buoy program that would make the wrecks more easily accessible. The mooring buoys would provide a clear indication of where specific shipwrecks are located, which would make it easier for divers to locate the shipwrecks. In addition, NOAA would distribute sanctuary maps to the public that include the location of known and suspected shipwreck sites. As appropriate, NOAA would update the maps as new shipwreck sites are found, increasing the number of known sites to divers to visit.

Based on the anticipated increase in tourists driven by the name recognition associated with the significance of becoming a national marine sanctuary. NOAA determined that the preferred alternative would result in **minor beneficial impacts** due to the enhanced promotion of shipwreck tourism and improved recreational experiences. Although it is expected that the sanctuary designation will have positive impacts to human uses, given an absence of baseline data specific to the proposed WSCNMS designation and region, NOAA is unable to state the impacts would be substantial with certainty.

5.3.2.1.2 Transfers and Positive Economic Contributions from Increased Recreation and Tourism Spending to the Local Economy

The natural, recreational, and underwater cultural resources located along Wisconsin's central Lake Michigan coastline are integral to the region's current economy, support a vibrant quality of life, and create a unique sense of place. An increase in tourists to the proposed sanctuary could continue to benefit the local economy in many ways. The increase in tourism may result in an associated increase in potential revenue since tourists may stay at hotels, eat at restaurants, purchase supplies from dive shops, and visit other local businesses. Such business may be newly established or enhanced from the increased visitation. For example, a dive shop recently opened in Port Washington in part due to the proposed national marine sanctuary. New or expanded boat charter businesses could be established, as in the case of the Skyline Princess tour boat company in Manitowoc that operated for several months during the summer of 2016.

NOAA determined that the preferred alternative would result in **minor transfers** due to the increase in potential revenue and positive contributions to the local economy since local tourists and users may stay at hotels, eat at restaurants, purchase supplies from dive shops, and visit other local businesses. These positive transfers occur from local users to business within the study area that rely or utilize sanctuary resources from other business located within the study area that do not use sanctuary resources.

Additionally, minor beneficial impacts are expected as a result of new users entering the study area to utilize the sanctuary and/or businesses that rely on sanctuary resources. When users from outside the study area visit the region and spend money, this is 'new' money entering the study area economy. Further, it is possible that some locals may now decide to stay within the study area, recreate and frequent business that use or rely on sanctuary resources. The people that decide to stay within the study area for tourism and recreation versus leave the study area for experiences elsewhere, would also have a positive impact on the local economy by keeping their spending within the region.

Although it is expected that the sanctuary designation will have positive impacts to the local economy, given an absence of baseline data specific to the proposed WSCNMS designation and region, NOAA is unable to state the impacts would be substantial with certainty. However, as mentioned above, the similar heritage-based Thunder Bay National Marine Sanctuary has had positive impacts in the northeastern Michigan region. For example, the 2018 study in Thunder Bay National Marine Sanctuary referenced above, found that of those who used the Great Lakes Maritime Heritage Center and Alpena Shipwreck Tours, their spending in the study area totaled $32.4 million and supported nearly 500 jobs and $40.0 million in output. Visitors to the region accounted for 88% of the total spending (Schwarzmann et al. 2019).

5.3.2.1.3 Increased Value from Sanctuary Designation

Many of the goods and services provided by cultural and heritage resources do not require market transactions to derive benefit. These benefits are split into two types: use value and non use value. WTP is mathematically defined as the area below the demand curve for a good or service and includes both use and non-use value. Use value can be estimated using several methods including the travel cost method. Use value may be impacted by the number of

shipwrecks protected and the level of investments in museum exhibits, maritime heritage trails – including virtual trails using video and mobile phone technology – and educational workshops on maritime heritage and training in maritime archaeology.[1]

While use value comes from the direct enjoyment of the use of resources, non-use value is derived from those who may never use the resource and is comprised of option value (the value people place on the option to use the resource in the future), existence value (the value knowing a resource or place exists) and bequest value (the value knowing that the resource will be available to future generations). Non-use value is typically estimated using stated preference surveys that elicit WTP from non-users. Although no studies have been conducted specific to the use or non-use value of shipwrecks in the proposed sanctuary, there is evidence that both users and non-users have WTP for the protection of these resources (Whitehead & Finney, 2003[2], Mires, 2014. Although some of the benefits discussed above would be captured in measures of willingness to pay, non-use values are not captured in the previous sections.

5.3.2.1.4 Reduced Entanglement of Fishing Gear and Related Costs to Commercial and Recreational Fishing

Sanctuary activities could indirectly benefit commercial and recreational fishing by reducing the likelihood of fishing gear entanglement with shipwrecks or other lake bottom structures that could tear, damage, or otherwise destroy fishing gear. For example, NOAA's management plan includes efforts to better characterize the lake bottom, including the location of structures that could damage fishing gear; installing buoys to clearly identify shipwreck locations; and disseminating such information through public maps and other sources. These activities would benefit commercial and recreational fishing by helping fishers better avoid these areas, limiting entanglement of fishing gear, and avoiding user conflict between fishers and divers near shipwrecks. The proposed action does not include any regulations specific to commercial fishing. NOAA determined that the preferred alternative would result in **negligible beneficial impacts** due to the indirect benefits to commercial and recreational fishing from reducing the likelihood of fishing gear entanglement with shipwrecks or other lake bottom structures that could tear, damage, or otherwise destroy fishing gear.

5.3.2.1.5 Summary of Beneficial Impacts to Human Uses and Socioeconomic Resources

The preferred alternative would result in several beneficial impacts to human uses and socioeconomic resources, including:

[2] Whitehead, J & Finney, S. 2003. Willingness to Pay for Submerged Maritime Cultural Resources. Journal of Cultural Economics. 27(3/4):231-240.

- An increase in tourists driven by:
    - Name recognition associated with the significance of becoming a national marine sanctuary;
    - Collaboration with state and local partners to create more public exhibits,

improve outreach, and raise awareness and knowledge of sanctuary resources; and

- ○ An improved dive experience from the implementation of a mooring buoy program and distribution of sanctuary maps that would make the wrecks more easily accessible.

- ● An increase in potential revenue and positive contributions to the local economy since tourists may stay at hotels, eat at restaurants, purchase supplies from dive shops, and visit other local businesses.
- ● An increase in willingness to pay for additional protection to cultural and heritage resources, trails, interactive experiences, and educational opportunities. ● Indirect benefits to commercial and recreational fishing by reducing the likelihood of fishing gear entanglement with shipwrecks or other lake bottom structures that could tear, damage, or otherwise destroy fishing gear.

Based on the above activities, NOAA anticipates that under the NEPA analysis framework, the preferred alternative would result in **minor beneficial** effects on human uses and socioeconomic resources in the study area. Again, NOAA cannot state this conclusion with certainty. Future monitoring, in addition to the collection of baseline data, will help to determine if the benefits derived from designation resulted in larger benefits than reported here.

5.3.2.2 Adverse Impacts to Human Uses and Socioeconomic Resources

5.3.2.2.1 Potential User Conflicts from Increased Tourism The number of boats operating within the proposed sanctuary would likely increase under the preferred alternative because of management activities using NOAA-authorized or operated vessels and visitors using recreational boats. This projected increase in boats could potentially cause conflicts among recreational boaters and the various industries that currently operate within the proposed sanctuary (e.g., commercial shipping, commercial fisheries). Given that the increase in boating tourists would be relatively small compared to overall boating activity on Lake Michigan, and tourists would remain within the proposed sanctuary for a limited amount of time, NOAA does not expect this increase in boats to be on a scale that would cause user conflicts. In addition, NOAA expects that field operations would result in relatively few vessel trips per year compared to overall boating activity of Lake Michigan, and each vessel trip would be of a short duration. Therefore, boat traffic is not expected to rise to the level where conflicts between users or safety issues would occur. The mooring buoy program and NOAA-issued maps would also help minimize the likelihood of user conflicts since industry and recreational boaters would be aware of and avoid popular dive locations and submerged shipwrecks. Based on the relatively small increase in boats on the lake and the implementation of the mooring buoy program and distribution of maps to clearly mark popular diving locations, NOAA determined that the preferred alternative would have **negligible adverse impacts** on human uses of the study area from potential user conflicts within the proposed sanctuary.

5.3.2.2.2 Potential Burden on Infrastructure

An increase in visitors could result in more vehicular traffic on roads and use of other public services when tourists visit the proposed sanctuary and adjacent shoreline. However, given that

the increase in tourists would be relatively small compared to the overall vehicular traffic, and tourists would remain within the proposed sanctuary for a limited amount of time, NOAA does not expect this increase to be on a scale that existing public facilities and roadways would be unable to accommodate. Furthermore, NOAA does not anticipate an increase in population in the study area, because tourists would not likely permanently relocate to the Wisconsin coastal area near the proposed sanctuary. Similarly, if workers are hired due to increased patrons at hotel, restaurant, dive, or tour company businesses, population and employment numbers suggest that additional workers could be hired from within the local population. As such, the increased business would not result in an influx of workers that permanently relocate to the area surrounding the proposed sanctuary. Given that NOAA does not anticipate any permanent relocation of workers or tourists, there would be **negligible adverse impacts** from any potential increased traffic to the area.

5.3.2.2.3 Potential Burden of Permitting

NOAA would adopt a streamlined permitting system to ensure it is not overly burdensome on the user. Consequently any permitting system developed is likely to have negligible adverse impacts on the permit requester.

5.3.2.2.4 Summary of Adverse Impacts to Human Uses and Socioeconomic Resources

Based on the temporary increase in tourists that would be spread out over a large area, and maps that would help avoid user conflicts, NOAA determined that the potential **adverse** impacts on infrastructure and resources from increased human use would be **negligible**.

5.3.2.3 Human Use Activities that Would Not Be Impacted

Implementation of this regulation in the proposed sanctuary would not affect commercial shipping and military activities, as all harbors, marinas, and shipping lanes would be excluded from the sanctuary boundaries, no sanctuary regulation would limit regular military activities, and sanctuary regulations would not impose any restrictions on vessels transiting the sanctuary. NOAA excluded the commercial ports and marinas of Two Rivers, Manitowoc, Sheboygan, and Port Washington from the preferred alternative in order to avoid any potential use conflicts with the shipping industry. In addition, with the passage of the Coast Guard Authorization Bill of 2015, USCG and EPA regulations prohibiting ballast water exchange in national marine sanctuaries would not apply to this proposed sanctuary since this is a Great Lakes sanctuary that protects maritime heritage resources.

As noted in Section 3.3.3.2, anchoring within the sanctuary would only be prohibited on shipwreck sites. NOAA designed this regulation to protect historic shipwreck sites from dive vessel related anchor damage, while still allowing anchoring outside of these discrete areas in order to avoid any impacts to commercial shipping.

The proposed action does not include any regulations related to oil and gas drilling. These activities have been prohibited in the Great Lakes by Section 386 of the Energy Policy Act of 2005, and therefore, the sanctuary designation would not have an effect on this activity.

5.3.3 Impacts to Physical Resources (Preferred Alternative)

Under the preferred alternative, the regulation and management plan objectives would be designed to protect sanctuary underwater cultural resources in the proposed sanctuary. Management activities in support of these objectives, such as vessel operations and research activities, may increase some negative effects on physical resources in the action area. The proposed sanctuary designation may also attract more public users to the area, resulting in increased boat traffic and associated air and water pollution.

5.3.3.1 Beneficial Impacts to Physical Resources

5.3.3.1.1 Less Disturbance of the Lakebed

Under the preferred alternative, NOAA would prohibit grappling into or anchoring on a shipwreck site. Although the purpose of the prohibition is to protect underwater cultural resources, the prohibition could also result in beneficial impacts to physical resources by reducing disturbance of the lakebed. Anchoring can gouge depressions into sediment or create new holes in substrate if anchors are dragged along the lakebed or dropped in soft sediments. Altering the lakebed structure and other physical interactions between the anchor and the lakebed could stir up or resuspend sediments, causing localized increases in turbidity. In addition, installing mooring buoys at popular shipwreck sites would provide users a means of anchoring their vessels close to shipwrecks but would eliminate disruption of sediments and possible water quality degradation that may be caused by anchoring to the lakebed. Therefore, prohibiting anchoring near shipwrecks and encouraging the use of mooring buoys would limit lakebed disturbance, thereby resulting in a **negligible beneficial impact** to the lakebed and water quality.

The Regulation that prohibit moving, removing, recovering, or otherwise injuring underwater cultural resources, such as shipwrecks, would also indirectly protect the lakebed below and near the shipwreck. Recreational divers would not be allowed to cause any injury or to take any underwater cultural resources. If damage to these resources were restricted, damage to the adjacent and underlying lakebed would be less likely to occur, because less activity would be concentrated near the shipwreck sites. In addition, salvage activities that would likely damage the substrate would be prohibited. Restricting lakebed disturbance from salvaging or other activities that could disturb shipwrecks would also result in a **negligible beneficial impact** to the lakebed and water quality.

5.3.3.1.2 Summary of Beneficial Impacts to Physical Resources In summary, prohibiting anchoring on and damage to underwater cultural resources and encouraging the use of mooring buoys would result in a **negligible beneficial impact** on physical resources in the study area. These activities would reduce the likelihood for anchors to disturb the lakebed, which could alter the lakebed structure and stir up sediments to cause increased turbidity and a localized decline in water quality. Additionally, prohibitions on activities such as salvaging would reduce opportunities for the lakebed to be disturbed when it is associated with a sanctuary resource.

5.3.3.2 Adverse Impacts

5.3.3.2.1 Direct Disturbance of the Lakebed in Small Areas Installation and maintenance of mooring buoys and other equipment on the lakebed could result in direct local disturbances to the physical properties of the lakebed. Installation of a mooring system requires placing a steel block (typically a train wheel) on the lakebed. While this activity could very minimally change the structural properties of the lakebed, **adverse impacts** from installation and maintenance of mooring buoys and lakefloor equipment would be **negligible** due to the very small amount of area that would be directly disturbed (less than 2 square meters) and the implementation of best management practices, such as selecting installing sites that avoid important lakefloor structures.

5.3.3.2.2 Potential for Localized, Temporary Decline in Water Quality Vessel operations and the installation and maintenance of mooring buoys could result in a localized, temporary degradation of water quality during certain activities. Turbidity could temporarily increase during the installation and maintenance of mooring buoys when NOAA would use drills to anchor equipment to the lakebed. Vessel operations could result in minimal adverse impacts to water quality due to the small potential for a localized decline in water quality from unintended fuel, lubricant, sewage, or garbage spills from sanctuary vessels. Adherence to ONMS best management practices and NOAA's guidance would minimize the likelihood of a spill and the impacts if a spill were to occur. In addition, any localized decline in water quality would dissipate quickly. Therefore, NOAA determined that the **adverse effects** of these activities on water quality would be **negligible** because the activities would be short term and localized, and sanctuary staff would employ training procedures and a variety of other best management practices to avoid or minimize impacts to water quality.

5.3.3.2.3 Low Generation of Air Emissions

Under the preferred alternative, air quality could be affected by the generation of emissions during NOAA-authorized vessel operations and indirectly from the potential increase in recreational boaters. Adherence to ONMS best management practices would minimize impacts of NOAA-authorized vessel activity. Similarly, education and outreach efforts would help promote responsible use of the sanctuary and increase public appreciation and stewardship of these resources. Therefore, under this alternative, there would be **negligible adverse** impacts to air quality from vessel exhaust in the sanctuary.

5.3.3.2.4 Summary of Adverse Impacts to Physical Resources Under the preferred alternative, adverse impacts to physical resources could result from the direct disturbance of installing mooring buoys, the potential localized and temporary decline in water quality from unintended spills, and the low generation of emissions during vessel operations. NOAA determined that these activities would result in **negligible adverse impacts** on physical resources in the study area due to the small amount of lakebed that would be directly disturbed, the implementation of best management practices such as selecting installing sites that avoid important lakefloor structures, the low potential for an unintended spills or leaks, and the low level of vessel operations.

5.3.4 Impacts to Biological Resources (Preferred Alternative)

5.3.4.1 Beneficial Impacts

5.3.4.1.1 Biological Habitat

Any disturbance of underwater cultural resources not only jeopardizes the preservation of these resources, but could also disturb associated habitat for aquatic biota. The regulation under the preferred alternative would regulate salvage, artifact taking, activities using suction equipment, anchoring on the shipwrecks, and other activities that could damage or otherwise injure shipwrecks and potentially degrade biological habitat for aquatic organisms. Mooring buoys would protect benthic habitat by providing boaters an option to remain near shipwrecks without damaging habitat by dropping anchors on the lake bottom. Given that the sanctuary regulation would protect underwater cultural resources that may provide habitat for aquatic biota, but only at 36 discrete locations (shipwreck sites), the preferred alternative would result in **negligible beneficial impacts** to benthic habitats.

5.3.4.2 Adverse Impacts

5.3.4.2.1 Temporary Displacement or Disturbance of Fish, Birds, and Other Wildlife

When vessels transit within the proposed sanctuary, minor acoustic disturbance from engine noise could impact fish, birds, or other wildlife in the area of vessel activity. Scuba divers visiting shipwreck sites, whether recreational or for management or research purposes, may also disturb and displace mobile organisms through their physical movements or noise. If any species were to be within close enough proximity to a NOAA-authorized vessel, recreational boat, or scuba divers, the interaction could result in a response ranging from no reaction to a startled reaction that leads to a rapid fleeing from the area. In such cases, organisms would be able to move to nearby suitable habitat. For sonar surveys, sound detection by the majority of freshwater fishes, and hence behavioral disturbance and hearing impairment, is unlikely to occur due to the much higher frequencies of these instruments relative to fish hearing capabilities. For those species capable of detecting the frequencies of sonar equipment, the greatest potential for adverse impacts as a result of active underwater acoustic sound sources would be related to changes in behavior. Fish usually avoid human activity. As a result, the most likely effect on fish from interactions with vessels, scuba divers, or sonar equipment, would be a moderate to high energy avoidance behavior resulting in the animal temporarily leaving the immediate area unharmed. This disturbance would be brief and is not likely to substantially impact the organism's ability to feed, reproduce, or avoid predators. Species occurring near popular docks or shipwrecks would likely be familiar with the current levels of recreational diving that occurs. Therefore, these activities would be unlikely to cause species to avoid or abandon habitat within the proposed sanctuary.

Disturbance from vessel activities would be minimized because of the low level of NOAA authorized vessel trips likely to occur within a year, and the relatively short duration of each trip. Disturbance from research activities such as diving would be minimized because staff are highly trained and would follow best management practices to protect biological resources and to avoid, or minimize, disturbing species. Many proposed management plan activities involve educating the public and researchers about and promoting the responsible use of biological resources in the sanctuary (see Appendix A). These outreach and educational activities would

help ensure that all user groups are aware of the need to avoid or minimize impacts to habitat. Thus, the **adverse effects** from vessel disturbances and scuba activities within the proposed sanctuary would be **negligible** given that noise from operational activity would be of limited duration, NOAA-authorized vessels and divers would follow best management practices, and in the event of disturbance organisms could move to adequate suitable habitat nearby.

5.3.4.2.2 Direct Disturbance of Benthic Habitat in Small Areas Installation and maintenance of mooring buoys and other equipment on the lakebed could result in direct local disturbances to the lakebed. Installation of a mooring system requires placing a steel block (typically a train wheel) on the lakebed. While this activity could very minimally change the structural properties of the lakebed, **adverse impacts** from installation and maintenance of mooring buoys and lakefloor equipment would be **negligible** due to the very small amount of area that would be directly disturbed (less than 2 square meters) and the implementation of best management practices such as selecting sites that avoid important lakefloor structures.

5.3.4.2.3 Localized, Temporary Decline in Water Quality

Installation and maintenance of mooring buoys and vessel operations could result in a localized, temporary degradation of water quality and pelagic habitat during certain activities. Turbidity could temporarily increase during the installation and maintenance of mooring buoys when NOAA would use drills to anchor equipment to the lakebed. Vessel operations could result in minimal adverse impacts to water quality due to the small potential for a localized decline in water quality from unintended fuel, lubricant, sewage, or garbage spills from sanctuary vessels. Adherence to ONMS best management practices and NOAA guidance would minimize the likelihood of a spill and the impacts if a spill were to occur. In addition, any localized decline in water quality would dissipate quickly. Based on similar field operations at other national marine sanctuaries, such as Thunder Bay National Marine Sanctuary, the **adverse effects** of these activities on biological resources in the action area would be **negligible** because the activities would be short-term and localized, and sanctuary staff would employ training procedures and a variety of other best management practices to avoid or minimize impacts to water quality and pelagic habitats.

5.3.4.3 Impacts to Federally Protected Species and Habitats NOAA analyzed the potential environmental consequences to protected species and habitats within the regulatory framework of the relevant statute, including the ESA and the MBTA. As noted in Section 4.5.4, no Essential Fish Habitat, as defined under the MSA, occurs within Lake Michigan. See Section 6.1 for additional information regarding other federal and state consultations, and the regulatory framework for other federal and state laws.

5.3.4.3.1 Endangered Species Act

As noted in Section 4.5.4.1, NOAA determined that seven species listed under the ESA may occur in the action area. In addition to these seven species, NOAA determined that the rusty patched bumble bee would not occur within the action area, and therefore, the proposed action would have **no effect** on this species. NOAA analyzed the potential for impacts to the seven species that may occur within the action area, as discussed below.

The red knot and the piping plover may infrequently occur within the action area during the

limited portions of the year that they breed, foraging, or migrate through Lake Michigan. NOAA determined that the proposed action would result in **no effect** to these species because of following:

- The low intensity of activities that would occur within the sanctuary, especially along the shoreline where these species would be most likely to occur;
- The small migratory period when the red knot may transit through the sanctuary or forage within coastal areas of the lake; and
- The infrequent observations of piping plovers along the shoreline within the action area.

The northern long-eared bat and the Hine's emerald dragonfly would not occur within the proposed sanctuary, but may infrequently roost, travel, or forage within riparian forests that are adjacent to the proposed sanctuary. NOAA determined that the proposed action would result in **no effect** on these species because sanctuary management activities would not occur in these habitats adjacent to the proposed sanctuary.

Three terrestrial plants, the dwarf lake iris, the eastern prairie fringed orchid, and the Pitcher's thistle, may occur within terrestrial habitats adjacent to the proposed sanctuary. NOAA determined that the proposed action would result in **no effect** to these three terrestrial plants because no ground-disturbing or other activities would occur outside the sanctuary, where these species would occur.

Therefore, NOAA determined that the proposed action would result in **no effect** on species listed or proposed to be listed under the ESA (see Table 5.2).

Table 5.2. Effect Determination for ESA-listed Species Under USFWS Jurisdiction Potentially Found in the Action Area

Species Common Name	Species Name	Status	Effect
Northern long-eared bat	*Myotis septentrionalis*	Threatened	No effect
Red knot	*Calidris canutus rufa*	Threatened	No effect
Piping plover	*Charadrius melodus*	Endangered	No effect
Hine's emerald dragonfly	*Somatochlora hineana*	Endangered	No effect
Rusty patched bumble bee	*Bombus affinis*	Endangered	No effect
Dwarf lake iris	*Iris lacustris*	Threatened	No effect
Eastern prairie fringed orchid	*Platanthera leucophaea*	Threatened	No effect
Pitcher's thistle	*Cirsium pitcheri*	Threatened	No effect

As noted in Section 4.5.4.1, designated critical habitat for the piping plover occurs along sandy beaches adjacent to the proposed sanctuary. The proposed action would not include any ground

disturbing activities along the shoreline. Field operations and other activities to implement the proposed management plan would primarily occur within buildings or on the water. Therefore, NOAA determined that the proposed action would have **no effect** on designated critical habitat because the proposed action would not result in a direct or indirect alteration that would appreciably diminish the value of critical habitat for both the survival and recovery of the piping plover.

5.3.4.3.2 Migratory Birds

Section 4.5.4.2 describes the 24 bird species protected under the MBTA that may be found transiting, resting, or foraging within the sanctuary. The MBTA prohibits pursuing, hunting, taking, capturing, or killing migratory birds, their nests, or their eggs. Based on the Department of Interior's memo dated December 22, 2017,[3] this prohibition is limited to activities whereby the purpose of the activity is to pursue, hunt, take, capture, or kill migratory birds, their nests, or their eggs. Incidental take, where a take may occur during an activity but is not the purpose of that activity, is no longer considered a take under the MBTA.

Any impacts to migratory birds would be negligible and incidental, such as human disturbances from vessel traffic, noise from recreational activities, or from other activities in support of the sanctuary management such as research or educational activities. Since any disturbances would be negligible and incidental, no take under the MBTA would occur under the proposed action.

[3] See doi.gov/sites/doi.gov/files/uploads/m-37050.pdf.

5.4 Impacts of Other Action Alternatives (Alternatives 1, 3, and 4)

This section describes the beneficial and adverse impacts from the other action alternatives (alternatives 1, 3, and 4), as described in detail in Section 3.3. The other action alternatives are as follows:

- Alternative 1 (Boundary A, Regulatory Option A, management plan)
- Alternative 3 (Boundary B, Regulatory Option A, management plan), and
- Alternative 4 (Boundary B, Regulatory Option B), management plan).

The major differences between Boundary B and the Boundary A are that under Boundary B:

- The proposed sanctuary would be larger (1,260-square miles vs. 962-square miles).
- More known shipwrecks would be included in the proposed sanctuary (40 vs 36).
- More unknown shipwrecks would be included in the proposed sanctuary (73 vs 59).
- The proposed western (shoreline) sanctuary boundary would be the ordinary high water mark rather than the low water datum.

The major differences between Regulatory Option A and Regulatory Option B are that under Regulatory Option A:

- Grappling into or anchoring on shipwrecks would only be prohibited at shipwrecks marked

with a mooring buoy, not at all shipwrecks in the proposed sanctuary. Given the similarities among the various alternatives, the analysis below focuses on any differences in consequences between the preferred alternative and the other action alternatives.

5.4.1 Impacts to Underwater Cultural Resources (Alternatives 1, 3, and 4)

5.4.1.1 Direct Protection of Underwater Cultural Resources NOAA's regulation and management activities that would occur under the other action alternatives would have the same type of beneficial and adverse impacts on the sanctuary's underwater cultural resources as described for the preferred alternative (see Section 5.3.1). However, the intensity of the impacts would vary slightly, as explained below, given that Boundary B is larger than Boundary A, and that Regulatory Option B is slightly more protective than Regulatory Option A.

Alternatives 3 and 4 (which include Boundary B) would protect and manage 40 known shipwrecks, which is four additional known shipwrecks as compared to alternatives 1 and 2 (the preferred alternative), which include Boundary A. Alternatives 3 and 4 would also protect 73 unknown shipwrecks, which is 14 additional unknown shipwrecks as compared to alternatives 1 and 2 (the preferred alternative) that include Boundary A. Overall, the sanctuary under alternatives 3 and 4 (Boundary B) would extend over a 298 mi^2 (771.8 km^2) larger area in Lake Michigan waters off Ozaukee, Sheboygan, Manitowoc, and Kewaunee counties in Wisconsin. Including these additional shipwrecks within the boundary of the proposed sanctuary would allow NOAA to conduct research and monitoring activities on more sites, which would increase the amount of new archaeological information available for the research community and the public. In addition, NOAA would have more information about shipwrecks to better inform its management decisions and long term plans. Nonetheless, all the action alternatives would protect a substantial number of nationally significant shipwrecks. Based on the number of nationally significant shipwrecks within all the action alternatives, all the action alternatives (alternatives 1, 2. 3, and 4) would result in **substantial beneficial impacts** on underwater cultural resources in the study area.

Implementing Regulatory Option A under alternatives 1 or 3 would provide slightly less protections to shipwrecks than Regulatory Option B under alternatives 2 (preferred) and 4. Specifically, under alternatives 1 and 3, NOAA would implement a prohibition on the use of grappling hooks and other anchoring devices only on shipwreck sites when there is a mooring buoy present. For shipwrecks where a mooring buoy is not located, divers and other visitors to the shipwreck site would be allowed to use grappling hooks or other anchoring devices at shipwreck sites. However, the prohibition on damaging underwater cultural resources (defined as "injury" under the regulations) would apply to all shipwrecks in the proposed sanctuary. Therefore, grappling and anchoring on a shipwreck could only occur if it did not damage the shipwreck. Based on this protection that would prohibit any damage to underwater cultural resources, NOAA determined that all the action alternatives (alternatives 1, 2, 3, and 4) would result in **substantial beneficial impacts**.

All other beneficial and adverse impacts to underwater cultural resources would be the same as

those described in Section 5.3.1 due to the similar type and intensity of field operations and management plan activities that NOAA would implement under alternatives 1, 2, 3, or 4.

5.4.2 Impacts to Human Uses and Socioeconomic Resources (Alternatives 1, 3, and 4)

NOAA's regulation and management activities that would occur under the other action alternatives would have the same types of beneficial and adverse impacts on human uses and socioeconomic resources as described for the preferred alternative (see Section 5.3.2). However, the intensity of the impacts would vary slightly, as explained below, given that Boundary B is larger than Boundary A.

Under all the action alternatives, the national visibility of a marine sanctuary would likely attract more tourists to the sanctuary and local region, especially divers interested in viewing shipwrecks. This increase in tourism would be driven by name recognition associated with the significance of becoming a national marine sanctuary and NOAA's own outreach and advertising activities for the sanctuary and region. NOAA's research, education, interpretation, and outreach activities would also have a positive impact on tourism by heightening public awareness of, and interest in, the underwater cultural resources found in Lake Michigan. However, because of the additional shipwrecks protected under Boundary B (included in alternatives 3 and 4), NOAA's promotion of the sanctuary would be slightly wider in scope than in alternatives 1 and 2. As noted above, Boundary B would protect an additional four known shipwrecks and 14 potential shipwrecks compared to Boundary A and extend over a 298 mi^2 (771.8 km^2) larger area in Lake Michigan. A recent study analyzing the economic contributions of Thunder Bay National Marine Sanctuary found that nearly half of out-of-town visitors cited the sanctuary visitor center (the Great Lakes Maritime Heritage Center) and Alpena Shipwreck Tours (a glass bottom boat that visits shipwrecks) as having "a lot" to do with their decision to visit the area (Schwarzmann et al. 2019). A larger sanctuary that protected a larger number of shipwrecks could result in slightly more tourists, and therefore, slightly more spending at local businesses, such as hotels, restaurants, dive shops, and other local businesses. Nonetheless, the national visibility of a marine sanctuary from all the action alternatives would likely attract more tourists to the sanctuary and local region, and result in **minor beneficial impacts** to human uses and socioeconomic resources due to the improved recreational experiences and positive economic benefits. Further, it is expected that the sanctuary designation will have positive impacts to human uses, but given an absence of baseline data NOAA is unable to state the impacts would be substantial with certainty.

All other adverse and beneficial impacts to human uses and socioeconomic resources would be the same as those described in Section 5.3.2 due to the similar type and intensity of field operations and management plan activities that NOAA would implement under alternatives 1, 2, 3, or 4.

Similar to the preferred alternative (Alternative 2), alternatives 1, 3, and 4 would have no effect on commercial shipping, military activities, or the population size in adjacent communities since the sanctuary regulation or other activities would not impose any restrictions on those industries or interfere with their activities occurring in the proposed sanctuary.

5.4.3 Impacts to Physical Resources (Alternatives 1, 3, and 4)

Under alternatives 1, 3, and 4, NOAA anticipates that the type and intensity of activities that would occur in the proposed sanctuary that may affect physical resources would be similar to those described for the preferred alternative (Alternative 2). However, these anticipated activities would occur throughout a larger geographic area (298 mi^2 [771.8 km^2] additional area) under Boundary B (included in alternatives 3 and 4). Additionally, under alternatives 1 and 3, anchoring and grappling would only be prohibited at shipwreck sites with mooring buoys, not at all shipwreck sites in the proposed sanctuary. As noted above in Section 5.3.3, anchoring can result in gouging depressions into sediment or creating new holes in substrate if anchors are dragged along the lakebed or dropped in soft sediments. Altering the lakebed structure and other physical interactions between the anchor and the lakebed could also stir up or resuspend sediments, causing localized increases in turbidity. Similarly, while NOAA intends to pursue a mooring buoy program under all action alternatives, the larger sanctuary boundaries included in alternatives 3 and 4 may require more buoys and more minor disturbances of the lakebed during installation.

However, since NOAA would prioritize the installation of mooring buoys at the most popular dive sites, NOAA anticipates **negligible adverse impacts** to water quality and lakebed sediment as a result of the additional grappling and anchoring that may occur throughout the proposed sanctuary where mooring buoys are not installed.

All other beneficial and adverse impacts to physical resources would be the same as those described in Section 5.3.3 due to the similar type and intensity of field operations and management plan activities that NOAA would implement under alternatives 1, 2, 3, or 4.

5.4.4 Impacts to Biological Resources (Alternatives 1, 3, and 4)

Under alternatives 1, 3, and 4, NOAA anticipates that the type and intensity of activities that would occur in the proposed sanctuary that may affect biological resources would be similar to those described for the preferred alternative (Alternative 2). However, they would occur throughout a larger geographic area (298 mi^2 [771.8 km^2] additional area) under Boundary B (included in alternatives 3 and 4), and possibly in the area between the OHWM and the LWD if discoveries of cultural resources are made in this area. Additionally, under alternatives 1 and 3, anchoring and grappling would only be prohibited at shipwreck sites with mooring buoys, not at all shipwreck sites in the proposed sanctuary. As noted above in Section 5.3.4, anchoring can result in gouging depressions into sediment or creating new holes in substrate if dragged along the lakebed or dropped in soft sediments. Altering the lakebed structure and other physical interactions between the anchor and the lakebed could stir up or resuspend sediments, causing localized increases in turbidity. However, since NOAA would prioritize the installation of mooring buoys at the most popular dive sites, NOAA anticipates **negligible adverse impacts** to benthic habitat as a result of the additional grappling and anchoring that may occur throughout the proposed sanctuary where mooring buoys are not installed.

All other beneficial and adverse impacts to biological resources would be the same as those described in Section 5.3.4 due to the similar type and intensity of field operations and management plan activities that NOAA would implement under alternatives 1, 2, 3, or 4.

5.4.4.1 Impacts to Federally Protected Species and Habitats

5.4.4.1.1 Endangered Species Act

Based on the similar activities and action area among all the action alternatives, alternatives 1, 3, and 4 would result in **no effect** to species listed or proposed for listing on the ESA or their designated critical habitat because NOAA's activities would be concentrated within the water or in buildings. In addition, no ground-disturbing activities would be included in the proposed action.

5.4.4.1.2 Migratory Birds

Based on the similar activities and proposed sanctuary area among all the alternatives, as described above, alternatives 1, 3, and 4 would result in **no take** to species listed under the MBTA because any impacts to migratory birds would be negligible and incidental.

5.5 Comparison of Impacts

Under the no-action alternative, NOAA would not designate a national marine sanctuary in Wisconsin's Lake Michigan waters. The no-action alternative would result in no changes to existing management of the resources or other activities taking place in this area described above in Chapter 4. The no-action alternative is the baseline for this analysis, resulting in no impacts occurring from maintaining status quo. .

All of the action alternatives would have **substantial beneficial impacts** on cultural and historical resources as they directly and indirectly protect several important cultural and historical resources. Since alternatives 1 and 2 are slightly smaller than alternatives 3 and 4, those alternatives would protect fewer shipwrecks and historic reported vessel losses, respectively. All four action alternatives would have no impact or negligible adverse impacts on socioeconomic resources and human uses, and **minor beneficial impacts** on socio economic resources and human uses. The impacts on physical and biological resources would be the same across all of the alternatives but would be spread over different spatial extents.

Table 5.3. Summary of the Four Action Alternatives

	Alternative 1	**Alternative 2 (Preferred Alternative)**	**Alternative 3**	**Alternative 4**
Boundary	Boundary A (926 square miles)	Boundary A (926 square miles)	Boundary B (1,075 square miles)	Boundary B (1,075 square miles)
Regulatory Component	Regulatory Option A	Regulatory Option B	Regulatory Option A	Regulatory Option B
Management Plan	Final Management Plan	Final Management Plan	Final Management Plan	Final Management Plan

Known Shipwrecks	36	36	40	40
Potential Shipwrecks	59	59	73	73

Table 5.4 Summary of the Impacts for the Four Action Alternatives relative to the no-action alternative

Resource Area	**Subcategory**	**Preferred Alternative (Alternative 2)**		**Alternatives 1, 3, and 4**	
		Beneficial Impacts	**Adverse Impacts**	**Beneficial Impacts**	**Adverse Impacts**
Underwater Cultural Resources	Direct Protection of Underwater Cultural Resources	Substantial	Negligible	Substantial	Negligible
	Management through Research and Monitoring	Substantial	NA	Substantial	NA
	Stewardship through Education and Outreach Activities	Substantial	NA	Substantial	NA
	Summary of Impacts to Underwater Cultural Resources	**Substantial**	**Negligible**	**Substantial**	**Negligible**
Human Uses and Socioeconom ic Resources	Tourism and Recreation	Minor	Negligible	Minor	Negligible
	Spending and Contribution to Local Economy	Minor	NA	Minor	NA
	Value from Sanctuary Designation	Substantial	NA	Substantial	NA
	Commercial and Recreational Fishing	Negligible	NA	Negligible	NA
	Infrastructure	NA	Negligible	NA	Negligible
	Permitting	NA	Negligible	NA	Negligible

	Summary of Impacts to Human Uses and Socioeconomic Resources	**Minor**	**Negligible**	**Minor**	**Negligible**
Physical Resources	Disturbance of the Lakebed	Negligible	Negligible	Negligible	Negligible
	Decline in Water Quality	NA	Negligible	NA	Negligible
	Generation of Air Emissions	NA	Negligible	NA	Negligible
	Summary of Impacts to Physical Resources	**Negligible**	**Negligible**	**Negligible**	**Negligible**
Biological Resources	Benthic Habitat	Negligible	Negligible	Negligible	Negligible
	Disturbance of Organisms	NA	Negligible	NA	Negligible
	Decline in Water Quality	NA	Negligible	NA	Negligible
	Protected Species and Habitats	No Impact	No Impact	No Impact	No Impact
	Summary of Impacts to Biological Resources	**Negligible**	**Negligible**	**Negligible**	**Negligible**

5.5.1 Comparison of Alternatives: Environmentally Preferred Alternative

CEQ regulations for implementing NEPA state that an agency must describe the environmentally preferred alternative (40 C.F.R. 1505.2(b)). NOAA's Administrative Order 216- 6A companion manual, "Policy and Procedures for Compliance with the National Environmental Policy Act and Related Authorities," further explains that the environmentally preferred alternative is determined based on two criteria:

Criterion 1: the alternative that provides the greatest benefit to the human

environment **Criterion 2:** the alternative that causes the least damage to the human

environment

Given the multiple criteria, in some situations, such as when different alternatives impact different resources to different degrees, there may be more than one environmentally preferable alternative.

In terms of Criterion 1, all the action alternatives would benefit the human environment because

they would protect and preserve historical and cultural resources, such as shipwrecks. Alternatives 3 and 4 would protect and preserve the greatest number of historical and cultural resources, as compared to the other alternatives. Under alternatives 2 and 4, NOAA would implement a prohibition on the use of grappling hooks and other anchoring devices on all shipwreck sites, whereas alternatives 1 and 3 would only prohibit grappling hooks and other anchoring devices when there is a mooring buoy present. Nonetheless, the prohibition on damaging underwater cultural resources (defined as "injury" under the regulations) would apply to all shipwrecks in the proposed sanctuary. Based on this protection that would prohibit any damage to underwater cultural resources, NOAA determined that all the action alternatives (alternatives 1, 2, 3, and 4) would result in substantial beneficial impacts on underwater cultural resources. In addition, as a byproduct of protecting historical and cultural resources, the structure provided by sunken ships often becomes artificial reef habitat for fish and aquatic biota. Based on the larger boundary size and the more protective regulation, Alternative 4 would provide the greatest benefit to the human environment.

For Criterion 2, all the alternatives would result in negligible adverse impacts to the human environment primarily due to minor disturbances from vessel operations and potential disturbances to the lake bed during installation and maintenance of mooring buoys. The type and intensity of activities that would result in negligible adverse impacts would be the same for alternatives 1 through 4. Nonetheless, the adverse impacts from all alternatives would be negligible.

Therefore, Alternative 4 is the environmentally preferable alternative.

5.6 Cumulative Impacts

The CEQ regulations for implementing the provisions of 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). The 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."[4]

This section presents the methods used to evaluate cumulative impacts, lists projects that may have cumulative effects when combined with the impacts from the proposed action or alternatives discussed in this FEIS, and evaluates potential cumulative impacts.

5.6.1 Cumulative Impact Assessment Methods

CEQ's cumulative effects guidance sets out several different methods for assessment, such as checklists, modeling, forecasting, and economic impact assessment, where changes in employment, income, and population are evaluated.[5] This FEIS uses a variety of methods, depending on the resource area, to determine cumulative effects. In general, past, present, and future foreseeable projects are assessed by topic area. Cumulative effects may arise from single

[4] CEQ 1997; https://ceq.doe.gov/publications/cumulative_effects.html.
[5] CEQ 1997.
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.[6] The projects in Table 5.5 are anticipated to occur in the reasonably foreseeable future within the study area. NOAA has 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 study area.

Table 5.5. Other Federal and Non-Federal Actions with Potential to Contribute to Cumulative Impacts

Action	Action Location	Action Agency	Action Description	Projected Completion
Coastal park management	Harrington Beach State Park, Forest Beach Migratory Preserve, Ulao Waterfowl Production Area, Port Washington South Beach Park, Cedar Gorge Swamp Area, Cedar Gorge Ravine Nature Area, Amsterdam Park, Cedar Grove Hawk Research Station State Natural Area, Lake View Park, King Park, Deland Park, North Point Park, Vollrath Park, 6th Street Park, Pigeon River Park, Hika Bay Park, Fischer Creek State Conservation Area, Point Creek Natural Area, Manitowoc Silver Creek Park, Neshotah Park	Wisconsin state, coastal counties, and city parks	Parks management	Ongoing
Lake Michigan Water Trail	Coastal paddling trail - runs through the study area near shore	Bay-Lake Regional Planning Commission, Wisconsin Coastal Management Program, WDNR, NPS	Partnership providing recreational opportunities	Ongoing

[6] CEQ 1997.

Coastal tourist areas	Lake Park Bluffs, Port Washington; Kohler-Andrae State Park, Sheboygan; Point Beach State Park/Rawley Point Lighthouse, Manitowoc/Two Rivers; Lion's Den Gorge Nature Preserve, Port Washington; Sanderling Nature Center, Sheboygan County; Woodland Dunes, Two Rivers; Donges Bay Gorge, Fairy Chasm State Natural Area, Amsterdam Dunes, Kohler Park Dunes State Natural Area, Point Beach Ridges, Two Creeks Buried Forest (nonprofits, state, and counties); Riveredge Nature Center, Ozaukee County (releases lake sturgeon into the Milwaukee River).	Wisconsin state, coastal counties, and city parks	Parks management	Ongoing
Fisheries regulations	Rivers, Lake Michigan	WDNR	Fisheries regulations	Ongoing
Watercraft regulations	Rivers, Lake Michigan	WDNR	Watercraft regulations	Ongoing
Urbanizatio n	Coastal Wisconsin/Lake Michigan: Two Rivers, Manitowoc, Sheboygan, Port Washington, Milwaukee	Wisconsin coastal county management	Continued growth and development	Ongoing
Cultural resources Wisconsin state regulations	Coastal Wisconsin/Lake Michigan	WDNR, WHS Maritime Preservation and Archaeology Program	Shipwreck protection, info	Ongoing
Navigatio nal channels	Two Rivers, Manitowoc, Sheboygan, Port Washington	USCG, WDNR	Navigatio nal and vessel regulations	Ongoing

Power stations: Kewaunee, Point Beach, Manitowoc, Port Washington,	Manitowoc, Edgewater, Port Washington Generating Station, Point Beach Nuclear Plant, Tisch Mills Wind, Custer Energy Center, Lincoln Turbines, Sheboygan Falls Energy Facility, Ridgeview Wind Turbine, Germantown Power Plant, Omega Hills Gas Recovery, Dairyland WTE Plant, Milwaukee County Valley (WEPCO), FCPC Renewable Generation, MMSD Jones Island Wastewater, Shirley Wind, Glenmore Turbines	Wisconsin state, counties, utilities, federal agencies	Power plant operations	Ongoing
WDNR - Wisconsin Pollutant Discharge Elimination System (WPDES) permits	Manitowoc Public Utilities & Man. WWTF, Port Washington WWTP & Wisconsin Electric Power Co. PW Generation Station, Sheboygan WWTP, Wisconsin Power & Light Edgewater Generation Station, Cleveland WWTF, Two Rivers WWTF, Nextera Energy Point	WDNR	WPDES permit reviews and renewals	Ongoing

	Beach, Domino Energy Kewaunee			
Visitor Centers, museums	Wisconsin Maritime Museum, Manitowoc; Rogers Street Fishing Village, Two Rivers; Port Exploreum, Port Washington	Private groups	Research, education, and outreach	Ongoing
NOAA's Great Lakes Environmental Research Laboratory (GLERL)	Throughout Great Lakes	NOAA, partner universities, municipalities, state, federal, international agencies, non governmental institutions, etc.	Regional environmental research	Ongoing
USGS Great Lakes Science Center	Throughout Great Lakes	USGS	Regional environmental research	Ongoing

Navigational channels	Two Rivers, Manitowoc, Sheboygan, Port Washington	USCG, WDNR	Navigational and vessel regulations	Ongoing

5.6.2 Past, Present, and Reasonably Foreseeable Future Projects

The numerous actions that could contribute to cumulative impacts are listed in Table 5.4. This list was compiled from several sources. Only those actions with potential to contribute to cumulative impacts are listed. These actions are similar in scope to the proposed action, relate to coastal activities, have similar types of impacts within the study area, affect similar resources, or are large enough to have far-reaching effects on a resource. This approach was taken to include actions for which detailed descriptions and expected impacts are known, as well as actions that have less defined impacts but may contribute to the regional impacts.

As the proposed action for WSCNMS is a regulatory and management action rather than a specific development action, the cumulative effects are related primarily to local and regional management of underwater cultural resources. Several of the actions listed in Table 5.4 are regulatory as well. For the purposes of this cumulative analysis, it is assumed that the actions in Table 5.4 that have not already been implemented would be approved and implemented.

The combination of the alternatives and actions in Table 5.4 would result in cumulative beneficial impacts to underwater cultural resources and human uses and socioeconomic resources. The cumulative actions identified in Table 5.4 would not cause adverse impacts on those resource categories. In other issues, as described below, the proposed alternatives' contribution to any adverse cumulative impacts would be minor.

5.6.2.1 Cumulative Impacts on Underwater Cultural Resources The proposed action would cause no substantial adverse effects on underwater cultural resources. Cumulative effects that could impact underwater cultural resources may include disturbance and physical impacts from increased visitation to historic shipwrecks resulting from public use and management activities. However, the sanctuary would mitigate the intensity of these human use effects through regulatory prohibitions and public outreach, which would lower the risk of damage to the sanctuary's shipwrecks.

Commercial and recreational fishing in the area may damage cultural and historical resources by entangling fishing gear on a resource. However, through research and survey of the lakebed, the sanctuary would identify resources and share these locations with fishers to avoid future entanglements.

5.6.2.2 Cumulative Impacts on Human Uses and Socioeconomic Resources

Table 5.4 includes several attractions that are similar to national marine sanctuaries, such as parks and maritime museums. These attractions also draw visitors to the coastal communities adjacent to the proposed expansion area. These sites' efforts to attract tourism, in conjunction with efforts to attract tourists to the proposed sanctuary, would have overlapping beneficial

impacts on the tourism industry in the coastal communities next to the proposed sanctuary. Designating the national marine sanctuary would add a major water-based attraction that would encourage both land-based tourism (e.g., visitor centers and museums) and water-based tourism (e.g., scuba diving).

Increased tourism from these other activities could also increase the number of recreational users within the sanctuary, potentially resulting in densely-used local areas. Nonetheless, the sanctuary would regularly review its management plan and regulations and could update these documents, if necessary, to respond to changing threats to sanctuary resources. Thus, although the actions listed in Table 5.4 would have positive, beneficial impacts, the cumulative impacts can be estimated with high confidence to at a minimum have minor cumulative beneficial impacts on human uses or socioeconomic resources in the proposed sanctuary. Baseline monitoring and future monitoring of the proposed area would help to determine if the actual impacts from designation rise to the level of substantial impacts (defined at the beginning of Chapter 5).

5.6.2.3 Cumulative Impacts on Biological and Physical Resources

The proposed action would not contribute to any substantial adverse impacts on habitats, wildlife, protected species, climate, air, or water. NOAA's implementation of actions of the preferred alternative may result in increased public user and management activities, which may cause minor local adverse cumulative effects on biological and physical resources. However, these would be mitigated by best management practices and other regulatory and management activities that would protect habitats and substrate near shipwreck sites against physical disturbances of vessel anchoring.

Threats to aquatic and physical resources from other federal and non-federal activities within the sanctuary include the rise in invasive species, climate change, and pollution from point and nonpoint sources. The Great Lakes aquatic ecosystem has been constantly destabilized over many decades by the cumulative effects of chemical contamination, nutrient pollution that results in eutrophication and low dissolved oxygen levels, and invasive non-native species. Lake Michigan has undergone cycles of degradation and remediation, and these lake-wide effects affect the aquatic resources within the proposed sanctuary. Continued releases of nutrients, particularly from nonpoint sources, continued introductions of invasive non-native species, continued federal and state remediation efforts, and continued changes in temperature and rainfall due to climate change, will prevent stabilization over the next decade. While the proposed sanctuary would not directly protect biological or physical resources, the adverse impacts from field activities would be negligible, and therefore, would not substantially contribute to cumulative impacts.