Gulf Island National Seashore
Florida/Mississippi

U.S. Department of the Interior
National Park Service

Final Personal Watercraft Plan / Environmental Impact Statement

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UNITED STATES DEPARTMENT OF THE INTERIOR – NATIONAL PARK SERVICE
GULF ISLANDS NATIONAL SEASHORE
FINAL PERSONAL WATERCRAFT PLAN / ENVIRONMENTAL IMPACT STATEMENT

Lead Agency: National Park Service (NPS), US Department of the Interior

This *Gulf Islands National Seashore Final Personal Watercraft Plan / Environmental Impact Statement* (plan/EIS) evaluates a range of alternatives and management actions for personal watercraft (PWC) use at the national seashore and analyzes the impacts that could result from the implementation of these alternatives. Upon conclusion of this plan/EIS and decision-making process, one of the alternatives, or a combination of actions from multiple alternatives, will become the long-term PWC plan and special regulation, should an alternative be selected that would allow PWC use at the national seashore.

This final plan/EIS evaluates the impacts of the no-action alternative (alternative A) and four action alternatives (alternatives B, C, D, and E). Alternative A would involve NPS rescinding the special regulation at 36 CFR 7.12, which would result in the elimination of PWC use at the national seashore. Under alternative B, the NPS would allow PWC to operate in the same manner as all other watercraft per the Superintendent's Compendium. Under alternative C, the special regulation at 36 CFR 7.12 would be retained. Under alternative D, the special regulation in 36 CFR 7.12 would be revised to change flat-wake zone distances to 150 yards from shorelines in the Florida District and 300 yards from shorelines in the Mississippi District and there would be additional restrictions prohibiting landing on wilderness islands in the Mississippi District. Under alternative E, the special regulation in 36 CFR 7.12 would be revised to incorporate additional management prescriptions and PWC landing areas to protect seagrass beds. Alternative E would also include a requirement for PWC to meet the 2010 US Environmental Protection Agency (EPA) emissions standards. The final plan/EIS analyzes impacts of these alternatives in detail for water quality, air quality, acoustic environment, submerged aquatic vegetation (SAV)/shoreline vegetation, wildlife and wildlife habitat, threatened and endangered species and species of special management concern, visitor use and experience, socioeconomics, and wilderness.

The notice of availability for the draft plan/EIS was published in the *Federal Register* and online at the NPS Planning, Environment, and Public Comment (PEPC) website at http://parkplanning.nps.gov/guis-PWC-EIS on August 3, 2018. The public comment period for the draft plan/EIS was open from August 3, 2018, to September 17, 2018. A summary of responses to public and agency comments received on the draft plan/EIS is provided in appendix J of this final plan/EIS. Where needed, text was changed in this plan/EIS to address comments. The publication of the EPA notice of availability of this final plan/EIS in the *Federal Register* will initiate a 30-day wait period before the Regional Director of the Southeast Region will sign the Record of Decision (ROD), documenting the selection of an alternative to be implemented.

For further information, visit http://parkplanning.nps.gov/guis-PWC-EIS or contact:
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National Park Service
US Department of the Interior

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Final Personal Watercraft Plan / Environmental Impact Statement

June 2019

EXECUTIVE SUMMARY

This *Gulf Islands National Seashore Personal Watercraft Plan / Environmental Impact Statement* (plan/EIS) analyzes a range of alternatives and management actions for personal watercraft (PWC) use at the national seashore. The plan/EIS assesses the impacts that could result from implementation of any of the four action alternatives and of the "no-action" alternative, i.e., if the national seashore were to rescind the special regulation at 36 CFR 7.12 that allows PWC use at the national seashore and enforce 36 CFR 3.9, which prohibits PWC use in national park system units without a special regulation specifically authorizing it. Upon conclusion of the plan/EIS and decision-making process one of the alternatives, or a combination of actions from multiple alternatives, would become the long-term PWC plan and special regulation, should an alternative be selected that would allow PWC use at the national seashore.

BACKGROUND

More than one million PWC are estimated to be in operation today in the United States (DOT 2016). In May 1998, the Bluewater Network filed a petition urging the National Park Service (NPS) to initiate a rulemaking process to prohibit PWC use throughout the national park system. On March 21, 2000 (65 FR 15077), NPS issued a regulation prohibiting PWC use in most national park system units and required 21 other units, including Gulf Islands National Seashore, to determine the appropriateness of continued PWC use. However, the regulation allowed PWC use to continue for 2 years at the 21 units while the determinations were being made by NPS. During this 2-year period, the national seashore evaluated the effects of PWC use. The results of the evaluation conducted by the national seashore, dated October 17, 2001, concluded that the national seashore lacked specific evidence to support proposing unit-specific regulations to allow PWC use in the waters over which it has regulation authority. On April 22, 2002, after the 2-year grace period, NPS closed the national seashore to use, based on the national PWC rule (then codified at 36 CFR 3.24, now at 36 CFR 3.9) until a planning process could be completed. The planning process included proceeding with a special regulation as required by the final rule, and an environmental assessment (EA). As part of this planning process, in 2004 NPS completed the EA, which evaluated a range of alternatives and strategies for the management of PWC use within the national seashore. The effort resulted in a recommendation to authorize PWC use under a special NPS regulation with additional management prescriptions. NPS published the final regulation (36 CFR 7.12) for PWC use at the national seashore in the *Federal Register* in May 2006 (71 FR 26232).

In 2008, Bluewater Network and others filed a lawsuit claiming that the EA violated National Environmental Policy Act (NEPA), the NPS Organic Act, and the Administrative Procedure Act. On July 8, 2010, the US District Court for the District of Columbia found that the impact analysis in the EA was inadequate (Bluewater Network v. Salazar, 721 F. Supp.2d7 (D.D.C. 2010)). However, the court did not vacate the PWC rule, so that PWC use is still allowed. However, the court remanded the case to NPS "so that it may have an opportunity to provide adequate reasoning for its conclusions." As a result, NPS decided to readdress PWC use with a more comprehensive environmental impact statement (EIS).

PURPOSE OF THE PLAN

The purpose of this plan/EIS is to evaluate PWC use at the national seashore to ensure the protection of natural and cultural resources, provide a variety of visitor use experiences, minimize conflicts among various users, and promote the safety of all visitors, consistent with the national seashore's enabling legislation, mission, purpose, and goals.

NEED FOR ACTION

The action is needed to address the inadequacies in the 2004 EA for PWC use at the national seashore, as identified in the 2010 US District Court opinion. NPS has a need to collect and analyze additional

information to determine if PWC use should be permitted, and if so, how to manage this use while also protecting national seashore resources.

ISSUES AND IMPACT TOPICS

Table ES-1 details the issues that are discussed and analyzed in the plan/EIS.

TABLE ES-1: ISSUES CARRIED FORWARD FOR DETAILED ANALYSIS

Issue	Reason for Analysis
Water Quality	PWC emit hydrocarbons that can adversely affect water quality for humans and wildlife. Compounds that are found in discharged fuel include benzene, toluene, ethyl benzene, and xylene (collectively called BTEX). Polycyclic aromatic hydrocarbons (PAHs) are also of concern. Some PAHs can be found in fuel mixtures and are released during the combustion of fuel. Numerous state and federally listed species in the national seashore could be negatively impacted by degraded water quality. Shallow-water PWC use can increase sediment disturbances, which can negatively impact water quality. Other water quality issues may include indirect effects on benthic communities, plankton, fish, marine mammals and reptiles, and submerged aquatic vegetation (SAV) sensitive to water quality changes and degradation.
Air Quality	The types of pollutants emitted by PWC are generally the same as those emitted by other types of gasoline engine vehicles and include hydrocarbons, oxides of nitrogen (NO_X), carbon monoxide (CO), and particulate matter (PM). The national seashore is classified as a Class II airshed under the Clean Air Act. This air quality classification is the second most stringent and is designed to protect the majority of the country from air quality degradation.
Acoustic Environment	As with other sources of motorized noise, PWC noise has the potential to impact visitor experience, the quality of wildlife habitat, human health, animal behavior, and the functioning of animal communication.
SAV / Shoreline Vegetation	Direct disturbance to SAV/shoreline vegetation can be caused by running aground, pulling plant material into the engine intakes, or blowing away sediment. Indirect impacts of PWC use, such as disturbed sediment or increased water column turbidity, include impacts photosynthesis and growth of the plant. This may lead to disturbance of vegetation resources, including sensitive plant species.
Wildlife and Wildlife Habitat	PWC use generates noise (both in the air and in the water), human intrusion, physical damage, and pollution that can impact coastal and marine wildlife including marine mammals, waterbirds, sea turtles, and fish. Additionally, their shallow draft, jet propulsion (versus propeller), and high maneuverability enable PWC to access sensitive, nearshore, aquatic habitats and operate at high speeds within these areas. Collisions with waterfowl and wildlife are also a concern. Similarly, underwater noise can alter marine fauna behavior or mask marine fauna communications important to life functions.
Threatened and Endangered Species and Species of Special Management Concern	PWC may affect federally listed or other species of concern through interruption of normal activities, alarm or flight, avoidance and displacement of habitat, and effects on reproductive success. The national seashore is a permanent or seasonal home to 45 state or federal threatened or endangered species, or animals or plants of special concern. At the national seashore, piping plover, red knot, West Indian manatee, Perdido Key beach mouse, and various sea turtles are among threatened or endangered species that could be impacted by PWC use. The national seashore also contains critical habitat and proposed critical habitat for several listed species.
Visitor Use and Experience	Visitors to the national seashore enjoy a variety of activities including camping, hiking, swimming, fishing, snorkeling, bicycling, boating, and birdwatching. Although some visitors enjoy using PWC some research suggests that PWC are viewed by some segments of the public as a nuisance due to their noise, speed, and overall environmental effects; others believe PWC are no different from other watercraft and that people have a right to enjoy the activity.

Issue	Reason for Analysis
Socioeconomics	The alternatives associated with PWC use at the national seashore could have an impact on the socioeconomic environment of the national seashore and the region, including a greater demand for recreation and tourism-related amenities, the potential for increased profitability of commercial services in the area, and the enhancement of local economies.
Wilderness	Horn Island and Petit Bois Island are designated wilderness. Impacts on designated wilderness from PWC use may include those related to the acoustic environment. Because noise from PWC use could impact the wilderness character (e.g., natural, solitude and quiet) at Horn and Petit Bois Islands, wilderness is being carried forward as an impact topic.

ALTERNATIVES

Alternatives analyzed in this document were developed based on the results of internal and public scoping, agency consultations, and past planning efforts. These alternatives meet the management objectives of the national seashore, while also meeting the overall purpose of and need for the proposed action. Considered, but dismissed from further analysis, were alternative elements that were not technically or economically feasible, did not meet the purpose of and need for the project, created unnecessary or excessive adverse impacts on resources, or conflicted with the overall management of the national seashore or its resources. Summaries of the five alternatives analyzed below are detailed in table ES-2.

TABLE ES-2: SUMMARY OF ALTERNATIVES

Features	Alternative A (No Action)	Alternative B	Alternative C	Alternative D (Preferred Alternative)	Alternative E
PWC Flat-Wake Zones	Not applicable – PWC use would be prohibited at the national seashore.	500 feet around Davis Bayou launch ramps, West Ship Island Pier, Horn Island Pier, and Fort Pickens fishing and ferry piers. Posted areas on the north side of Perdido Key (at the east end) near the Fort McRee site. 100 feet from all other shorelines	0.5 mile (2,640 feet) from the shoreline on the designated wilderness islands of Horn and Petit Bois. 0.5 mile (2,640 feet) from the shoreline or within 0.5 mile from either side of the pier at West Ship Island. 300 yards (900 feet) from all other shorelines.	150 yards (450 feet) from all shorelines in the Florida District. 300 yards (900 feet) from all shorelines and piers in the Mississippi District.	• 300 yards (900 feet) from all shorelines and piers
Areas Closed to PWC Use	Not applicable – PWC use would be prohibited at the national seashore.	Within 500 feet of any swim beach. Within 200 feet of the fishing pier, old pier remains and passenger ferry piers at Fort Pickens. Lakes, ponds, lagoons and inlets of Cat Island, East Ship Island, West Ship Island, West Petit Bois Island, Horn Island, and Petit Bois Island; the lagoons of Perdido Key within Big Lagoon (Spanish and Langley). Seasonal closures within the national seashore would be implemented to protect wildlife and habitat according to the Superintendent's Compendium. The Superintendent may temporarily limit, restrict, or terminate access to the areas designated for PWC use after taking into consideration public health and safety, natural and cultural resource protection, and other management activities and objectives.	Same as alternative B.	Same as alternative C, plus: The shores of Horn and Petit Bois Islands would be closed to PWC use. Temporary floating buoys may be used on an as-needed basis on high-use days, as determined by park personnel.	Same as alternative D, plus: PWC use would be prohibited in specific areas where SAV habitat and cultural resources are at risk. These areas include Mississippi District • The Davis Bayou area. • The northern shores of Ship Island, except for 350 yards east from the western tip and 350 yards west from the eastern tip. • 300 yards around Horn Island. • 300 yards around Petit Bois Island. Florida District • The northern shores of Perdido Key, as well as the eastern edge of Perdido Key. • The northern shores of Santa Rosa Island, including the area between Navarre Beach and Okaloosa Island, but excluding the area west of the Ferry Pier on the western side of Santa Rosa Island. • The northern and southern shores of Naval Live Oaks. • The northern shores of Santa Rosa Area. • Crab Island. The Superintendent may temporarily limit, restrict, or terminate access to the areas designated for PWC use after taking into consideration public health and safety, natural and cultural resource protection, and other management activities and objectives.
Distance from People and Vessels	Not applicable – PWC use would be prohibited at the national seashore.	36 CFR 3.8.b requires all watercraft (including PWC) to be at flat-wake speed within 100 feet of people and vessels in the water and within 500 feet of swim beaches.	No PWC allowed within 200 feet of non-motorized vessels and people in the water.	Same as alternative C.	Same as alternative C.
PWC Landing Points	Not applicable – PWC use would be prohibited at the national seashore.	PWC may beach at any point along the shoreline except for those areas closed to PWC use, listed above and below: Above the mean high tide line on the designated wilderness islands of Horn and Petit Bois. The Superintendent may temporarily limit, restrict, or terminate access to the areas designated for PWC use after taking into consideration public health and safety, natural and cultural resource protection, and other management activities and objectives.	Same as alternative B.	Same as alternative B, except that PWC may not beach anywhere along the designated wilderness islands of Horn and Petit Bois, regardless of the mean high tide line.	PWC may beach only at the following locations: Mississippi District • The southern shores of Ship Island, including 350 yards on the northern shore east from the western tip and 350 yards west from the eastern tip. • West Petit Bois Island. Florida District • The southern shores of Perdido Key. • The southern shores of Santa Rosa Island, including the westernmost tip, the north shore west of Fort Pickens Fishing Pier, and the entire southern shore until the eastern boundary.

Features	Alternative A (No Action)	Alternative B	Alternative C	Alternative D (Preferred Alternative)	Alternative E
PWC Emissions Restrictions	Not applicable – PWC use would be prohibited at the national seashore.	There would be no additional PWC emissions requirements for operation of a PWC at the national seashore under alternative B.	Same as alternative B.	Same as alternative B.	All PWC must meet 2010 US Environmental Protection Agency (EPA) emissions standards (no two-stroke carbureted PWC allowed), within 2 years of publication of the final rule.
Daylight Restrictions	Not applicable – PWC use would be prohibited at the national seashore.	No person may operate a PWC between sunset and sunrise.	Same as alternative B.	Same as alternative B.	Same as alternative B.

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CHAPTER 1: PURPOSE OF AND NEED FOR ACTION

This chapter describes why the National Park Service (NPS) is taking action at this time with respect to personal watercraft (PWC) use at Gulf Islands National Seashore (the national seashore).

PROJECT SITE LOCATION

The national seashore is located in the northeastern portion of the Gulf of Mexico and includes a widely spaced chain of barrier islands extending nearly 160 miles from the eastern end of Santa Rosa Island in Florida to Cat Island in Mississippi (appendix D, figure D-1). The national seashore encompasses barrier islands, coastal mainland, and adjacent waters in Mississippi and Florida. The national seashore was set aside for the purpose of preserving areas possessing outstanding natural, historic, and recreational values for public use and enjoyment. The national seashore is currently authorized at 139,175 acres, which includes 3,800 acres that are designated wilderness (NPS 2014a). More than 80% of the national seashore is submerged lands (open water) (NPS 2014a). In general, the northern boundary of the offshore islands in Florida extends to the south boundary of the Intracoastal Waterway and the southern boundary outward to 1 mile beyond the low tide line of the offshore islands. All the water areas adjacent to Santa Rosa Island are included in the boundary, while some of the submerged lands underlying those waters are owned by the State of Florida (NPS 2014a). The boundaries of Pensacola Forts (Pensacola Naval Air Station Historic Sites) and of Naval Live Oaks extend seaward 100 yards from the low tide line. In general, both the northern and southern boundaries of the Mississippi District extend 1 mile below the low tide line of the offshore islands. The boundary is contiguous east to west from the Mississippi/Alabama state line to the east boundary of the Gulfport shipping channel. The waters surrounding Cat Island, and the Pascagoula shipping channel, are excluded from the national seashore. All of the submerged lands in Mississippi within this boundary are owned by the United States as part of the national seashore (NPS 2014a).

PURPOSE AND NEED

The purpose of this *Gulf Islands National Seashore Personal Watercraft Use Plan / Environmental Impact Statement* (plan/EIS) is to evaluate PWC use at the national seashore to ensure the protection of natural and cultural resources, provide a variety of visitor use experiences, minimize conflicts among various users, and promote the safety of all visitors, consistent with the national seashore's enabling legislation, mission, purpose, and goals. Upon completion of the National Environmental Policy Act (NEPA) process, NPS may either take action to revise the existing special regulation to manage PWC use at the national seashore, or implement a ban of PWC use at the national seashore, as described for the no-action alternative. Action is needed to address the inadequacies in the 2004 environmental assessment (EA) for PWC use at the national seashore (NPS 2004a), as identified in the 2010 US District Court opinion (see background discussion below). NPS has a need to collect and analyze additional information to determine if PWC use should be permitted, and if so, how to manage this use while also protecting national seashore resources.

BACKGROUND OF PWC REGULATIONS AT THE NATIONAL SEASHORE

Although all areas of the national seashore in the Florida District and the Davis Bayou area in the Mississippi District can be reached from Interstate 10, the Mississippi District barrier islands are only accessible by watercraft, including PWC. Sometimes referred to as "jet skis," these vessels use an inboard, internal combustion engine powering a water jet pump as their primary source of propulsion. They are used for enjoyment, particularly for touring and wave jumping, and they are capable of speeds up to 65 miles per hour (mph) (Miller, Fielding, and Stoldt 1998).

After studies in Everglades National Park showed that PWC use resulted in damage to vegetation, adversely impacted shorebirds, and disturbed the life cycles of other wildlife (Snow 1989), NPS prohibited PWC use by a special regulation at Everglades National Park in 1994. In recognition of its

duties under the Organic Act, as well as increased awareness and public controversy about PWC use, NPS subsequently reevaluated its approach to PWC regulation throughout the national park system. Historically, NPS had grouped PWC with all vessels; thus, PWC use had been allowed when the use of other vessels was allowed. In May 1998, the Bluewater Network filed a petition urging NPS to initiate a rulemaking process to prohibit PWC use throughout the national park system. In response to the petition, NPS issued an interim management policy requiring superintendents of parks where PWC use was allowed, but had not yet occurred, to close the unit to such use until the rulemaking process was completed. NPS's proposed servicewide regulation required evaluation of impacts from PWC use before authorizing the use. On March 21, 2000, NPS issued a regulation prohibiting PWC use in most national park system units and required 21 other units, including the national seashore, to determine the appropriateness of continued PWC use. However, the regulation allowed PWC use to continue for 2 years at the 21 units while the determinations were being made. During this 2-year period, the national seashore evaluated the effects of PWC use within its boundaries. The results of the evaluation, dated October 17, 2001, concluded that the national seashore lacked specific evidence to support proposing unit-specific regulations to allow PWC use in the waters over which it has regulatory authority (NPS 2001).

On April 22, 2002, after the 2-year grace period, NPS closed the national seashore to PWC use, based on the national PWC rule (then codified at 36 CFR 3.24, now at 36 CFR 3.9) until a planning process could be completed (NPS 2002). The planning process included developing a special regulation as required by the final rule. As part of this planning process, in 2004 NPS completed an EA to evaluate a range of alternatives and strategies for the management of PWC use within the national seashore. NPS published the final regulation for PWC use at the national seashore in the *Federal Register* in May 2006 (71 FR 26232, codified at 36 CFR 7.12). The final regulation allowed PWC use to continue at the national seashore. In 2008, Bluewater Network and others filed a lawsuit claiming that the EA violated NEPA, the NPS Organic Act, and the Administrative Procedure Act. On July 8, 2010, the US District Court for the District of Columbia found that the impact analysis in the EA was inadequate. The court did not vacate the PWC rule, but it remanded the case to NPS "so that it may have an opportunity to provide adequate reasoning for its conclusions." As a result, PWC use is still allowed at the national seashore, but NPS has decided to reevaluate PWC use with a more comprehensive environmental impact statement (EIS). Additionally, as part of this planning process, additional site-specific data were collected that include water sampling, PWC counts from both on land and in the air, soundscape monitoring and modeling, and air quality analysis. Laws and policies related to PWC use at the national seashore are provided in appendix A.

CHANGES IN THE NATIONAL SEASHORE GEOGRAPHY

The national seashore is comprised of barrier islands that are constantly changing and adjusting in response to coastal barrier processes. This is evident in the Mississippi District where East Ship and West Ship Islands are undergoing changes that are part of the Mississippi Coastal Improvements Program (MsCIP) Comprehensive Barrier Island Restoration Project. This project, currently underway, is restoring these two barrier islands into one single barrier island, Ship Island. Since the draft plan/EIS was completed, work has reached a point where the two islands have started to join, with the project expected to be complete in 2021. The alternatives maps in appendix D have been revised to show this area as a single island and illustrate the alternatives with a single Ship Island. However, throughout this document the terms East Ship Island and West Ship Island are used. Where these terms are used, it is referring to the single rejoined Ship Island and the terms are used to refer to each side of the rejoined land mass.

ISSUES AND IMPACT TOPICS

The impact topics discussed in table ES-1 were derived from the issues identified during the scoping process, described further in chapter 5. If no impacts, or minimal impacts, are expected based on available information, then the issue was eliminated from further discussion, discussed further below.

ISSUES CONSIDERED BUT DISMISSED FROM FURTHER CONSIDERATION

The NPS NEPA Handbook states that, "Analysis in an EA or EIS should focus on significant issues (meaning pivotal issues, or issues of critical importance) and only discuss insignificant issues briefly (1502.2(b))." Generally, issues should be retained for consideration and discussed in detail if the environmental impacts associated with the issue are central to the proposal or of critical importance; a detailed analysis of environmental impacts related to the issue is necessary to make a reasoned choice between alternatives; the environmental impacts associated with the issue are a big point of contention among the public or other agencies; or there are potentially significant impacts to resources associated with the issue. If none of these apply, an issue should be dismissed from further analysis. The below topics were considered and determined to not meet these statements.

Soils/Geologic Resources and Geohazards. Under all alternatives in this plan/EIS except for alternative B, the operation of PWC at more than a flat-wake speed would be allowed at a minimum of 100 feet from any shoreline. At this distance, impacts on the topography and soils of the national seashore from PWC use are not expected. Under alternative B, where there is not an extensive flat–wake zone, the operation of PWC would not impact geological resources in more than a minimal way (i.e., impacts would be limited to small, localized movement of shoreline sediments from wake- generated wave action). Therefore, this topic has been dismissed from further consideration. Known geohazards such as shifting shoals (sandbars) would not impact or be impacted by the implementation of any of the alternatives under consideration in this plan/EIS and PWC use does not disturb these areas. Therefore, this topic has been dismissed from further consideration.

Wetlands and Floodplains. The proposed alternatives do not consider any new development or construction in a floodplain; therefore, this impact topic has been dismissed from further consideration. PWC users that beach their vessels in upland areas of the national seashore could affect wetlands by trampling vegetation; however potential impacts on wetlands would be minimal and localized and would not be expected to result in measurable effects. Any potential impacts on shoreline vegetation (including wetland vegetation) are addressed in the "SAV / Shoreline Vegetation" section.

Greenhouse Gas and Climate Change. While PWC use contributes to mobile source greenhouse gas emissions, any effects of greenhouse gas emissions on climate change under any of the proposed alternatives would not be discernible at a regional scale. Further, nothing in NEPA explicitly requires an analysis of greenhouse gasses at the project level and no national standards have been established. This impact topic was therefore dismissed and not carried forward for analysis.

Archeological Resources. Known archeological resources at the national seashore are terrestrial and occur where PWC are not present. Further, there would be no effects to archaeological sites located along the shoreline from PWC wake due to the flat-wake zones proposed under the alternatives and the smaller wake size of these vehicles. Since PWC use occurs in the water and not land, and there would be no impact to resources from PWC use or associated wake, there would be no direct impacts to archeological resources from PWC use. Based on comments received during section 106 and Tribal consultation, the main threats to cultural resources are illegal collection and vandalism. These impacts have mainly been from boaters and pedestrians. While PWC use can allow access to areas where archeological resources occur, allowing the continued use of PWC would not increase access to these areas. Two of the action alternatives (including the preferred alternative) evaluated restricting beaching in certain areas, which would limit additional access to potential areas of archeological resources and would provide additional protections to cultural resources. Because the continued use of PWC would not increase the accessibility to archeological sites this topic was not carried forward for further analysis.

Cultural Landscapes and Historic Structures. While there could be some level of impact on identified cultural landscapes from the noise and visual intrusion of PWC in these areas, the level of PWC use under any of the alternatives would not result in long-standing impacts and would not detract from the overall cultural significance of the landscape; therefore, this issue was not analyzed in further detail. While historic structures are present at the national seashore, these structures are located inland from the water.

Because PWC use occurs on the water, the use of PWC does not occur in the same area as historic structures and would not impact these structures; therefore, this issue was not analyzed further.

Indian Trust Resources and Sacred Sites. Indian trust resources are land, water, minerals, timber, or other natural resources held in trust by the United States for the benefit of an Indian tribe or individual tribal member. Based on comments received during section 106 and Tribal consultation, there were concerns that PWC use could create wave action that could impact these sites. Alternatives that allow for PWC use all have flat-wake zones near shorelines, which would reduce wave action and minimize impacts to areas that may contain these resources. Therefore, Indian Trust resources and sacred sites have been dismissed from consideration in this plan/EIS. However, NPS will continue to consult with tribes about this PWC use plan/EIS and other planning and management topics, and will continue to manage the national seashore for the benefit of all citizens of the United States.

Ethnographic. Because there are no known ethnographic resources on national seashore lands, and no issues or concerns regarding these resources were raised by associated tribes during scoping, this topic has been dismissed from further consideration.

Paleontological Resources. Because the national seashore does not have an offshore source of paleontological material (Kenworthy, Santucci, and Visaggi 2007), and because PWC would not be allowed to access paleontological resources within the national seashore, paleontological resources has been dismissed from further consideration.

Health and Safety. The use of PWC and other motorized watercraft in popular recreational settings can lead to unsafe conditions due to the potential for reckless operation, high-speed use, or operation by inexperienced or impaired users. While there are inherent risks associated with PWC use, existing state and federal regulations currently being enforced in park waters in Florida and Mississippi would remain in place under all alternatives evaluated and would serve to minimize the potential for accidents or conflicts between different national seashore users. These existing regulations require PWC and other motorized watercraft to slow down to flat-wake speed when within 100 feet of people who are swimming or fishing along the shoreline and also within 100 feet of all non-motorized vessels such as kayaks or canoes. Federal regulations also prohibit the use of PWC and other motorized watercraft within 500 feet of all designated swim beaches. PWC use is restricted to daytime hours only. Existing state regulations prohibit reckless operation of a PWC and other motorized watercraft and establish age limits and education requirements for the use of PWC. Both state and federal regulations require the use of personal flotation devices and that all PWC operators have a lanyard-type engine cut-off switch attached to themselves. Okaloosa and Escambia Counties have established “restricted areas” where the speed of all motorized vessels (including PWC) is limited to “idle speed/no-wake.” None of the alternatives analyzed in this plan/EIS would remove or reduce the existing PWC safety regulations already in place nor would they measurably increase the potential for safety issues to occur in park-managed waters. The one meaningful difference between the alternatives is that under the no-action alternative, PWC use would cease within the national seashore, thus eliminating issues related to PWC use as a safety concern. Safety issues related to other motorized watercraft would remain.

Alternative E would include increasing the flat-wake zones and implementing full closures in areas of SAV habitat. This would result in beneficial impacts to visitor safety because it would reduce areas where PWC could be operated at higher speeds, which could decrease the possibility of collisions between PWC and other visitors. Alternative C would retain the existing flat-wake zones. Alternative D would reduce flat-wake zones in most areas, and although flat-wake distances would be reduced from current conditions, they would still provide large areas adjacent to the shoreline where PWC would have to operate at flat-wake speeds. Alternative B would reduce the existing flat-wake zone distances to 100 feet except in areas around piers, which would have a 500-foot flat-wake zone. This could increase the potential for PWC accidents in park waters due to an increase in area where PWC could be used at higher speeds. Also, as previously stated, existing local, state, and federal boating and PWC safety and flat-wake zone provisions would remain in place. In 2017, there were 19 documented PWC accidents in the three Florida counties adjacent to the national seashore (FFWCC 2017b), but these data do not indicate if the

incidents were within the boundaries of the national seashore as the state is the primary agency for responding to vessel accidents. The primary cause of the majority of these PWC accidents was operator inexperience, inattention, and careless operation (FFWCC 2017b). The action alternatives in this plan/EIS would not influence or affect any of these primary causes of PWC accidents in Florida. Similar boating accident data for Mississippi were not available. However, PWC use in that district of the national seashore is much less prevalent than in Florida. According to the 2017 statistics, PWC were involved in 20% of all reportable boating accidents in Florida. Issues related to human health and pollutant discharges from PWC are addressed in the water quality and air quality analysis in this plan/EIS. Because no actions in this plan would impact the existing state and federal regulations that govern PWC use and safety, the health and safety of PWC users would not be substantially affected by the alternatives in this plan/EIS. Therefore, this topic was dismissed from further consideration.

Environmental Justice. A minority population is identified within an affected area when either the minority population exceeds 50% of the population or the minority population percentage is meaningfully greater than the minority population of the general population (CEQ 1997). As shown in table 1, all counties in the region of influence (ROI) have a concentration of minority residents notably less than the general population of the state in which they are located and that do not exceed 50% of the population. The ROI is not classified as an area with high concentrations of minority residents. Each of the five counties located in the ROI has a concentration of people living below the poverty line that is lower than the 20% threshold (table 1), and the ROI is not classified as a poverty area. Based on the definitions provided in the executive order for minority or low-income populations, there are no such populations that would be disproportionately impacted by the implementation of this plan/EIS and no management actions proposed in this plan/EIS would impact these communities if they did exist in the area.

TABLE 1. MINORITY AND LOW-INCOME POPULATIONS IN THE REGION OF INFLUENCE

Geography	Minority	Below the Poverty Line
State of Florida	42.1%	17.1%
Escambia County	33.8%	17.1%
Okaloosa County	22.9%	13.8%
Santa Rosa County	15.0%	11.9%
State of Mississippi	42.0%	24.2%
Harrison County	32.8%	19.5%
Jackson County	30.1%	15.6%

Source: Minority data have been retrieved from the 2010 decennial Census SF1 files. Table QY-P4. Poverty data were retrieved from the 2012 American Community Survey 1-year estimates. Table S1701.

CHAPTER 2: ALTERNATIVES

Alternatives analyzed in this document were developed based on the alternatives in the 2004 *Personal Watercraft Use Environmental Assessment for Gulf Islands* (NPS 2004a) and on the results of internal and public scoping for this plan/EIS. The alternatives carried forward for detailed analysis meet, to a large degree, the management objectives of the national seashore, while also meeting the overall purpose of and need for the plan/EIS. See table ES-2 in the "Executive Summary" for a summary of the proposed alternatives, and appendix D for the alternative maps. Alternatives and actions that were considered but are not technically or economically feasible, do not meet the purpose of and need for the project, create unnecessary or excessive adverse impacts on resources, or conflict with the overall management of the national seashore or its resources were dismissed from detailed analysis and are described in this chapter.

ELEMENTS COMMON TO ALL ALTERNATIVES

This section describes elements that are common to all alternatives, including the no-action alternative.

Bird Closures. The national seashore would maintain the seasonal bird closures, as directed in the Superintendent's Compendium (NPS 2019). These closures include nesting closures for osprey and eagles. Closures for shorebirds, including piping plovers, establish buffers around the nesting, loafing, and foraging areas. Closures encompass both land and water, and prohibit any public use within the buffers. Please refer to the 2019 Superintendent's Compendium (NPS 2019) for a full list of restrictions.

The following locations are essential habitat used by shorebirds for nesting, loafing, or foraging and are closed to all public use and access:

- From March 1 through September 30, those portions of West Petit Bois Island (Sand Island), West Ship Island, and East Ship Island within the Mississippi District designated by posted signs.
- From March 1 through September 30, that portion of Santa Rosa area, from the national seashore's western boundary (East of University of West Florida property) to the eastern park boundary located at Navarre beach which is designated by posted signs. Designated piping plover loafing and foraging locations consist of that portion of Santa Rosa area, (approximately 5 acres) located on the north shore, approximately 1 mile east of Opal Beach complex, which is designated year-round by posted closure signs.
- From March 1 through September 30, that portion of Fort Pickens, from the national seashore boundary at Park West to the Fort Pickens Ranger Station, which is designated by posted signs. Designated piping plover loafing and foraging locations consist of that portion of Fort Pickens area, (approximately 4 acres) located near the Pensacola Pass, which is designated year-round by posted closure signs.
- From March 1 through September 30, those portions of Perdido Key which are designated by posted signs.

In addition, the following areas are used by osprey and bald eagles and are closed to all public use and access:

- From March 1 through July 31, osprey nesting areas on Petit Bois Island, West Petit Bois Island (Sand Island), Horn Island, West Ship Island, East Ship Island, NPS-owned portion of Cat Island, and Davis Bayou in the Mississippi District; and Santa Rosa Island and Perdido Key in Florida, which is designated by posted signs.
- From October 1 through April 30, eagle nesting areas on Petit Bois Island, West Petit Bois Island (Sand Island), Horn Island, West Ship Island, East Ship Island, NPS-owned portion of Cat Island, and Davis Bayou in the Mississippi District; and Santa Rosa Island and Perdido Key in Florida, which is designated by posted signs.

- Even where areas are not posted, if any active osprey or eagle nest is present, then any area within 300 yards of each nest, that contains adult or juvenile osprey or eagle, is closed to all public use.

Wildlife and Wildlife Habitat Protection. Seasonal closures within the national seashore would be implemented to protect wildlife and habitat according to the Superintendent's Compendium (NPS 2019).

ALTERNATIVE A: NO ACTION

Typically for a plan such as this, the no-action alternative represents the continuation of current management direction or level of intensity. In this case, that would mean continuing PWC use at the national seashore pursuant to the existing special regulation in 36 CFR 7.12. However, there are special circumstances associated with this plan as a result of the ruling in Bluewater Network v Salazar, 721 F. Supp. 7 (D.D.C. 2010). That court ruling invalidated the previous NEPA compliance document (NPS 2004a) that supported the existing special regulation, but allowed the national seashore to continue PWC use under the special regulation while the NPS corrected the deficiencies of the NEPA document. The special regulation remains in effect today.

The court found that the analysis in the 2004 EA was inadequate and did not provide enough information for the court to determine the validity of the NEPA document, specifically the finding of no significant impact and the conclusion that an EIS was not required. The court remanded the case to NPS "so that it may have an opportunity to provide adequate reasoning for its conclusions." As a result, NPS decided to reassess the impacts of PWC use with an EIS. To meet the requirements of the court's ruling and to provide for a comparable analysis of impacts among proposed alternatives, NPS has identified the no-action alternative as "no PWC use" at the national seashore, the same no-action alternative presented in the 2004 EA. NPS would enforce the ban on PWC use within its waters with existing staff, and information regarding the prohibition of PWC use would be made available to the public.

Therefore, under alternative A, NPS would rescind the special regulation at 36 CFR 7.12 that allows PWC use at the national seashore and enforce 36 CFR 3.9, which prohibits PWC use in national park system units without a special regulation specifically authorizing it.

ELEMENTS COMMON TO ALL ACTION ALTERNATIVES

Allowable Times of PWC Use. No person may operate a PWC between sunset and sunrise.

PWC Use Numbers and Regulations. The number of PWC operating at the national seashore at any one time would not be restricted. Federal and state regulations on vessels listed in appendix B generally would apply within the national seashore.

Enforcement and Outreach. The national seashore would continue joint water patrols and enforcement, in conjunction with cooperating agencies and commissioned staff, on a regular basis, which would include enforcement of PWC regulations as applicable. These water patrols would help ensure compliance with PWC closures and adherence to flat-wake zones, and would address public safety concerns related to PWC use. In addition, the national seashore would continue enforcement of federal regulations pertaining to harassment of marine mammals (Marine Mammal Protection Act and Endangered Species Act (ESA)) through ongoing and joint water patrols involving national seashore and state commissioned law enforcement authorities. Appendix C describes additional education and outreach activities associated with PWC regulations and resource protection.

Launch Sites. There would be no change to the number or location of current vessel launch sites (Okaloosa and Perdido Key in Florida, and Davis Bayou in the Mississippi District) located within the national seashore.

Noise Standards. All PWC would be required to comply with 36 CFR 3.15, which states: "A person may not operate a vessel at a noise level exceeding:

1. 75 dB(A) (A-weighted decibel) measured using test procedures applicable to vessels underway (Society of Automotive Engineers SAE--J1970). The SAE—J1970 standard is based on measurement of a single watercraft at the shore (as opposed to measurement at a set distance from the watercraft) or
2. 88 dB(A) measured utilizing test procedures applicable to stationary vessels (Society of Automotive Engineers SAE--J2005)." The SAE—J2005 standard is intended to determine if a watercraft has appropriate exhaust muffling when stationary. The measurement procedure involves operation of the engine at low idle speed and placement of the microphone at least one meter from the boat.

PWC Use at Horn and Petit Bois Islands

In compliance with the Wilderness Act, PWC landings would be prohibited above the mean high tide line on Horn and Petit Bois Islands, as these islands are designated wilderness.

ALTERNATIVE B

Under alternative B, NPS would revise the special regulation in 36 CFR 7.12 to allow PWC to operate in the same manner as all other watercraft per the Superintendent's Compendium (NPS 2019). PWC use would need to comply with state and federal PWC regulations described in appendix B.

Closures and Flat-Wake Zones. PWC use would be allowed throughout the national seashore, except in areas where all watercraft are restricted per the Superintendent's Compendium (NPS 2019), as listed below, and shown in appendix D, figures D-2 through D-10.

(1) PWC may operate within the national seashore except in the following closed areas:
   (i) Within 200 feet of the fishing pier at Fort Pickens;
   (ii) Within 200 feet of the remnants of the old pier which is located directly to the east of the current public fishing pier at Fort Pickens;
   (iii) In addition, 36 CFR 7.12 would be modified to include the area within 200 feet of the ferry pier at Fort Pickens;
   (iv) No docking of private vessels at the Ft. Pickens Ferry Pier; and

(2) PWC may not be operated at greater than flat-wake speed in the following locations:
   (i) Within 500 feet around Davis Bayou launch ramps, Ship Island (formerly known as West Ship and East Ship Islands) Pier, Horn Island Pier, and Fort Pickens fishing and ferry piers.
   (ii) Posted areas on the north side of Perdido Key (at the east end) near the Fort McRee site.

(3) PWC are allowed to beach at any point along the shoreline except as follows:
   (i) PWC may not beach in any restricted area listed in paragraph (1) of this section (above); and
   (ii) PWC may not beach above the mean high tide line on the designated wilderness islands of Horn and Petit Bois.

(4) The Superintendent may temporarily limit, restrict or terminate access to the areas designated for PWC use after taking into consideration public health and safety, natural and cultural resource protection, and other management activities and objectives.

Emissions Standards. There would be no emissions requirements specific to operation of PWC at the national seashore.

ALTERNATIVE C

Under alternative C, the special regulation in 36 CFR 7.12 (2006) would be retained to allow for PWC use.

Closures and Flat-Wake Zones. PWC may operate within the national seashore except in the following closed areas:

(1) The lakes, ponds, lagoons and inlets of Cat Island, East Ship Island, West Ship Island, Horn Island, West Petit Bois Island and Petit Bois Island;

(2) The lagoons of Perdido Key within Big Lagoon;

(3) The areas within 200 feet from the remnants of the old fishing pier, within 200 feet from the new fishing pier at Fort Pickens. In addition, 36 CFR 7.12 would be modified to include the area within 200 feet of the ferry pier at Fort Pickens; and

(4) Within 200 feet of non-motorized vessels and people in the water, except individuals associated with the use of the PWC.

PWC may not be operated at greater than flat-wake speed in the following locations:

(1) Within 0.5 mile from the shoreline or within 0.5 mile from either side of the pier at West Ship Island;

(2) Within 0.5 mile from the shoreline on the designated wilderness islands of Horn and Petit Bois; and

(3) Within 300 yards from all other national seashore shorelines.

PWC are allowed to beach at any point along the shoreline except as follows:

(1) PWC may not beach in any restricted area listed in paragraph (1) of this section (above); and

(2) PWC may not beach above the mean high tide line on the designated wilderness islands of Horn and Petit Bois.

The Superintendent may temporarily limit, restrict or terminate access to the areas designated for PWC use after taking into consideration public health and safety, natural and cultural resource protection, and other management activities and objectives.

The flat-wake zones and PWC use restriction areas listed above are shown in appendix D, figures D-11 through D-19.

Emissions Standards. There would be no emissions requirements specific to operation of PWC at the national seashore.

ALTERNATIVE D (PREFERRED ALTERNATIVE)

Alternative D would allow PWC use within the national seashore with the same management actions listed for alternative C, but would incorporate additional management prescriptions to maintain consistent flat-wake zone distances within each district to assist in compliance by PWC users and enforceability and would provide increased wilderness protection measures through the prohibition of beaching PWC on wilderness islands. The flat-wake zones and PWC use restriction areas for alternative D are shown appendix D, figures D-20 through D-28.

Closures and Flat-Wake Zones. Management of PWC under alternative D would be the same as alternative C, except for the provisions regarding flat-wake zones, which would be revised as follows:

- PWC would not be allowed to operate at greater than flat-wake speed at areas within 150 yards from all shorelines within the boundaries of the national seashore in the Florida District and 300 yards in the Mississippi District. This modification is intended to provide consistency within each district to allow more efficient enforcement and ease of understanding for the PWC user. National seashore law enforcement staff may place temporary floating buoys in the water as reference points to show PWC users what 150 yards and 300 yards from the shoreline looks like. This would be done on an as-needed basis, determined by national seashore personnel, and would likely occur on select high-use days and weekends.
- PWC may not beach or land at all on the designated wilderness islands of Horn or Petit Bois.

Emissions Standards. There would be no emissions requirements specific to operation of PWC at the national seashore.

ALTERNATIVE E

Under alternative E, the special regulation in 36 CFR 7.12 would be revised to include additional natural and cultural resource protections, and modified to include requirements for compliance with the 2010 US Environmental Protection Agency (EPA) *Marine Spark-Ignition Engines and Vessels – Exhaust Emission Standards*. NPS would adopt the 2010 EPA emission standards; therefore, PWC would not be allowed at the national seashore unless they meet the 2010 EPA emission standards. This alternative would allow PWC use at the national seashore, with the following additional management prescriptions and PWC landing areas to protect seagrass beds.

Closures and Flat-Wake Zones

Full PWC Closures – No Operation of PWC and No Landing along the Shoreline. In areas of the national seashore where resource concerns are minimal, PWC would be allowed to access the waters adjacent to the shoreline at a flat-wake speed, and would be able to land along the shoreline. Flat-wake zones would be 300 yards from all shoreline or piers, or the national seashore boundary, whichever occurs first. Areas closed to PWC use in the Mississippi District would include: (1) The Davis Bayou area; (2) The northern shores of Ship Island, except for 350 yards east from the western tip and 350 yards west from the eastern tip; (3) 300 yards around Horn Island; and (4) 300 yards around Petit Bois Island.

Areas closed to PWC use in the Florida District would include: (1) The northern shores of Perdido Key, as well as the eastern edge of Perdido Key, and (2) The northern shores of Santa Rosa Island, including the area between Navarre Beach and Okaloosa Island, but excluding the area west of the Ferry Pier on the western side of Santa Rosa Island, (3) The northern and southern shores of Naval Live Oaks, (4) The northern shores of Santa Rosa Area, and (5) Crab Island. The Superintendent may temporarily limit, restrict, or terminate access to the areas designated for PWC use after taking into consideration public health and safety, natural and cultural resource protection, and other management activities and objectives.

The national seashore does not have authority to allow or prohibit PWC from landing on non-NPS lands adjacent to NPS managed waters. However, the national seashore does have the authority to enforce PWC use restrictions in the waters themselves. Figures D-29 through D-37 in appendix D illustrate where PWC use restrictions would be enforced by the national seashore, as well as non-NPS lands adjacent to NPS managed waters by alternative.

Emissions Standards. All PWC must meet the 2010 EPA emission standards within 2 years upon publication of the final rule. A person operating a PWC that meets the 2010 EPA emission standards through the use of direct-injection two-stroke or four-stroke engines, or the equivalent thereof, would not be subject to this prohibition and would be allowed to operate as described in this section.

ALTERNATIVES AND ACTIONS CONSIDERED BUT DISMISSED FROM FURTHER CONSIDERATION

For various reasons, some alternatives or actions were initially considered but eliminated from further study. None of those alternatives or actions met the definition of a reasonable alternative, as defined by the Council on Environmental Quality (CEQ) 40 Questions (CEQ 1981), which states, "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 applicant." In addition, alternatives were eliminated that did not meet project objectives, resolve need, and alleviate potentially significant impacts on important resources. The alternatives considered but dismissed, along with the rationale for dismissal in accordance with 40 CFR 1502.14, are as follows:

Establishing Seasonal PWC Access Restrictions

Establishing seasonal PWC access restrictions was not carried forward as an alternative element because the national seashore already has seasonal closures in place for species protection (nesting season). Further, due to weather conditions (primarily high winds and rough waters), the national seashore does not experience much PWC traffic in the fall, winter, and spring, making formal seasonal restrictions unnecessary.

Requiring PWC Permits for all PWC Users

Requiring PWC permits would help the national seashore to ensure compliance with NPS and EPA regulations, as well as provide educational information about responsible use to PWC users. However, the geographic span of the national seashore and the number of launch sites accessing the national seashore from lands outside the national seashore hinders implementation of a PWC permit system. Other avenues of education and compliance monitoring were deemed more efficient, and have been included in the alternatives that are being considered.

Establishing Further PWC Use (Speed, Equipment, and behavior) Restrictions

Establishing the following additional PWC use restrictions were not carried forward as alternative elements:

- Establishing a reduced speed limit for PWC at the national seashore would not likely be beneficial outside the flat-wake zones. Existing state and federal regulations govern the speed of PWC when operating in proximity to the shoreline, swimmers, boaters, and others in the water. Since these regulations have been implemented, law enforcement staff have observed a high level of non-compliance among PWC users (NPS pers. comm. 2014d).
- State regulations already address PWC equipment requirements, which are applicable to PWC users within the national seashore.
- Prohibiting refueling PWC on beaches was dismissed because it could result in PWC users refueling on the water, which would be more likely to cause a spill than refueling on land. As an alternative, refueling guidelines would be included in educational outreach materials, and would also be available through state boating regulations and guidance.

NATIONAL PARK SERVICE PREFERRED ALTERNATIVE

The preferred alternative is that alternative "which the agency believes would fulfill its statutory mission and responsibilities, giving consideration to economic, environmental, technical and other factors" (46 FR 18026, Q4a). Alternative D was identified as NPS's preferred alternative. In identifying its preferred alternative, NPS considered factors such as the extent to which alternatives meet the purpose of and need for action, environmental consequences as evaluated in chapter 4, and implementation feasibility. As

described in detail in chapter 1, the purpose of this plan/EIS is to protect park resources, provide a variety of visitor experiences, minimize conflicts among users, and promote visitor safety.

By continuing to implement flat-wake zones, alternative D would continue to protect natural resources, such as wildlife and SAV, and cultural resources along the shoreline. The closure of Horn and Petit Bois Islands to PWC landings would provide benefits to the qualities of wilderness present on those islands. The 150-yard flat-wake zone in the Florida District would minimize impacts to commercial PWC rental businesses and visitor experience for PWC users. Implementation of flat-wake zones under alternative D would continue to minimize conflicts between various users of the national seashore and promote the safety of all visitors. Establishing consistent flat-wake zone distances for each district should result in easier enforcement of and increased compliance with flat-wake zones. By allowing PWC use to continue at the national seashore under alternative D, a variety of visitor experiences would be available to the public in a manner that is consistent with the national seashore's enabling legislation, mission, purpose, and goals.

CHAPTER 3: AFFECTED ENVIRONMENT

The resources addressed in this chapter include water quality, air quality, acoustic environment, SAV/shoreline vegetation, wildlife and wildlife habitat, threatened and endangered species and species of special management concern, visitor use and experience, socioeconomics, and wilderness.

WATER QUALITY

More than 80% of the national seashore is open water. Many factors affect the water quality of the Gulf of Mexico, including river outflows, runoff from neighboring land, water related recreational activities, marine commercial activities, and the cycling of the Loop Current (Anderson et al. 2005).

Water Quality – Florida District. The waters surrounding the Florida District have been impacted by numerous sources of non-point and point pollution (Northwest Florida Water Management District 2006). Non-point sources include urban stormwater runoff, agricultural runoff, marinas, boat traffic, the drainage of wetlands, and seepage of contaminated groundwater into surface waters. Due to the proximity to the Gulf Intracoastal Water Way (GIWW) and the Pensacola Ship Channel, some of the heaviest boat traffic (industrial, military, and recreational) in northern Florida is at the national seashore. Point sources include effluent from two sewer outlets near Pensacola, septic systems on Gulf Breeze peninsula, a chemical plant and coal-fired electric power plant on the Escambia River, a paper mill on the Perdido River, the American Creosote Works superfund site, the port of Pensacola, and Pensacola Naval Air Station, which contains a number of contaminated sites (NPS 2014a). The Clean Water Act requires that the surface waters of each state be classified according to designated uses. Florida has six classes with associated designated uses, which are arranged in order of degree of protection required (State of Florida 2013). National seashore waters around the Perdido Key and Fort Pickens areas are classified by Florida as class III waters, suitable for recreational purposes and for the maintenance of well-balanced fish and wildlife populations, but are not classified for shellfish harvesting meaning harvesting is not permitted (State of Florida 2013; FDACS 2012). From Destin west to just east of the Navarre Causeway, Florida, waters in Santa Rosa Sound are also classified as class III waters. From west of the Navarre Causeway to east of the Bob Sikes Bridge, waters in Santa Rosa Sound are classified as class II waters, and are prohibited for shellfish harvesting due to pollution. The lack of classification for shellfish harvesting is due to a lack of water quality monitoring data that meets the National Shellfish Sanitation Program standards and the current sanitary conditions of the area have not been characterized for the protection of the health of shellfish consumers (FDACS 2012). Further to the east, Choctawhatchee Bay is mostly classified as class II, but is prohibited for shellfish harvesting near the boundary of the national seashore, except conditionally approved areas (State of Florida 2013; FDACS 2012).

Big Lagoon is generally less than 1 mile wide and therefore the shared boundary with the national seashore and the GIWW coincide with the length of Perdido Key. Big Lagoon is classified as class III waters by the State of Florida. There are several marinas north of the Perdido Key unit, including the Grand Lagoon Yacht Club, the Lost Key Marina and Yacht Club (includes two marinas in the same location), the Harbour Lakes Condominiums and the Sherman Cove Marina on Naval Air Station Pensacola. All of these facilities are located directly north of Perdido Key. Coastal residential housing and developments along the north shore nearly all have personal access points to the waterway. There are a few boat launches in the area, the principal public launch point is at Big Lagoon State Park. While there are no associated point source discharges from the marinas or the residential housing, nonpoint source runoff from these developments likely contributes to chemical (pesticide, fertilizer, herbicide) and bacterial pollution to Big Lagoon (FDEP 2001).

Continuous water samples were collected from 2010 to 2014 throughout the water column within the Florida District (Meiman pers. comm. 2014), and analyzed for several parameters. Specific conductivity ranged from lows around 14,000 microsiemens per centimeter (µS/cm) to a high of 96,372 µS/cm at

Naval Live Oaks with medians ranging from 34,880 µS/cm to 42,917 µS/cm. Specific conductivity is closely related to salinity, and can vary greatly in coastal waters and is affected by many factors including tides, precipitation, and freshwater inputs from terrestrial sources. These values fall within the expected range for coastal habitats in the region. Throughout the water column, dissolved oxygen ranged from 0 milligrams per liter (mg/L) to 12.81 mg/L at Big Sabine, from 0.46 mg/L to 14.54 mg/L at Naval Live Oaks, and from 3.09 mg/L to 11.93 mg/L at Spanish Cove Big Lagoon although the median values ranged from 7.82 mg/L to 8.66 mg/L; percent dissolved oxygen saturation ranged from 0% to 263.5%. These values fall within the expected range for coastal habitats in the region. Dissolved oxygen concentrations have important implications for marine and estuarine species which require oxygen for survival. Dissolved oxygen concentrations can be affected by many factors, including temperature, stratification of the water column, and nutrient concentrations/algal biomass. When dissolved oxygen concentrations fall below 2 mg/L, the waters are considered to be hypoxic. While prolonged periods of hypoxia can have detrimental effects on marine life, occasional hypoxic events are not uncommon in the warm, shallow, coastal waters of the southeastern United States. Dissolved oxygen concentration is inversely related to temperature, so hypoxia occurs most frequently during the hot summer months. Turbidity, a measure of water clarity, ranged from a low of 0 nephelometric turbidity units at all three stations to a high of 2187.8 nephelometric turbidity units at Big Sabine. Turbidity can affect a variety of marine life, but most notably SAV, which requires low turbidity conditions for adequate light penetration. Nutrients (nitrogen and phosphorus) are an important metric of water quality because they act as fertilizers for algal growth. When present in excess, these nutrients can lead to ecological problems including changes at the trophic level due to excessive algal growth (i.e., eutrophication). In grab samples from the three stations nitrate was either not detected or detected below the quantification limit. During the most recent sampling year (2016) total phosphorus ranged from a low of 0.022 mg/L at Spanish Cove in Big Lagoon to a high of 0.036 mg/L at Naval Live Oaks in Santa Rosa Sound (NPS 2017a). These levels are not of concern because nitrogen, rather than phosphorus, is typically the limiting nutrient in marine or estuarine waters. Therefore, excess phosphorus would not result in excessive algal growth or eutrophication, unlike excess nitrogen.

Water quality within the Pensacola Bay system has been improving since the late 1960s, when water quality was considered bad throughout the bay system. This improvement is due to many efforts to reduce pollutant loading in the bay and control erosion and sedimentation in contributing waters. While these changes have resulted in measurable improvements in water quality, additional improvements are required to protect unique resources, such as SAV, which requires near-pristine conditions to thrive. The need for additional water quality improvements is evidenced by the decline in SAV coverage during this same period of time (table 5 in the "SAV / Shoreline Vegetation" section below). This was noted in a 2012 letter from the national seashore to the State of Florida, which explained that, "Maintaining the current water quality conditions is not sufficient to protect the resources of Gulf Islands National Seashore." In addition to the loss of SAV coverage, up to 25% of the Pensacola Bay/Santa Rosa Sound area experiences seasonal hypoxia (Yarbro and Carlson 2013).

Water Quality – Mississippi District. Because the islands in the Mississippi District of the national seashore are between 7 and 12 miles offshore and are almost completely undeveloped, human activities have impacted water quality less than waters closer to urban areas, such as those in the Florida District (NPS 2004a). The primary pollution sources include mainland urban stormwater and agricultural runoff, recreational boating, and commercial shipping in the GIWW and navigational channels in the passes (NPS 2004a). Surface waters in Mississippi are classified and assigned various use classifications by the Mississippi Department of Environmental Quality based on the existing use of the water body, along with any expected future uses (MDEQ 2012). Waters in the Mississippi District are classified by Mississippi as suitable for shellfish harvesting, with the exception of the areas including and surrounding the navigational channels running through the passes between the islands (MDEQ 2007). Shellfish beds are monitored and are either opened or closed based on water quality within a given area (MDMR pers. comm. 2014). Similar to Florida, the national seashore waters in the Mississippi District are under fish consumption advisories, including a "no consumption" mercury advisory for shark, swordfish, king mackerel, and tilefish because they contain high levels of mercury (MDEQ 2007).

Water samples collected in the Mississippi Sound near East Ship Island from 2010 through 2014 were measured for various water quality parameters (USGS 2014). Surface samples showed pH from 7.6 to 8.5 with an average of 8.2, and specific conductance from 15,800 µS/cm to 50,300 µS/cm with an average of 39,234 µS/cm. Surface dissolved oxygen ranged from 0.3 mg/L to 9.9 mg/L whereas concentrations at depths of 10 feet and below were 0.6 mg/L to 7.6 mg/L; percent dissolved oxygen saturation for all samples ranged from 4% to 121%. Total nitrogen was measured at less than 0.12 mg/L to 1.1 mg/L, phosphorus at less than 0.02 mg/L to 0.18 mg/L, and turbidity at 0.1 formazin nephelometric unit to 84 formazin nephelometric units. Values for all measured parameters fall within the expected range for coastal habitats in the region.

Deepwater Horizon (DWH) Oil Spill. The DWH oil spill began on April 20, 2010 and lasted 87 days, discharging an estimated 4.9 million barrels (210 million US gallons) of crude oil into the Gulf of Mexico (National Response Team 2011), released into the environment deep underwater. As a result, the oil remained in the water for a long time, with no opportunity for the release of volatile compounds to the atmosphere. Hence, water-soluble petroleum compounds dissolved into the water column to a much greater extent than is typically observed for surface spills (Reddya et al. 2012). The DWH oil spill resulted in the release of oil containing PAHs. PAHs are found in crude oil and have the potential to accumulate with each link in the aquatic food chain. Over time, they may be concentrated to levels that cause physiological impairment in humans from consuming fish and shellfish (Rotkin-Ellman, Wong, and Solomon 2012). Monitoring after the spill included a study by the US Geological Survey that conducted water and sediment sampling along the coast from Texas to Florida (Nowell et al. 2013). Seven sites within the larger set of pre- and post-landfall sites are within the national seashore including one in Florida and six in Mississippi. Toluene was significantly greater in post-landfall samples for a site at South Cat Island Beach in the Mississippi District (Nowell et al. 2013). Both benzene and xylene were also detected in water samples from this site. Sediment samples from Petit Bois Island Beach in Mississippi showed significantly higher post-landfall concentrations of PAHs. Benchmarks for human health and PAH-BTEX were not exceeded for water samples; however, post-landfall samples at sites on West Horn, East Horn, and Petit Bois Islands exceeded chronic aquatic-life benchmarks for boron and copper and acute aquatic-life benchmarks for copper (Nowell et al. 2013). Supplemental aquatic life benchmarks were exceeded for total PAHs in sediment samples. Additionally, an associated study reported that sediment and tarballs collected from the South Cat Island and Petit Bois Island sites had geochemical biomarkers consistent with DWH oil (Rosenbauer et al. 2011).

Water Quality Monitoring Within Gulf Islands National Seashore. Water quality sampling of surface waters within the national seashore was conducted on May 26, 2013, in both Mississippi and Florida Districts (Volkert 2015). The study methodology and figures with sampling locations are provided in appendix E. Water quality sampling results did not detect concentrations of methyl tertiary-butyl ether, total PAH, or any PAH constituent above the method detection limit (Volkert 2015). For BTEX, the only measurable petroleum component found to be above the method detection limit was toluene. Toluene was found in two Florida sampling points, one designated as a PWC use area and one as a non-PWC use area (Volkert 2015). However, the PWC operation counts indicated that both of these points were located in areas of high PWC and pleasure boat activity near Perdido Key (Volkert 2015). The finding of measurable toluene concentrations is similar to what was reported in the US Geological Survey study, which found elevated levels of toluene after the DWH spill (Nowell et al. 2013). Laboratory equipment also detected the presence of benzene and ethyl benzene in one sample each, and xylene in 14 samples; however, these concentrations were below the method detection limit.

AIR QUALITY

National Ambient Air Quality Standards (NAAQS). The national seashore is located within Jackson and Harrison Counties, Mississippi and Escambia, Santa Rosa and Okaloosa Counties, Florida. All five counties are in attainment for all six criteria pollutants (EPA 2018). Therefore, General Conformity requirements (40 CFR 93, Subpart B) are not applicable to this plan, which means an applicability analysis and conformity determination are not required. The Mississippi and Florida Districts of the

national seashore are classified as a class II area under the Clean Air Act, the second most stringent designed to protect the majority of the country from air quality degradation.

State Air Quality Standards. Except for odor, Mississippi's ambient air quality standards are identical to the NAAQS. The Mississippi regulation of odor is qualitative and states, "There shall be no odorous substances in the ambient air in concentrations sufficient to adversely and unreasonably: affect human health and well-being; interfere with the use or enjoyment of property; or affect plant or animal life" (11 Miss. Admin. Code Part 2, Chapter 4)." Florida does not have state-level air quality or odor standards (the section of the Florida Administrative Code pertaining to ambient air quality standards was repealed in 2012) (FDEP 2013). Therefore, the NAAQS are the only appropriate standards applicable in Florida.

Air Quality Monitoring Data. No specific air quality monitoring data are available for the national seashore. Table 2 summarizes the available monitoring data from other locations in the general region for the past 3 years (2015–2017). Although not representative of the national seashore, they provide general context for understanding potential background concentrations of criteria pollutants. Given that the majority of air quality monitors are located in urbanized areas with numerous mobile and point emissions sources, existing pollutant concentrations on the barrier island portions of the national seashore would be expected to be less than the regional monitored concentrations shown in table 2.

TABLE 2. REGIONAL AIR QUALITY MONITORING DATA (2015–2017)

Pollutant	Averaging Time	NAAQS	Units and Form	2015	2016	2017	Location
nitrogen dioxide (NO_2)	1-hour	100 ppb	ppb (98th percentile)	26.6	28.1	29.5	Pascagoula, MS
	annual	53 ppb	ppb (annual mean)	4.5	4.4	4.0	
Ozone	8-hour	0.070 ppm	ppm (4th highest daily maximum 8-hour concentration)	0.065	0.062	0.064	Pascagoula, MS
				0.061	0.061	0.064	Naval Air Station Pensacola, FL
particle pollution $PM_{2.5}$	annual	12 µg/m^3	µg/m^3 (annual mean)	9.0	7.8	8.0	Pascagoula, MS
	24-hour	35 µg/m^3	µg/m^3 (98th percentile)	19	13.7	20.2	
sulfur dioxide	1-hour	75 ppb	ppb (99th percentile)	24	6	5	Pascagoula, MS
	3-hour	0.5 ppm	ppm (max)	0.0176	0.004	0.005	

Source: EPA 2018

ppb = parts per billion; ppm parts per million; µg/m^3 = micrograms per cubic meter

Carbon monoxide monitoring data near the national seashore are not available; however, it is expected that concentrations at the national seashore would be low given the localized nature of CO (concentrations drop off rapidly with increasing distance from the source, such as roadways). Nitrogen dioxide (NO_2), ozone, PM, and sulfur dioxide monitoring data available from a site in Pascagoula, Mississippi (approximately 10.6 miles northeast from the eastern end of Horn Island) indicate that ambient concentrations of these criteria pollutants are below the NAAQS. In addition, ozone monitoring data from Naval Air Station Pensacola show concentrations very similar to the Pascagoula, Mississippi monitor and below the NAAQS.

Meteorology. Meteorology influences dispersion of air pollution in the atmosphere. For example, stagnant conditions can result in elevated pollutant concentrations and wind direction/speed influences the migration of pollutants from a source to receptors. The national seashore is located in a subtropical climate with hot, humid summers and mild winters. Temperatures are moderated by the coastal location. Winds blow from the north to northeast and between southwest and southeast most often (IEM 2015). Winds blowing directly from the east or west are less common. There are calm conditions 23.2% of the time (IEM 2013). The highest wind speeds tend to be from the southeast and the lowest wind speeds from the northeast.

ACOUSTIC ENVIRONMENT

According to NPS *Management Policies 2006* and Director's Order 47: Sound Preservation and Noise Management, an important component of NPS's mission is the preservation of natural acoustic conditions associated with national park system units (NPS 2006, 2000). An overview of acoustic terminology relevant to this plan is provided in appendix F. Appendix F also includes a summary of available PWC airborne noise measurement data based on a study at Glen Canyon National Recreation Area.

Existing Sound Levels at the National Seashore. During the summer of 2013, NPS conducted approximately 30 days of continuous airborne acoustical monitoring at three locations within the national seashore. The results of this monitoring study are summarized below. Detailed technical information on the acoustical monitoring methodology and subsequent data analysis is provided in NPS's report Gulf Islands National Seashore Acoustic Monitoring Report (NPS 2014b). The three monitoring sites were selected to represent a range of conditions, including wilderness and non-wilderness areas. Figure 1 is a map of the monitoring sites. Site GUIS001 (Fort Pickens) is a non-wilderness area located near a campground and popular beach, and approximately 1 mile from Naval Air Station Pensacola. The GUIS002 (Horn Island) and GUIS003 (Petit Bois Island) monitoring sites are within designated wilderness area and represent a less visited portion of the national seashore and were anticipated to have lower levels of non-natural sounds than GUIS001. Sources of human-caused sounds at the national seashore include watercraft, aircraft, and (at Fort Pickens only) on-road vehicles.

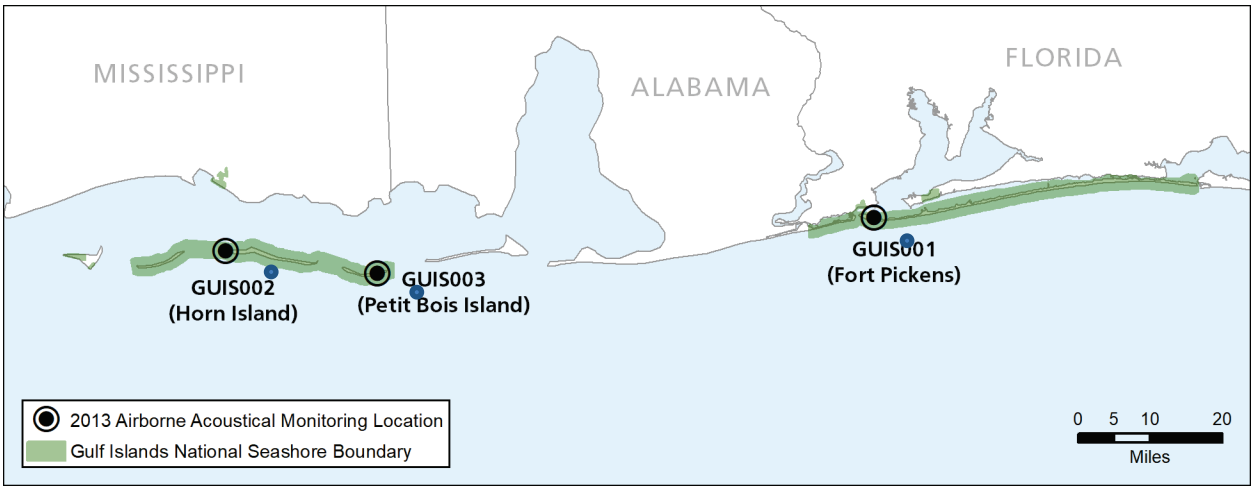


FIGURE 1. LOCATION OF ACOUSTIC MONITORING SITES AT GULF ISLANDS NATIONAL SEASHORE

Table 3 displays percent time audible values for each of these common noise sources during the monitoring period as well as ambient sound levels. Results indicated that the natural ambient sound levels (L_{nat}) at these sites ranged between 38.4 and 41.3 dBA during the daytime, and 36.3 and 48.0 dBA at night. Median existing ambient sound levels (L_{50}) were slightly higher, ranging from 41.8 to 43.4 dBA during the day and 39.0 to 48.9 dBA at night. The Fort Pickens monitor had a higher median existing ambient (L_{50}) during the day than at night, likely due to increased human activity during daylight hours. Horn Island and Petit Bois Island, by contrast, had higher L_{50} values at night than during the day. This is likely attributable to the increased wind during the evening and nighttime hours, as the L_{nat} is also higher at night for these two sites (NPS 2014b). In determining the current conditions of an acoustical environment, it is informative to examine how often sound pressure levels exceed certain values. Table 4 reports the percent of time that measured levels were above four key values. The first value, 35 dBA, is designed to address the health effects of sleep interruption. Recent studies suggest that sound events as low as 35 decibels (dB) can have adverse impacts on blood pressure while sleeping (Haralabidis et al. 2008). This is also the desired background sound level in classrooms (ANSI S12.60-2010). The second value addresses the World Health Organization's recommendations that noise levels inside bedrooms remain below 45 dBA (Berglund, Lindvall, and Schwela 1999). The third value, 52 dBA, is based on the

EPA speech interference level for speaking in a raised voice to an audience at 10 meters (EPA 1974). This value addresses the effects of sound on interpretive presentations in parks.

TABLE 3. MEAN PERCENT TIME AUDIBLE FOR EXTRINSIC, AIRCRAFT, WATERCRAFT, AND VEHICLE SOUNDS; EXISTING AND NATURAL AMBIENT SOUND LEVELS

Site	Mean Percent time Audible (in 24-hour period)[a]				Median Existing Ambient (L_{50}) in dBA		Median Natural Ambient (L_{nat}) in dBA	
	All Extrinsic[b]	Aircraft	Watercraft	Vehicles	Day[c]	Night	Day	Night
GUIS001, Fort Pickens	94.7	23.5	16.0	16.8	43.4	39.0	38.4	36.3
GUIS002, Horn Island	38.3	4.8	26.4	0.0	42.8	47.2	41.3	46.6
GUIS003[d], Petit Bois Island	43.5	5.8	38.1[c]	0.0	41.8	48.9	39.0	48.0

Source: NPS 2014b

a. Over a 24-hour period, based on eight days of analysis.
b. Total human-caused percent time audible (including the listed aircraft, watercraft and roadway vehicle percent time audible and others).
c. Day hours are 7:00 a.m. – 7:00 p.m.; night hours are 7:00 p.m. – 7:00 a.m.
d. Total watercraft sounds at GUIS003 included low-frequency shipping traffic noise. Recreational watercraft sounds (small motorboats) were audible 4.5% of the time.

TABLE 4. PERCENT TIME ABOVE METRICS

Site	Frequency Hertz (Hz)	% Time above sound level: 7:00 a.m. to 7:00 p.m. (Day)				% Time above sound level: 7:00 p.m. to 7:00 a.m. (Night)			
		35 dBA	45 dBA	52 dBA	60 dBA	35 dBA	45 dBA	52 dBA	60 dBA
GUIS001, Fort Pickens	20–800	93.22	13.53	2.33	0.51	53.29	1.47	0.13	0.00
	12.5–20,000	99.62	36.84	6.71	0.96	97.29	9.66	1.60	0.14
GUIS002, Horn Island	20–800	97.39	6.48	0.43	0.07	99.97	7.90	0.15	0.01
	12.5–20,000	99.85	26.61	3.21	0.42	100.00	65.09	17.34	0.20
GUIS003, Petit Bois Island	20–800	37.13	0.88	0.28	0.06	64.43	0.41	0.04	0.00
	12.5–20,000	87.14	29.84	4.71	0.12	100.00	81.72	16.09	0.06

The final value, 60 dBA, provides a basis for estimating impacts on normal voice communications at 1 meter. Kayakers, hikers, or visitors viewing scenic areas in the national seashore would likely be conducting such conversations. At the national seashore, all three sites exceeded 35 dBA most of the time. However, wind and wave sounds were significant contributors to the soundscape, elevating the overall sound levels (NPS 2014b).

Fort Pickens had the loudest existing daytime conditions and highest percent time audible of extrinsic (human-caused) noise. Major noise sources included military and commercial aircraft, road vehicles, watercraft, and motors (including generators in the campground and unknown motor sounds). Extrinsic noise was heard 94.7% of the time at Fort Pickens, compared with 38.3% at Horn Island and 43.5% at Petit Bois Island. Horn Island and Petit Bois Island had the highest existing ambient levels at night and higher natural ambient levels at all times. This result is attributable to sounds of wind and waves, which are prominent and expected features of the offshore islands. Major noise sources at Horn Island were watercraft and aircraft. At Petit Bois Island, the most prevalent noise source was an unidentified low-frequency rumble from the nearby shipping channel. Recreational watercraft were also heard; however, these data do not identify specific vehicle types because acoustical properties of PWC were not readily distinguishable from other motorized watercraft in NPS's *Acoustic Monitoring Report* (NPS 2014b).

Underwater Noise. The underwater acoustic environment is the sound field in which wildlife detect signals from their same species, predators or prey (Hildebrand 2009). In some cases, the acoustic environment is the signal. For example, some larval fish and invertebrate species use reefs sounds to navigate to suitable habitat (Simpson et al. 2004). The acoustic environment results from both the characteristics of the multitude of contributing sound sources and the ability of sound to propagate from one location to another. The addition of anthropogenic noise in the ocean (e.g., small vessels, ships, seismic air guns, pile-driving) is increasing as the utilization of marine resources intensifies globally. In some parts of the ocean, there has been a reported 15 dB rise in low frequency ambient noise (less than 100 Hz) over the past 50 years (McDonald, Hildebrand, and Wiggins 2006). The introduction of these novel sounds is known to mask biological signals from predators, mates or the environment (Hatch et al. 2012; Radford, Kerridge, and Simpson 2014), disrupt migratory, foraging and vocal behaviors (Ellison et al. 2012; Jensen et al. 2009; Holles, Simpson, and Radford 2013; Lundquist, Gemmell, and Würsig 2012) and in some cases causes permanent and temporary hearing loss (Mooney, Nachtigall, and Vlachos 2009) and increases stress (Rolland et al. 2012). These behavioral changes not only have significant impacts on individual animals, but can have both population and ecosystem level consequences. A broad range of cetacean species (whales, dolphins, and porpoises) are known to inhabit the offshore waters of the northern Gulf of Mexico and use sound for navigation, to locate food, and to communicate. These species have been monitored visually (Davis et al. 2002) and acoustically (Hildebrand et al. 2013). The addition of watercraft activity in the area will increase man-made noise to in this sensitive coastal habitat. The underwater acoustic energy of PWC is broad band (100 Hz–10 kHz) resulting from the vibrating bubble cloud generated by the jet stream and impeller blades cavitation (Erbe 2013).

SAV / SHORELINE VEGETATION

SAV covers a diverse assembly of rooted aquatic plants that grow in shallow water and soft sediments (Williams and Heck 2001). Under federal regulations, SAV beds are considered special aquatic sites (40 CFR 230 section 404 (b)(1) Guidelines – Protection of Wetlands and other Waters of the United States). SAV communities are dynamic and SAV coverage and density can vary greatly among seasons, across sites, and through time (Hossain, Rogers, and Saintilan 2010). SAV coverage reported below is based on the most recent inventory of SAV at the national seashore, conducted in October 2011 (NPS 2013a), unless otherwise indicated. However, it should be noted that SAV habitat (areas which may be suitable for SAV based on physical and biological characteristics) likely extends beyond the boundaries of active SAV coverage reported during inventories, which represent a snapshot in time. SAV habitat is characterized by sandy substrates containing some shell fragments, and calm, relatively shallow waters. In the turbid Mississippi Sound waters, the seagrasses are rarely found in water deeper than 6 feet, while in the clearer Florida waters, seagrass beds can be found in depths of up to 12 feet (NPS 2014a).

According to the latest inventory, the SAV community at the national seashore has an aerial coverage of approximately 7,573 acres (NPS 2013a) and is comprised of four species (Phillips and Menez 1988; Fonseca et al. 1994; FDEP 2003): turtle grass (*Thalassia testudinum*), shoal grass (*Halodule wrightii*), manatee grass (*Syringodium filiforme*), and one typically brackish or freshwater species, widgeon grass (*Ruppia maritima*). Shoreline vegetation at the national seashore consists primarily of marsh grasses. Dominant species along the northern Gulf of Mexico include smooth cordgrass (*Spartina alterniflora*), saltmeadow cordgrass (*Spartina patens*), and black needlerush (*Juncus roemerianus*). Smooth cordgrass and black needlerush can withstand a wide range of salinities and are found along the edges of salt marshes, while the less salt-tolerant saltmeadow cordgrass typically occurs further from the marsh edge. These species provide habitat for a variety of wildlife species and play an important role in stabilizing sediments along the shoreline.

Florida District. As shown in table 5, the Florida District waters of the national seashore contain approximately 4,390 acres of active SAV coverage (NPS 2013a). In 1949, SAV beds in the Pensacola Bay system were extensive, but by 1975, these beds had receded or disappeared (Northwest Florida Water Management District 1997). SAV decline in these areas was attributed to increased turbidity caused by harbor and GIWW dredge and fill activities, boat traffic, shoreline modification, varying degrees of water

quality degradation from residential, commercial, and industrial development, and hurricane-related effects (Handley, Altsman, and DeMay 2007).

TABLE 5. ESTIMATED SAV COVERAGE IN THE FLORIDA DISTRICT OF GULF ISLANDS NATIONAL SEASHORE

Area	SAV Coverage 1992 (acres)[a,b]	SAV coverage 2003 (acres)[a,b]	SAV Coverage 2011 (acres)[c]
Big Lagoon (Near Perdido Key)	537	543	560
Fort Pickens	-	-	362
Naval Live Oaks	-	-	85
Santa Rosa Area	2,760	3,032	2,197
Okaloosa Area	4,261	2,623	1,187
Total	**7,558**	**6,198**	**4,390**

Sources:

a. FDEP 2011a; Note: SAV values from FDEP 2011a include areas outside the national seashore boundaries and are likely higher than actual values within the national seashore.
b. FDEP 2011b.
c. NPS 2013a.

Within the Florida District, SAV is found in Big Lagoon, in the Perdido Key area, waters on the north side of Fort Pickens, the Santa Rosa area, waters near Naval Live Oaks, and a small portion of the western edge of Choctawhatchee Bay (located within the Okaloosa area) (NPS 2013a). The Crab Island area of the national seashore (located within the Okaloosa area) is also known to support SAV habitat. A 3-year (1993–1995) inventory and assessment of SAV ecosystems in the national seashore concluded that growing conditions within the Florida District, specifically Big Lagoon and Santa Rosa Sound, were marginal at best (Heck et al. 1995, 1996). Because of the decline of SAV beds in the Pensacola Bay System (which includes Big Lagoon and Santa Rosa Sound), the FDEP conducted a 2-year monitoring program beginning in 1999 that monitored SAV coverage and water quality parameters (FDEP 2001). A summary report prepared for the Florida Integrated Seagrass Mapping and Monitoring Program compared SAV coverage for data collected in 1992 and 2003 for Big Lagoon and Santa Rosa Sound. Both areas showed a slight increase in coverage in 2003 (6 acres in Big Lagoon and 272 acres in Santa Rosa Sound) (table 5; appendix D, figure D-26). However, these data are not exclusive to SAV within the boundaries of the national seashore (FDEP 2011a).

Mississippi District. Shoal grass is the dominant SAV found in the shallow water on the sheltered sides of the Mississippi District islands, protected from the high wave energy of the open Gulf of Mexico (Moncrieff 2007). SAV acreage has decreased over the last half century at the Mississippi District Islands (table 6). This loss has been attributed to decline in water quality related to land use changes in the watershed, boating activities, dredging, and other development pressures (Moncrieff et al. 1998). Historically, SAV loss has been attributed to physical disturbances related to tropical weather systems or flood events (Moncrieff 2007). One of the earliest published efforts to map and quantify SAV coverage around the Mississippi District islands was conducted in 1969 (pre-Hurricane Camille) by using a series of survey transects and sampling stations throughout Mississippi Sound (Eleuterius 1973). Eleuterius (1973) reported that the majority of SAV within the Mississippi Sound was located on the north side of the barrier islands. A 3-year (1993–1995) inventory and assessment of SAV ecosystems in the national seashore concluded that growing conditions within the Mississippi District were favorable for dominant SAV types, although specific acreage values were not reported (Heck et al. 1995, 1996). A 1998 mapping survey of SAV in Mississippi Sound revealed that although SAV was present along the north shore of the Mississippi District islands, community composition had changed. SAV meadows on the north side of Ship and Horn Islands which once supported populations of *Halodule wrightii*, *Halophila engelmannii*, *Syringodium filiforme*, and *Thalassia testudinum* were dominated almost exclusively by *Halodule wrightii*, indicating that an ecological shift had occurred (Moncrieff et al. 1998). Carter et al. found that SAV coverage varied annually at Horn and Cat Islands between 2006 and 2007 (Carter et al. 2009, 2011). SAV coverage may naturally vary annually by at least a factor of 2, making exact calculations of SAV

coverage challenging (Carter et al. 2009, 2011). Furthermore, it is important to consider methodological differences and advancements in aerial survey and mapping technologies when comparing SAV coverage among studies, especially older studies (Carter et al. 2009, 2011). These differences may partly account for the drastic change in reported SAV coverage since 1969. SAV aerial extent in the Mississippi District of the national seashore from 1969 to 2011 is presented in table 6 and is shown in appendix D, figure D-27. Additionally, mapping by Moncrieff et al. (1998) indicated a 50% loss of total SAV coverage in Mississippi Sound between 1968 and 1998.

TABLE 6. ESTIMATED SAV COVERAGE IN THE MISSISSIPPI DISTRICT OF GULF ISLANDS NATIONAL SEASHORE

Area	1969 (acres)[a]	1999 (acres)[b]	2006 (acres)[c]	2007 (acres)[c]	2011 (acres)[d]
Ship Island	1,534	242	41	39	720
Horn Island	5,567	578	203	94	1,543
Petit Bois Island	1,690	425	47	42	920
Total	**8,791**	**1,245**	**291**	**175**	**3,183**

a. Eleuterius 1973; Note: SAV coverage includes algae in addition to typical SAV.
b. Handley et al. 2007.
c. Carter et al. 2011.
d. NPS 2013a.

Ecological Status of SAV / Shoreline Vegetation. Human activities impacting SAV include those altering water quality or clarity, such as nutrient and sediment loading from runoff and sewage disposal, dredging and filling, pollution, and coastal development (Sargent et al. 1995; Short and Wyllie-Echeverria 1996; Hauxwell et al. 2003; Johnson, Heck, and Fourqurean 2006). The direct influence of other organisms (e.g., brown tides, urchin overgrazing, and disease) has led to large-scale losses and, when acting in concert with suspended sediments and nutrients, can accelerate the trajectory of SAV loss for a given area (Duarte 2002; Dawes, Phillips, and Morrison 2004). Vessel groundings and boating effects are also among the multiple stressors contributing to SAV decline (Orth et al. 2006).

WILDLIFE AND WILDLIFE HABITAT

Located along the northern edge of the Gulf of Mexico, the national seashore provides marine, estuarine, beach, riparian, and upland habitats, which collectively support hundreds of diverse animal species. One value of the national seashore is to preserve and protect the natural processes of an extensive range and variety of terrestrial and marine ecosystems within a very dynamic and rapidly changing landscape (NPS 2011a). This discussion of wildlife and wildlife habitat focuses on the most common mammals, birds, reptiles, amphibians, fish, and invertebrates at the national seashore that could be affected by PWC use.

Birds. More than 300 species of birds have been observed at the national seashore, using the barrier islands for loafing, nesting, feeding, wintering, or migratory rest stops. They include songbirds, waterfowl, wading birds, raptors, marine birds, and shorebirds (NPS 2011b). A 2012 survey of bird species at the national seashore concluded that the ten most abundant species in the Florida District were the red-winged blackbird, Carolina wren, eastern towhee, mourning dove, blue jay, osprey, northern mockingbird, northern cardinal, purple martin, and least tern. The ten most abundant species in the Mississippi District were the red-winged blackbird, osprey, Carolina wren, northern cardinal, blue jay, fish crow, laughing gull, northern mockingbird, mourning dove, and eastern towhee (Granger 2013). In the Florida District, shorebird nesting, foraging, and loafing areas are located along the north and south shorelines of islands as well as along both the north and south shores of the Naval Live Oaks area. In the Mississippi District, Horn and Petit Bois Islands are important nesting areas for large colonies of least terns, sandwich terns, black skimmers, and royal terns, along with other shorebirds. Ospreys and eagles are known to nest on Horn, Petit Bois, Cat and East and West Ship Islands as well as Davis Bayou in the slash pine habitats. Furthermore, clapper rail, indigenous to salt marshes, and night heron nest and roost in Davis Bayou (NPS 2004b). Seventeen federally and/or state listed bird species are known to occur within the national seashore (FFWCC 2018; MNHP 2018) (see the section “Threatened and Endangered Species and Species of Special Management Concern”). Bald eagles and osprey are also protected under

the Bald and Golden Eagle Protection Act and many of the migratory bird species known to occur within the national seashore are protected under the Migratory Bird Treaty Act. As described in chapter 2, the national seashore implements seasonal closures to further protect bald eagles, osprey, and shorebirds and their habitat from impacts due to public use, including PWC activity. Bird closures within both districts are reviewed annually (NPS 2004b).

Marine Mammals. Twenty-nine species of marine mammals are known to exist in the Gulf of Mexico: 28 species of dolphins and whales and one sirenien, the West Indian manatee (NMFS 2006). All of these species are protected under the Marine Mammal Protection Act of 1972, and the West Indian manatee is listed as threatened under the ESA. Many of these species are transient in nature and occur only in offshore waters (NMFS 2006). Only three species commonly occur at the national seashore: the bottlenose dolphin (*Tursiops truncatus*), Atlantic spotted dolphins (*Stenella frontalis*), and West Indian manatee (NPS 2004b). The West Indian manatee is discussed in greater detail in the "Threatened and Endangered Species and Species of Special Management Concern" section. Bottlenose dolphins are the most common marine mammal documented in the waters of the national seashore and frequently present in both the Florida and Mississippi Districts (NPS 2004b).

Marine Reptiles. Marine and estuarine reptile species potentially occurring at the national seashore include five species of sea turtles: the Atlantic loggerhead (*Caretta caretta*), green (*Chelonia mydas*), hawksbill (*Eretmochelys imbricate*), Kemp's ridley (*Lepidochelys kempii*), and leatherback (*Dermochelys coriacea*) (Chapman et al. 2004; MDWFP 2005; NPS 2005, 2011a) (see the "Threatened and Endangered Species and Species of Special Management Concern" section). Also, estuary bays, estuary marshes, Mississippi Sound, salt pannes, and seagrass beds provide habitat for Mississippi diamondback terrapins (Malaclemys terrapin pileata), which is abundant in the Mississippi District, particularly in Davis Bayou (NPS n.d.a), and coarse-textured beaches are very important nesting areas for this species (MDWFP 2005).

Fish (Estuary and Marine). More than 200 fish species have been documented in the waters in and around the national seashore (NPS 2005), including the federally endangered gulf sturgeon, described below under Threatened and Endangered Species and Species of Special Management Concern. Many larval and juvenile fish occupy the shallow waters and find protection in seagrass beds (discussed in the section "SAV / Shoreline Vegetation") (NPS 2011a). The 1996 Magnuson-Stevens Act requires cooperation among the National Marine Fisheries Service, (NMFS) fishing participants, and federal and state agencies to protect, conserve, and enhance essential fish habitats (EFH). EFH is defined as those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (16 USC 1802(10)) of ecologically or commercial important species of fish and invertebrates. EFH has been designated for several species of fish in the Florida and Mississippi Districts, including several commercial species such as red drum, gray snapper, Spanish mackerel, brown shrimp, white shrimp, pink shrimp, and stone crabs (NPS 2004b).

Invertebrates. There is incredible diversity of invertebrates near the national seashore, including cnidarians (jellyfish and sea anemones), chelicerates (horseshoe crabs), crustaceans (crabs and shrimp), echinoderms (starfish and sea urchins), mollusks (clams and snails), marine worms (ribbon worms and tube worms), and sponges (NPS 2011a). Brown, white, and pink shrimp are also found in the Mississippi Sound, while pink shrimp are more abundant than the other two species in Santa Rosa Sound (NPS 2005).

THREATENED AND ENDANGERED SPECIES AND SPECIES OF SPECIAL MANAGEMENT CONCERN

The national seashore is home to a variety of special-status species including mammals, birds, reptiles, fish, plants, and invertebrates. Special-status species known to occur within the national seashore boundaries but outside the project area were excluded from analysis because they would not be affected by the alternatives. Special-status species that may occur within the national seashore and could be

affected by the alternatives are listed below in table 7, along with their federal and state statuses. Detailed descriptions of the species evaluated in the plan/EIS are found in appendix G.

TABLE 7. SPECIAL-STATUS SPECIES LIKELY TO OCCUR IN PROJECT AREA

Common Name	Scientific Name	Federal Status	FL Status	MS Status
Terrestrial Mammals				
Perdido Key Beach Mouse	*Peromyscus polionotus tryssyllepsis*	E		
Marine Mammals				
West Indian Manatee	*Trichechus manatus*	T		E
Birds				
American Oystercatcher	*Haematopus palliates*		T	
Bald Eagle	*Haliaeetus leucocephalus*	[a]		
Black Skimmer	*Rynchops niger*		T	
Brown Pelican	*Pelecanus occidentalis*			E
Least Tern	*Sternula antillarum*		T	
Little Blue Heron	*Egretta caerulea*		T	
Marian's Marsh Wren	*Cistothorus palustris marianae*		T	
Peregrine Falcon	*Falco peregrinus*			E
Piping Plover	*Charadrius melodus*	T		E
Reddish Egret	*Egretta rufescens*		T	
Red Knot	*Calidris canutus rufa*	T		
Southeastern Snowy Plover	*Charadrius nivosus*		T	E
Tricolored Heron	*Egretta tricolor*		T	
Wood Stork	*Mycteria americana*	T		E
Reptiles				
American Alligator	*Alligator mississippiensis*	T (SOA)		
Green Sea Turtle	*Chelonia mydas*	T		E
Hawksbill Sea Turtle	*Eretmochelys imbricate*	E		E
Kemp's Ridley Sea Turtle	*Lepidochelys kempii*	E		E
Leatherback Sea Turtle	*Dermochelys coriacea*	E		E
Loggerhead Sea Turtle	*Caretta*	T		E
Fish				
Gulf Sturgeon	*Acipenser oxyrinchus desotoi*	E		E
Saltmarsh Topminnow	*Fundulus jenkinsi*	C	T	

Sources: FFWCC 2018; MNHP 2018

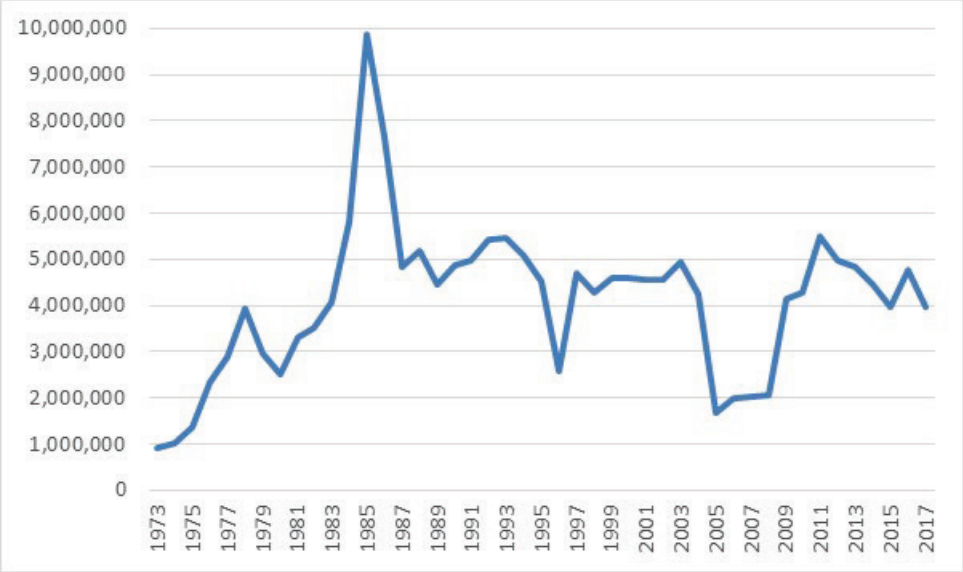
Key: E = endangered; T = threatened; C = candidate species; T (SOA) = threatened due to similarity of appearance; SSC = species of special concern

a. The bald eagle has been delisted at the federal level due to recovery but remains protected under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act.

VISITOR USE AND EXPERIENCE

The national seashore is one of the most heavily visited seashores in the national park system, as well as one of the most visited national park system units overall. The national seashore attracts visitors from throughout the nation, who come to enjoy the beach and cultural and historic features this national seashore has to offer. Although the national seashore is open year-round, visitation peaks between May and August (NPS 2011a). Annual visitation typically ranges between four and five million visitors (NPS 2018b), although this fluctuates depending on the prevalence of hurricanes. Visitation trends from 1973 to 2017 are shown in figure 2. Some areas within the national seashore can be accessed by land; however, because more than 80% of the national seashore area is classified as submerged lands, most areas can

only be accessed by water; those opportunities related to or accessed by PWC use are discussed below. The national seashore is located in three counties in Florida (Escambia, Okaloosa, and Santa Rosa) and two counties in Mississippi (Jackson and Harrison). Between Florida and Mississippi are two Alabama counties, Mobile and Baldwin. The affected environment for Visitor Use and Experience includes the five counties in which the national seashore is located, in addition to the two adjacent Alabama counties.



Source: NPS 2018b.

FIGURE 2. ANNUAL RECREATIONAL VISITATION AT GULF ISLANDS NATIONAL SEASHORE, 1973–2017

In the Florida District, the Fort Pickens and Santa Rosa areas have typically been some of the more heavily visited areas. Visitation by boat is likely higher, as it was not possible to count all of the boats in the Florida District. In the Mississippi District, the data indicate that the majority of visitors access the national seashore by road. For the years in which data are reported in table 8, between 1.8% and 8.1% of visitors in the Mississippi District did so by private boat.

TABLE 8. VISITATION BY DISTRICT AND AREA WITHIN GULF ISLANDS NATIONAL SEASHORE FOR SELECT YEARS, 1998–2017

Visit Location and State	1998	2003	2008	2013	2017
State of Florida					
Fort Pickens	589,826	644,334	0[a]	1,255,183	611,817
Santa Rosa Area	1,715,835	2,341,657	128,997	2,149,906	1,616,574
Perdido Key	442,863	569,056	393,540	264,434	354,117
Navy Live Oaks Visitor Center	163,954	157,759	237,926	50,769	177,956
Navy Live Oaks Picnic Area	10,067	37,533	34,380	13,087	130,850
Youth Group CG Road	42,225	69,536	34,106	26,880	32,580
Okaloosa	189,109	255,782	225,143	134,991	161,798
Redoubt/Barrancas	52,472	35,926	38,077	37,345	18,920
Visitors by Boat (via rental)	94,840	66,000	79,440	9,872	N/A[b]
Bus Visitors	15,950	N/A[b]	N/A[b]	N/A[b]	N/A[b]
Total Visitors	3,317,141	4,177,583	1,171,609	3,942,467	3,104,612

Visit Location and State	1998	2003	2008	2013	2017
State of Mississippi					
National Seashore Road	641,501	817,786	807,161	884,827	800,877
Tour Boats	60,783	65,327	37,418	44,418	47,452
Private Boat (visitors with boat ownership)	95,621	77,075	37,052	17,279	N/A[b]
Bus Visitors	7,240	3,600	960	880	N/A[b]
Total Visitors	1,181,146	963,787	882,592	947,404	848,329

Source: NPS 2018b. These numbers are based on NPS counting procedure developed for the national seashore (NPS 2016b). December year to date information for each year shown.

a. There were no visitors to Fort Pickens due to a road closure.

b. Visitors by rental boat (Florida District), private boat (Mississippi District), and/or bus (Florida District) not counted

PWC Use at Gulf Islands National Seashore and Vicinity. PWC use is currently permitted in all waters of the national seashore where other motorized water-borne vessels are allowed following the restrictions detailed under alternative B. PWC and other watercraft are required to be registered in the states of Florida and Mississippi. Current registration data available from the state of Florida do not separate vessel type except by class (length) (FLHSMV 2014). However, data from 2016 show that PWC registered in the Florida District counties represented between 11.2% and 17.9% of all registered vessels. Escambia County had the fewest registered PWC (1,737), while Okaloosa County had the most (3,342) (shown in table 9). The percentage of registered PWC that were privately owned ranged from 90.3% to 97.7% (FFWCC 2017a). Similar data were not available for Mississippi.

Before 2003, manufacturers were producing PWC with two-stroke engines that had 90% more emissions than four-stroke engines (PWIA 2011). After 2003, all PWC manufacturers began producing models with four-stroke engines because they are cleaner and more efficient. As of May 2018, there were a total of 7,742 registered PWC in five counties surrounding the national seashore (table 101). Okaloosa (Florida) had the highest number of registered PWC with 2,673, and the lowest number was 785 in Jackson (Mississippi) (NMMA 2018). This is consistent with registration data from 2014 as well, as shown in table 10 below. Between 2014 and 2018, the percentage of PWC registered that were model year 2010 or newer increased from 23% to 45% of registrations. Likewise, those that were model year 2003 or newer also increased from 64% to 76% (table 11). Both of these trends indicate that the number of older model PWC is being reduced over time.

TABLE 9. 2016 PWC AND VESSEL REGISTRATION BY FLORIDA COUNTY ADJACENT TO GULF ISLANDS NATIONAL SEASHORE

Indicator		Escambia County	Okaloosa County	Santa Rosa County
Registered PWC	Privately Owned	1,697 (97.7%)	3,019 (90.3%)	1,903 (96.5%)
	Rental	40 (2.3%)	323 (9.7%)	68 (3.5%)
	Total PWC	1,737	3,342	1,971
Total Recreational Vessels		15,115	17,909	14,150
Total Vessels		15,503	18,583	14,443
Registered PWC as a % of Total Registered Vessels		11.2%	17.9%	13.6%

Source: FFWCC 2017a.

TABLE 10. NUMBER OF PWC REGISTERED IN THE FIVE COUNTIES SURROUNDING THE NATIONAL SEASHORE

Counties	2014	2018
PWC Registered in Escambia, FL	1,359	1,429
PWC Registered in Okaloosa, FL	2,470	2,673
PWC Registered in Santa Rosa, FL	1,707	1,806
PWC Registered in Harrison, MS	1,036	1,049
PWC Registered in Jackson, MS	917	785
Total	7,489	7,742

Source NMMA 2018, 2014

TABLE 11. AGE OF REGISTERED PWC IN THE AREA OF GULF ISLANDS NATIONAL SEASHORE

	2014 Data	2018 Data
2010 or newer	1,728	3,463
% of fleet	23.1	44.7
2003 or newer	4,783	5,914
% of fleet	63.9	76.4

Source: NMMA 2014, 2018

PWC Observation Study at Gulf Islands National Seashore (2013 and 2015). In 2013, NPS conducted a study within the national seashore to determine the level of PWC use to inform the national seashore concerns about PWC use in the development of this plan/EIS. The survey was developed through a collaborative process and included NPS staff, field personnel, and subject-matter experts. It was understood there may be caveats to the data and these counts should be taken into consideration with the PWC count report and the methodology used. This survey is available as a separate report (Volkert 2015). PWC counts—all of which took place on weekends for logistical reasons—were conducted on May 26 (Memorial Day weekend), June 22 and 23, and August 4, 2013. Summer dates and a holiday weekend were selected because PWC use is often higher in the summer than during colder months. PWC counts took place at 11 designated stations, 6 in Florida, and 5 in Mississippi. Table 12 shows Florida and Mississippi counting locations. Additional surveys were taken by NPS in 2015 at Santa Rosa Island (Station PC 01) and Perdido Key Point (Station PC 06) on July 1 (a Wednesday), and at Destin (Crab Island) on July 2 (a Thursday, but immediately before the July 4 weekend), in order to capture use in the Okaloosa/Choctawhatchee Bay that was not included in the first counts and to obtain an estimate for weekday usage. The PWC counters typically conducted surveys from 8:00 a.m. until 8:00 p.m., though severe weather and low PWC counts at the end of the day influenced when the surveys were completed. The surveyors observed 10 PWC at the Santa Rosa Island location (PC 01), and 19 PWC at Perdido Key Point (PC 06) on July 1, and 202 PWC at Crab Island on July 2 (see table 13).

TABLE 12. PWC COUNTS BY STATION AND DATE (2013)

PWC Count Locations	May 26, 2013 (Memorial Day)	June 22, 2013 (Saturday)	June 23, 2013 (Sunday)	August 4, 2013 (Sunday)
Florida District Stations				
PC 01 (Santa Rosa Island – west of Navarre Beach at property entrance)	50	44	12	19
PC 02 (Opal Beach near parking lot 10)	15	16	9	9
PC 03 (Ft. Pickens, west of property entrance)	23	12	No data	17
PC 04 (Ft. Pickens on ferry dock)	35	21	8	36
Subtotal – Santa Rosa Sound	**123**	**93**	**29**	**81**
PC 05 (Perdido Key at dune crossover D)	48	26	21	42
PC 06 (Perdido Key near Spanish Cove at Robertson Island)	129	34	24	43
Subtotal – Perdido Key / Big Lagoon	**177**	**60**	**45**	**85**
Total – Florida District	**300**	**153**	**74**	**166**
Mississippi District Stations				
PC 07 (West Petit Bois)	2	0	0	0
PC 08 (West Petit Bois, east end)	5	0	0	2
PC 09 (Horn Island East)	3	2	0	1
PC 10 (Horn Island West)	24	0	7	6
PC 11 (East Ship Island, east end of island)	4	0	0	0
Total – Mississippi District	**38**	**2**	**7**	**9**
Total of All Stations within the National Seashore	**338**	**155**	**81**	**175**

Source: Volkert 2015.
Numbers shown above and used in subsequent analysis in chapter 4 were based on unique sightings of PWC.

TABLE 13. PWC COUNTS BY STATION AND DATE – FLORIDA (2015)

PWC Count Locations	July 1, 2015 (Wednesday)	July 2, 2015 (Thursday)
Crab Island (Choctawhatchee Bay)	N/A	202
PC 01(Santa Rosa Island, west of Navarre Beach at property entrance)	10	N/A
PC 06 Perdido Key Point	19	N/A
Total	**29**	**202**

Source: NPS 2015a

Station PC 01, located at Santa Rosa Island, was the eastern most station, while PC 11 at East Ship Island was the westernmost station (table 12). In the Florida District, PC 06, located in the vicinity of Perdido Key (near Spanish Cove at Robertson Island), generally had the greatest PWC volumes. Robertson and Santa Rosa Islands (PC 05 and PC 01) were other popular locations for PWC use. In the Mississippi District, the western part of Horn Island (PC 10) generally had the greatest PWC volumes (Volkert 2015). Because the islands in the Mississippi District are up to 11 miles away from the mainland (making them less conducive for PWC access), Florida had more active stations for PWC observations than Mississippi. In the additional counts that were taken in 2015, Crab Island (Choctawhatchee Bay) exhibited relatively high PWC activity (NPS 2015a). During PWC counts, counters were able to observe how PWC users complied with site-specific regulations for PWC operations (Volkert 2015). The more active stations were more likely to have PWC operators that did not act in accordance with existing flat-wake zone requirements. There was only one instance recorded of a PWC operating closer than 200 feet from a non-motorized vessel. Vessels also violated the no-wake regulation. Other non-compliance issues observed

included the operation of a PWC within the lagoons on the north side of Perdido Key and the operation of a PWC within 200 feet of a swimmer or an unassociated boat.

General Watercraft Use (Motorboats, Canoes, and Kayaks). Water-borne vessels have been permitted within the national seashore since it was established in 1971. While boating is not specifically identified in the enabling legislation for the national seashore, it is recognized as a mode of access for many visitors because of the national seashore's spatial distribution as a series of islands and submerged features. Boating occurs in all marine waters of the national seashore; however, the northern sides of the barrier islands are more popular than the southern sides. Boats are permitted to moor on all shores of the national seashore, except in areas with designated closures. NPS performed an aerial count of vessels during the summer of 2013 on a non-holiday (August 3, 2013) and holiday weekend (September 2, 2013) to obtain data on the number of recreating boats, kayaks, and PWC in popular areas at the national seashore (NPS 2013b). While the objective of the PWC counts, described above, was to gauge the number and behavior of PWC observed on a given day, the aerial observations served to capture exactly where boating was occurring, at a snapshot in time. Table 14 and figures 3a and 3b show the results of the 2013 aerial counts for both districts.

TABLE 14. AERIAL PWC COUNTS AT THE NATIONAL SEASHORE (2013)

	Florida District	Mississippi District
Non-holiday weekend boats	2,890	527
Non-holiday weekend Kayaks	471	3
Non-holiday weekend PWC	514	18
Non-holiday weekend total	**3,875**	**548**
Holiday weekend boats	2,373	272
Holiday weekend Kayaks	266	9
Holiday weekend PWC	442	10
Holiday weekend total	**3,181**	**291**

From the aerial study, it was observed that in the Florida district, boats and PWC typically concentrate on the northern shores of the barrier islands. Heavy concentrations of both boats and PWC were primarily observed on Pensacola Beach and Navarre Beach, areas of Santa Rosa Island, and the east end of Okaloosa and Crab Island. In the Mississippi District, boats congregated on the shores of East and West Ship Island, as well as the east end and north shore of Horn Island. PWC were concentrated primarily on the west end of Horn Island, as similarly observed in the 2015 PWC study, and were also observed in high concentrations on West Petit Bois Island.

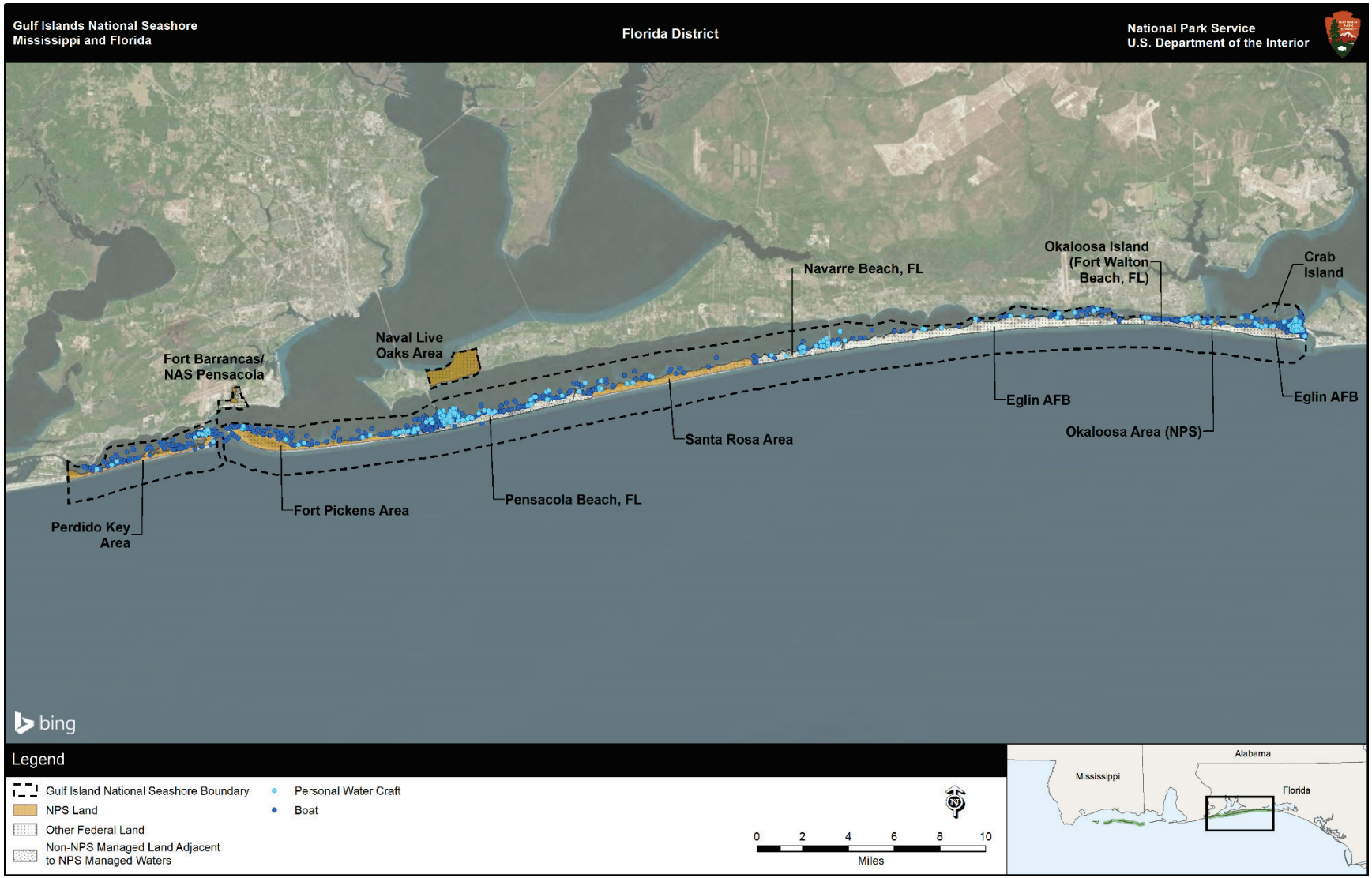


FIGURE 3A. PWC AND BOAT LOCATIONS AND CONCENTRATIONS FROM THE AERIAL COUNT

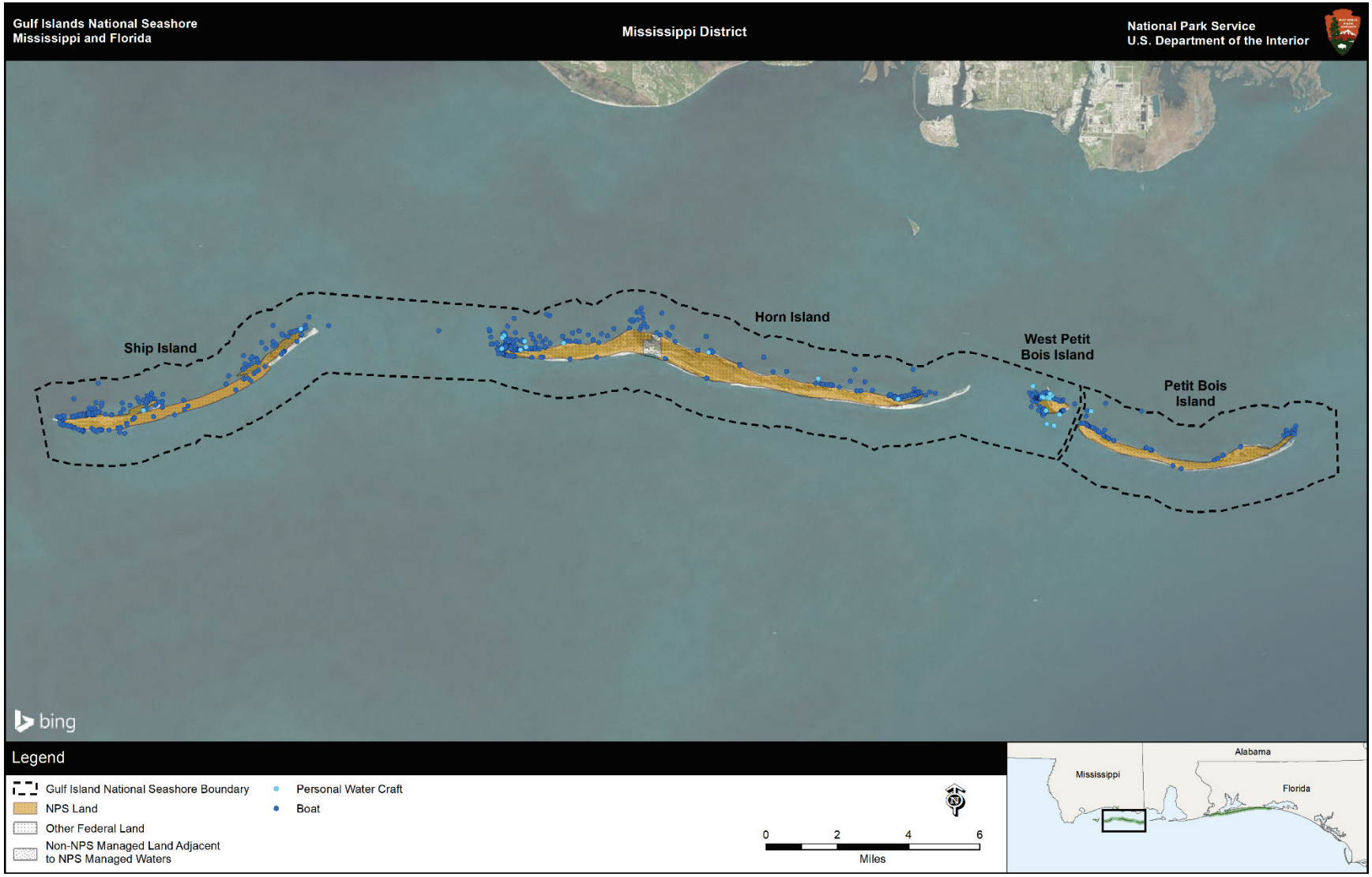


FIGURE 3B. PWC AND BOAT LOCATIONS AND CONCENTRATIONS FROM THE AERIAL COUNT

In the Florida District, there is an NPS-owned boat launch in the Okaloosa area and another for kayaks and canoes in Perdido Key, which has the most concentrated boating use. The NPS-owned boat launch in the Okaloosa area is currently in need of repair and is only appropriate for launching kayaks and canoes, though after repairs it will be able to launch motorized boats as well. In 2016, there were a total of 931,450 vessels registered in Florida, 15,503 of which were registered in Escambia County, 18,583 in Okaloosa County, and 14,443 in Santa Rosa County (FLHSMV 2016). Recreational fishing boats are often present along the Gulf shore of Santa Rosa Island. It is not uncommon for boats to traverse waters within the national seashore to access Pensacola Bay and the area north of Santa Rosa Island. Popular nonmotorized water uses include canoes, sea kayaks, sailboats, stand up paddleboards, and sailboards. There is a free kayak touring program led by the NPS in both districts of the national seashore (Bromley 2014). Kayak programs in the Mississippi District can accommodate up to 8 visitors at a time, while programs in the Florida district can accommodate up to 16 visitors. Programs in each district run for approximately one hour per group (NPS 2018c, 2018a).

In the Mississippi District, there is an NPS-owned boat launch at Davis Bayou. The most concentrated boating use in the Mississippi District is within the vicinity of the east and west tips of the barrier islands, around the West Ship Island pier, and along the entire north shore of West Petit Bois Island. Spring and summer weekends experience high boating volumes, particularly at Horn Island (NPS 2011a). The Mississippi District also has a NPS concession operated ferry that brings visitors to West Ship Island. The ferry runs from March to October. There have been no observed or reported conflicts between PWC users and other boaters in either district (Bromley 2014).

Other Recreational Activities. Visitors can use PWC to access a variety of recreational experiences across the national seashore including picnicking, camping, swimming, snorkeling and scuba diving, fishing, and bird watching.

SOCIOECONOMICS

The social and economic conditions of a region are characterized by its demographic composition, structure, and size of its economy, and types and levels of service and social qualities and factors available to its citizens. The national seashore provides recreational opportunities, quality of life factors, and other amenities to both visitors and residents of the region that contribute to the social and economic conditions of the region. In addition to examining the surrounding communities, a survey of eight local PWC rental operators within the Florida District within the ROI was conducted in 2017 to assist in the evaluation of potential impacts to such businesses under each action alternative (Louis Berger 2017). No PWC operations have been identified in the Mississippi District.

The companies that responded to the phone survey were Key Sailing, Crab Island Watersports, Portofino Island Resort, Radical Rides, Fudpuckers Watersports, Adventure Marina, Xtreme Watersports, and Navarre Family Watersports. PWC rental operators were asked questions about local PWC launch locations, the length of the PWC operating season, the number of PWC available for rent, and operational restrictions. Between these companies, the operating season varied from four months, to year-round, and the number of PWC available for rent ranged between six and 20. With the exception of one rental operator, all PWC launch locations occur at the same site as the rental location, and the majority of rental operators were aware of the national seashore boundary (Louis Berger 2017). Geographic operational boundaries are expanded upon and discussed further in chapter 4 where potential impacts to these areas under each alternative are evaluated.

Socioeconomic ROI. The five counties in which the national seashore is located, in addition to the two adjacent Alabama counties (see above), are represented in the ROI for this analysis. Social and economic characteristics within the ROI are summarized below. National seashore visitor spending supports the economy in many communities in proximity to the national seashore, including business and employment in hotel accommodations, food and beverage establishments, retail, and other recreational service sectors. Given the large geographic area that the national seashore spans, and the ability for visitors (particularly PWC and other watercraft users) to access the national seashore from coastal communities, the potential

exists for there to be numerous communities that experience economic benefits from visitation to the national seashore. Those communities in which the visitor centers for the national seashore are located are also described below. Additional information on demographic characteristics and employment characteristics, including those of the gateway communities, is provided in appendix I.

National Seashore Economic Impacts to Local Economies. Visitation to the national seashore and associated spending contribute to local and regional economies. The 2016 National Park Visitor Spending Effects report (NPS 2017b) provides estimates of visitor spending associated with parks and describes the economic contribution of this spending in terms of jobs, income, and value added. The report measures value added as the contribution of NPS visitor spending to the gross domestic product of a regional economy, and is defined as the difference between the amount an industry sells a product for and the cost of production for the product (NPS 2017b).NPS's Visitor Spending Effects Model estimates visitor spending by visitor type (i.e., local day trips, nonlocal trips, overnight stays, and camping) and applies multipliers to estimate these effects on local and regional economies within proximity to parks. Visitor spending within the local gateway region for each park unit is provided. NPS defines the local gateway region as all counties contained within or intersecting a 60-mile radius around the national seashore boundary. The report allocates visitors and associated spending to parks located in more than one state. This information is based on percentages provided by NPS's Public Use Statistics Office and assumes that spending and economic impacts are proportional to where recreational visits are assigned. For the national seashore, the allocated percent of visitors to the state of Florida is approximately 75%, and approximately 25% in Mississippi (NPS 2017b). There were an estimated 4,771,308 visitors to the national seashore in 2016, with $206.6 million in visitor spending, as shown in table 15 (NPS 2017b). As of 2016, visitor spending supported $90 million in labor income and $145.9 million in value added (NPS 2017b). In 2015, the last year for which local and non-local visitor spending was reported, non-local visitation and associated spending in and around the national seashore supported approximately 2,220 jobs, with 1,665 jobs in Florida and 555 jobs in Mississippi (NPS 2015b). In 2015 non-local spending supported $66.9 million in labor income and 108.8 million in value added. Approximately $67,387 in nonlocal visitor spending supported one local job (NPS 2015b)[1].

TABLE 15. 2016 NATIONAL SEASHORE VISITOR SPENDING AND OVERALL ECONOMIC CONTRIBUTION

Indicator	Total National Seashore
National Seashore Visitors	4,771,308
Visitor Spending	$206,607,700
Jobs Supported by Visitor Spending	3,000
Labor Income by Visitor Spending	$90,031,600
Value Added by Visitor Spending	$145,918,800

Source: NPS 2017b.

WILDERNESS

Congressional intent for the meaning of wilderness character is expressed in the Definition of Wilderness, Section 2(c) of the 1964 Wilderness Act. The Forest Service national framework applied this legal definition to identify four tangible qualities of wilderness that make the idealized description of wilderness character relevant and practical to wilderness stewardship (USDA 2008):

Untrammeled—The Wilderness Act states that wilderness is "an area where the earth and its community of life are untrammeled by man," and "generally appears to have been affected primarily by the forces of nature." In short, wilderness is essentially unhindered and free from modern human control or

[1] Estimates taken from the *2015 NPS Economic benefits to local communities from national park visitation and payroll* report (NPS 2015b). Economic impacts were only estimated for nonlocal visitor spending because it is assumed that local visitors do not introduce new money or spending in the region as result of their visit to the national seashore.

manipulation. This quality is degraded by modern human activities or actions that control or manipulate the components or processes of ecological systems inside the wilderness.

Natural—The Wilderness Act states that wilderness is "protected and managed so as to preserve its natural conditions." In short, wilderness ecological systems are substantially free from the effects of modern civilization. This quality is degraded by intended or unintended effects of modern people on the ecological systems inside the wilderness since the area was designated.

Undeveloped—The Wilderness Act states that wilderness is "an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation," "where man himself is a visitor who does not remain" and "with the imprint of man's work substantially unnoticeable." This quality is degraded by the presence of structures, installations, habitations, and by the use of motor vehicles, motorized equipment, or mechanical transport that increases people's ability to occupy or modify the environment.

Solitude or a primitive and unconfined type of recreation—The Wilderness Act states that wilderness has "outstanding opportunities for solitude or a primitive and unconfined type of recreation." This quality is about the opportunity for people to experience wilderness; it is not directly about visitor experiences per se. This quality is degraded by settings or management actions that increase visitor encounters, signs of modern civilization, and recreation facilities.

In addition to the four tangible qualities related to wilderness character used in this interagency strategy, there are also important intangible aspects of wilderness character that would be difficult or even impossible to quantify or monitor. These intangible aspects are diverse and include the scenic beauty and immensity of an area and the opportunity for self-discovery, self-reliance, and challenge that comes from wilderness settings.

In 1978, Congress designated Horn and Petit Bois Islands as wilderness under the 1964 Wilderness Act, protecting the wilderness character of two of the last undisturbed barrier islands along the Atlantic Ocean and Gulf of Mexico. Since the Mississippi District islands are not linked to the mainland by road, they still provide a primitive undeveloped character that is almost unprecedented in public parkland located so close to intensely developed and populated areas (NPS 2004b). Similarly, the wilderness islands provide visitors with an untrammeled, natural setting, which is consistent with the wilderness designation. Although there are some audible and visual disturbances from the presence of motorized vessels adjacent to the wilderness islands, wilderness character on Horn and Petit Bois Islands is largely preserved. All land except 7 acres on Horn Island (3,650 acres) is wilderness or potential wilderness. The potential wilderness area includes privately owned tracts, lands partially owned by the federal government, and an administrative enclave at the ranger station. On Petit Bois Island (1,466 acres), all land is wilderness (NPS 2014a). The following activities connected with recreational visitation are prohibited on the wilderness islands: vehicles, bicycles, walking on the dunes, collecting sea oats, feeding wildlife, pets, and bringing glass containers (i.e., bottles) into wilderness.

Horn Island has roughly seven acres that hold: a boat dock; a generator building; a fenced compound which includes a national seashore staff residence and a maintenance building; and a fenced area holding a telecommunications tower and two photovoltaic panels (NPS 2004b).The presence of manmade structures and equipment as well as the noise associated with management activities within this area of Horn Island diminish the wilderness qualities of the island. This does not, however, compromise the wilderness standing of Horn Island, because these structures and equipment are confined to a specific and limited area. There are no administrative facilities on Petit Bois Island and no specialized equipment is needed for wilderness management (NPS 2004b).

Wilderness Opportunities. The national seashore's wilderness provides many recreational opportunities. Visitors access the wilderness islands via watercraft, primarily motorized watercraft. Visitors to the wilderness areas enjoy a preserved natural area, clean water, and habitat for a variety of plants and wildlife including rare and endangered species (wilderness.net n.d.). However, motorized vessels

operating near the wilderness islands can detract from the existing conditions of wilderness character (natural, undeveloped and solitude or primitive and unconfined recreation), primarily due to the noise from those vessels. Visitors can also enjoy recreational activities like hiking, wilderness camping, bird watching, fishing, swimming, and stargazing. Surf fishing is a popular activity among visitors with the potential to catch mackerel, red drum, and sea trout. No motorized vessels are allowed on the interior ponds and lagoons of the islands and restrictions on access are enforced for critical seagrass habitat protection. Wilderness camping is available year-round, although for groups of over 10 individuals a permit is required.

PWC in and Adjacent to Wilderness Areas. As noted previously, PWC are not permitted above the mean high tide line on the designated wilderness islands of Horn and Petit Bois (NPS 2004a). Currently, there is also a 0.5-mile flat-wake zone surrounding the islands. There are currently no additional limitations prohibiting PWC landing on the wilderness islands. Horn and Petit Bois Islands are accessible by boat (landing below the high-water line) for day and overnight use (NPS 2011a). Most PWC use at these islands occurs at the east and west ends where concentrated PWC operations could potentially disturb visitors and wildlife (NPS 2004a).

CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

This "Environmental Consequences" chapter analyzes the beneficial and adverse impacts that would result from implementation of any of the alternatives considered in this plan/EIS. The resource topic presented in this chapter corresponds to the descriptions of existing conditions in chapter 3.

METHODOLOGY FOR ASSESSING IMPACTS

A substantial body of scientific literature has described the effects of PWC on the environment. The NPS interdisciplinary planning team reviewed literature and studies applicable to the region and setting and the resources being evaluated. This information was used to augment the on-site observations and documentation gathered by NPS personnel at the national seashore and the advice of internal and external resource management experts to support the qualitative and quantitative statements presented in this impact analysis section. When resource-specific data, observations, studies, or other evidence are available, these resources are noted in the "Methods and Assumptions" section for each impact topic. Geographic information system (GIS) analysis also contributed to the assessment of impacts for several topics. In order to determine environmental consequences, all anticipated impacts from the proposed alternatives and actions are compared to the existing conditions of the resources at the national seashore; that is, the baseline condition to which impacts are compared is the existing condition of those resources. The following guiding assumptions were used for this analysis:

Period for Impact Analysis. This analysis assumes that this plan/EIS would manage PWC use at the national seashore for the next 10 to 15 years or until conditions necessitate revising the plan.

Analysis Area. The geographic study area for this plan/EIS is the national seashore. The analysis area may be adjusted to reflect each impact topic as deemed necessary. These adjustments are explained in the "Area of Analysis" section associated with each impact topic, as applicable. As noted in chapter 1, where the analysis refers to East Ship and West Ship Islands, it is referencing those areas of the reconnected Ship Island. Any changes to the impact analysis from these two islands becoming one land area would be minimal and within the range of impacts discussed in this chapter.

Type and Duration of Impacts. The following types of impacts are assessed:

Direct and Indirect. Direct impacts would occur as a result of the proposed action at the same time and place of implementation (40 CFR 1508.8). Indirect impacts would occur as a result of the proposed action but later in time or farther in distance from the action (40 CFR 1508.8).

Cumulative. 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 nonfederal) or person undertakes such other actions (40 CFR 1508.7).

Duration. Duration describes the length of time over which an effect may occur. For example, impacts could occur over minutes, days, months, or years. The analysis includes a description of the expected time frame over which impacts are expected. Short-term impacts would be short in duration and would not persist long after implementation. Long-term impacts associated with the action alternatives would generally be those that occur after implementation and persist beyond 1 year.

ASSESSING IMPACTS USING CEQ CRITERIA

The impacts of the alternatives are assessed using the CEQ definition of "significantly" (40 CFR 1508.27), which requires consideration of both context and intensity:

(a) **Context**. This means that the significance of an action must be analyzed in several contexts such as society as a whole (human, national), the affected region, the affected interests, and the locality. Significance varies with the setting of the proposed action. For instance, in the case of a

site-specific action, significance would usually depend upon the effects in the locale rather than in the world as a whole. Both short- and long-term effects are relevant.

(b) **Intensity**. This refers to the severity of impact.

For each impact topic, a discussion of the potential context and intensity of impacts is provided in the "Conclusion" section that follows the discussion of the impacts under a topic. If it is determined that an impact to a resource is significant, it is noted in the discussion of that particular impact topic.

Cumulative Impacts Analysis Methods

Cumulative impacts were determined by combining the impacts of each alternative with the impacts of other past, present, and reasonably foreseeable future actions. Therefore, it was necessary to identify other past, ongoing, or reasonably foreseeable future projects and plans that are impacting or will impact the same resources that will be affected by actions taken under any of the alternatives under consideration (table 16). Following CEQ guidance, past actions were included, "to the extent that they are relevant and useful in analyzing whether the reasonably foreseeable effects of the agency proposal for the actions and its alternatives may have a continuing, additive, and significant relationship to those effects" (CEQ 2005).

TABLE 16. CUMULATIVE IMPACT SCENARIO

Cumulative Action	Description	Resource(s) Affected
Boat traffic (inboard and outboard, non PWC-pleasure and commercial)	Boats use the same areas as PWC; estimates of boat numbers at the national seashore are provided based on aerial counts.	Water quality, air quality, acoustic environment, SAV/shoreline vegetation, wildlife and wildlife habitat, threatened and endangered species and species of management concern, visitor use and experience, socioeconomics, wilderness
Continued maintenance dredging and spoil disposal from three ship channels that cross the national seashore	Ongoing process that is expected to continue to keep waterways open for large vessels.	Water quality, acoustic environment, wildlife and wildlife habitat, threatened and endangered species and species of management concern, visitor use and experience
Military related operations and activities	Coast Guard patrols in waters around the national seashore, US Navy operations air units practice sessions each week during the summer; Marine Corps amphibious unit operations at eastern edge of national seashore: two to three per year.	Water quality, acoustic environment (air units), wildlife and wildlife habitat, threatened and endangered species and species of management concern, visitor use and experience
MsCIP actions	The proposed Comprehensive Barrier Island Restoration as described in the MsCIP PEIS includes the restoration of the Mississippi District islands through the placement of up to 22 million cubic yards (mcy) of sand within the national seashore's Mississippi unit and an undetermined quantity of sand near Cat Island. This action involves filling Camille Cut, the 3.5-mile breach in Ship Island.	Water quality, wildlife and wildlife habitat, SAV/shoreline vegetation, visitor use and experience
DWH Natural Resource Damage Assessment (NRDA) Emergency SAV Restoration	Emergency seagrass restoration has been completed to address spill-related injuries to seagrasses in the Gulf of Mexico from the DWH spill. Some of the restoration area was near or within the Florida District of the national seashore. All areas have been restored and are in their second or third year of monitoring.	SAV/shoreline vegetation, wildlife and wildlife habitat, threatened and endangered species and species of management concern

Cumulative Action	Description	Resource(s) Affected
DWH NRDA Early Restoration Projects - Florida District Passenger Ferry to the national seashore	The ferry is currently in operation and operates in same waterways as PWC and could increase number of non-PWC visitors to the national seashore as well increase air and noise emissions.	Water quality, air quality, acoustic environment, wildlife and wildlife habitat, threatened and endangered species and species of management concern, visitor use and experience, socioeconomics
DWH NRDA Early Restoration Projects - Norriego Point	The project is adjacent to the eastern extent of Florida District of the national seashore and will involve the construction of several erosion control structures and expand the land area lost over time. Two new embayments will provide additional swimming areas as well as more space for boats and kayaks to pull in.	Water quality, air quality, acoustic environment, SAV/shoreline vegetation, wildlife and wildlife habitat, threatened and endangered species and species of management concern, visitor use and experience, socioeconomics
DWH NRDA Compensatory Restoration Projects - SAV Restoration at the national seashore (Florida District)	Project would restore 0.02 acres of seagrass injured by propeller scars, blow holes and human foot traffic, primarily in turtle grass habitats on Department of Interior-managed lands located along the south side of the Naval Live Oaks Preserve in Santa Rosa Sound. Project activities would include harvesting and transplanting seagrass, installing bird stakes to condition sediments to promote seagrass survival, and signage to educate visitors about the restoration project and the ecological importance of seagrass.	SAV/shoreline vegetation, wildlife and wildlife habitat, threatened and endangered species and species of management concern, visitor use and experience

GENERAL ASSUMPTIONS

Appendix H provides general assumptions related to the number of PWC and motorboats at the national seashore.

WATER QUALITY

Methods and Assumptions

Emissions of pollutants of concern in gasoline and exhaust associated with each of the alternatives were compared to existing water quality conditions and to appropriate water quality criteria or other ecotoxicological and human health toxicity benchmarks. These benchmarks are an appropriate metric for analyzing potential impacts to water quality because they represent levels at which impacts to the environment or human health would be likely to occur, based on the best available science. In addition, national and state antidegradation policies were considered, along with available surface water quality data and information about the fate and transport of chemicals in water. The steps that were used to determine the effects of PWC discharges (also called emissions) on water quality included the following:

1. Emissions of the pollutants of concern to the water during PWC operational hours were estimated, based on values acquired from scientific literature.
2. The total loading of the pollutants to the water was calculated for a “high-use” scenario day, based on the estimated numbers and hours of PWC use and the estimated concentrations of emissions (appendix E, table E-1). Loading is a product of the concentration of the pollutant in gas/oil and/or exhaust; the rate of discharge of the engine (based on two-stroke or four-stroke operation); and the running time of the engine. Use of a “high-use” day is a conservative approach and represents a worst-case scenario for assessing water quality impacts; water quality impacts would be much less on average use days and during the shoulder seasons, and would be essentially zero during the off season and at night when PWC are not used.
3. The volume of water required to dilute the calculated emission loading to the level of the water quality criterion or benchmark, referred to as the “threshold volume of water,” was calculated.

The toxicity benchmarks in appendix E were obtained from scientific literature and were used as a comparison tool in determining impacts.

4. The threshold volume of water was then compared to the volume of water available in the most limited mixing area used by PWC.
5. Other mechanisms that would result in the change in a pollutant concentration in water were qualitatively considered. Baseline water quality data were also examined.
6. Cumulative impacts were assessed by calculating the effects of emissions of other boats in national seashore waters used by PWC quantitatively, in the same manner as described above, and also qualitatively considering other sources of water quality impacts, in conjunction with the PWC emissions.

The water quality calculations described above assumed that 50% of PWC operating at the national seashore would be two-stroke and 50% four-stroke. The assumption of 50% two-stroke PWC is generally consistent with 2018 PWC registration data, which show 55.8% of PWC with a model year before 2010 (NMMA 2018). Additionally, because four-stroke engines do not mix oil with fuel and are designed for complete combustion before discharge, they emit 97% less pollution overall compared to conventional two-stroke engines (KIMO 2002; Long 1997), resulting in a negligible discharge of oil or gas to the water. Therefore, emissions to water from four-stroke marine engines were assumed to be zero. Additional detail about assumptions related to PWC and other watercraft use for the purposes of this analysis is provided in appendix H. It was assumed that minimal mixing would occur between flat-wake zones and areas open to full-throttle PWC use. Therefore, the volume of water available for dilution of pollutants was calculated by multiplying the acres of water open to full-throttle PWC use under each alternative by average depth within those areas. This means that if there is a larger flat-wake zone, and less water open for full-throttle PWC use, there is less water available for mixing. Conversely, if there is a reduced flat-wake zone, more water is available for mixing. However, changes in water volume under the alternatives would not make a meaningful change to water quality because the concentration of pollutants would not exceed ecotoxicological and human health toxicity benchmarks. Additional information on the steps used in the analysis of water quality is found in appendix E.

Area of Analysis

The areas of PWC and motorized boating activities summarized and evaluated for the Florida District include waters under the national seashore's jurisdiction soundside (north) of Perdido Key, soundside (north) of Santa Rosa Island, and the channel connecting the area east of Navarre and Destin, known as the Okaloosa area. For purposes of the analysis, the Okaloosa area was defined as beginning where the Santa Rosa sound channel narrows down considerably, about 6 miles east of the bridge at Navarre, and extending east to the end of the national seashore near Destin. The areas summarized and evaluated for the Mississippi District include waters under the national seashore's jurisdiction in the Mississippi Sound. No gulf (ocean) side waters were evaluated because of the general lack of PWC use in ocean waters. These areas are indicated on the tables presented in the impact analyses for all alternatives.

Potential Impacts on Water Quality from PWC Use

The adverse impacts on water quality from PWC (or any motorized boat) use are related to the discharge of unburned gasoline and gasoline additives, combustion byproducts, and the spilling of such components during refueling. Motorized watercraft can contribute to water pollution in the form of fuel, oil and other chemical discharges. The majority of this pollution is from two-stroke engines traditionally used on small PWC and other small boats with outboard engines, although the introduction of cleaner four-stroke engines, together with the increased use of modern unleaded fuels, have reduced this pollution (Prideaux 2012). The main chemical contaminants of concern in gasoline and its combustion byproducts are volatile monoaromatic hydrocarbons including BTEX and PAHs (Prideaux 2012). These compounds have variable levels of acute or chronic toxic effects on aquatic biota depending on the vulnerability of the organism and the length of exposure (Loong, Faithful, and Brodie 2001). The effect on different biota is

variable and based on factors such as a species' ability to metabolize harmful pollutants, bioaccumulation capacity, and life stage, in addition to physical environmental conditions. To assess these impacts, state and federal environmental agencies have established water quality criteria or developed benchmarks for the chemical concentration in the water below which there would not be unacceptable effects on human health or aquatic organisms. Appendix E provides a methodology for this analysis as well as an explanation of why the toxicity benchmark used in the analysis is appropriate and protective of resources at the national seashore.

The effects of these pollutants are dependent on their concentration in the water, which in turn depends on the amount of the chemical released from the motorized watercraft and the fate and transport of the chemical in the water. Many fate and transport mechanisms operate to alter the concentration of hydrocarbons that are released to ocean waters from PWC and other boat engines. Since these apply to all the alternatives for PWC use and the cumulative impacts of motorboat discharges, they are described below and are referred to in the analysis that follows.

Volatilization. In general, BTEX compounds are very volatile and very hydrophobic (low water solubility). Therefore, they do not persist in the aquatic surface water environment for long periods of time. Numerous studies have examined factors that influence the compositional evolution of oil spilled at the sea surface (Harrison et al. 1975; Boehm et al. 1982; Southworth, Herbes, and Allen 1983; Wolfe et al. 1994; NRC 2003), where evaporation and dissolution remove hydrocarbons from the floating fuel. When fuels come in contact with the water surface, highly volatile components such as BTEX, C3-benzenes, and naphthalene quickly volatilize and are rapidly lost to the atmosphere within hours to days, thereby limiting the extent of aqueous dissolution into the water column (Reddya et al. 2012). Both benzene (NPS 2003; EPA 2016) and toluene (WHO 2004) have half-lives in water of 5 hours at 25°C (77°F). Higher temperatures would increase the amount lost through volatilization. The water temperatures recorded during a sampling event at the national seashore on May 26, 2013 ranged from 77 to 79°F in Florida waters, and from 79 to 81°F in Mississippi waters (Volkert 2015), indicating that benzene and toluene would be rapidly removed from the water column during the peak PWC use season.

Tides, Currents, and Wave Action. The "available volume" of water used in the quantitative analysis in this section assumes an artificial boundary around a body of water for the purposes of calculating a concentration in a given area. However, this water will mix vertically and horizontally with contiguous waters, and the amount of mixing will vary from location to location depending on tidal flows and currents. Wave action would increase mixing in shallow areas. At the Pensacola Bay entrance, the maximum tidal range is 2.6 feet (NOAA 2002a) and the maximum current speed is 4.1 knots (NOAA 2003). Incoming tides increase the available water volume, especially in the Big Lagoon area of Perdido Key where the average depth is about 7.5 feet (NPS 2011a). The maximum tidal range in Florida District is 2.6 feet (NOAA 2002a); in Mississippi, it is 3.2 feet (NOAA 2002b). Outgoing tides transport soluble pollutants out of national seashore waters to the Gulf of Mexico, and ocean currents constantly provide mixing and flushing in the vicinity of the Mississippi District islands.

Alternative A: No Action

Under alternative A, PWC use would be prohibited throughout the national seashore. Consequently, alternative A would result in beneficial effects on water quality because PWC use would cease, removing the potential for PWC-related hydrocarbon emissions to national seashore waters.

Cumulative Impacts. Cumulative impacts on water quality from past, present, and reasonably foreseeable actions would result from motorized boat traffic in national seashore waters, as well as motorized commercial and recreational boat and PWC traffic outside national seashore waters. In addition, ongoing military-related operations including periodic patrols and amphibious operations may use boats or equipment that contribute to cumulative impacts on water quality. Channel dredging and the barrier island restoration that involves placement of sediment near shorelines could result in temporary adverse impacts on water quality due to increased turbidity, or periodic chemical discharges from construction equipment or boats. An erosion control project at Norriego Point could also cause temporary

turbidity increases. Calculations were performed per the methodology in appendix E to quantitatively assess cumulative impacts of boat engine discharges to national seashore waters used by PWC. Impacts from other actions in the area of analysis are not included in calculations but are addressed qualitatively.

Motorboat numbers were based on analysis of aerial photographs, which show that motorboats outnumber PWC about 5 to 1 in the Florida District and about 30 to 1 in the Mississippi District. As shown in appendix H, table H-1, peak-day motorized boat use within national seashore waters is assumed to be distributed as follows: 885 at Perdido Key (Big Lagoon), 615 north of Santa Rosa Island, 1,010 in the waters of Okaloosa Island up to Destin, and 1,040 in the sound side waters in Mississippi. Each motorized boat in Florida was assumed to operate for an equivalent of 2 hours at full throttle, except at Okaloosa Island, where it is 1 hour at half throttle. In Mississippi, a trip length of 1 hour at full throttle was assumed. Table 17 summarizes the results of the analysis and gives threshold volumes needed to dilute pollutants to less than benchmark values and the available volume of water for each area of the national seashore. All water volumes are in acre-feet. As can be seen, estimated motorized boat emissions to water would not exceed ecotoxicological or human health benchmarks because the amount of water needed to dilute the chemicals of concern to below the benchmark values is substantially less than the volume of water present in any of the areas analyzed. For example, for Perdido Key, the volume of water required to dilute the motorized boat emissions to all ecotoxicological benchmarks is less than 5% of the water volume available, and the volume of water required to dilute boat emissions to human health benchmarks is less than 2% of that water volume. This does not account for other fate and transport mechanisms such as volatilization of organics, sorption to sediments, and dispersal to adjacent waters from tides and currents, all of which would further reduce the concentration of most organic pollutants in national seashore waters.

Based on the data in table 17, the dilution factors are large. When combined with the rapid volatilization of organic chemicals (e.g., benzene), it is extremely unlikely that the amount of hydrocarbons released from motorized boats into national seashore waters would either adversely affect human health or be in conflict with state anti-degradation policy relevant to national seashore waters (which include OFW). Water quality sampling done in national seashore waters supports this conclusion. No samples were found to have PAH or PAH constituents above the Method Detection Limit. Also, benzene was detected in 1 of 20 samples but not at a level that could be measured. The only compound that could be measured (toluene) did not come near the level of human health concern (EPA 2005). This conclusion is unlikely to change since no increase in motorboat use is expected. Also, a reduction in impacts on water quality associated with the emission of hydrocarbon pollutants would be expected in the future because emissions from motorboats are projected to decrease as lower emission four-stroke engines gradually replace the older two-stroke models, in accordance with 2010 EPA emission standards.

TABLE 17. CUMULATIVE THRESHOLD WATER VOLUMES FOR PWC DAILY PEAK USE CONDITIONS BY AREA, ALTERNATIVE A

Assessment Area	Perdido Key	Santa Rosa Island	Okaloosa Island	Mississippi District
Motorboat two-stroke hours	584	406	167	376
Available national seashore waters for dilution (acre-feet)	102,923	1,382,327.70	151,820.90	853,519.50
Volume of Water Required to Meet Ecotoxicological Benchmarks (acre-feet)				
Benzo(a)pyrene (fuel and exhaust)	0.4 (0.00%)	0.3 (0.00%)	0.1 (0.00%)	0.2 (0.00%)
Naphthalene	844 (0.82%)	586 (0.04%)	241 (0.16%)	543 (0.06%)
1-methyl naphthalene	1,627 (1.58%)	1,130 (0.08%)	464 (0.31%)	1,048 (0.12%)
Benzene	473 (0.46%)	329 (0.02%)	135 (0.09%)	305 (0.04%)

Assessment Area	Perdido Key	Santa Rosa Island	Okaloosa Island	Mississippi District
Volume of Water Required to Meet Human Health Benchmarks (acre-feet)				
Benzo(a)pyrene (fuel and exhaust)	628 (0.61%)	437 (0.03%)	179 (0.12%)	405 (0.05%)
Benzene	1,011 (0.98%)	702 (0.05%)	288 (0.19%)	651 (0.08%)

Numbers in parentheses represent the percentage of available national seashore water required to dilute pollutants to the benchmarks or criteria.

Impacts from other actions in the area include additional inputs of hydrocarbons from engines of various motorized recreational, commercial, and military vessels in waters adjacent to the national seashore. Although data are not available to include these in the quantitative analysis, it is likely that their emissions would contribute small amounts to the overall cumulative impact based on the results of the calculations for boats within national seashore waters (table 17), and the fact that many of the larger and commercial boats are inboard or diesel-powered vessels that do not discharge hydrocarbons to water. Impacts from other cumulative actions such as dredging or placement of sediment would contribute turbidity, but only a minimal amount of hydrocarbon pollution since the chemicals of concern either volatilize rapidly or are held in the sediments. PAHs that are sorbed to sediments could be redistributed into the water columns from construction or dredging actions that disturb sediments; the amount of this occurring would be very variable and large releases are unlikely given other processes that break down organics over time and the binding to the sediments.

Overall, cumulative actions considered would contribute mostly adverse impacts on water quality from marine vessel emissions. When combined with the actions under alternative A, overall cumulative impacts would be adverse. Alternative A would result in a small beneficial increment on water quality due to the elimination of PWC use and the subsequent discontinuance of hydrocarbon discharge from PWC into national seashore waters.

Conclusion. Alternative A would result in beneficial effects on water quality because eliminating PWC use at the national seashore would discontinue the discharge of hydrocarbons from PWC and eliminate that source of the chemicals of concern in national seashore waters. Prohibition of PWC in national seashore waters would result in slightly improved conditions compared to existing conditions because these emissions would no longer occur. However, because PWC make up a small number of vessels operating at the national seashore and newer, cleaner PWC are replacing the older PWC, these benefits would be small. There would be overall adverse cumulative impacts under alternative A, mainly related to other actions of motorized vessels in the area. Alternative A would contribute a beneficial increment to the cumulative impacts, which are otherwise largely adverse.

Alternative B

PWC distribution and use for a high-use day are assumed to be: 177 at the Perdido Key area, 123 north of Santa Rosa Island, 202 at Okaloosa Island, in Florida and 38 in the soundside in Mississippi. Each PWC is assumed to operate for 3 hours at full throttle, except at Okaloosa where 1 hour at half throttle is assumed; in Mississippi, a trip length is assumed to be 4 hours at full throttle. Threshold volumes were calculated using the PWC use parameters described for alternative B in chapter 2. Table 18 provides a summary of threshold volumes (acre-feet) for alternative B. Given the large volume of water available to dilute pollutants emitted by PWC, pollutant concentrations at the national seashore would be well below levels at which adverse impacts to human or ecosystem health would likely occur. The volume of water needed to dilute all pollutants below toxicity threshold levels is less than 1% of the total available volume. This is an indication of just how minimal the impacts to water quality under alternative B would be.

TABLE 18. THRESHOLD WATER VOLUMES FOR PWC DAILY PEAK USE CONDITIONS BY AREA, ALTERNATIVE B

Assessment Area	Perdido Key	Santa Rosa Island	Okaloosa Island	Mississippi District
PWC two-stroke hours*	266	185	51	76
Available national seashore waters for dilution (acre-feet)	102,923	1,382,327.70	151,820.90	853,519.50
Volume of Water Required to Meet Ecotoxicological Benchmarks (acre-feet)				
Benzo(a)pyrene (fuel and exhaust)	0.2 (0.00%)	0.1 (0.00%)	0.03 (0.00%)	0.05 (0.00%)
Naphthalene	383 (0.37%)	266 (0.02%)	73 (0.05%)	110 (0.01%)
1-methyl naphthalene	739 (0.72%)	514 (0.04%)	141 (0.09%)	212 (0.02%)
Benzene	215 (0.21%)	149 (0.01%)	41 (0.03%)	62 (0.01%)
Volume of Water Required to Meet Human Health Benchmarks (acre-feet)				
Benzo(a)pyrene (fuel and exhaust)	286 (0.28%)	198 (0.01%)	54 (0.04%)	82 (0.01%)
Benzene	459 (0.45%)	319 (0.02%)	87 (0.06%)	132 (0.02%)

Numbers in parentheses represent the percentage of available national seashore water required to dilute pollutants to the benchmarks or criteria.

* Assuming that 50% of PWC operating at the national seashore would be two-stroke and 50% four-stroke

Based on the high dilution factor, hydrocarbons released from PWC into national seashore waters are not expected to have adverse impacts on human health or the environment, nor be in conflict with state antidegradation policy relevant to national seashore waters (which include OFW). In addition, a reduction of chemical concentrations in national seashore waters is expected to continue further as a result of tidal flushing and mixing with adjacent waters, evaporation (benzene and other volatile hydrocarbons), and sorption to sediments (PAHs), as described under "Potential Impacts on Water Quality from Personal Watercraft Use," above. As a result, any water quality impacts due to PWC emissions would be expected to be minimal. Water concentrations of these contaminants would be even lower on average use days, at night, and during the off season when PWC use is reduced or non-existent, but would likely be higher in locations where PWC tend to concentrate, such as around the east tip of Perdido Key, the east tip of Santa Rosa Island, and the west tip of Horn Island. However, this would be a temporary increase only until water mixed with surrounding waters and other mechanisms described above reduced the concentrations in any particular area.

Water quality sampling done in national seashore waters in the vicinity of PWC use areas represents a "snapshot" of existing conditions at the national seashore, and the results show only a few detections of hydrocarbons, and at levels below those of concern to human health or marine organisms (Volkert 2015). The sampling results support the conclusion reached in the above analysis, and demonstrate that these contaminants do not remain in the water column or are found in very low concentrations. As described under "Potential Impacts on Water Quality from Personal Watercraft Use," above, PAHs may remain in the system adhered to sediments. However, large releases of PAHs from sediments are unlikely given the other processes that break down organics over time, and no PAHs were found in water samples taken from the national seashore. PWC use is not expected to increase measurably in the near future (see appendix H); therefore, emissions are expected to remain approximately the same in the short term. In the long term, discharges or emissions are expected to decline, as the remaining two-stroke engines are gradually replaced by cleaner four-stroke models. Even if two-stroke PWC continued to operate in the national seashore at their current numbers, there would only be minimal impacts to water quality and no perceptible effects on human health or marine organisms as a result of PWC use under alternative B.

Cumulative Impacts. Impacts on water quality from other past, present, and reasonably foreseeable future actions would be the same as described under alternative A. When the adverse impacts of these actions are combined with the actions of alternative B, adverse cumulative impacts would result from combining PWC emissions under alternative B with emissions from motorized boats within national seashore waters, as well as from other sources that cannot be quantified. Table 19 shows the threshold volumes of water calculated for all motorized boats and PWC combined. For all contaminant discharges

evaluated, the threshold volumes of water would be well below the dilution volumes available in national seashore waters. For example, the largest threshold volume for ecotoxicological effects (2,366 acre-feet for 1-methyl naphthalene in the Perdido Key area) is only about 2.3% of the available volume. When the impacts on water quality from alternative B are combined with impacts of the other actions in the study area, an overall adverse cumulative impact would be expected. Alternative B would contribute a very small adverse increment to the overall cumulative impact because PWC would be allowed to operate in the national seashore and would continue to discharge fuel into the water. However, pollutant discharges from other sources (motorized boats) would be much larger than PWC discharges, due to the higher proportion of motorized boats compared to the number of PWC operating at the national seashore.

TABLE 19. CUMULATIVE THRESHOLD WATER VOLUMES FOR PWC DAILY PEAK USE CONDITIONS BY AREA, ALTERNATIVE B

Assessment Area	Perdido Key	Santa Rosa Island	Okaloosa Island	Mississippi District
PWC two-stroke hours	266	185	51	76
Non-PWC two-stroke hours (motorboats)	584	406	167	376
Available national seashore waters for dilution (acre-feet)	102,923	1,382,327.70	151,820.90	853,519.50
Volume of Water Required to Meet Ecotoxicological Benchmarks (acre-feet)				
Benzo(a)pyrene (fuel and exhaust)	0.5 (0.00%)	0.4 (0.00%)	0.1 (0.00%)	0.3 (0.00%)
Naphthalene	1,227 (1.19%)	853 (0.06%)	314 (0.21%)	653 (0.08%)
1-methyl naphthalene	2,366 (2.30%)	1,644 (0.12%)	605 (0.40%)	1,259 (0.15%)
Benzene	688 (0.67%)	478 (0.03%)	176 (0.12%)	366 (0.04%)
Volume of Water Required to Meet Human Health Benchmarks (acre-feet)				
Benzo(a)pyrene (fuel and exhaust)	914 (0.90%)	635 (0.05%)	234 (0.15%)	486 (0.06%)
Benzene	1,470 (1.43%)	1,022 (0.07%)	376 (0.25%)	782 (0.09%)

Numbers in parentheses represent the percentage of available national seashore water required to dilute pollutants to the benchmarks or criteria.

Conclusion. Based on an analysis of a high-use day, when PWC use is at its maximum, PWC use under alternative B would add a small amount of hydrocarbons to national seashore waters, but impacts would be minimal and not result in degradation of national seashore waters or impacts on either human health or the environment. These impacts would be even less during average use days, at night, and during the off season when PWC use is reduced or non-existent. Concentrations of contaminants may be greater in areas where PWC concentrate, but it is expected that the levels of contaminants would rapidly decline due to mixing and other mechanisms that reduce the concentration of these chemicals in the water column. Overall cumulative impacts to water quality would be adverse, mostly as a result of emissions from other motorized vessels. Alternative B would contribute a very small adverse increment to the overall cumulative impacts because PWC would be allowed to operate in the national seashore and would continue to discharge fuel and pollutants into the water. However, adverse impacts to water quality from PWC use should decline over time as older PWC are replaced by newer, cleaner PWC. Even without the eventual replacement of two-stroke PWC, there would only be minimal impacts to water quality and no perceptible effects on human health or marine organisms as a result of PWC use under alternative B.

Alternative C

Alternative C would continue the implementation of existing flat-wake zones as established in the special regulation in 36 CFR 7.12 (2006). The summary of threshold volumes (acre-feet) for alternative C is presented in table 20. Given the large volume of water available to dilute pollutants emitted by PWC, pollutant concentrations at the national seashore would be well below levels at which adverse impacts to human or ecosystem health would likely occur. The volume of water needed to dilute all pollutants below toxicity threshold levels is less than 1% of the total available volume. This is an indication of just how small the impacts to water quality under alternative C would be.

TABLE 20. THRESHOLD WATER VOLUMES FOR PWC DAILY PEAK USE CONDITIONS BY AREA, ALTERNATIVE C

Assessment Area	Perdido Key	Santa Rosa Island	Okaloosa Island	Mississippi District
PWC two-stroke hours*	266	185	51	76
Available national seashore waters for dilution (acre-feet)	90,735.60	1,299,838.20	142,281.00	643,919.07
Volume of Water Required to Meet Ecotoxicological Benchmarks (acre-feet)				
Benzo(a)pyrene (fuel and exhaust)	0.2 (0.00%)	0.1 (0.00%)	0.03 (0.00%)	0.05 (0.00%)
Naphthalene	383 (0.42%)	266 (0.02%)	73 (0.05 %)	110 (0.02%)
1-methyl naphthalene	739 (0.80%)	514 (0.04%)	141 (0.10%)	212 (0.03%)
Benzene	215 (0.24%)	149 (0.01%)	41 (0.03 %)	62 (0.01%)
Volume of Water Required to Meet Human Health Benchmarks (acre-feet)				
Benzo(a)pyrene (fuel and exhaust)	286 (0.32%)	198 (0.02%)	54 (0.04%)	82 (0.01%)
Benzene	459 (0.50%)	319 (0.02%)	87 (0.06%)	132 (0.02%)

Numbers in parentheses represent the percentage of available national seashore water required to dilute pollutants to the benchmarks or criteria.

* Assuming that 50% of PWC operating at the national seashore would be two-stroke and 50% four-stroke

Based on the high dilution factor, hydrocarbons released from PWC into national seashore waters are not expected to have adverse impacts on human health or the environment, nor be in conflict with state antidegradation policy relevant to national seashore waters (which include OFW). In addition, a reduction of chemical concentrations in national seashore waters is expected to continue further as a result of tidal flushing and mixing with adjacent waters, evaporation (benzene and other volatile hydrocarbons), and sorption to sediments (PAHs), as described under "Potential Impacts on Water Quality from Personal Watercraft Use." As a result, any water quality impacts due to PWC emissions would be expected to be minimal. Water concentrations of these contaminants would be even lower on average use days, at night, and during the off season when PWC use is reduced or non-existent, but would likely be higher in locations where PWC tend to concentrate, such as around the east tip of Perdido Key, the east tip of Santa Rosa Island, and the west tip of Horn Island. However, this would be a temporary increase only until water mixed with surrounding waters and other mechanisms described above reduced the concentrations in any particular area.

Water quality sampling done in national seashore waters in the vicinity of PWC use areas (Volkert 2015) demonstrates that contaminants emitted by marine engines do not remain in the water column or are found in very low concentrations. As described under "Potential Impacts on Water Quality from Personal Watercraft Use," above, PAHs may remain in the ecological system adhered to sediments. However, large releases of PAHs from sediments are unlikely given the other processes that break down organics over time, and no PAHs were found in water samples taken from the national seashore. PWC use is not expected to increase measurably in the near future (appendix H); therefore, emissions are expected to remain approximately the same in the short term. In the long term, PWC emissions are expected to decline, as the remaining two-stroke engines are gradually replaced by cleaner four-stroke models. Even if two-stroke PWC continued to operate in the national seashore at their current numbers, there would only be minimal impacts to water quality and no perceptible effects on human health or marine organisms as a result of PWC use under alternative C.

Cumulative Impacts. Impacts on water quality from past, present, and reasonably foreseeable future actions would be the same as described under alternative A. When these impacts of these actions are combined with the actions of alternative C, adverse cumulative impacts would result from combining the emissions of PWC under alternative C with emissions from motorized boats within national seashore waters, as well as from other sources that cannot be quantified. Table 21 shows the threshold volumes of water calculated for all motorized boats and PWC combined. For all contaminant discharges evaluated, the threshold volumes of water would be well below the dilution volumes available in national seashore waters. For example, the greatest threshold volume for ecotoxicological effects (2,366 acre-feet for 1-

methyl naphthalene in the Perdido Key area) is only 2.60% of the available volume. When the impacts on water quality as a result of alternative C are combined with impacts of these other actions in the study area, an overall adverse cumulative impact would be expected. Alternative C would contribute a slight adverse increment to the overall cumulative impact because discharges or emissions from gas and PWC exhaust would remain approximately the same as under existing conditions.

TABLE 21. CUMULATIVE THRESHOLD WATER VOLUMES FOR PWC DAILY PEAK USE CONDITIONS BY AREA, ALTERNATIVE C

Assessment Area	Perdido Key	Santa Rosa Island	Okaloosa Island	Mississippi District
PWC two-stroke hours	266	185	51	76
Motorboat two-stroke hours	584	406	167	376
Available national seashore waters for dilution (acre-feet)	90,735.60	1,299,838.20	142,281.00	643,919.07
Volume of Water Required to Meet Ecotoxicological Benchmarks (acre-feet)				
Benzo(a)pyrene (fuel and exhaust)	0.5 (0.00%)	0.4 (0.00%)	0.1 (0.00%)	0.3 (0.00%)
Naphthalene	1,227 (1.35%)	853 (0.07 %)	314 (0.22%)	653 (0.10%)
1-methyl naphthalene	2,366 (2.60%)	1,644 (0.13%)	605 (0.42%)	1,259 (0.20%)
Benzene	688 (0.76%)	478 (0.04%)	176 (0.12%)	366 (0.06%)
Volume of Water Required to Meet Human Health Benchmarks (acre-feet)				
Benzo(a)pyrene (fuel and exhaust)	914 (1.01%)	635 (0.05%)	234 (0.16%)	486 (0. 08%)
Benzene	1,470 (1.62%)	1,022 (0.08%)	376 (0.26%)	782 (0.12%)

Numbers in parentheses represent the percentage of available national seashore water required to dilute pollutants to the benchmarks or criteria.

Conclusion. Alternative C would not result in any new adverse impacts to water quality from PWC emissions in the near term compared to existing conditions. Ongoing impacts to water quality as a result of emissions from PWC are expected to be minimal and would not result in degradation of national seashore waters or impacts on either human health or the environment. These ongoing impacts would be even less during average use days, at night, and during the off season when PWC use is reduced or non-existent. Concentrations of contaminants may be greater in areas where PWC concentrate, but it is expected that the levels of contaminants would rapidly decline due to mixing and other mechanisms that reduce the concentration of these chemicals in the water column. Overall cumulative impacts to water quality would be adverse, mostly due to emissions from other motorized boats. Alternative C would contribute a slight adverse increment to the overall cumulative impact because discharges or emissions from gas and PWC exhaust would remain approximately the same as under existing conditions. In the long term, PWC emissions are expected to decline, as the remaining two-stroke engines are gradually replaced by cleaner four-stroke models. Even if two-stroke PWC continued to operate in the national seashore at their current numbers, there would only be minimal impacts to water quality and no perceptible effects on human health or marine organisms as a result of PWC use under alternative C.

Alternative D

Under alternative D, existing flat-wake zone distances would be reduced, resulting in larger areas of water open to full-throttle PWC use. Table 22 provides the results of the analysis. Given the large volume of water available to dilute pollutants emitted by PWC, pollutant concentrations at the national seashore would be well below levels at which adverse impacts to human or ecosystem health would likely occur. The volume of water needed to dilute all pollutants below toxicity threshold levels is less than 1% of the total available volume. This is an indication of just how small the impacts to water quality under alternative D would be. Based on the high dilution factor, hydrocarbons released from PWC into national seashore waters are not expected to have adverse impacts on human health or the environment, and any water quality impacts from PWC emissions would be expected to be minimal, as described under alternatives B and C.

TABLE 22. THRESHOLD WATER VOLUMES FOR PWC DAILY PEAK USE CONDITIONS BY AREA, ALTERNATIVE D

Assessment Area	Perdido Key	Santa Rosa Island	Okaloosa Island	Mississippi District
PWC two-stroke hours*	266	185	51	76
Available national seashore waters for dilution (acre-feet)	99,503.40	1,356,692.10	148,638.40	818,191.80
Volume of Water Required to Meet Ecotoxicological Benchmarks (acre-feet)				
Benzo(a)pyrene (fuel and exhaust)	0.2 (0.00%)	0.1 (0.00%)	0.03 (0.00%)	0.05 (0.00%)
Naphthalene	383 (0.38%)	266 (0.02%)	73 (0.05%)	110 (0.01%)
1-methyl naphthalene	739 (0.74%)	514 (0. 04%)	141 (0.09%)	212 (0.03%)
Benzene	215 (0.22%)	149 (0.01%)	41 (0.03%)	62 (0.01%)
Volume of Water Required to Meet Human Health Benchmarks (acre-feet)				
Benzo(a)pyrene (fuel and exhaust)	286 (0.29%)	198 (0.01%)	54 (0.04%)	82 (0.01%)
Benzene	459 (0.46%)	319 (0.02%)	87 (0.06%)	132 (0.02%)

Numbers in parentheses represent the percentage of available national seashore water required to dilute pollutants to the benchmarks or criteria.

* Assuming that 50% of PWC operating at the national seashore would be two-stroke and 50% four-stroke

As described under alternatives B and C, contaminants emitted by PWC are not expected to remain in the water column for a long period of time and PWC use is not expected to increase measurably in the near future; therefore, emissions are expected to remain approximately the same in the short term. In the long term, PWC emissions are expected to decline, as the remaining two-stroke engines are gradually replaced by cleaner four-stroke models. Even if two-stroke PWC continued to operate in the national seashore at their current numbers, there would only be minimal impacts to water quality and no perceptible effects on human health or marine organisms as a result of PWC use under alternative D. Water concentrations of these contaminants would be even lower on average use days, at night, and during the off-season when PWC use is reduced or non-existent, but would likely be higher in locations where PWC tend to concentrate, such as around the east tip of Perdido Key, the east tip of Santa Rosa Island, and the west tip of Horn Island. However, this would be a temporary increase only until water mixed with surrounding waters and other mechanisms described above reduced the concentrations in any particular area.

Cumulative Impacts. Impacts on water quality from past, present, and reasonably foreseeable future actions would be the same as described under alternative A. When the impacts of these actions are combined with the impacts of alternative D, adverse cumulative impacts would result from combining the emissions of PWC under alternative D with emissions from motorized boats as well as from other sources that cannot be quantified. Table 23 shows the threshold volumes of water calculated for all motorized boats and PWC combined. As can be seen in the table, for all contaminant discharges evaluated, the threshold volumes of water would be well below the dilution volumes available in national seashore waters. For example, the greatest threshold volume for ecotoxicological effects (2,366 acre-feet for 1-methyl naphthalene in the Perdido Key area) is only 2.38% of the available volume. When the impacts on water quality as a result of alternative D are combined with impacts of these other actions in the study area, an overall adverse cumulative impact would be expected. Alternative D would contribute a slight adverse increment to the overall cumulative impact because two-stroke PWC would be allowed to operate in the national seashore and would continue to discharge fuel into the water.

TABLE 23. CUMULATIVE THRESHOLD WATER VOLUMES FOR PWC DAILY PEAK USE CONDITIONS BY AREA, ALTERNATIVE D

Assessment Area	Perdido Key	Santa Rosa Island	Okaloosa Island	Mississippi District
PWC two-stroke hours	266	185	51	76
Motorboat two-stroke hours	584	406	167	376
Available national seashore waters for dilution (acre-feet)	99,503.40	1,356,692.10	148,638.40	818,191.80
Volume of Water Required to Meet Ecotoxicological Benchmarks (acre-feet)				
Benzo(a)pyrene (fuel and exhaust)	0.5 (0.00%)	0.4 (0.00%)	0.1 (0.00%)	0.3 (0.00%)
Naphthalene	1,227 (1.23%)	853 (0.06%)	314 (0.21%)	653 (0.08%)
1-methyl naphthalene	2,366 (2.38%)	1,644 (0.12%)	605 (0.41%)	1,259 (0.15%)
Benzene	688 (0.70%)	478 (0.04%)	176 (0.12%)	366 (0.04%)
Volume of Water Required to Meet Human Health Benchmarks (acre-feet)				
Benzo(a)pyrene (fuel and exhaust)	914 (0.92%)	635 (0.05%)	234 (0.16%)	486 (0. 06%)
Benzene	1,470 (1.48%)	1,022 (0.08%)	376 (0.25%)	782 (0.10%)

Numbers in parentheses represent the percentage of available national seashore water required to dilute pollutants to the benchmarks or criteria.

Conclusion. Similar to other action alternatives, analysis of a high-use day scenario indicates that PWC use under alternative D would add a small amount of hydrocarbons to national seashore waters, but impacts are expected to be minimal and not result in degradation of national seashore waters or impacts on either human health or the environment. These impacts would be even less during average use days, at night, and during the off season when PWC use is reduced or non-existent. Concentrations of contaminants may be greater in areas where PWC concentrate, but it is expected that the levels of contaminants would rapidly decline due to mixing and other mechanisms that remove these chemicals from the water column. Overall cumulative impacts to water quality would be adverse, primarily due to motorized boat emissions. PWC use under alternative D would contribute a slight adverse increment to the overall cumulative impact because two-stroke PWC would be allowed to operate in the national seashore and would continue to discharge fuel into the water. In the long term, PWC emissions are expected to decline, as the remaining two-stroke engines are gradually replaced by cleaner four-stroke models. Even if two-stroke PWC continued to operate in the national seashore at their current numbers, there would only be minimal impacts to water quality and no perceptible effects on human health or marine organisms as a result of PWC use under alternative D.

Alternative E

Under alternative E, flat-wake zone distances would be expanded and more areas would be closed to PWC use, resulting in reduced areas of water open to full-throttle PWC use when compared to existing conditions. This would result in reduced dilution of pollutants that are emitted by PWC because less water would be available for dilution. Adverse impacts on water quality under alternative E would be similar but slightly increased compared to those described under alternative C because full-throttle PWC use would be concentrated within a smaller area. Table 24 provides the results of the analysis. There would be no potential for impacts to water quality in the Okaloosa area under alternative E because PWC use would no longer occur (appendix D, figure D-37). Even with the smaller areas available for use based on the additional PWC closures under alternative E, pollutant concentrations at the national seashore would be well below levels at which adverse impacts to human or ecosystem health would likely occur. The volume of water needed to dilute all pollutants below toxicity threshold levels is less than 1% of the total available volume.

TABLE 24. THRESHOLD WATER VOLUMES FOR PWC DAILY PEAK USE CONDITIONS BY AREA, ALTERNATIVE E

Assessment Area	Perdido Key	Santa Rosa Island	Okaloosa Island	Mississippi District
PWC two-stroke hours*	266	185	0	76
Available national seashore waters for dilution (acre-feet)	90,735.60	1,289,457.60	132,202.20	818,191.80
Volume of Water Required to Meet Ecotoxicological Benchmarks (acre-feet)				
Benzo(a)pyrene (fuel and exhaust)	0.2 (0.00%)	0.1 (0.00%)	0.03 (0.00%)	0.05 (0.00%)
Naphthalene	383 (0.12%)	266 (0.02%)	73 (0.06%)	110 (0.01%)
1-methyl naphthalene	739 (0.23%)	514 (0.04%)	141 (0.11%)	212 (0.03%)
Benzene	215 (0.07%)	149 (0.01%)	41 (0.03%)	62 (0.01%)
Volume of Water Required to Meet Human Health Benchmarks (acre-feet)				
Benzo(a)pyrene (fuel and exhaust)	286 (0.09%)	198 (0.02%)	54 (0.04%)	82 (0.01%)
Benzene	459 (0.15%)	319 (0.02%)	87 (0.07%)	132 (0.02%)

Numbers in parentheses represent the percentage of available national seashore water required to dilute pollutants to the benchmarks or criteria.

* Assuming that 50% of PWC operating at the national seashore would be two-stroke and 50% four-stroke

Based on the high dilution factor, hydrocarbons released from PWC into national seashore waters are not expected to have adverse impacts on human health or the environment, and any water quality impacts due to PWC emissions would be expected to be minimal, as described under alternatives B,C, and D. Water quality impacts due to PWC emissions of organic pollutants would be slightly more adverse than those described for alternative B as they would be concentrated over a smaller area. Impacts from PWC use in the Okaloosa area would essentially be eliminated, although mixing with contiguous waters in the bay would provide a source for some level of contaminant input to national seashore waters. As described under alternatives B and C, contaminants emitted by PWC are not expected to remain in the water column for a long period of time and PWC use is not expected to increase measurably in the near future; therefore, emissions are expected to remain approximately the same in the short term. In the long term, emissions are expected to decline. After the phase out of older, two-stroke carbureted PWC, discharges from PWC would essentially be zero, because all PWC would need to meet 2010 EPA emission standards, reducing emissions to extremely low levels. Alternative E would have fewer impacts from PWC emissions in the long term compared to either alternative B, C (representative of current conditions) or D because of the required phase out of two-stroke PWC.

Cumulative Impacts. Impacts on water quality from past, present, and reasonably foreseeable future actions would be the same as described under alternative A. When the impacts of these actions are considered with the actions of alternative E, adverse cumulative impacts would result from combining the emissions of PWC under alternative E with emissions from motorized boats within national seashore waters, as well as from other sources that cannot be quantified. Table 25 shows the threshold volumes of water calculated for all motorized boats and PWC combined. For all contaminant discharges evaluated, the threshold volumes of water would be well below the dilution volumes available in national seashore waters. For example, the greatest threshold volume for ecotoxicological effects (2,366 acre-feet for 1-methyl naphthalene in the Perdido Key area) is only 2.6% of the available volume.

When the impacts on water quality as a result of alternative E are combined with impacts of these other actions in the study area, an overall adverse cumulative impact would be expected, in the short term. Over the long term, alternative E would contribute a beneficial increment to the overall cumulative impact because impacts to water quality from PWC emissions would be reduced to essentially zero when older, two-stroke carbureted PWC are phased out over two years.

TABLE 25. CUMULATIVE THRESHOLD WATER VOLUMES FOR DAILY PWC PEAK USE CONDITIONS BY AREA, ALTERNATIVE E

Assessment Area	Perdido Key	Santa Rosa Island	Okaloosa Island	Mississippi District
PWC two-stroke hours	266	185	0	76
Motorboat two-stroke hours	584	406	167	376
Available national seashore waters for dilution (acre-feet)	90,735.60	1,289,457.60	132,202.20	818,191.80
Volume of Water Required to Meet Ecotoxicological Benchmarks (acre-feet)				
Benzo(a)pyrene (fuel and exhaust)	0.5 (0.00%)	0.4 (0.00%)	0.1 (0.00%)	0.3 (0.00%)
Naphthalene	1,227 (1.35%)	853 (0.07%)	241 (0.24%)	653 (0.08%)
1-methyl naphthalene	2,366 (2.60%)	1,644 (0.13%)	464 (0.46%)	1,259 (0.15%)
Benzene	688 (0.76%)	478 (0.04%)	135 (0.13%)	366 (0.04%)
Volume of Water Required to Meet Human Health Benchmarks (acre-feet)				
Benzo(a)pyrene (fuel and exhaust)	914 (1.01%)	635 (0.05%)	179 (0.18%)	486 (0.06%)
Benzene	1,470 (1.62%)	1,022 (0.08%)	288 (0.28%)	782 (0.10%)

Numbers in parentheses represent the percentage of available national seashore water required to dilute pollutants to the benchmarks or criteria.

Conclusion. The analysis of a high-use day scenario indicates that PWC use under alternative E would add a small amount of hydrocarbons to national seashore waters, but impacts are expected to be minimal and not result in degradation of national seashore waters or impacts on either human health or the environment. These impacts would be even less during average use days, at night, and during the off season when PWC use is reduced or non-existent. Concentrations of contaminants may be greater in areas where PWC concentrate, but it is expected that the levels of contaminants would rapidly decline due to mixing and other mechanisms that reduce the concentration of these chemicals in the water column. Adverse impacts on water quality nearshore under alternative E may be less intense compared to existing conditions in both districts due to the implementation of closures and beaching restrictions along shorelines, and impacts from PWC use in the Okaloosa area of national seashore waters would essentially be eliminated. Overall cumulative impacts would be adverse from PWC use and marine vessel emissions in the short term. Alternative E would contribute a beneficial increment to overall cumulative impacts because PWC discharges and emissions would be reduced to essentially zero when older, two-stroke carbureted PWC are phased out over two years, as required under alternative E.

AIR QUALITY

Methods and Assumptions

A summary of the methodology used to assess air quality impacts is provided below. For further detailed information, refer to the *Gulf Islands National Seashore Air Quality Analysis Technical Support Document* (ARS 2018). To estimate recreational marine engine exhaust emissions (PM, CO, and NO_x) for PWC and other boats, emission factors estimates were computed using the current EPA recommended model for mobile source emissions at the time the analysis was conducted, the Motor Vehicle Emission Simulator (MOVES 2014).

Emissions modeling was performed for PWC and boats to allow for quantification of the incremental change in emissions due specifically to PWC in the context of the total watercraft-related emissions at the national seashore. Alternative E would require all PWC operating at the national seashore to meet the 2010 EPA Marine Spark-Ignition Engines and Vessels – Exhaust Emission Standards after a two-year transition (phase-out) period, which effectively prohibits higher-emitting two-stroke PWC. Therefore, 100% of PWC were assumed to be four-stroke for the modeling of long-term effects of alternative E, with long-term reflecting post-phase out conditions. Alternatives B, C, and D would not require PWC to adhere to the 2010 EPA emission standard. Therefore, the analysis for alternatives B, C, and D assumed

that 50% of PWC operating at the national seashore would be two-stroke and 50% four-stroke, to reflect the mixed PWC fleet that is currently assumed to exist. Under alternative E, pre-phase out conditions are assumed to be the same as those modeled for alternatives B, C, and D (e.g., assuming a mix of two-stroke and four-stroke PWC).

The assumption of 50% two-stroke PWC is generally consistent with 2018 PWC registration data, which show 55.8% of PWC with a model year before 2010 (NMMA 2018). It is also likely that there is even a higher percentage of four-stroke PWC operating in park waters because four-stroke PWC have been manufactured since 2003 and only 24% of the PWC registered in the surrounding counties are older than 2003. Over time the proportion of four-stroke PWC would increase as the older two-stroke models are retired from service. The registration data show this trend of turnover of PWC (see tables 10 and 11). These data are for the five counties closest to national seashore waters in Mississippi and Florida as a whole and may not directly line up with use occurring just at the national seashore but instead give a relative measure of conditions in the area.

The alternatives in this plan/EIS would not regulate boats, but analysis of boat use in the area is included in the cumulative impact analysis. For all alternatives, motorized boats other than PWC were assumed to be 33% two-stroke (only outboard motors), and 67% four-stroke (a mix of outboard and inboard motors determined by MOVES2014a based on data the MOVES model contains for the counties analyzed).

PWC and other boat data for the air quality analysis were derived from counts of vessel use in the national seashore (Volkert 2015), the 2013 aerial PWC survey and other travel assumptions, as detailed below. The daily estimates of watercraft trips for analysis areas were determined from use count data collected in recent years, and provided for "peak" high-use day, average high-use days, and average use days. The "peak" high-use day was based on the worst-case day over the Memorial Day holiday weekend, average high-use day is based on an average of summer season weekend and holiday count data, and average use days represent non-high-use days (i.e., weekday use) during the summer "high" season, which is Memorial Day through Labor Day. For the dispersion modeling, in order to determine hourly emissions, it was assumed that 60% of daily PWC and other boat use occurs during the 12:30–4:30 p.m. period. This 4-hour peak period was based on review of the PWC count data, which showed 60% of PWC activity occurring between 12:30–4:30 p.m. In addition, PWC use was assumed only during hours between sunrise and sunset, due to existing regulations prohibiting PWC use at night.

PWC emission rates varying by hour of the day, weekend vs. weekday, and month of the year were developed based on the PWC survey data. The "peak" high-use day (based on the worst-case day over the Memorial Day holiday weekend) was conservatively assumed to occur on all Sundays in May, average high-use days were represented by summer season month (June through August) weekends, and average use days were represented by summer season weekday use. For the rest of the year, or "low" season (January through May and September through December) emission rates were based on 5% of annual use occurring the low season (95% of the use occurs during the high season).

The EPA dispersion model AERMOD was used to simulate how emissions from PWC/boat use could impact ambient air quality taking into account the timing and magnitude of the emissions, and prevailing meteorological conditions. The output of the model is an incremental pollutant concentration attributable to PWC/boat use at specific receptor locations that can be combined with background concentrations (e.g., concentrations due to other sources in the region that are not being explicitly modeled) in order to determine the total ambient pollutant concentration in the air. One important indicator that is used to assess the total pollutant concentrations is the NAAQS. The NAAQS are set by EPA based on requirements under the Clean Air Act to protect public health and welfare for six criteria pollutants (CO, lead, NO_2, ozone, PM, and sulfur dioxide). Concentrations at or above the NAAQS are not the expected natural condition for a park and could result in a non-attainment designation for a park unit, reflecting unacceptable and polluted air. However, pollutant concentrations below the NAAQS can also have effects on park resources and human health (NPS 2011c). Consistent with the NPS 2006 Management Policies direction to "perpetuate the best possible air quality in parks," potential impacts of changes in air quality at concentrations below the NAAQS were also considered as part of the air quality analysis. Methods

used to accomplish this included comparing the predicted "percentage below the NAAQS" for the various air quality standards and alternatives, and in relation to background concentrations. This approach of examining the percentage below the NAAQS is consistent with the framework used by EPA's Air Quality Index (AQI), which is used for communicating air quality conditions to the public. For example, an AQI of 100 corresponds to the NAAQS and exceedance of 100 is considered unhealthy for sensitive groups, while an AQI of 50 (e.g., 50% of the NAAQS) is considered good air quality. For modeling purposes, receptors were "placed" in a dense grid network beginning 100 meters from where the PWC were assumed to be operating. Closer receptors are not warranted the PWC move around and are not at any specific location for more than a few minutes. For details of the dispersion modeling methodology, including meteorological data, source characterization, receptor placement and background concentrations see the *Gulf Islands National Seashore Air Quality Analysis Technical Support Document* (ARS 2018).

Emission Inventory. An emissions inventory of PWC and other boats use in the national seashore was completed, evaluating emissions from each of the alternatives. Although this plan addresses PWC use, total emissions from boats and PWC was considered because boats are part of the existing condition and are assumed to remain constant under all alternatives. Changes in emissions among alternatives are the result in changes to PWC management in the alternatives. Total annual emissions estimates from watercraft exhaust for all Florida and Mississippi marine engine use in the national seashore were calculated for the criteria pollutants of interest (PM, CO, and NO_X) in tons per year and are presented in table 26. Alternative A includes a prohibition of PWC use, so the emissions shown represent other boats only. Watercraft emissions at the national seashore would be higher under alternatives B, C, and D than under alternative E because PWC would not be subject to the mandatory phase-out of older, more polluting PWC after two years under alternatives B, C, and D. Although alternatives may include various restrictions on the location of PWC activity, such as flat-wake zones or closed areas, no reduction in overall PWC activity was assumed to result from the restrictions under the various alternatives in the quantitative emissions analysis.

TABLE 26. CUMULATIVE ANNUAL EMISSIONS (TONS PER YEAR)

Description	PM_{10}	$PM_{2.5}$	CO	NO_X
Alternative A (Boat emissions only)	0.23	0.21	64	4
Alternatives B, C, and D Total (Boats + PWC)	0.42	0.39	94	5.2
Alternative B, C, and D: Increase over alternative A (PWC)	**+0.19**	**+0.18**	**+30**	**+1.2**
Alternative E: Total (Boats + PWC Post-Phase Out)	0.25	0.23	92	5.6
Alternative E: Increase over alternative A (PWC Post-Phase Out)	**+0.02**	**+0.02**	**+28**	**+1.6**

Dispersion Modeling Results. Tables 27 through 29 summarize the dispersion modeling results for PM_{10}/$PM_{2.5}$, CO, and NO_2, with comparison to the NAAQS. The results shown represent the highest predicted impact for any receptor included in the analysis accounting for both boat emissions (which are unchanged by any alternative) and PWC emissions. The tables also provide the incremental contribution of PWC use to criteria pollutant concentrations, and the background concentrations. The total concentration (boats, PWC, and background) is compared to the NAAQS to provide an indicator of the degree of impact.

TABLE 27. DISPERSION MODELING RESULTS – MAXIMUM PM_{10}/$PM_{2.5}$ CONCENTRATIONS FOR ALTERNATIVES

Averaging Period	Alternative	Background ($\mu g/m^3$)	Modeled Impact ($\mu g/m^3$)*	Total Impact ($\mu g/m^3$)**	Primary NAAQS ($\mu g/m^3$)
PM_{10} 24-Hour	A (Boat emissions only)	41	0.02	41	150
	B, C, and D (Boats+ PWC)	41	0.03	41	
	B, C, and D (PWC)	-	*0.01*	-	
	E (Boats+ PWC)	41	0.02	41	
	E (PWC)	-	*<0.01*	-	
$PM_{2.5}$ 24-Hour	A (Boats emissions only)	19.5	0.02	19.5	35
	B, C, and D (Boats+ PWC)	19.5	0.02	19.5	
	B, C, and D (PWC)	-	*<0.01*	-	
	E (Boats+ PWC)	19.5	0.02	19.5	
	E (PWC)	-	*<0.01*	-	
$PM_{2.5}$ Annual	A (Boat emissions only)	9.25	<0.01	9.25	12
	B, C, and D (Boats+ PWC)	9.25	<0.01	9.25	
	B, C, and D (PWC)	-	*<0.01*	-	
	E (Boats+ PWC)	9.25	<0.01	9.25	
	E (PWC)	-	*<0.01*	-	

*The AERMOD concentration shown is the concentration expressed in the form of the NAAQS. For example, the $PM_{2.5}$ 24-hour NAAQS is based on the 98th percentile, averaged over 3 years. Other pollutants are addressed similarly based on the form of the NAAQS.

** This includes a 24-hour background concentration of 41.0 $\mu g/m^3$ for PM_{10} and 19.5 $\mu g/m^3$ for $PM_{2.5}$, and an annual background concentration of 9.25 $\mu g/m^3$ for $PM_{2.5}$. Data provided by FDEP or Mississippi Department of Environmental Quality.

TABLE 28. DISPERSION MODELING RESULTS – MAXIMUM CO CONCENTRATIONS FOR ALTERNATIVES

Averaging Period	Alternative	Background (ppm)	Modeled Impact (ppm)*	Total Impact (ppm)**	Primary NAAQS (ppm)
CO 1-Hour	A (Boat emissions only)	2.2	0.05	2.2	35
	B, C, and D (Boats+ PWC)	2.2	0.06	2.3	
	B, C, and D (PWC)	-	*0.01*	-	
	E (Boats+ PWC)	2.2	0.05	2.3	
	E (PWC)	-	*<0.01*	-	
CO 8-Hour	A (Boat emissions only)	1.5	0.01	1.5	9
	B, C, and D (Boats+ PWC)	1.5	0.01	1.5	
	B, C, and D (PWC)	-	*<0.01*	-	
	E (Boats+ PWC)	1.5	0.01	1.5	
	E (PWC)	-	*<0.01*	-	

*The AERMOD concentration shown is the concentration expressed in the form of the NAAQS.

**This includes an hourly background concentration of 2.2 ppm and an 8-hour background concentration of 1.5 ppm for CO. Data provided by FDEP or Mississippi Department of Environmental Quality.

TABLE 29. DISPERSION MODELING RESULTS – MAXIMUM NO_2 CONCENTRATIONS FOR ALTERNATIVES

Averaging Period	Alternative	Background (ppm)	Modeled Impact (ppm)*	Total Impact (ppm)**	Primary NAAQS (ppm)
NO_2 1-Hour	A (Boat emissions only)	0.038	0.006	0.044	0.1
	B, C, and D (Boats+ PWC)	0.038	0.008	0.046	
	B, C, and D (PWC)	-	*0.002*	-	
	E (Boats+ PWC)	0.038	0.009	0.047	
	E (PWC)	-	*0.003*	-	
NO_2 Annual	A (Boat emissions only)	0.008	<0.001	0.008	0.053
	B, C, and D (Boats+ PWC)	0.008	<0.001	0.008	
	B, C, and D (PWC)	-	*<0.001*	-	
	E (Boats+ PWC)	0.008	<0.001	0.008	
	E (PWC)	-	*<0.001*	-	

*The AERMOD concentration shown is the concentration expressed in the form of the NAAQS.

**This includes an hourly background concentration of 0.038 ppm and an annual background concentration of 0.008 ppm for NO_2. Data provided by FDEP or Mississippi Department of Environmental Quality.

The results show the incremental increase in pollutant concentration at the national seashore resulting from PWC use under all alternatives would be less than the impact due to boat use. For example, the modeled impact of PWC use under alternatives B, C, and D on 1-hour NO_2 concentrations shown in table 27 is 0.02 ppm, and the impact of boats is 0.06 ppm showing for that particular pollutant and averaging time that PWC use would constitute 33% of the impact attributable to boats. The combined impact of boat and PWC on ambient air quality would be very small in relation to background concentrations. For example, the combined boat and PWC PM_{10} concentration is 0.03 $\mu g/m^3$ under alternatives B, C, and D compared to the background concentration of 41 $\mu g/m^3$. The relative differences in modeled concentrations between the alternatives are very small (e.g., 0.02 $\mu g/m^3$ vs 0.03 $\mu g/m^3$ for alternative A vs. alternatives B, C, and D for PM_{10}).

As shown in tables 29, 30 and 31, for the highest $PM_{10}/PM_{2.5}$ and CO concentrations taking into account both boat and PWC emissions would occur under alternatives B, C, and D, and the highest NO_2 concentrations would occur under alternative E. This result is consistent with the expected influence of two-stroke vs. four-stroke PWC, with four-stroke PWC having lower PM and CO emissions, but higher NO_X emissions compared to two-stroke PWC. Alternative A has the lowest concentrations of any of the alternatives due to the elimination of PWC at the national seashore (the concentrations shown for alternative A are due entirely to the operation of other motorized boats). Full details of the air quality impact analysis are provided in the *Gulf Islands National Seashore Air Quality Analysis Technical Support Document* (ARS 2018).

Alternative A: No Action

Under alternative A, there would be beneficial impacts when compared to existing conditions because PWC would no longer emit pollutants at the national seashore.

Cumulative Impacts. All of the past, present and reasonably foreseeable future actions described in table 16 would have the potential to create temporary and/or long-term air pollutant emissions. The use of motorized boats at the national seashore would continue to emit criteria pollutants, as shown in the emissions inventory presented in table 27. These emissions would contribute to concentrations of criteria pollutants within the national seashore as shown in the dispersion modeling results presented in tables 27 through 29. The modeled maximum impact of boat use results in concentrations well below the NAAQS. As an example, the impact of boat use under alternative A on 1-hour NO_2 concentrations is 0.006 ppm, or approximately 16% of the background concentration of 0.038 ppm. Background concentrations due to regional pollution at the national seashore would be expected to be lower than the data available from urbanized areas, but this would not alter the overall conclusion of the air modeling study that the

contribution of boat use is a small proportion of the total ambient concentration. Similarly, other projects in the region, such as dredging, would incrementally contribute to emissions of criteria pollutants and adversely impact air quality. When taken together, these past, present and reasonably foreseeable future actions would have an adverse impact on air quality due to the emissions related to motorized vessel use which would continue. When these actions are combined with alternative A, overall adverse impacts would occur, related to the other actions that would continue in the areas around the national seashore. Alternative A would contribute an incremental improvement of air quality over the current conditions, from the prohibition of PWC and the resulting reduction in emissions from the national seashore.

Conclusion. Overall air quality impacts would be beneficial (assuming recreational boat use remains at current levels) with the elimination of PWC use under alternative A. Actions by others would continue to adversely impact air quality at the national seashore, such as boats and dredging projects. Overall air quality at the national seashore is expected to continue to be good, with the concentrations predicted due to boats (no PWC use at the national seashore) use between 23 and 94% below the NAAQS, depending on the pollutant and averaging time. Cumulative impacts under alternative A would be adverse with the actions under alternative A contributing a slight beneficial increment to the overall cumulative impact from prohibition of PWC at the national seashore which would remove this emission source.

Alternatives B, C, and D

Alternatives B, C, and D would not require PWC to meet the 2010 EPA emissions rule, and therefore overall PWC emissions would continue similar to existing conditions, with a mix of older two-stroke PWC and cleaner four-stroke PWC in use. PWC emissions would still decrease overtime as older models are retired from use, but this decrease would be at a much slower pace than under alternative E which would require all PWC to meet the 2010 EPA emissions rule within two years. As shown in table 26, PWC use under alternatives B, C, and D would result in emissions of 0.19, 0.18, 30 and 1.2 tons per year for PM_{10}, $PM_{2.5}$, CO and NO_X, respectively. Table 30 summarizes the predicted maximum impact of alternatives B, C, and D on ambient air quality. PWC use under alternatives B, C, and D would contribute $0.01 \mu g/m^3$, 0.01 ppm, and 0.002 ppm to 24-hour PM_{10}, 1-hour CO, and 1-hour NO_2 concentrations, respectively. For other pollutants/averaging times, the PWC contribution would be less than the relevant number of reported significant digits, indicating no meaningful impact on air quality at the national seashore. The total concentration of all criteria pollutants would be between 23 and 93% below the NAAQS, depending on the pollutant and averaging time. The lowest percentage below the NAAQS would occur for annual average $PM_{2.5}$ concentrations (the total concentration is 9.25 $\mu g/m^3$, which is 2.75 $\mu g/m^3$ less than the NAAQS of 12 $\mu g/m^3$, or 23% below the NAAQS), however the contribution of alternatives B, C, and D (including PWC and boats) is less than 0.01 $\mu g/m^3$, meaning that the percentage is due entirely to background concentrations and not a result of changes from implementation of alternatives B, C, and D.

TABLE 30. ALTERNATIVES B, C AND D CRITERIA POLLUTANT CONCENTRATIONS, PERCENT BELOW NAAQS

	Units	Modeled Concentration (PWC +Boat)	PWC Increment	Total (Modeled + Background)	NAAQS	Difference between Total concentration and NAAQS	Percent Below NAAQS
PM_{10} 24-hour	$\mu g/m^3$	0.03	0.01	41	150	109	73%
$PM_{2.5}$ 24-hour	$\mu g/m^3$	0.02	<0.01	19.5	35	15.5	44%
$PM_{2.5}$ Annual	$\mu g/m^3$	<0.01	<0.01	9.25	12	2.75	23%
CO 1-hour	ppm	0.06	0.01	2.3	35	32.7	93%
CO 8-hour	ppm	0.01	*<0.01*	1.5	9	7.5	83%
NO_2 1-hour	ppm	0.008	0.002	0.046	0.1	0.054	54%
NO_2 Annual	ppm	<0.001	<0.001	0.008	0.053	0.045	85%

Although not accounted for quantitatively due to the uncertainty in predicting how PWC users would react to the alternatives, the potential for flat-wake zones or closures to affect PWC use in localized areas was considered qualitatively. Alternative B would reduce the size of the PWC flat-wake zones relative to existing conditions. This change could potentially have the effect of encouraging additional PWC activity in the area 100 feet from shore, resulting in increased localized emissions. Under alternative B, areas closed to PWC use would be the same as existing conditions. Alternative C would include flat-wake zones and closures that are the same as existing conditions. Therefore, there would be no potential for localized changes in ambient air quality relative to existing conditions as a result of this alternative (assuming enforcement remains constant).

Relative to alternative C, alternative D would reduce the size of the flat-wake zones in the Florida District (150 yards compared to 300 yards). This change could potentially have the effect of encouraging additional PWC activity in the area of the seashore 150 yards from shore, resulting in increased localized emissions. In the Mississippi District, alternative D flat-wake zones (300 yards) would be the same as existing conditions (except for Horn and Petit Bois Islands). Although the flat-wake zones would be reduced to 300 yards around Horn and Petit Bois Islands under alternative D, this alternative would also close Horn and Petit Bois Islands to PWC landings which could indirectly lead to reduced activity and emissions in those areas.

Cumulative Impacts. Impacts on air quality from past, present, and reasonably foreseeable future actions would be the same as described under alternative A. Collectively, these actions have contributed or would contribute adverse impacts to air quality from emissions. When the impacts to air quality as a result of alternatives B, C, and D are combined with impacts of these other actions in the study area, adverse cumulative impacts would be expected. Alternatives B, C, and D would contribute a barely perceptible adverse increment to the overall cumulative impact (see table 30). For example, the 1-hour NO_2 concentration attributable to PWC and boats under alternatives B, C, and D is 0.008 ppm, in comparison to background concentrations of 0.038 ppm. The modeled concentration of PWC and boat emissions is an order of magnitude lower than the contribution from other sources represented by the background concentration. The PWC portion of the modeled concentration is even less, 0.002 ppm, which is a barely perceptible contribution to the overall cumulative impact and would not perceptively change the condition of the air quality at the national seashore.

Conclusion. Air quality at the national seashore would remain in a state similar to current conditions even with the continued operation of two-stroke PWC. The contribution of pollutants from PWC are expected to decline over time as older two-stroke PWC continue to be replaced by cleaner four-stroke models, as demonstrated by the PWC registration data in chapter 3. Air quality modeling results show the total concentration of all criteria pollutants would be between 23 and 93% below the NAAQS, depending on the pollutant and averaging time. Impacts from past, present, reasonably foreseeable future actions would continue to adversely impact air quality at the national seashore. Cumulative impacts under alternatives B, C, and D would be adverse with the actions under alternatives B, C, and D contributing a barely perceptible adverse increment to the overall cumulative impact on air quality.

Alternative E

During the initial two-year transition period (pre-phase out), air quality impacts under alternative E would be similar to alternatives B, C, and D and existing conditions because a mix of two-stroke and four-stroke PWC would be expected to continue operating in park waters. The emissions modeling and pollutant concentrations presented for alternatives B, C, and D are representative of the pre-phase out time period (table 30). As with alternatives B, C, and D, the total concentration of all criteria pollutants would be between 23 and 93% below the NAAQS, depending on the pollutant and averaging time.

Post phase-out, alternative E would have a beneficial impact on air quality compared to existing conditions because of the requirement for all PWC to meet the 2010 EPA emissions standards. As discussed in the methodology section, this requirement would eliminate the older and higher emitting PWC at the national seashore. As shown in table 26, PWC use under alternative E would result in

emissions of 0.02, 0.02, 28 and 1.6 tons per year for PM_{10}, $PM_{2.5}$, CO and NO_X, respectively. These PWC emission quantities are substantially lower than alternatives B, C, and D for $PM_{10}/PM_{2.5}$, slightly lower CO and slightly higher than alternatives B, C, and D for NO_X. Note that these changes in emissions do not necessarily equate directly to predicted ambient concentrations (which are further discussed below), but rather provide another indicator or metric for comparing the alternatives. For example, since PM_{10} emissions are relatively low under alternatives B/C/D (0.42 tons/year) and the modeled watercraft PM_{10} concentration increment is also very low (0.03 $\mu g/m^3$ for the 24-hr PM_{10} standard), the reduction in emissions to 0.25 tons/year under alternative E post-phase out does not provide a large benefit in the AERMOD analysis of the effect of watercraft emissions on specific receptors.

Table 31 summarizes the predicted maximum impact of alternative E on air quality post-phase out in terms of ambient concentrations of the criteria pollutants. PWC use under alternative E would contribute 0.003 ppm to 1-hour NO_2 concentrations (which is 0.001 ppm higher than predicted under alternatives B, C, and D because of tradeoffs between different pollutants with four-stroke vs. two-stroke engines). For other pollutants/averaging times, the PWC contribution would be less than the relevant number of reported significant digits, indicating no meaningful impact on air quality at the national seashore. The total concentration of all criteria pollutants would be between 23 and 93% below the NAAQS, depending on the pollutant and averaging time. The lowest percentage below the NAAQS would occur for annual average $PM_{2.5}$ concentrations, however the contribution of alternative E (including PWC and boats) is less than 0.01 $\mu g/m^3$, meaning that the percentage is due entirely to background concentrations.

TABLE 31. ALTERNATIVE E CRITERIA POLLUTANT CONCENTRATIONS, PERCENT BELOW NAAQS

	Units	Modeled Concentration (PWC +Boat)	PWC Increment	Total (Modeled + Background	NAAQS	Difference between Total concentration and NAAQS	Percent Below NAAQS
PM_{10} 24-hour	$\mu g/m^3$	0.02	<0.01	41	150	109	73%
$PM_{2.5}$ 24-hour	$\mu g/m^3$	0.02	<0.01	19.5	35	15.5	44%
$PM_{2.5}$ Annual	$\mu g/m^3$	<0.01	<0.01	9.25	12	2.75	23%
CO 1-hour	ppm	0.05	<0.01	2.3	35	32.7	93%
CO 8-hour	ppm	0.01	*<0.01*	1.5	9	7.5	83%
NO_2 1-hour	ppm	0.009	*0.003*	0.047	0.1	0.053	53%
NO_2 Annual	ppm	<0.001	<0.001	0.008	0.053	0.045	85%

Although not accounted for quantitatively due to the uncertainty in predicting how PWC users will react to the alternatives, the potential for flat-wake zones or closures to affect PWC use in localized areas was considered qualitatively. Relative to existing conditions, alternative E would reduce the size of the flat-wake zones around the wilderness islands in the Mississippi District (from 0.5 mile to 300 yards). This change could potentially have the effect of encouraging additional PWC activity, resulting in increased localized emissions around wilderness islands in the Mississippi District. Alternative E would also institute a closure on PWC landings on Horn and Petit Bois Islands and this could indirectly lead to reduced activity and emissions in those areas. Additional resource closures under alternative E would be expected to eliminate or substantially reduce PWC activity in the closed areas, which would result in reduced PWC emissions in those areas. However, it is possible that PWC could simply relocate to other areas of the national seashore and the closures would provide a localized as opposed to "net" benefit to the national seashore as a whole.

Cumulative Impacts. Impacts on air quality from past, present, and reasonably foreseeable future actions would be the same as described under alternative A. Collectively, these actions have contributed or would contribute adverse impacts to air quality from emissions, but the project area remains in attainment with the NAAQS. When the impacts to air quality as a result of alternative E are combined with impacts of these other projects in the study area, adverse cumulative impacts would be expected. Post-phase out, alternative E would contribute a minimal beneficial increment to the overall cumulative impact (see tables

29, 30, and 31) when compared to alternatives B, C (represents existing conditions), and D. For example, the maximum 24-hour PM_{10} concentration under alternatives B, C, and D would be 0.03 $\mu g/m^3$, compared to 0.02 $\mu g/m^3$ under alternative E, a reduction of 0.01. For context, the background concentration for this pollutant is 41 $\mu g/m^3$ and the NAAQS is 150 $\mu g/m^3$.

Conclusion. Alternative E impacts would be the same as existing conditions prior to phase out with slight beneficial impacts in the long-term after the required emissions standards are fully implemented (post phase out). The total concentration of all criteria pollutants would be between 23 and 93% below the NAAQS, depending on the pollutant and averaging time. PWC emissions of $PM_{10}/PM_{2.5}$ would be substantially reduced compared to existing conditions (e.g., 89% reduction from 0.19 tons per year to 0.02 tons per year for PM_{10}), however NO_X emissions would increase slightly (0.4 tons per year or a 25% increase) due to the phase-out of older two-stroke PWC and exclusive use of four-stroke PWC. Actions by others, such as the use of other motorized vessels and dredging projects, would continue to adversely impact air quality at the national seashore. Actions under alternative E would contribute beneficial impacts to air quality in the long term mainly from the emissions standards on PWC, with elements of some of the alternative such as flat-wake zones, landing limitations, and resource closures adding to that beneficial impact.

ACOUSTIC ENVIRONMENT

The impact analysis in this section is focused on the airborne acoustic environment, with descriptions of the potential impacts from noise on wildlife and wildlife habitat, threatened and endangered species and species of special management concern, visitor use and experience, and wilderness provided separately in those respective sections of this plan/EIS. Potential impacts of underwater noise on wildlife are discussed in the "Wildlife and Wildlife Habitat" section. Refer to chapter 3 and appendix F for an explanation of the acoustic environment terminology and metrics used in this section (L_{max}, L_{eq}, dBA etc.).

Methods and Assumptions

Impacts of PWC were examined using two separate analyses, one examining the impact of a single PWC pass-by generically within the national seashore, and one examining the combined impact of multiple PWC in terms of the energy-average sound level during the daytime at specific locations. For both of these analyses, two-stroke and four-stroke PWC impacts are compared. The two-stroke PWC results are representative of the potential impacts under existing conditions and alternatives B, C, and D, and alternative E prior to the phase-out. The four-stroke results represent the post-phase out condition under alternative E. For all alternatives, the analysis of impacts on soundscapes (acoustic environment) evaluates the change from the alternative relative to existing conditions.

PWC Measurement Data. Fristrup and Joyce (2014) determined the reduction in PWC noise for four-stroke engines compared to two-stroke engines based on data on two and four-stroke snowmobile engine noise. These data were used to estimate PWC noise post phase-out of carbureted two-stroke PWC. Table 32 presents the measured L_{max} noise level of three different two-stroke PWC engines, along with the corresponding estimated four-stroke noise level at full throttle and a distance of 82 feet. The data show PWC L_{max} reductions of approximately 6 to 9 dBA from the use four-stroke instead of two-stroke PWC.

TABLE 32. COMPARISON OF L_{MAX} BETWEEN TWO-STROKE AND FOUR-STROKE PWC

PWC Model	Measured two-stroke engine L_{max} (dBA)	Estimated four-stroke engine L_{max} (dBA)	Estimated L_{max} Reduction for four-stroke engines (dBA)
Kawasaki 1100 STX DI (direct injection)	75.5	66.5	9.0
SeaDoo GTX DI	75.8	66.6	9.2
SeaDoo GTS (carbureted)	72.3	66.5	5.8

Note: all data for PWC at full throttle and 82 feet from an observer.

Appendix F provides a detailed summary of a PWC noise measurement study of two-stroke PWC at the Glen Canyon National Recreation Area (HMMH 2002). The measured L_{max} at 82 feet ranged from 68 to 76 dBA, depending on operating speed/engine load and the specific PWC model. This information was additionally incorporated into the noise analysis. Based on a literature review conducted for this plan/EIS, NPS's Glen Canyon study is the best available study that involved direct measurement of PWC noise characteristics. The study included detailed documentation of the measurement methodology and PWC acoustic characteristics (including 1/3 octave spectrum analysis) that is applicable for the analysis of PWC use at the national seashore.

Analysis of soundscapes also recognizes that over time, PWC will naturally transition from two-stroke to four-stroke machines, which are quieter. Starting with the 2003 model year, four-stroke PWC were being produced by all manufacturers (PWIA 2006). Since 2010, two-stroke engines have not been manufactured for recreational PWC (PWIA 2012a). The PWC industry states that PWC noise levels have been reduced over time due to design improvements (PWIA 2013). Advances in PWC hull design technology include the following features to achieve reduced sound emissions: engine mount isolation, quieter four-stroke technology engines, advanced water jacketing, water lock boxes/mufflers, and exhaust exits at the air/water interface (PWIA 2012b). For the purposes of the analysis of soundscapes, information is presented for both two-stroke and four-stroke PWC. As stated under the methodology for water quality, based on available registration data it was assumed that 50% of PWC operating at the national seashore would be two-stroke and 50% four-stroke. By presenting both the two-stroke and four-stroke results of the analysis, it can be assumed these represent the range of potential impacts which would vary due to the mix of PWC being used at the national seashore. As shown in table 10, the proportion of registered two-stroke PWC is naturally decreasing over time and this trend is expected to continue. Therefore, over the next several decades, PWC noise impacts would decline to the four-stroke level as two-stroke PWC become increasingly uncommon.

PWC L_{max} Analysis

NPS's Natural Sounds and Night Skies Division has developed an "Attenuation Calculator" that provides a map-based visualization of the noise level generated by a single PWC. The calculator incorporates PWC noise spectra measurement data from the 2002 Glen Canyon noise measurement study discussed in chapter 3 for the following models: Kawasaki 1100cc, Sea Doo GTS, and the Sea Doo Bombardier GTX. For the analysis of two-stroke PWC, the Sea Doo Bombardier GTX model specifically was used as the basis for the impact assessment because it has a slightly higher noise level than the other two models studied at Glen Canyon. For the post-phase out analysis of four-stroke PWC, the NPS attenuation calculator spreadsheet includes an adjusted version of the Sea Doo GTX noise spectra that is representative of the quieter four-stroke PWC operation. The calculator incorporates the effects of acoustically hard ground cover such as pavement or water. For the hypothetical PWC operating location, a 0% porous ground input was used to reflect sound transmission over the surface of water. An ambient temperature of 82.2°F was assumed based on the average temperature in Pensacola, Florida in July (NWS 2015). The average Pensacola July morning relative humidity of 86% was used (Southeast Regional Climate Center n.d.) and an atmospheric pressure of 30 inches of Hg (101.58 kpa) was assumed (Florida Climate Center 2014). A receiver height of 5 feet was assumed.

The attenuation calculator was used to quantify the distance at which PWC noise would attenuate to be equal to the daytime median existing ambient (L50) sound level of approximately 42 dBA. Up to this distance, PWC noise could result in a 3 dBA or greater increase in sound levels above the existing ambient. This is because decibels (dB) are expressed on a logarithmic scale and cannot be added together directly. Through "decibel addition," two sources at the same sound level combine to create a total sound level 3 dBA higher. To provide additional information on the potential extent of impacts under various alternatives, PWC noise levels were also examined at distances of 50 feet, 100 feet, 200 feet, 450 feet (150 yards), 900 feet (300 yards) and 2,640 feet (0.5 mile) from shore. The potential extent of impacts based on criteria for speech interferences (52 dBA) was also examined. A related tool, also developed by NPS's Natural Sounds and Night Skies Division, is the PWC L_{eq} calculator. An hourly L_{eq} (refer to chapter 3 for background on the energy-equivalent sound level) is computed for PWC traveling parallel to

the shoreline based on the distance between the PWC and a receptor, the speed of the PWC, and the number of PWC in the area per hour. To account for PWC play behavior (circling, high-speed maneuvers), the calculator allows for the input of a rectangular boundary on the area where the PWC play is occurring and the minutes of play behavior out of the total duration of the analysis period. The calculation treats the edges of the hypothetical play area rectangle as line sources and estimates the duration of each "circuit" around the rectangle based on the user-inputted PWC speed. The number of PWC operating in any one time varies greatly both spatially and temporally. Rather than attempt to predict PWC noise levels in detail at specific locations, a range of potential impacts was considered for the entire national seashore based on the available PWC count data. The L_{eq} analysis was performed to quantify the potential range of impacts on the national seashore based on three PWC count locations (two in Florida the District more heavily used by PWC, and one in the Mississippi District).

As shown in table 33, the PWC count data were used to consider a high-use (Memorial Day), a medium-use (typical summer weekend in a frequently used area), and a low-use scenario. Daily PWC counts were converted into hourly volumes for purposes of calculating a 1-hour L_{eq} by assuming the majority of PWC activity occurs over a 4-hour period during the daytime. The 4-hour peak period was based on review of the PWC count sheets which showed 60% of PWC activity occurring between 12:30–4:30 p.m. The impact on L_{eq} was examined from PWC operating parallel to shore at 35 mph based on national seashore staff observations of typical speeds (NPS 2016a). A second analysis was performed assuming the same numbers of PWC were engaged in play behavior instead of travelling parallel to shore. An average speed of 35 mph, based on observations of typical use at the national seashore, was assumed for play behavior and it was assumed the behavior was occurring 50% of the time during the analysis hour. The 50% activity rate was based on consideration of the range of the time spent in play behavior as observed during the 2015 PWC observation study (Volkert 2015).

For both the travel parallel to shore and play behavior analyses, the resulting 1-hour daytime L_{eq} was determined by combining the L_{eq} from the play behavior with the 42 dBA daytime existing ambient. The potential for PWC soundscape impacts was identified based on the extent of the national seashore within the zone that would potentially experience a 3 dBA or greater increase in 1-hour L_{eq}. Potential speech interference impacts were also identified based on a threshold of 52 dBA (see chapter 3).

TABLE 33. PWC DAILY COUNT DATA USED IN L_{EQ} ANALYSIS SCENARIOS

High-Use Scenario			Medium-Use Scenario			Low-Use Scenario		
Data Used	Daily PWC Count	Peak Hour PWC Est.	Data Used	Daily PWC Count	Peak Hour PWC Est.	Data Used	Daily PWC Count	Peak Hour PWC Est.
PC 06 (Perdido Key near Spanish Cove at Robertson Island) May 26, 2013 (Memorial Day)	157	24	PC 01 (Santa Rosa Island, west of Navarre Beach at property entrance June 22, 2013	49	7	PC 10 (Horn Island West) June 23, 2013	8	1

Potential Impacts on the Acoustic Environment from PWC Use

Impact of Single PWC Pass-by (L_{max}). Table 34 summarizes the L_{max} analysis results for various distances from a single PWC. The results for two-stroke PWC show it would take a distance of 4,575 feet (0.87 mile) for a PWC pass-by L_{max} to be equal to the existing ambient noise level of approximately 42 dBA. In contrast, the quieter four-stroke PWC would equal the existing ambient noise level when operating at 1,980 feet from a receiver. The calculated distances assume travel over water and do not account for attenuation by ground cover on islands, or shielding by dunes etc. In terms of NPS's watercraft noise regulation (36 CFR 3.15), the results show a two-stroke PWC at full throttle would need to stay at least 125 feet from shore in order to not exceed the 75 dBA limit (the regulation is used for

enforcement purposes and is based on the measured noise level at shore). For a four-stroke PWC at full throttle, it could operate at up to 44 feet from shore without exceeding the 75 dBA limit. Note that the 36 CFR 3.15 requirement is designed to measure L_{max} from a single watercraft and is therefore not applicable to assessing L_{max} of multiple watercraft operating simultaneously. The regulation is also not applicable to L_{eq}-based analyses.

TABLE 34. PWC L_{MAX} ANALYSIS RESULTS

Distance from PWC	Two-Stroke PWC			Four-Stroke PWC		
	PWC L_{max} (dBA)	Total Noise Level (PWC + Ambient)	Increase over Existing Ambient	PWC L_{max} (dBA)	Total Noise Level (PWC + Ambient)	Increase over Existing Ambient
50 feet	83.0	83.0	41.0	73.7	73.7	31.7
100 feet	76.9	76.9	34.9	67.6	67.6	25.6
200 feet	71.0	71.0	29.0	61.7	61.7	19.7
450 feet (150 yards)	65.1	65.1	23.1	55.8	56.0	14.0
900 feet (300 yards)	59.1	59.2	17.2	49.8	50.5	8.5
1,980 feet (four-stroke equals existing ambient)	51.3	51.8	9.8	**42.0**	45.0	**3.0**
2,640 feet (0.5 mile)	48.2	49.1	7.1	39.0	43.8	1.8
4,575 feet (two-stroke equals existing ambient)	**42.0**	45.0	**3.0**	32.7	42.5	0.5

Note: Bolded values indicate the distance at which two-stroke and four-stroke PWC noise would be equal to the existing ambient noise level (resulting in a 3 dBA increase over existing conditions).

Figure 4 presents the L_{max} sound levels shown in the table in the form of a map for a PWC operating at a point 900 feet (300 yards) from shore. In this scenario, a receptor on the shore would experience the PWC L_{max} as 59 dBA, which would potentially cause speech interference for the duration of the PWC event. For a PWC travelling parallel to shore, the event duration would be short, with the L_{max} occurring when the distance between the PWC and receiver is the smallest and the PWC sound level decreasing as it travels further away. Figure 5 presents the same L_{max} sound levels as figure 4, but with the PWC assumed to be operating at 0.5 mile from shore instead of 300 meters. In this scenario the sound level for a receiver on shore would be 48.2 dBA, which is below the speech interference threshold of 52 dBA. Areas along the shoreline would still experience a 3 dBA or greater increase in sound levels over the existing natural ambient as shown by the location 40 dBA L_{max} contour line. Impact of Multiple PWC Operating Simultaneously (1-hour L_{eq}). Table 35 summarizes the l-hour L_{eq} analysis for the three PWC use scenarios, showing the energy-average sound level taking into account the number of PWC pass-bys. The predicted L_{eq} sound levels are much lower than the L_{max} noise levels that examine the highest sound level only. For two-stroke PWC, the high-use scenario of 24 PWC/hour would result in a 1-hour L_{eq} that exceeds the 42-dBA existing ambient out distances of 4,500 feet. However, with the medium-use scenario (corresponding to average summer use levels), 1-hour L_{eq} from two-stroke PWC would reach 42 dBA at a distance of 2,000 feet. In a low-use scenario, 1-hour L_{eq} would exceed 42 dBA only in close proximity to the two-stroke PWC (less than 450 feet). This shows that the degree of PWC impact on the acoustic environment is highly variable based on the number of PWC in operation at any given time.

In terms of four-stroke PWC, the results show four-stroke PWC would have substantially lesser impact on the acoustic environment compared to the same number of two-stroke PWC. In fact, 24 four-stroke PWC pass-bys at 50 feet from shore would have a lower impact on 1-hour L_{eq} onshore (54.2 dBA) than 7 two-stroke PWC pass-bys at the same distance (58.2 dBA).

TABLE 35. PWC 1-HOUR L_{EQ} ANALYSIS RESULTS, PWC TRAVELLING PARALLEL TO SHORE AT 35 MPH

	High-Use		Medium-Use		Low-Use	
Number of PWC/hr	**24**		**7**		**1**	
Distance from PWC	**Two-Stroke PWC L_{eq}(h) (dBA)**	**Four-Stroke PWC L_{eq}(h) (dBA)**	**Two-Stroke PWC L_{eq}(h) (dBA)**	**Four Stroke PWC L_{eq}(h) (dBA)**	**Two-Stroke PWC L_{eq}(h) (dBA)**	**Four Stroke PWC L_{eq}(h) (dBA)**
50 feet	63.5	54.2	58.2	48.9	49.7	40.4
100 feet	60.4	51.1	55.1	45.8	46.6	37.3
200 feet	57.6	48.3	52.2	42.9	43.7	34.4
450 feet (150 yards)	55.2	45.9	49.8	40.5	41.4	32.1
900 feet (300 yards)	52.2	42.9	46.8	37.5	38.4	29.1
2,000 feet	47.7	38.4	42.3	33	33.9	24.6
2,640 feet (0.5 mile)	45.9	36.7	40.5	31.3	32.1	22.9
4,500 feet	42.0	32.7	36.6	27.3	28.2	18.9

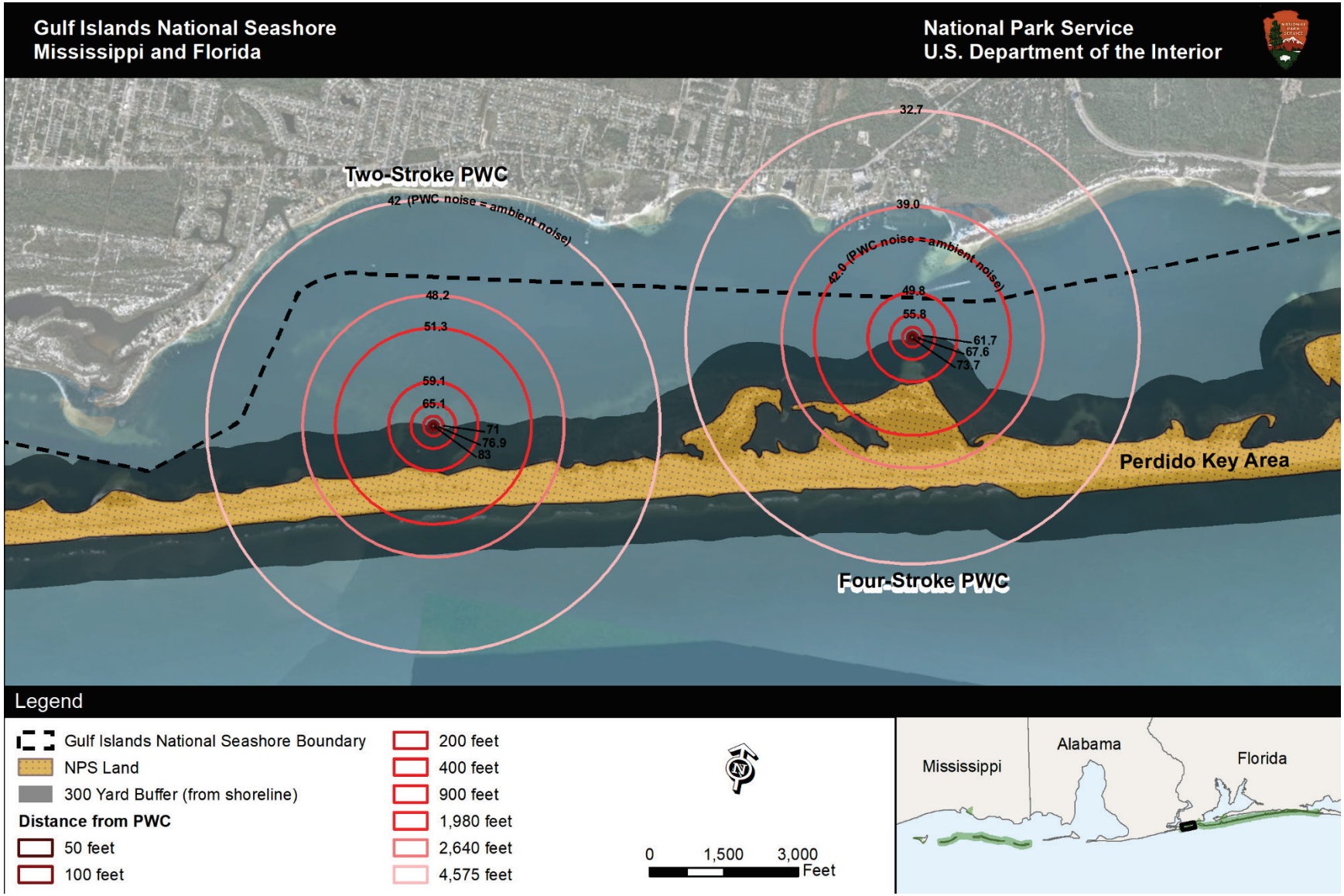


FIGURE 4. L_{MAX} (DBA) WITH PWC OPERATING AT 300 YARDS FROM SHORE

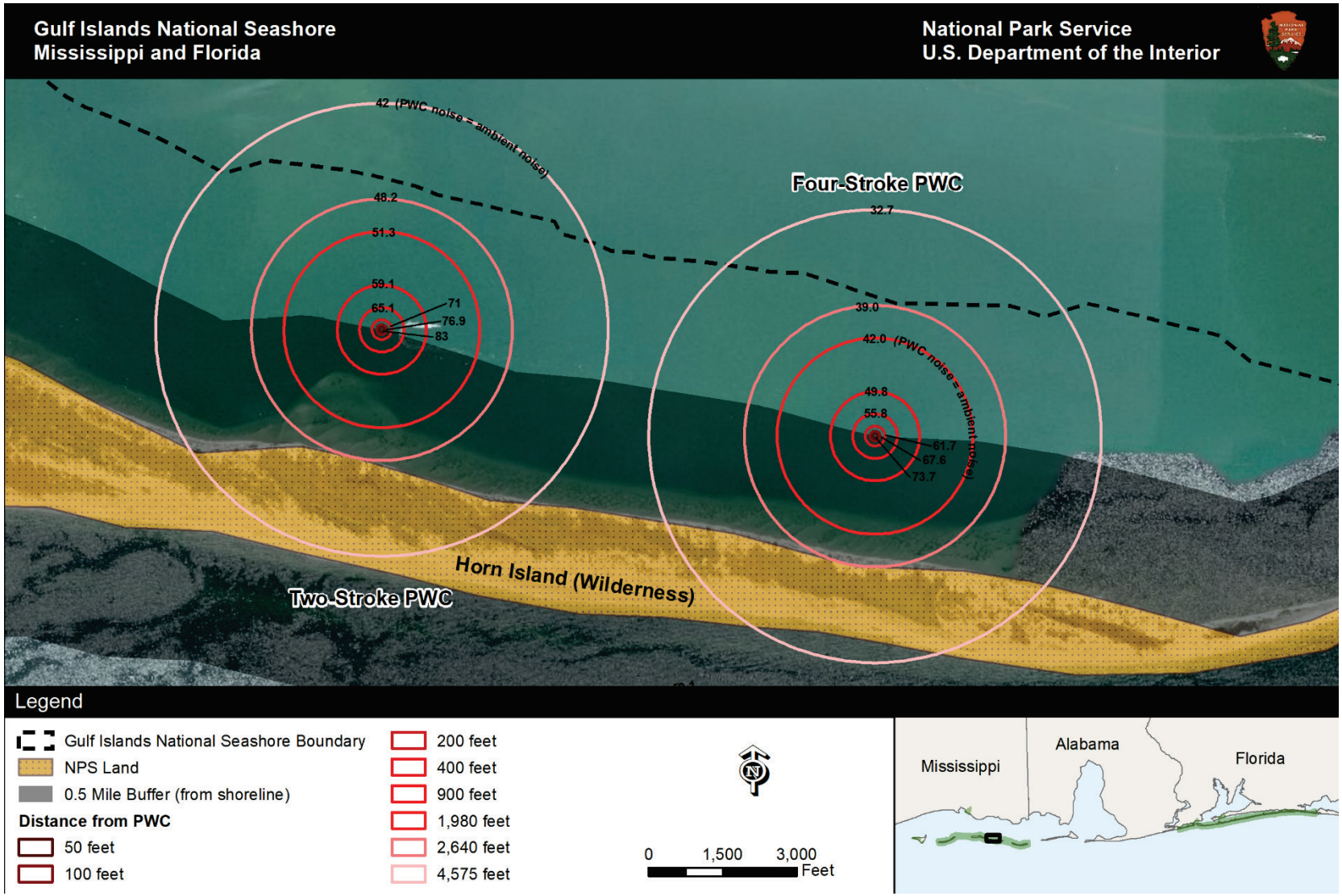


FIGURE 5. L_{MAX} (DBA) WITH PWC OPERATING 0.5 MILE FROM SHORE

The PWC count data from the 2015 Volkert study show that the hot-spots where multiple PWC tend to operate include Santa Rosa Island and Perdido Key, both in the Florida District. The Mississippi District experiences much lower PWC use and multiple PWC operating at once in the vicinity of Petit Bois, West Petit Bois Island, and Horn Island is uncommon (Volkert 2015). Table 36 summarizes the results of the l-hour L_{eq} play behavior analysis assuming PWC are actively in use 50% of the time during the analysis hour. Overall, the play behavior results are approximately 20 dB higher than the corresponding pass-by analysis results (table 35) because of the greater length of noise exposure by assuming the PWC are travelling continuously in loops around the play area. Play behavior by two-stroke PWC less than 100 feet from shore may approach or exceed 80 dBA L_{eq} if multiple PWC are involved. This level of noise would be annoying to listeners, particularly in a park context (see appendix F, table F-1). At 300 yards, the two-stroke PWC play behavior results range from 58 dBA L_{eq} (one PWC) to 72 dBA L_{eq} (24 PWC), which is 16 to 30 dB greater than the 42 dBA existing ambient. A two-stroke PWC engaged in play behavior has the potential to exceed the 52 dBA speech interference threshold even at distance of 0.5 mile.

TABLE 36. PWC 1-HOUR L_{EQ} ANALYSIS RESULTS, PWC PLAY BEHAVIOR AT 35 MPH

	High-Use		Medium-Use		Low-Use	
Number of PWC/hr	**24**		**7**		**1**	
Total Minutes of PWC Use in 1 Hour (Number of PWC × 30 minutes)	**720**		**210**		**30**	
Distance from PWC	**Two Stroke PWC L_{eq}(h) (dBA)**	**Four Stroke PWC L_{eq}(h) (dBA)**	**Two Stroke PWC L_{eq}(h) (dBA)**	**Four Stroke PWC L_{eq}(h) (dBA)**	**Two Stroke PWC L_{eq}(h) (dBA)**	**Four Stroke PWC L_{eq}(h) (dBA)**
50 feet	83.3	74.0	78.0	68.7	69.5	60.2
100 feet	80.2	70.9	74.9	65.6	66.4	57.1
200 feet	77.4	68.1	72.1	62.8	63.6	54.3
450 feet (150 yards)	75.0	65.7	69.7	60.4	61.2	51.9
900 feet (300 yards)	72.0	62.7	66.7	57.4	58.2	48.9
2,000 feet	67.5	58.2	62.2	52.9	53.7	44.4
2,640 feet (0.5 mile)	65.7	56.4	60.4	51.1	51.9	42.6
4,500 feet	61.8	52.5	56.5	47.2	48.0	38.7

Notes: L_{eq} at 50 feet based on NPS L_{eq} calculator, using a play area "box" with a maximum lateral distance of 300 feet and a distance to the edge of the box of 600 feet

As with the other metrics examined, the four-stroke PWC sound levels are substantially lower than the two-stroke levels, but would still result in impact to the acoustic environment at the national seashore. At a distance of 50 feet from shore, the estimated four-stroke PWC play behavior noise level would range from 74 dBA L_{eq} (24 PWC) to 60.2 dBA L_{eq} (one PWC). This could be intrusive to a listener in a park context, but would be perceived as approximately half as loud as the two-stroke PWC at the same distance. At 300 yards, the four-stroke PWC play behavior results range from 49 dBA L_{eq} (one PWC) to 63 dBA L_{eq} (24 PWC), which is 7 to 21 dB greater than the 42 dBA existing ambient. A four-stroke PWC engaged in play behavior has the potential to exceed the 52 dBA speech interference threshold at a distance of up 450 feet (compared to 0.5 mile for a two-stroke PWC).

Characteristics of PWC Noise

In addition to the L_{eq} and L_{max} metrics which can be readily quantified, human perception of noise is also affected by other characteristics, including frequencies and impulsiveness of the noise. This section provides a qualitative discussion of the available information on the characteristics of PWC noise and how this may relate to human annoyance. Measurements of two-stroke PWC pass-by noise levels at multiple speeds were made at Glen Canyon National Recreation Area in 2001 (HMMH 2002). Overall, the Glen Canyon study concluded PWC and typical outboard motorboat single event noise exposure level (SEL) and L_{max} pass-by levels were similar. One distinguishing feature of PWC was that they exhibited

more tonal characteristics (peaks in 125 Hz to 400 Hz bands). PWC had less sound energy in the lower frequencies (less than 100 Hz) in comparison to motorboats. These measurements are consistent with the general observation that two-stroke PWC can create higher-pitched "whine" noises that are different from motorboats (even though the total sound energy may be the similar).

Another characteristic of PWC noise is rapid fluctuations in sound levels, especially while going over waves or performing maneuvers. The Glen Canyon study found fluctuations in PWC noise of 10–15 dB over periods of less than one minute during times when PWC noise was the dominant component at soundscapes monitoring sites. Fluctuations of 3–5 dB can occur within less than a second, with the largest fluctuations while the PWC is accelerating. A sudden 180-degree turn by a PWC was found to cause a 10 dB spike in noise levels. Fluctuations with a small outboard motorboat were generally less than 2 dB. Miller, Solangi and Kuczaj (2008) notes that PWC sound levels fluctuate rapidly and the tonal components make PWC easy to distinguish from other types of watercraft. Users often take turns using PWC, resulting in visitors elsewhere experiencing "a continuous, repetitive pattern of recognizable sound events."

In research sponsored by the Noise Pollution Clearinghouse, Komanoff and Shaw (2000) state their belief that the biggest difference between noise from PWC and noise from motorboats is that PWC continually leave the water, which magnifies noise in two ways. First, without the muffling effect of water, the engine noise is typically 15 dB louder[2], and second, the smacking of the craft against the water surface results in a loud "whomp" or a series of them. Also, with the rapid maneuvering and frequent speed changes, the impeller has no constant "throughput" and no consistent load on the engine. Consequently, the engine speed rises and falls, resulting in a variable pitch. In general, sounds with prominent impulses are often perceived as more annoying than a constant sound with the same equivalent sound pressure level (EPA 1979). Thus, it could be inferred that PWC may cause greater annoyance than motorboats at the same sound level, but no empirical evidence of this theory specific to PWC use was identified in the literature review conducted as part of this EIS process. However, it should be noted that many of these older studies (such as Komanoff and Shaw 2000) were based on two-stroke PWC and do not address the characteristics of quieter four-stroke PWC that are increasing in market share as older two-stroke PWC are retired (see table 10).

Area of Analysis

The area of analysis for impacts of the direct and indirect alternatives on the acoustic environment includes all land and waters of the national seashore. The cumulative impact analysis also includes consideration of the impact of noise sources outside the national seashore on the acoustic environment inside the national seashore.

Alternative A: No Action

Alternative A would have beneficial effects on the acoustic environment because the existing PWC use at the national seashore would cease. The magnitude of beneficial effects would be greatest in those areas where there is currently a concentration of PWC activity, such as Perdido Key and Santa Rosa Island in the Florida District. The beneficial effect of the prohibition of PWC on the acoustic environment in the Mississippi District would be less because PWC activity is less frequent there.

Cumulative Impacts. NPS has developed a National-scale geospatial model that provides generalized predictions of how much man-made noise raises ambient sound levels (Mennitt, Sherrill, and Fristrup 2014). At the national seashore, the mean impact is predicted to be 4.6 dBA, ranging from 1.3 dBA in the least impacted areas to 15 dBA in the most impacted. That is, the existing sound level (with the influence

[2] The 15 dB increase for PWC operating out of the water was based on measurements conducted in 1993 by Dr. Kenneth J. Wagner. See Wagner, K.J. 1994. Of hammocks and horsepower: The noise issue at lakes. LakeLine 14:24-28. This is consistent with, but at the high end of, the variability in noise levels reported in the 2001 Glen Canyon study (10-15 dB variability within one minute).

of man-made sounds) is predicted to be 4.6 dB above the natural ambient sound level. Limitations of the geospatial model are discussed in detail in Mennitt, Sherrill, and Fristrup, 2014.

Operation of motorized boats would also contribute to impacts on the acoustic environment under alternative A. Similar to PWC, the L_{max} of a typical small outboard motorboat at full throttle is in the range of 75 to 80 dBA at a distance of 50 feet (HMMH 2002). High performance motorboats can generate noise levels substantially higher than PWC. For example, the V-8 muscle boat studied in the Glen Canyon study generated a L_{max} level at 50 feet of 90 dBA, 10 dBA higher than a PWC (HMMH 2002). As with PWC, the degree of impact from boat operations would depend on the number and location of boats, the type of activity engaged in, and the distance of the boat operations from the national seashore. Areas of concentrated boat activity include Pensacola Beach and Navarre Beach areas of Santa Rosa Island, the east end of Okaloosa Island (Crab Island), the shores of East and West Ship Island, and the east end and north shore of Horn Island. The watercraft count studies demonstrate there are substantially more boats in operation than PWC, consequently the relative contribution of boats to overall acoustic environment impacts may be higher than PWC. For example, there are approximately 30 boats per PWC in the Mississippi District and 5 boats per PWC in the Florida District (NPS 2014e).

The operation of ferries to the national seashore would generate diesel engine noise, including the ferry to Fort Massachusetts and the new ferry route to Fort Pickens. The impact of ferries would be greatest in the immediate dock area. The impact of ferries would be relatively infrequent, for example, the two ferries to Fort Pickens would operate only three times per day (NOAA 2013). Related to motorized boat activity, additional impacts could occur during periodic dredging to maintain the three commercial shipping channels that cross the national seashore. Equipment used in dredge and disposal activity includes tugboats, barges, and mechanical dredges. A tugboat generates a L_{max} of 87 dBA at 50 feet and excavator clamshell dredge generates a L_{max} of 77 dBA at 50 feet (Epsilon 2006). Military operations would contribute to acoustic environment impacts, primarily from aircraft overflights. Detailed information quantifying the impact of existing military operations in the region on the national seashore is not available. Temporary impacts on the acoustic environment would occur from boat ramp construction at four locations in the Florida District, as well as various erosion control projects and construction of two new embayments as part of DWH Early Restoration projects.

When the impacts on the acoustic environment as a result of alternative A are combined with impacts of other activities in the study area, overall adverse cumulative impacts would be expected from the continued operation of other motorized vessels in the area of the national seashore. Alternative A would contribute a beneficial increment to the overall adverse cumulative impact, because of the beneficial effects associated with the prohibition on PWC use within the national seashore. Beneficial effects would be concentrated in areas of current PWC activity, such as Perdido Key and Santa Rosa Island and in these areas the reduction in PWC-related noise would be prominent for onshore visitors. Visitor annoyance due to PWC play behavior would be eliminated. In other areas less popular with PWC users (such as the wilderness islands), given the number and diversity of human-caused noise affecting the national seashore, less noticeable, but still beneficial changes in the overall condition of the acoustic environment would be anticipated because all other noise sources would continue (including motorboats which greatly outnumber PWC).

Conclusion. Alternative A would result in beneficial direct and indirect impacts on the acoustic environment by eliminating one of the human-caused sound sources at the national seashore. When compared to existing conditions, alternative A would have the greatest benefit to the acoustic environment of all alternatives evaluated because of a reduction in potential PWC impacts. Alternative A would result in adverse cumulative impacts, with the actions under alternative A contributing a beneficial increment to the overall adverse cumulative impact, but the overall condition of the acoustic environment outside of PWC high-use areas such as Perdido Key would remain similar to existing conditions given the numerous other sources affecting the national seashore (including motorboats).

Alternative B

PWC would be allowed to operate in the same manner as other types of watercraft under alternative B, including the elimination of the 300-yard flat-wake zone and the 0.5-mile flat-wake zone around Horn and Petit Bois Islands. As a result, PWC would be able to operate closer to shore and adverse impacts on the acoustic environment would increase substantially relative to existing conditions. For example, table 34 shows that a single two-stroke PWC operating at 300 yards from the shoreline results in a L_{max} of 59 dBA onshore, compared to 76.9 dBA L_{max} when the PWC is operating 100 feet from shore. A single four-stroke PWC operating at 300 yards from the shoreline generates a L_{max} of 49.8 dBA onshore, compared to 67.6 dBA when the PWC is operating 100 feet from shore. This represents an increase of approximately 18 dBA, which would be very noticeable to an observer onshore (for reference, a 10-dB increase is generally perceived as a doubling of loudness, a 20 dBA increase is perceived as four times as loud). The impact of eliminating the 300-yard flat-wake zone in Florida would likely be more adverse to the acoustic environment than the elimination of the 0.5-mile flat-wake zone around Horn and Petit Bois Islands because PWC count data shows low levels of PWC use in the vicinity of the wilderness islands.

Multiple PWC operating at once in the vicinity of the wilderness islands is not common based on the PWC count study. In terms of L_{eq}, a single two-stroke PWC pass-by at 100 feet results in a 1-hour L_{eq} of 46.6 dBA, compared to 32.1 dBA at a distance of 0.5 mile. A single four-stroke PWC pass-by at 100 feet results in a 1-hour L_{eq} of 37.3 dBA, compared to 22.9 dBA at a distance of 0.5 mile. A single two-stroke PWC engaged in play behavior would result in a 1-hour L_{eq} of 66.4 dBA at 100 feet, compared to 51.9 dBA at 0.5 mile. A single four-stroke PWC engaged in play behavior would result in a 1-hour L_{eq} of 57.1 dBA at 100 feet, compared to 42.6 dBA at 0.5 mile. The two and four-stroke PWC 1-hour L_{eq} at 100 feet for play behavior would exceed the 52 dBA threshold for potential speech interference. The relative increase in L_{eq} exceeds 10 dBA, indicating that it could be perceived as more than twice as loud during times when PWC are operating at 100 feet from shore. The reduction in size of the flat-wake zone would likely result in reactions of annoyance for some visitors if it results in PWC operating closer to the shore of wilderness islands.

Impacts of multiple PWC operating simultaneously would increase in areas such as Perdido Key and Santa Rosa in Florida District. The 1-hour L_{eq} analysis of play behavior (table 36) shows an impact of 72 dBA L_{eq} for 24 two-stroke PWC each operating for 30 minutes out of an analysis period of one hour at 300 yards, compared to 83.3 dBA L_{eq} at 50 feet. For four-stroke PWC, the impact of 24 PWC each operating in play behavior mode for 30 minutes out of an analysis period of one hour is 62.7 dBA L_{eq} and 74.0 dBA L_{eq} at 300 yards and 50 feet, respectively. Note that 24 PWC operating in the same area during the same hour is a peak use scenario that occurs infrequently and that impacts would be less when fewer PWC are operating as is more typical (see table 36).

The 500-foot flat-wake zone around the around Davis Bayou launch ramps, West Ship Island Pier, Horn Island Pier, and Fort Pickens fishing and ferry piers would result in a L_{max} of 64.2 for a receiver on shore during a two-stroke PWC pass-by at the edge of the flat-wake zone. This is more than 20 dBA higher than the existing ambient of 42 dBA and would exceed the 52 dBA threshold for potential speech interference. For comparison, under existing conditions the flat-wake zone at West Ship Island Pier, Horn and Petit Bois Islands is 0.5 mile and the corresponding two-stroke PWC L_{max} would be 48.2 dBA resulting in a total noise level of 49.1 dBA or 7.1 dBA higher than the existing ambient. Providing the same example for a four-stroke PWC, the L_{max} at 500 feet would be 55 dBA, still higher than existing ambient and exceeding the threshold of potential speech interference, but substantially less impact than a two-stroke PWC. For comparison, under existing conditions, a four-stroke PWC operating 0.5 mile from shore, the PWC L_{max} would be 39 dBA, resulting in a total noise level of 43.8 dBA or an increase over existing ambient of 1.8 dBA. Since two-stroke PWC would continue to be allowed, human annoyance due to the particular tonal characteristics of two-stroke engines (e.g., high-pitched “whine”) could continue to occur, although over time this would lessen as older two-stroke PWC age out of active use.

Cumulative Impacts. Impacts of past, present and reasonably foreseeable future actions would be the same as described for alternative A. When the impacts on the acoustic environment as a result of

alternative B are combined with impacts of other activities in the study area, overall adverse cumulative impacts would be expected. Alternative B would have a noticeable contribution to cumulative impacts due to the elimination of the existing flat-wake zone requirements, especially in areas of more intense PWC use such as Perdido Key and Santa Rosa.

Conclusion. Alternative B would result in significant adverse impacts on the acoustic environment, primarily due to PWC operating much closer to shore with the elimination of most flat-wake zones that currently exist. Impacts could include substantial increases in onshore PWC noise. Changes in flat-wake zones could result in an increase in PWC noise in the vicinity of 20 dBA relative to the PWC noise occurring under existing conditions. This change could be perceived as four times as loud in some locations. While the reduction of the 0.5-mile flat-wake zone to 100 feet around the wilderness islands would increase PWC noise, overall noise impacts would be more intense in high PWC use areas in the Florida district, where the flat-wake zone would be reduced from 300 yards to 100 feet. Implementation of alternative B would increase noise levels above the existing condition to the greatest extent of all alternatives. PWC noise impacts would lessen over time as older, louder two-stroke PWC are replaced (see table 11 demonstrating fleet turnover of pre-2003 model year two-stroke PWC). Cumulative impacts under alternative B would be adverse, for which the actions under alternative B would contribute a notable component.

Alternative C

Alternative C would not increase impact on the acoustic environment compared to the existing conditions because the existing flat-wake zones of 0.5 mile (2,640 feet) from the shoreline on the designated wilderness islands of Horn and Petit Bois; 0.5 mile (2,640 feet) from the shoreline or within 0.5 mile from either side of the pier at West Ship Island; and 300 yards (900 feet) from all other shorelines would continue to be in effect. As with the existing conditions, impacts on the acoustic environment would be greatest where multiple PWC operate simultaneously, such as adjacent to Perdido Key and Santa Rosa. For example, the 1-hour L_{eq} analysis of play behavior shows an impact 72 dBA L_{eq} for 24 two-stroke PWC operating for 30 minutes out of an analysis period of one hour at 300 yards. For four-stroke PWC, the impact of 24 PWC each operating in play behavior mode for 30 minutes out of an analysis period of one hour is 62.7 dBA L_{eq} at 300 yards. Note that 24 PWC operating in the same area during the same hour is a peak use scenario that occurs infrequently and that impacts would be less when fewer PWC are operating as is more typical (see table 36 for the full results for high, medium and low use). Since two-stroke PWC would continue to be allowed, human annoyance due to the particular tonal characteristics of two-stroke engines could continue to occur, although over time this would lessen as older two-stroke PWC age out of active use.

Cumulative Impacts. Impacts of past, present and reasonably foreseeable future actions would be the same as described for alternative A. PWC use under alternative C would contribute to the adverse impacts in the same manner as existing conditions because the existing flat-wake zone distances would continue to be in use. Other non-PWC noise sources would continue to result in adverse impacts to the acoustic environment, primarily from the operation of large numbers of other motorized vessels that aren't subject to PWC flat-wake zones. When the adverse impacts on the acoustic environment as a result of alternative C are combined with impacts of other actions in the study area, overall adverse cumulative impacts would be expected with the actions under alternative C contributing adverse effects in the same manner as existing conditions. Noise from PWC use under alternative C would contribute less to the overall cumulative effects on the acoustic environment than the continued operation of other motorized vessels.

Conclusion. Alternative C would result in no new impacts to the acoustic environment compared to the existing conditions because the existing flat-wake zones would continue and two-stroke PWC would continue to be allowed. The condition of the acoustic environment would be similar to existing conditions. PWC noise impacts would lessen over time as older, louder two-stroke PWC are eventually replaced by newer, quieter models (see table 11 demonstrating fleet turnover of pre-2003 model year two-stroke PWC). Cumulative impacts under alternative C would be expected to be adverse, with the actions under alternative C contributing in the same manner as existing conditions.

Alternative D

In the Mississippi District, alternative D would implement the same flat-wake zone distance (300 yards) as current conditions, except for at the wilderness islands of Horn and Petit Bois, and West Ship Island where alternative D would require a 300-yard flat-wake zone instead of 0.5 mile. For the portions of the Mississippi District where the 300-yard flat-wake zone would be maintained, impacts on soundscapes from PWC use would remain the same as existing conditions. While use of PWC around the wilderness islands occurs at lower levels than other areas of the national seashore, when it does occur the reduction in flat-wake zone distance could increase the PWC noise level experienced on shore. In terms of L_{max}, the impact from the reduction of the 0.5-mile flat-wake zone around the wilderness islands would be an increase of approximately 10 dBA (for both two-stroke and four-stroke PWC), which generally would be perceived as a doubling of loudness relative to existing conditions during the instant of the PWC pass-by. The L_{max} of a two-stroke PWC 300 yards from shore is approximately 59 dBA (17 dBA above existing ambient), compared to 48 dBA (6 dBA above existing median ambient) at 0.5 mile. The L_{max} of a four-stroke PWC 300 yards from shore is approximately 50 dBA (8 dBA above existing ambient), compared to 39 dBA (which is below the existing median ambient) at 0.5 mile.

Multiple PWC operating at once in the vicinity of the wilderness islands is not common based on the PWC count study. In terms of L_{eq}, a single two-stroke PWC pass-by at 300 yards results in a 1-hour L_{eq} of 38.4 dBA, compared to 32.1 dBA at a distance of 0.5 mile. A single four-stroke PWC pass-by at 300 yards results in a 1-hour L_{eq} of 29.1 dBA, compared to 22.9 dBA at a distance of 0.5 mile. A single two-stroke PWC engaged in play behavior would result in a 1-hour L_{eq} of 58.2 dBA at 300 yards, compared to 51.9 dBA at 0.5 mile. A single four-stroke PWC engaged in play behavior would result in a 1-hour L_{eq} of 48.9 dBA at 300 yards, compared to 42.6 dBA at 0.5 mile. The two-stroke PWC engaging in play behavior would exceed the 52-dBA speech interference threshold at 300 yards, but the four-stroke PWC at the same distance would not. The relative increase in L_{eq} during PWC play behavior is less than 10 dBA, meaning it could be noticeable, but not a doubling of perceived loudness. The reduction in size of the flat-wake zone would likely result in reactions of annoyance for some visitors if it results in PWC operating closer to the shore of wilderness islands. Alternative D would also close the shores of Horn and Petit Bois Islands to PWC landings, which could have a beneficial effect on the acoustic environment by discouraging PWC use in these areas (note that the wilderness islands are not heavily used by PWC based on the count study).

In the Florida District, flat-wake zones under alternative D would be 150 yards (instead of 300 yards under alternative C and existing conditions), resulting in increased PWC noise impacts on the acoustic environment. For example, table 31 shows that a single two-stroke PWC operating at 150 yards results in a L_{max} of 65.1 dBA onshore, compared to 59.1 dBA L_{max} when the PWC is operating 300 yards from shore. A single four-stroke PWC operating at 150 yards results in a L_{max} of 55.8 dBA onshore, compared to 49.8 dBA L_{max} when the PWC is operating 300 yards from shore. The increase in L_{max} is less than 10 dBA, indicating a potentially noticeable, but less than doubling of perceived loudness during the instant of a PWC pass-by. In terms of L_{eq}, a single two-stroke PWC pass-by would result in 41.4 dBA L_{eq} at 150 yards, compared to 38.4 dBA L_{eq} at 300 yards. For a single four-stroke PWC pass-by, the results are 32.1 dBA L_{eq} at 150 yards and 29.1 L_{eq} dBA at 300 yards. For play behavior L_{eq} with up to 24 PWC operating for 30 minutes each during one hour (a peak use condition that occurs infrequently), the results for two-stroke PWC are 75 dBA L_{eq} at 150 yards compared 72 dBA L_{eq} at 300 yards. For four-stroke PWC, the play behavior results for 24 PWC per hour are 65.7 dBA L_{eq} at 150 yards and 62.7 dBA L_{eq} at 300 yards. The increase in L_{eq} with the flat-wake zone change in the Florida District is approximately 3 dBA, which is generally considered a barely perceptible change in the hourly noise level. The smaller flat-wake zones would result in adverse impacts for both boating users (motorized and non-motorized) and non-boating users in the Florida District, primarily on the northern shores where PWC are typically operated.

Since two-stroke PWC would continue to be allowed, human annoyance due to the particular tonal characteristics of two-stroke engines could continue to occur, although over time this would lessen as older two-stroke PWC continue to age out of active use.

Cumulative Impacts. Impacts of past, present and reasonably foreseeable future actions would be the same as described for alternative A. PWC use under alternative D would contribute to the adverse impacts in the in the Florida District because flat-wake zone distances would be reduced relative to existing conditions. For much of the Mississippi District, impacts would be the same as existing conditions as flat-wake zones would remain the same in some areas. Alternative D could increase impacts due to the reduction of the flat-wake zone distance around wilderness islands and West Ship Island. For the wilderness islands only, this potential impact could be offset by closing the islands to PWC landings. Other non-PWC noise sources would continue to result in adverse impacts to the acoustic environment, primarily from the operation of large numbers of other motorized vessels that aren't subject to PWC flat-wake zones. When the impacts on the acoustic environment as a result of alternative D are combined with impacts of other actions in the study area, overall adverse cumulative impacts would be expected, with actions under alternative D contributing an adverse increment. Noise from PWC use under alternative D would contribute less to the overall cumulative effects on the acoustic environment than the continued operation of other motorized vessels.

Conclusion. Alternative D would result in adverse impacts from the reduction in the size of the flat-wake zone in the Florida District and at the wilderness islands. In the Mississippi District, PWC use overall is less common and therefore the intensity of impact of the flat-wake zone changes is limited. Also, the prohibition on PWC landings on the wilderness islands could discourage PWC use and associated noise in those areas. The impact of flat-wake zone changes would be greater in the Florida District, where PWC use is much more frequent. The reduction in flat-wake zone distance means PWC could operate at higher speeds closer to shore, generating greater noise (e.g., 6 dB increase in L_{max} from a two or four stroke PWC operating at 150 yards instead of 300 yards or a 3 dB increase in L_{eq}). Impacts in the Florida District would be limited to the northern shores of the national seashore, where PWC use is common. PWC noise impacts would lessen over time as older, louder two-stroke PWC are replaced by quieter models (see table 11 demonstrating fleet turnover of pre-2003 model year two-stroke PWC). Cumulative impacts under alternative D would be expected to be adverse, with the actions under alternative D contributing an adverse increment.

Alternative E

Alternative E would effectively eliminate two-stroke PWC after a two-year transition period by requiring PWC to meet the 2010 EPA emission standards. During the transition period, older two-stroke PWC would continue to be allowed and similar adverse effects could continue to occur. After the transition period, the elimination of two-stroke PWC would have substantial benefits to the acoustic environment as summarized in tables 36, 37, and 38. The L_{max} of a modern four-stroke PWC is estimated to be up to 9 dBA less than older two-stroke PWC and this difference translates into smaller geographic areas of impact to the acoustic environment associated with PWC use. The elimination of older two-stroke PWC could also have qualitative benefits in reducing high-pitched engine whine that is typically associated with older two-stroke engines.

Alternative E would implement additional management measures tied to seagrass bed protection that would also potentially reduce the impact of PWC use on the acoustic environment relative to existing conditions. The closure of seagrass bed areas could decrease PWC activity and impacts in some areas (including high-use areas such as the bay side of Perdido Key and Santa Rosa Island). The prohibition on PWC use within 300 yards of the wilderness islands could reduce PWC use near these islands and improve the high-quality natural soundscape. It is not known if the full closures would result in shifting in the location of PWC use and impacts on different areas, or simply a reduction in overall PWC use. If shifting in the location of PWC use occurs, this could offset some or all of the beneficial effects of the closures on the acoustic environment. Impacts for reduction of flat-wake zones around wilderness islands

would be the same as alternative D, although PWC closures in these areas could result in fewer adverse impacts under alternative E.

Cumulative Impacts. Impacts of past, present and reasonably foreseeable future actions would be the same as described for alternative A. During the transition period, PWC use under alternative E would contribute to the adverse impacts in a similar manner as existing conditions in the Florida District because two-stroke PWC would continue to be allowed. In the Mississippi District adverse impacts would be slightly higher than existing conditions due to the lessening of the flat-wake zone distance around wilderness islands. After the transition to all four-stroke PWC, the elimination of louder two-stroke PWC would result in substantial benefits to the acoustic environment with benefits somewhat less in the Mississippi District around the wilderness islands where the flat-wake zone would be reduced. However, closures related to seagrass would prohibit PWC use in multiple areas of the national seashore (including around the wilderness islands), and provide beneficial impacts to those areas both pre and post phase-out. Alternative E would contribute a beneficial increment to the overall cumulative impact as a result of PWC closures near shoreline areas containing SAV, the prohibition on landing on the wilderness islands, and the elimination of two-stroke PWCs after two years. Other non-PWC noise sources would be unaffected and would continue to contribute adverse impacts, primarily as a result of other motorized vessel use close to the shorelines.

Conclusion. During the transition period, alternative E would result in adverse impacts as a result of the reduction in the size of the flat-wake zone at the wilderness islands. After the transition period, the elimination of louder two-stroke PWC would have a beneficial impact on the acoustic environment. Alternative E would also result in beneficial impacts to the acoustic environment as a result of limitations on areas where PWC can operate and land due to seagrass closures where PWC use would be prohibited. Cumulative impacts to the acoustic environment under alternative E would be expected to be adverse, with the actions under alternative E contributing a beneficial increment.

SAV / SHORELINE VEGETATION

Methods and Assumptions

Potential impacts on SAV were evaluated based on locations and patterns of PWC use relative to the locations of SAV within national seashore waters. Numbers and locations of PWC in use at the national seashore were evaluated based upon 2013 PWC counts (NPS 2013b) except for the Okaloosa area, which was based upon PWC counts conducted in 2015 (NPS 2015a). Operating behavior of PWC users and the percentage of PWC operating in compliance with applicable regulations were also documented in the 2013 PWC counts and taken into consideration for the purposes of the following analysis. Results of the 2013 and 2015 PWC counts are summarized in the “Visitor Use and Experience” section in chapter 3. Locations of SAV and extent of spatial coverage are presented in appendix D. Resource-specific context for assessing impacts of the alternatives on SAV includes the potential for PWC use to damage SAV or alter environmental conditions which may reduce the overall health and function of SAV communities under each alternative, site-specific PWC traffic volumes relative to locations of SAV, and regional importance of SAV to overall ecological health of natural systems at the national seashore. For the purposes of assessing impacts to SAV as a result of the proposed alternatives, it is assumed that direct impacts of PWC use on SAV would be limited to SAV habitats at depths of 3 feet or less in the Florida District and depths of 4 feet or less in the Mississippi District because studies have shown that in a water depth of 3 feet or more, PWC have little negative impact to seagrass beds (Continental Shelf Associates 1997; MDNR 2002).

The NPS reviewed bathymetric data to determine the approximate water depths adjacent to park shorelines. The average horizontal distance from shorelines in the Florida district to the 3-foot depth contour is 150 yards, which means that the depth of the water within 150 yards of the shorelines in the Florida district of the national seashore is generally 3 feet or less. In Mississippi, the average horizontal

distance to the 4-foot depth contour is 300 yards, which means that the depth of water within 300 yards is generally 4 feet or less (3-foot bathymetric data were not available for Mississippi).

Area of Analysis

The area of analysis for impacts of the alternatives on SAV includes all waters of the national seashore, and includes additional areas not specifically analyzed in the 2004 EA as described in chapter 1.

Potential Impacts on SAV / Shoreline Vegetation from PWC and Motorboat Use

PWC can be operated in shallow water, at high speeds, and in remote areas not usually frequented by boats. PWC may impact SAV both directly and indirectly (Ballestero 1990). Direct impacts occur when PWC come into direct contact with SAV or its associated sediments by running aground, pulling SAV plant material into the engine intakes (Currey n.d.), or blowing away sediments (Folit and Morris 1992). Indirect impacts typically occur when PWC use indirectly impedes primary productivity and plant growth, via sediment disturbances or increases in water column turbidity (Currey n.d.; Short, Wolf, and Jones 1989; Short, Jones, and Burdick 1991). Suspension-induced turbidity may decrease light penetration enough to inhibit photosynthesis (Short, Wolf, and Jones 1989; Stolpe 1992) and resettling particles may temporarily smother the photosynthetic receptors found on plant surfaces.

Studies evaluating PWC use in seagrass beds show that when operated according to manufacturer recommendations, PWC do not significantly affect erosion rates or ambient turbidity levels (Continental Shelf Associates 1997). However, PWC are frequently operated in ways that enhance their capacity to damage seagrass communities. For example, PWC can be used in shallow water areas, where their jet wash is more likely to disturb sediments. PWC also tend to stir up more sediment when operators are performing acrobatic maneuvers, traveling at slower speeds or rapidly accelerating. These activities tilt PWC back into the water column and direct their jet wash downward into underlying sediments and seagrass beds. PWC-related seagrass damage may also be exacerbated if PWC operation is spatially and/or temporally concentrated. Multiple PWC circling about in that same vicinity may have a greater impact than a single PWC traveling through the same area (Currey n.d.). A 1998 review of PWC impacts on SAV in Everglades National Park (Snow 1989) indicated PWC had a negative impact on SAV, including damaging emergent shoreline vegetation due to their ability to operate at high speeds close to shorelines. Other studies in New Hampshire and the Florida Keys found no significant PWC-related impacts (Continental Shelf Associates 1997; Anderson 2000). A 2002 study from Maryland found that in a water depth of 2–3 feet, PWC showed little direct negative impact to seagrass beds (MDNR 2002), and a 1997 study in the Florida Keys found no detrimental direct effects to seagrass beds when PWC are operated at depths of 2 feet or more (Continental Shelf Associates 1997). Overall, these results indicate that direct and indirect PWC-related impacts on SAV are site-specific and depend on multiple factors including physical and biological environmental characteristics, volume of PWC use, water depth, and ways in which PWC are operated. When operated according to manufacturer recommendations, PWC are not likely to affect shoreline vegetation (marsh grasses) because it occurs in intertidal or upland zones. Physical damage to emergent vegetation could occur if PWC run aground in salt marsh habitat. However, users would likely avoid this if possible, as salt marshes are composed of extremely dense, sharp, and rigid vegetation and are not suitable environments for PWC use.

Impacts to SAV from other vessel types were also considered in the analysis. Physical damage by boats to SAV at the national seashore has occurred for many years and contributes considerably to the disturbance of SAV meadows (Zieman 1976; Folit and Morris 1992; Sargent et al. 1995). Damage from boats generally occurs when a boat propeller contacts either the SAV or the bay bottom. Propeller scarring can be caused by many factors, including lack of understanding of the relationship of the draft of the boat to depth of the water where the boat is operating, poor marking of navigational channels, use of short cuts around channels and over flats where there is insufficient water depth, and efforts to plane a boat in shallow areas where there is insufficient water depth. Propeller scars create structural changes in SAV communities including physical destruction of the SAV, increased sediment resuspension, and a potential increase in the susceptibility of SAV beds to damage from hurricanes (Ballestero 1990; Dusek and Battle

1998). When vessels run aground, propeller scars are often coupled with large holes (blow holes) in the vegetation and substrate. Blow holes are created when a vessel operator attempts to use the motor's power to free the vessel (Whitfield et al. 2002). Propeller scarring can be caused when boaters use the propeller to dredge new channels or maintain existing, unmarked manmade channels, also referred to as "wheel ditches." Sediment excavated by boat propellers from blow holes and wheel ditches can form berms adjacent to the holes. Berms may bury SAV, causing vegetation mortality (Duarte et al. 1997; Whitfield et al. 2002). Propeller scarring is an issue of particular concern in the state of Florida where there is a high concentration of boat traffic (figure 6). A 1995 technical report conducted for the Florida Fish and Wildlife Conservation Commission reported that propeller scarring occurs throughout Florida including some within the boundaries of the national seashore, based on aerial survey data (Sargent et al. 1995).

Heck (2013) assessed recovery of SAV due to prop scarring within the Florida District of the national seashore. This study found that the success of SAV recovery in prop scars and blow holes was site specific, with some sites showing nearly full recovery (Choctawhatchee Bay), while others showed few signs of recovery (Santa Rosa Sound), and others showed partial recovery (Big Lagoon). Heck (2013) also reported that as recolonization of prop scars and blow holes occurred, smaller faster growing species (*Halodule wrightii*) sometime replace larger slower growing *Thallasia testudinum*, as was the case in Big Lagoon. This indicates that propeller damage in SAV beds may cause changes to community composition, even if prop scars and blow holes recolonize naturally. The report also indicated that blow holes recovered at a slower rate than prop scars (Heck 2013).

Indirect impacts on SAV from motorized boats are similar to those described above for PWC and consist of increased turbidity and sedimentation (Short, Wolf, and Jones 1989; Short, Jones, and Burdick 1991). Shoreline vegetation (marsh grasses) is generally more tolerant to disturbances than SAV and is not subject to propeller scarring because it occurs in intertidal or upland zones. However, marsh edges can be affected by erosion which can be enhanced by boats

Source: Sargent et al. 1995

FIGURE 6. PROPELLER SCARRING DAMAGE TO SAV

Alternative A: No Action

Because PWC use under alternative A would be prohibited throughout the national seashore, alternative A could result in beneficial effects on SAV in shallow water areas where PWC use is currently occurring. PWC use would end, removing the potential for direct physical damage to SAV beds and indirect impacts from temporary increases in turbidity as a result of PWC use. All 7,573 acres of SAV within the national seashore would be protected against potential impacts from PWC use under alternative A.

Cumulative Impacts. Cumulative impacts on SAV from past, present, and reasonably foreseeable future actions would result from continued boat traffic, military-related activities, and various restoration projects associated with both the MsCIP and the DWH Oil Spill restoration efforts. Ongoing military-related activities which may adverse impact SAV include Coast Guard patrols in waters around the national seashore and Marine Corps amphibious unit operations, which occur two to three times per year near the Florida District. These activities, combined with other motorized boating activities may increase the potential for direct or indirect adverse impacts on SAV when boats are operated in areas where SAV are present. Heavy commercial and recreational boating use in shallow SAV habitat at Crab Island (Okaloosa area) would also contribute adverse cumulative impacts to SAV in the Florida District.

Boat propeller scarring creates structural changes in SAV communities including physical destruction of plants, sediment resuspension, and a potential increase in the susceptibility of SAV beds to damage from hurricanes (Ballestero 1990; Dusek and Battle 1998). Propeller scarring occurs throughout Florida, including within the boundaries of the national seashore. Recreational boating at the national seashore occurs at much higher levels than PWC use. Data derived from PWC counts and analysis of aerial photographs revealed that motorboats outnumber PWC 5 to 1 in the Florida District and 30 to 1 in the Mississippi District. Increased potential for damage to SAV by other boats compared to PWC (as even with no PWC use under alternative A, boat use would continue), coupled with substantially higher levels of boating use compared to PWC use at the national seashore, suggests that recreational boating makes a larger contribution to adverse cumulative impacts on SAV than PWC use. Boats would continue to be allowed to operate in SAV areas, resulting in ongoing adverse impacts to SAV at the national seashore.

Portions of the national seashore were adversely impacted by the DWH Oil Spill. Associated response and cleanup efforts resulted in adverse impacts on SAV due to boat traffic in SAV beds. However, ongoing restoration efforts following the spill have contributed to beneficial effects on SAV. One restoration project included transplanting of seagrasses, installation of bird stakes to enhance nutrient supply to SAV beds, long-term monitoring, and visitor education. In the Mississippi District, reasonably foreseeable future actions associated with the MsCIP include barrier island restoration that involves placement of sediment near shorelines, which could temporarily adversely impact SAV due to burial of vegetation, increased turbidity, or other impacts associated with the presence construction equipment or boats. In the Florida District, reasonably foreseeable future actions associated with the DWH Oil Spill NRDA include an erosion control project at Norriego Point, which could cause temporary turbidity increases adversely impacting SAV beds. While some beneficial impacts would occur, overall, these past, present and reasonably foreseeable future actions would result in adverse to SAV.

When the impacts on SAV as a result of alternative A are combined with impacts of other actions in the study area, overall adverse cumulative impacts would be expected. Alternative A would contribute a beneficial increment to the overall adverse cumulative impact, because prohibition of PWC use in the national seashore would remove the potential for adverse impacts to SAV as a result of PWC use.

Conclusion. Alternative A would result in beneficial direct and indirect impacts on SAV when compared to existing conditions because eliminating PWC use at the national seashore would remove the potential for PWC to adversely impact SAV. Alternative A would have the greatest benefit to SAV of all considered alternatives because of this elimination of potential PWC impacts. Implementation of alternative A would result in closer to natural conditions for SAV at the national seashore. There would be overall adverse cumulative impacts, and alternative A would contribute a beneficial increment to the overall adverse cumulative impact, because of the prohibition on PWC use within the national seashore.

Alternative B

The Florida District contains 2,527 acres of SAV which are located at depths of 3 feet or less, where impacts associated with PWC use could occur (NPS 2013a). Under alternative B, 80 acres of SAV located at depths of 3 feet or less would be protected by PWC closures and an additional 459 acres would be protected by flat-wake zones (543 total acres protected in the Florida District). The remaining 1,988 acres would not receive additional protection and would be subject to potential direct and indirect adverse impacts associated with PWC use operating at full throttle in these areas. Direct impacts on SAV under alternative B could include physical damage to SAV beds by running aground or trampling of individual plants during dismounts in areas containing SAV in shallow water (less than approximately 3 feet). Potential indirect impacts include disturbance or suspension of sediments which can interfere with photosynthesis (Currey n.d.). The greatest adverse impacts on SAV would occur when PWC users run PWC aground in areas where SAV is present; or perform acrobatic maneuvers in which PWC are tilted back into the water column, directing their jet wash downward into underlying sediments and SAV beds with impacts being greater in shallower areas.

PWC counts conducted during 2013 reported that far more PWC activity was observed along the north shore of Perdido Key, in Big Lagoon, than any other survey site at the national seashore. Perdido Key contains approximately 560 acres of SAV coverage, of which 151 acres occurs at depths of 3 feet or less in areas open to full-throttle PWC use, and would be subject to potential direct and indirect impacts due to PWC use. Results of 2013 PWC counts indicated that the Santa Rosa and Okaloosa areas had approximately equal volumes of PWC traffic, lower than those observed in Big Lagoon, but higher than those reported in the Mississippi District (NPS 2013b). Additional PWC counts conducted in 2015 reported that the areas near Destin and Crab Island also had levels of PWC use which are among the highest at the national seashore. Previous PWC counts conducted in 2013 did not include the sites in the study. Therefore, SAV in and around Perdido Key and Crab Island (Okaloosa area) may be at the greatest risk of impacts under alternative B.

The Mississippi District contains approximately 1,910 acres of SAV coverage, located on the north side of East and West Ship, Horn, and Petit Bois Islands, which are located at depths of 4 feet or less (NPS 2013a). Under alternative B, PWC would be allowed to operate in all Mississippi District waters containing SAV following restrictions in some area for flat-wake. Flat-wake zones at the Davis Bayou public boat launch and the Horn Island pier would limit impacts on approximately 235 acres of SAV (in waters 4 feet deep or less) at those locations, resulting in 1,675 acres of shallow water SAV, which would be subject to potential direct and indirect impacts from full-throttle PWC use. Overall, PWC use is much less abundant in the Mississippi District compared to Florida. However, results of 2013 PWC counts indicated that the majority of PWC use in the Mississippi District occurred near Horn Island, where shallow water SAV habitat is present (NPS 2013b).

Approximately 45% of the total SAV acreage in the Florida District and nearly 53% of the total acreage of SAV in the Mississippi District could potentially be impacted by full-throttle PWC use within shallow-water SAV habitats under alternative B. Allowing PWC to operate at full throttle within 100 feet of the shoreline would result in the largest potential for adverse impacts to SAV compared to all other action alternatives.

Cumulative Impacts. Cumulative impacts on SAV from past, present, and reasonably foreseeable future actions would be the same as described under alternative A. Collectively, these actions have contributed or would contribute adverse effects on SAV. When the impacts on SAV as a result of alternative B are combined with impacts of these other actions, adverse cumulative impacts would be expected. Alternative B would contribute a noticeable adverse increment to the overall adverse cumulative impact because PWC would be allowed to operate at full-speed up to 100 feet from shoreline, including shallow-water areas containing SAV. Operation of PWC in SAV habitat could lead to direct and indirect impacts, causing physical damage to plants, disturbance of sediments, and increased turbidity.

Conclusion. PWC use under alternative B would result in increased potential for direct and indirect adverse impacts on SAV in both the Florida and Mississippi Districts. Alternative B would allow full-throttle PWC use in nearly all shallow water SAV areas outside of 100 feet from the shoreline. Direct and indirect impacts on SAV are described under "Potential Impacts on SAV from Personal Watercraft Use." Greater impacts would occur in the Florida District which receives by far the highest volume of PWC traffic. With the exception of the area north of Perdido Key, PWC would be allowed to enter SAV habitats where direct adverse impacts may occur. Alternative B would reduce protection of shallow-water SAV to a total of 774 acres throughout the national seashore from closures and flat-wake zones, compared to 3,689 acres of shallow-water SAV currently protected because it would allow operation of PWC use at full throttle in shallow waters (less than 3 feet in Florida and 4 feet in Mississippi). Alternative B would have the greatest potential for impacts to SAV and likely result in some adverse impacts on SAV, but would not cause substantial loss or alteration to SAV communities over a wide area or in areas that would not recover.

Alternative C

Alternative C would have no new impacts on SAV compared to existing conditions because PWC closures and flat-wake zones would continue to be implemented in accordance with the current special regulation in 36 CFR 7.12. The presence of flat-wake zones would limit potential indirect impacts on SAV beds in shallow water areas by minimizing sediment disturbances and temporary increases in turbidity due to wave action caused by PWC wakes. Flat-wake zones would limit the ability of PWC users to conduct acrobatic maneuvers that are able to be performed at higher speeds in those areas, reducing the potential for direct and indirect adverse impacts on SAV within flat-wake zones. Additionally, in areas where full-throttle PWC use is allowed, impacts to SAV would be minimal because PWC do not have propellers, which can cause physical damage to SAV. Under alternative C, 80 acres of SAV located at depths of 3 feet or less in the Florida District would remain protected due to PWC closures and an additional 1,758 would be protected by flat-wake zones (1,839 total acres protected in the Florida District). The remaining 688 acres of shallow-water SAV, located mostly in the Santa Rosa area and at Perdido Key, would not receive protection from closures or flat-wake zones and would remain subject to potential direct and indirect adverse impacts associated with full-throttle PWC use. SAV at Crab Island (Okaloosa area) would also be at risk of potential impacts due to high PWC use in this area.

In the Mississippi District, although all waters would be open to PWC use, flat-wake zones under alternative C would limit impacts on 1,850 acres of shallow-water SAV habitat located around the Mississippi District islands. The remaining 61 acres of shallow-water SAV would remain open to full-throttle PWC use. Approximately 16% of the total SAV acreage in the Florida District and nearly 2% of the total acreage of SAV in the Mississippi District could potentially be impacted by full-throttle PWC use within shallow-water SAV habitats under alternative C. Overall, most impacts to SAV would be avoided, due to continued presence of flat-wake zones. SAV near Perdido Key and Crab Island (Okaloosa area) may be at the highest risk of impact due to high volumes of PWC traffic in these areas.

Cumulative Impacts. Cumulative impacts on SAV from past, present, and reasonably foreseeable future actions would be the same as described under alternative A. Collectively, these actions have contributed or would contribute adverse effects on SAV. When the impacts on SAV as a result of alternative C are combined with impacts of these other projects in the study area, an adverse cumulative impact would be expected. Alternative C would contribute a slight ongoing adverse increment to the overall adverse cumulative impact because PWC would continue to be allowed to operate in areas containing SAV, potentially leading to direct and indirect impacts due to physical damage to plants, disturbance of sediments, and increased turbidity. However, flat-wake zones would continue to limit potential for impacts to the majority of SAV in the national seashore.

Conclusion. Under alternative C, potential impacts would continue to be the same as existing conditions. Ongoing impacts would be the same as discussed under "Potential Impacts on SAV from Personal Watercraft Use." Overall 1,839 acres of shallow-water SAV in the Florida District would remain protected and 688 acres would remain open to full-throttle PWC use. In the Mississippi District 1,850

acres of shallow-water SAV would remain protected and 61 acres would remain open to full-throttle PWC use. This would result in approximately 16% of the total acres of SAV in the national seashore remaining subject to potential impacts from PWC use in the Florida District and nearly 2% of the total SAV being impact in the Mississippi District. There would be no new impacts to SAV under alternative C compared to existing conditions as the continuation of flat-wake zones would continue to limit impacts to the majority of SAV. Any ongoing impacts would be localized and would not be anticipated to result in noticeable impacts to large areas of SAV. There would be adverse cumulative impacts, and alternative C would contribute an ongoing adverse increment to the overall adverse cumulative impact because PWC would continue to be allowed to operate in areas containing SAV.

Alternative D

Under alternative D, potential impacts on SAV would be greater than those described under existing conditions because flat-wake zone distances would be reduced. In the Florida District, 80 acres of SAV located at depths of 3 feet or less would continue to receive protection due to PWC closures, as described under alternative C. Although reduced under alternative D, flat-wake zones would limit impacts on an additional 1,304 acres of shallow-water SAV resulting in 1,384 total acres protected in the Florida District. Reduction of the flat-wake zones under alternative D from 300 yards to 150 yards, would result in 1,143 acres of shallow-water SAV susceptible to impacts from full-throttle PWC use and would result in less protection than existing conditions.

In the Mississippi District, SAV would receive slightly less protection compared to existing conditions because flat-wake zones around West Ship Island, Horn Island, and Petit Bois Island would be reduced from 0.5 mile to 300 yards. A total of 1,673 acres of shallow-water SAV habitat in the Mississippi District would be protected flat-wake zones under alternative D, while 237 acres of shallow-water SAV would remain susceptible to impacts from full-throttle PWC use. Prohibiting PWC landings on wilderness islands would reduce potential for impacts to SAV because users would be less likely to enter shallow waters where impacts to SAV could occur.

Approximately 26% of the total SAV acreage in the Florida District and 7% of the total acreage of SAV in the Mississippi District could potentially be impacted by full-throttle PWC use within shallow-water SAV habitats under alternative D. With flat-wake zones of 150 yards in the Florida District and 300 yards in the Mississippi District, the majority of full-throttle PWC use would occur in waters greater than 3 feet deep in Florida and 4 feet deep in Mississippi where impacts are less likely to occur. Impacts to SAV from full-throttle PWC use in these areas would be minimal because PWC do not have propellers, which can cause physical damage to SAV. Impacts could occur as a result of sudden starts in shallow-water SAV habitat, which can cause blowouts. However, such impacts would be localized and would not be anticipated to result in noticeable impacts to large areas of SAV.

Cumulative Impacts. Cumulative impacts on SAV from past, present, and reasonably foreseeable future actions would be the same as described under alternative A. Collectively, these actions have contributed or would contribute adverse effects on SAV. When the impacts on SAV as a result of alternative D are combined with impacts of these other projects in the study area, an adverse cumulative impact would be expected. Alternative D would contribute an adverse increment to the overall adverse cumulative impact because flat-wake zones would be reduced, resulting in increased potential for impacts to SAV.

Conclusion. Under alternative D, impacts would be greater than under existing conditions because flat-wake zone distances would be reduced. The types of impacts would be the same as described under "Potential Impacts on SAV from Personal Watercraft Use." Overall 1,384 acres of shallow-water SAV in the Florida District would be protected and 1,143 acres would be open to full-throttle PWC use. In the Mississippi District 1,673 acres of shallow-water SAV would be protected and 237 acres would be open to full-throttle PWC use. This would result in approximately 26% of the total acres of SAV in the Florida District remaining subject to potential impacts from PWC use and nearly 7% of the total SAV in the Mississippi District. Impacts would be localized and would not be anticipated to result in noticeable impacts to large areas of SAV. Alternative D would reduce potential for impacts to SAV around the Mississippi wilderness islands because PWC landings would be prohibited, resulting in users being less likely to enter shallow waters where impacts to SAV could occur. There would be adverse cumulative

impacts, and alternative D would contribute an adverse increment to the overall adverse cumulative impact because PWC would continue to be allowed to operate in areas containing SAV.

Alternative E

Under alternative E, overall potential impacts on SAV would be less than those described under existing conditions because PWC closures would cover the majority of the shallow-water SAV coverage within the national seashore and flat-wake zones would provide additional protection. Alternative E would also designate PWC landing areas at the national seashore. Designating restricted PWC landing areas would further reduce the potential for adverse impacts on SAV by limiting locations where PWC are allowed to beach. Beaching of PWC can cause direct impacts on SAV by causing physical damage to plants and large disturbances of sediments. This may occur as a result of the PWC running aground, or by users pushing or dragging PWC through shallow SAV habitats to reach adjacent shorelines.

In the Florida District, 1,494 acres of SAV located at depths of 3 feet or less would receive protection due to PWC closures, as described in chapter 2. Flat-wake zones would limit impacts on an additional 705 acres of shallow-water SAV resulting in 2,199 total acres protected in the Florida District. Under alternative E, 327 acres of shallow-water SAV habitat in the Florida District would be susceptible to impacts from full-throttle PWC use and would result in greater protection than under existing conditions. Under alternative E, increased protection of shallow-water SAV in the Florida District, where PWC use is greatest, would offer better protection to SAV in the most vulnerable areas.

In the Mississippi District, SAV would receive slightly less protection compared to existing conditions because flat-wake zones around West Ship Island, Horn Island, and Petit Bois Island would be reduced to from 0.5 mile to 300 yards. A total of 1,551 acres of SAV located at depths of 3 feet or less would receive protection due to PWC closures. Flat-wake zones would limit impacts on an additional 122 acres of shallow-water SAV resulting in 1,673 total acres protected in the Mississippi District. Under alternative E, 237 acres of shallow-water SAV habitat in the Mississippi District would be susceptible to impacts from full-throttle PWC use and would result in slightly less protection than under existing conditions, based on combined acres of shallow-water SAV within PWC closures and flat-wake zones. Although the total amount of shallow-water SAV habitat subject to impacts from full-throttle PWC use in the Mississippi District would increase slightly compared to existing conditions, the implementation of full closures in large areas of shallow-water SAV habitat would more than compensate for this change, resulting in greater overall protection for SAV compared to existing conditions.

Approximately 7% of the total SAV acreage in the Florida District and 7% of the total acreage of SAV in the Mississippi District could potentially be impacted by full-throttle PWC use within shallow-water SAV habitats under alternative E. However, potential impacts would be localized and would not be anticipated to result in noticeable impacts to large areas of SAV. Implementation of alternative E would result in overall beneficial impacts to SAV.

Cumulative Impacts. Cumulative impacts on SAV from past, present, and reasonably foreseeable future actions would be the same as described under alternative A. Collectively, these actions have contributed or would contribute adverse effects on SAV. When the impacts on SAV as a result of alternative E are combined with impacts of these other projects in the study area, an adverse cumulative impact would be expected. Alternative E would contribute a beneficial increment to the overall adverse cumulative impact because PWC closures and flat-wake zones would provide additional protection for SAV compared to existing conditions.

Conclusion. Under alternative E, potential impacts would be less than under existing conditions due to PWC closures. The types of impacts would be the same as discussed under “Potential Impacts on SAV Vegetation from Personal Watercraft Use.” Overall 2,199 acres of shallow-water SAV in the Florida District would be protected and 327 acres would be open to full-throttle PWC use. In the Mississippi District 1,673 acres of shallow-water SAV would be protected and 237 acres would be open to full-throttle PWC use. This would result in approximately 7% of the total acres of SAV in the Florida District

subject to potential impacts from PWC use and 7% of the total SAV subject to potential impacts from PWC in the Mississippi District. There would be adverse cumulative impacts, and alternative E would contribute a beneficial increment to the overall adverse cumulative impact because PWC closures would protect the majority of the shallow-water SAV coverage within the national seashore and flat-wake zones would continue to provide additional protection.

WILDLIFE AND WILDLIFE HABITAT

Methods and Assumptions

Potential impacts on wildlife and wildlife habitat were evaluated based on locations and patterns of PWC use relative to locations of wildlife habitat and potential locations of individual species within the national seashore. Numbers and locations of PWC used within the national seashore were evaluated during 2013 (NPS 2013b) and 2015 (NPS 2015a) PWC counts and are summarized in the "Visitor Use and Experience" section in chapter 3. Information on wildlife species and habitats known to occur or likely to occur within the national seashore was obtained during an extensive literature review (NPS 2015c). Additional information was acquired from existing NPS reports, NPS staff, US Fish and Wildlife Service (USFWS), Florida Fish and Wildlife Conservation Commission, Mississippi Wildlife, Fisheries and Parks, and other relevant public information resources. The following assumptions were made to assess the potential impacts on wildlife and wildlife habitat under each alternative:

- Impacts on terrestrial species would only occur in areas immediately adjacent to shorelines and would extend no more than 200 feet inland (Rodgers and Schwikert 2002).
- Impacts on wildlife associated with noise from PWC engines would be commensurate with impacts described under the Acoustic Environment section of this chapter.
- Impacts on wildlife associated with noise from PWC engines would decrease over time as older, louder PWC are phased out naturally over time (under alternatives B, C, D, and E) or as required to meet the 2010 EPA Emissions Standards (under alternative E only).

Resource-specific context for assessing impacts of the alternatives on wildlife and wildlife habitat considered the potential for PWC use to harm, displace, or disturb wildlife or wildlife habitats within the national seashore; site-specific PWC traffic volumes relative to locations of where wildlife habitat exists or where native species are likely to be present; and the value of wildlife and wildlife habitat to the ecology and quality of user experience at the national seashore.

Area of Analysis

The area of analysis for impacts of the alternatives on wildlife and wildlife habitats includes all waters of the national seashore and all immediately adjacent shorelines.

Potential Impacts on Wildlife and Wildlife Habitat from PWC Use

PWC use may adversely affect wildlife and wildlife habitat both directly and indirectly. Impacts vary widely depending on the operation of the PWC and the species present, but typically entail disruptions to behavior and disturbances to or destruction of wildlife habitat. Potential direct impacts on wildlife from PWC use include collisions with individuals resulting in death or injury. The chances of these types of impacts increase the closer to shore PWC are allowed to operate at full throttle. Direct collision impacts to birds are not expected under any alternative. Such collisions are extremely unlikely given the ability of most birds to flee prior to a potential collision and the likelihood that PWC operators would maneuver to avoid collisions with wildlife. To date, there have been no documented cases of PWC collisions with birds at the national seashore (Bromley pers. comm. 2016). Only species which spend a portion of their time in the water would be subject to such impacts. Similarly, no PWC collisions with marine mammals have been documented at the national seashore in the last 20 years (Nicholas pers. comm. 2018).

Indirect impacts can include disturbances due to noise (in-air and in-water) generated by PWC engines, human intrusion into habitats, disturbances from vessel wake, and increased turbidity due to sediment resuspension in shallow marine or aquatic habitats. Additionally, PWC' shallow draft, jet propulsion (versus propeller), and high maneuverability enable them to access sensitive, nearshore, aquatic habitats and operate at high speeds within these areas. The impact to shoreline habitats from erosion was also considered. Because PWC cause only relatively small wakes, PWC use is not expected to result in a measurable amount of shoreline erosion within the national seashore when compared to storms and other natural events.

PWC use can potentially impact many groups of species present in areas where PWC are operated. The most vulnerable group of species to such impacts are birds, particularly those species which are found along shorelines, where noise from PWC engines is greater. Birds are likely to leave their habitat or "flush" due to noise or visual disturbances associated with PWC use (Burger 1998, 2002; Burger and Leonard 2000; Rodgers and Schwikert 2002). These disturbances may disrupt feeding, nesting, or reproductive behavior. Larger species such as osprey and herons are more likely to be impacted by PWC use than smaller species such as skimmers and terns (Rodgers and Schwikert 2002). More specifics on flushing distances are discussed under the alternatives.

Other terrestrial and marine species groups including mammals, reptiles, fish, and invertebrates may be similarly impacted by noise and visual disturbances due to PWC use. Impacts on fish and marine invertebrates from PWC use consist primarily of noise and visual disturbances and impacts on habitat, including EFH, such as temporary increases in turbidity, disturbance of sediments, and water pollution. Increased turbidity can impede foraging ability, reduce respiratory function, and cause behavioral changes in fish and other aquatic species (Newcombe and Jensen 1996).

Underwater noise from PWC engines may especially impact marine mammals. Underwater noise from PWC engines has been shown to cause dramatic behavioral responses in manatees and dolphins (Koschinski 2008; Morisaka et al. 2005; Miksis-Olds et al. 2007). Noise disturbances from PWC engines frequently trigger panic responses characterized by rapid changes in swim speed and direction (Koschinski 2008) and changes in respiration (Miksis-Olds et al. 2007), resulting in unnecessary energetic demands on individuals. Panic responses in dolphins have been shown to increase commensurate with increasing vessel speed and decreasing water depth, with panic response being greatest in shallow areas where PWC or other vessels are traveling at high rates of speed (Koschinski 2008). This suggests that flat-wake zones may effectively limit disturbances to dolphins and other marine mammals by preventing PWC from traveling at high speeds in shallow waters adjacent to shorelines. Underwater noise may also interfere with communication among individuals by disrupting echolocation (Morisaka et al. 2005). High levels of ambient underwater noise, such as that generated by PWC and boat engines interferes with the ability of dolphins to detect communications among individuals (Koschinski 2008; Morisaka et al. 2005). However, dolphins are able to adapt to ambient underwater noise, to some extent, by altering the frequency of their communication calls (Morisaka et al. 2005). Although these studies did not assess the level of interference based on the distance between watercraft and dolphins, it can be reasonably inferred that potential for disruption of echolocation would be greatest when PWC are operating at full throttle, when the greatest amount of noise would be generated, and that impacts would increase as distance between watercraft and animals decreases. Noise disturbances may disrupt essential behaviors such as feeding or mating and cause unnecessary stress to marine mammals. Underwater PWC noise is caused by different sources than airborne noise. Noise heard on the surface is primarily engine noise and the sound of the hull slapping on the surface. Underwater, the sound of the hull's passage through the water and cavitation (the formation of bubbles and their collapse due to changes in pressure, causing a hissing sound) dominate (ASCOBANS 2008). Because the shape of the hull is the primary determinant of noise, it is not expected that noise underwater would differ greatly between two-stroke and four-stroke PWC.

PWC use could directly and indirectly affect both terrestrial and aquatic habitats. Direct impacts on terrestrial habitats can occur only during landings, particularly when PWC are dragged ashore, or in the unlikely event of a collision with land. Indirect impacts on terrestrial habitats include noise from PWC engines. Direct impacts on marine and aquatic habitats caused by PWC use can include physical damage

caused by running aground or trampling during mounts and dismounts in shallow areas, while indirect impacts consist of temporary increases in turbidity disturbance of sediments, and degradation of water quality. Turbidity increases and sediment disturbances are most likely to occur when PWC are operated in shallow areas and when users perform acrobatic maneuvers in which the jet wash is directed downward. Degradation of water quality due to PWC engines is expected to have only minimal impacts on wildlife and wildlife habitats because estimated emissions to water would not exceed ecotoxicological or human health benchmarks, as described in the "Water Quality" section of this chapter. SAV habitats are particularly sensitive, and potential impacts on SAV due to PWC use are further described in the "SAV / Shoreline Vegetation" section of this chapter.

Alternative A: No Action

Under alternative A, PWC use would be prohibited throughout the national seashore. Consequently, alternative A would result in beneficial effects on wildlife and wildlife habitat, including EFH, compared to existing conditions because PWC use would end, removing the potential for impacts on this resource.

Cumulative Impacts. Cumulative impacts on wildlife and wildlife habitat from past, present, and reasonably foreseeable future actions would result from continued boat traffic, ship channel dredging and maintenance activities, military-related activities, and various restoration projects associated with both the MsCIP and the DWH Oil Spill restoration efforts. Boat traffic at the national seashore may result in direct and indirect impacts on wildlife and wildlife habitat similar to those described for PWC use. Impacts may include disturbances to wildlife due to engine noise, visual disturbances, increased turbidity, and shoreline erosion due to vessel wake. Recreation boating at the national seashore occurs at much higher levels than PWC use. Data derived from PWC counts and analysis of aerial photographs revealed that motorboats outnumber PWC 5 to 1 in the Florida District and 30 to 1 in the Mississippi District. Therefore, impacts from other motorized vessels would be much more intense than impacts from PWC.

Ongoing military-related activities which may contribute to cumulative impacts on wildlife and wildlife habitat include Coast Guard patrols in waters around the national seashore and Marine Corps amphibious unit operations, which occur two to three times per year near the Florida District. These activities, combined with other motorized boating activities may increase the potential for direct or indirect adverse impacts on wildlife and wildlife habitats when boats are operated in areas where wildlife habitat exists.

Portions of the national seashore were impacted by the DWH Oil Spill. Associated response and cleanup efforts resulted in temporary adverse impacts on wildlife and wildlife habitat due to increased boat traffic. Ongoing restoration projects following the spill have contributed and will continue to contribute to beneficial and adverse impacts on wildlife and wildlife habitat. One NRDA early restoration project contributed to beneficial effects on wildlife habitat through transplanting of seagrasses, installation of bird stakes to enhance nutrient supply to SAV beds, long-term monitoring, and visitor education.

In the Mississippi District, ongoing and reasonably foreseeable future actions associated with the MsCIP include barrier island restoration that involves placement of sediment near shorelines, which could temporarily impact wildlife and wildlife habitat due to noise, increased turbidity, or other impacts associated with the presence construction equipment or boats. In the Florida District, ongoing and reasonably foreseeable future actions include a passenger ferry which transports visitors to the Florida District of the national seashore. This may result in adverse impacts on wildlife due to noise and increased visitor use. Construction of erosion control structures at Norriego point would temporarily contribute to adverse impacts during construction due to noise and the presence of construction equipment and personnel. However, following construction, the project will contribute beneficial effects due to reduced rates of coastal erosion and habitat loss.

Overall, past, present, and reasonably foreseeable future actions have resulted in a mostly adverse cumulative impact to wildlife and wildlife habitat at the national seashore. When the impacts on wildlife and wildlife habitat as a result of alternative A are combined with mostly adverse impacts of other activities in the study area, overall adverse cumulative impacts would be expected. Alternative A would

contribute a noticeable beneficial increment to the overall cumulative impact, because of the beneficial effects to wildlife and wildlife habitat associated with the prohibition on PWC use within the national seashore.

Conclusion. When compared to existing conditions, alternative A would result in beneficial effects on wildlife and wildlife habitat, including EFH, within the national seashore because eliminating PWC use at the national seashore would remove the potential for impacts from PWC use such as noise, visual disturbances, and damage to aquatic and terrestrial habitats associated with PWC groundings. Alternative A would have the greatest benefit to wildlife and wildlife habitat because it is the only alternative under which PWC use would be completely discontinued. Cumulative effects under alternative A would be adverse, with the actions under alternative A contributing a noticeable beneficial increment to the overall adverse cumulative impact, because of the beneficial effects to wildlife and wildlife habitat associated with the prohibition on PWC use within the national seashore.

Alternative B

Under alternative B, impacts on wildlife and wildlife habitat may occur anywhere motorized vessels are allowed, because PWC use would be allowed throughout the national seashore, except in areas where all watercraft are restricted. In general, the greatest impacts on wildlife and wildlife habitat resulting from PWC use would occur in the areas that receive the most PWC traffic. Impacts on wildlife and wildlife habitat associated with PWC use would increase compared to current conditions under alternative B because flat-wake zones would be reduced, allowing PWC to operate at full speed throughout most of the national seashore, except within 100 feet of the shoreline. Potential impacts on wildlife and wildlife habitat under alternative B are described above under "Potential Impacts on Wildlife and Wildlife Habitat from Personal Watercraft Use." Specific impacts are described in detail below.

Wildlife Habitats

Terrestrial Habitats. Direct impacts on terrestrial habitats under alternative B would be minimal and would occur only during landings, where damage to habitats may occur if PWC are dragged ashore. Marshes and dunes are the most sensitive terrestrial habitat types present within the national seashore. However, PWC users would likely avoid grounding their vessels in marsh habitat, due to the inhospitable nature of this habitat type, and would not enter dune habitats which are unsuitable for PWC use. Indirect impacts on terrestrial habitats would consist of noise from PWC engines, which could alter the acoustic setting of nearshore habitats. Under alternative B, noise impacts would be greater than existing conditions, because flat-wake zones would be reduced to 100 feet from the shoreline. All other potential direct and indirect impacts on terrestrial habitats under alternative B would be temporary, and conditions would quickly return to baseline. All of these impacts would be similar to those under existing conditions.

Marine and Aquatic Habitats. Direct impacts on marine and aquatic habitats, including EFH, would consist of physical damage caused by running aground or trampling during mounts and dismounts in shallow areas. SAV habitats would be the most vulnerable habitat to these impacts due to their sensitive nature and because they occur in shallow areas where PWC would be allowed to operate under alternative B. However, the implementation of flat-wake zones within 100 feet of shorelines would aid slightly in minimizing impacts on nearshore SAV habitats. Potential impacts on SAV habitats are discussed in detail in the "SAV / Shoreline Vegetation" section. Other marine or aquatic habitats which are present in shallow areas which may be subject to direct impacts from PWC use under alternative B consist primarily of marine soft-bottom habitats. Although these habitats could be similarly affected by grounding of vessels or trampling during mounts and dismounts, these habitats are generally less sensitive than SAV habitats. Thus, direct impacts on soft-bottom habitats would likely be temporary and localized and habitats would quickly recover from temporary disturbances. Indirect impacts on marine or aquatic habitats would include disturbances due to noise from PWC engines, disturbances from vessel wake, and increased turbidity due to sediment resuspension in shallow areas. Indirect adverse impacts on marine or aquatic habitats, such as noise, wake, and turbidity pulses, would be temporary disturbances, from which habitats would quickly recover to baseline conditions and would be expected to be slightly greater than

existing conditions due to reduced flat-wake zones. Intensity of these impacts would be commensurate with the volume of PWC traffic in any given area.

Terrestrial Species

Birds. While many species are present at the national seashore, only those species that spend time in or near the coastlines would be vulnerable to impacts by PWC use. Adverse impacts on birds under alternative B would be almost, if not exclusively, indirect and would consist of temporary disturbances from PWC engine noise and presence of humans, which would be localized and temporary. Birds may flush at varying distances, depending on the species (Rodgers and Schwikert 2002). Noise and visual disturbances under alternative B could disrupt feeding, mating or nesting behaviors. Indirect impacts due to noise and visual disturbances would especially effect shorebirds, wading birds, and other species which spend a substantial portion of time in or near coastal waters in areas where PWC are present, and larger species may be impacted more than smaller species due to their greater flushing distances (Rodgers and Schwikert 2002). Noise disturbance can cause birds to flush, potentially disrupting feeding or nesting behavior. Ongoing noise in high PWC use areas such as Perdido Key could cause birds to avoid these habitats entirely. A detailed discussion of the anticipated increase in noise from PWC engines under alternative B is provided above under "Acoustic Environment." Intensity of impacts on birds would be commensurate with the volume of PWC traffic in any given area. Seasonal PWC closures for shorebirds, osprey, and eagles (described in chapter 2) would help minimize impacts on these species. When looking at disturbance for noise and visual intrusion of humans, the recommended buffer distance to avoid flushing for most bird species is 150 meters (approximately 500 feet) (Rodgers and Schwikert 2002). Compared to existing conditions, flat-wake zones would be substantially reduced under alternative B. Indirect impacts to birds would occur, and would be greater than existing conditions, because flat-wake zones would be less than the recommended 150 meters to avoid flushing birds.

In the Florida District, shorebird nesting, foraging, and loafing areas are located along the north and south shorelines of all islands as well as along both the north and south shores of the Naval Live Oaks area. In the Mississippi District, all of the islands provide important nesting areas for large colonies of terns, skimmers, and other shorebirds. Clapper rail may be present in salt marshes throughout the Mississippi District and night heron nest and roost in Davis Bayou (NPS 2004b). In general, groups most likely to be impacted include egrets, herons, ibises, gulls, terns, skimmers, and waterfowl. Songbirds may also be impacted by noise, but would generally be more abundant in inland habitats, further from areas where PWC are operated.

Marine and Aquatic Species

Marine Mammals. Adverse impacts on marine mammals under alternative B would include potential collisions with PWC and temporary disruption of feeding or mating behavior resulting from visual or auditory disturbances, including underwater noise. Effects of underwater noise from PWC engines could include panic responses in dolphins (rapid changes in swim speed and direction) resulting in stress to individual animals and potential disruption of feeding or other behaviors (Koschinski 2008). Allowing PWC use at full throttle closer to shore under alternative B would increase the likelihood of temporary disruption due to noise or visual disturbances. Dolphins occur throughout the national seashore, thus impacts may occur in any location where they are present. However, impacts are most likely to occur in the Florida District where PWC use is the greatest (particularly around Perdido Key and Santa Rosa Island). Alternative B would result in increased underwater noise compared to existing conditions because flat-wake zones would be substantially reduced, resulting in an large increase in areas open to full-throttle PWC use. Therefore, disturbances to dolphins and other marine mammals associated with underwater noise would increase under alternative B, when compared to current conditions. However, since dolphins already are experiencing current levels of underwater noise from motorboats and other recreational activities under existing conditions, there is not expected to be a change in overall health or productivity of dolphins or other marine mammals at the national seashore.

PWC collisions with dolphins are also a potential impact, although unlikely due to the low draft of PWC when traveling at high speeds, the absence of a propeller, and the ability of PWC operators to change course to avoid collision. However, the likelihood of PWC collisions with marine mammals, including dolphins, would increase slightly compared to existing conditions because flat-wake zones would be substantially reduced under alternative B. Collisions would be most likely to occur in shallow waters (depths of 4 ft. or less) where animals have limited ability to avoid collisions by diving. Therefore, allowing PWC use at full throttle closer to shore would increase chances of collisions with marine mammals compared to existing conditions. However, no PWC collisions with dolphins have been documented at the national seashore in the last 20 years (Nicholas pers. comm. 2018). PWC use would continue to be restricted within the lagoons of Perdido Key within Big Lagoon, so there would be no potential for PWC collisions with marine mammals in these areas. Sea turtles and West Indian manatees are listed as threatened or endangered under the ESA and are further discussed in the "Threatened and Endangered Species and Species of Special Management Concern" section.

Fish. Adverse impacts on fish as a result of PWC use would consist of temporary disturbances due to noise, turbidity pulses due to sediment resuspension from wake, or impacts on habitat. Marsh and SAV habitats serve as important nursery grounds for many fish species (Orth, Heck, and van Montfrans 1984). Therefore, any impacts on these habitats (described above under "Marine and Aquatic Habitats") could also impact fish. As for marine mammals, the reduced flat-wake zones under alternative B would increase the potential for impacts to these species when compared to existing conditions.

Invertebrates. Impacts on marine invertebrates under alternative B would consist almost exclusively of indirect impacts due to habitat disturbances. Coastal marsh and SAV habitats serve as important nursery grounds for many marine invertebrate species including shrimp, crabs, and bivalves (Orth, Heck, and van Montfrans 1984). Impacts on marine invertebrates may occur indirectly as a result of damage to SAV which could result in the loss of habitat and temporary turbidity pulses due to sediment resuspension from wake. Reduced flat-wake zones under alternative B would increase the potential for impacts to these species compared to existing conditions.

Essential Fish Habitat

Species with designated EFH within the national seashore include red drum, gray snapper, Spanish mackerel, brown shrimp, white shrimp, pink shrimp, and stone crabs. Adverse impacts on EFH under alternative B would be the same as those impacts described above under "Marine and Aquatic Habitats" and would be increased compared to current conditions. Impacts would be indirect, consisting of disturbances due to PWC noise and turbidity pulses due to sediment resuspension from vessels wake. These disturbances would be temporary, localized impacts and conditions would quickly return to baseline following individual disturbances. Any adverse impacts on marine habitats including SAV beds would also impact EFH because SAV beds provide important nursery habitat for many managed species.

Cumulative Impacts. Cumulative impacts on wildlife and wildlife habitat from past, present, and reasonably foreseeable future actions would be the same as described under alternative A. Collectively, these actions have contributed or would contribute overall adverse effects on wildlife and wildlife habitat. When the impacts on wildlife and wildlife habitat as a result of alternative B are combined with impacts of other actions in study area, adverse cumulative impacts would be expected. Alternative B would contribute a noticeable adverse increment to the overall cumulative impact because PWC would be allowed to operate at full-speed in shallow nearshore habitats, up to 100 feet from shorelines, where impacts to wildlife and wildlife habitats are likely. However, the level of overall adverse effects on wildlife would most likely be driven by the impact of other motorized vessels due to the much larger number of motorboats in use compared to PWC.

Conclusion. PWC use under alternative B would result in direct and indirect adverse impacts on wildlife and wildlife habitat. Direct impacts would include physical damage to habitats due to PWC landings or trampling during mounts and dismounts in shallow marine habitats, and potential PWC collisions with wildlife. Indirect impacts on wildlife and wildlife habitats would include auditory and visual disturbances

due to the presence of PWC and noise from PWC engines. Groups of species impacted by PWC use under alternative B would include marine mammals, birds, fish, and invertebrates. Coastal bird species would be the most heavily impacted group with impacts most intense near the Perdido Key and Santa Rosa Island where PWC activity is high. The most common and pervasive adverse impacts on wildlife and wildlife habitats would be indirect impacts from PWC engine noise. Noise would impact nearly all species within the auditory range of a PWC while in use, but may have the greatest impact on birds, causing them to flush or avoid habitats in high PWC use areas such as Perdido Key. Potential physical damage to habitat could persist well into the future. EFH for all designated species would be temporarily impacted by noise and turbidity pulses. These impacts would be greater than those under existing conditions due to substantially smaller flat-wake zone distances.

Alternative B is likely to adversely effect, to some extent, most groups of fish and wildlife species, as well as marine and aquatic habitats including EFH. Most impacts would be indirect, temporary, and localized. Impacts on wildlife and wildlife habitat due to PWC use would not be expected to cause measurable population declines of any native species within the national seashore or result in destruction or substantial degradation of wildlife habitats including EFH compared to existing conditions. Adverse impacts on wildlife and wildlife habitat would be somewhat limited by vessel restrictions prescribed by the Superintendent's Compendium and may be further reduced by seasonal bird closures. Cumulative impacts under alternative B would be adverse with the actions under alternative B contributing a noticeable adverse increment to the overall adverse cumulative impact because PWC would be subject to flat-wake zone provisions within 100 feet from the shoreline, instead of the current PWC flat-wake zones of 300 yards and 0.5 mile.

Alternative C

Alternative C would result in no new impacts on wildlife and wildlife habitat for all species described under alternative B compared to existing conditions because PWC closures and flat-wake zones would continue to be implemented in accordance with the current special regulation at 36 CFR 7.12. The continued presence of the existing flat-wake zones would limit potential for impacts on wildlife and wildlife habitat by reducing the likelihood of collisions with wildlife, limiting noise (underwater and in air) generated by PWC engines operating at full throttle, reducing disturbances and minimizing sediment disturbances and temporary increases in turbidity.

In the Florida District, flat-wake zones would continue to extend 300 yards from the shoreline around Perdido Key, Santa Rosa Island, and Okaloosa Island, and within 500 feet of the fishing pier and ferry pier at Fort Pickens. PWC use would be prohibited in the lagoons of Perdido Key. In the Mississippi District, flat-wake zones extending 0.5 mile from the shorelines of West Ship Island, Horn Island, and Petit Bois Island would continue to limit potential direct and indirect impacts on wildlife and wildlife habitats in these areas. Flat-wake zones would remain at a distance of 300 yards from all other national seashore shorelines, providing a buffer between fast-moving PWC and terrestrial wildlife habitat.

Cumulative Impacts. Cumulative impacts on wildlife and wildlife habitat from past, present, and reasonably foreseeable future actions would be the same as described under alternative A. Collectively, these actions have contributed or would contribute overall adverse effects on wildlife and wildlife habitat. Alternative C would contribute a continued adverse increment to the overall cumulative impact because PWC would continue to be allowed to operate at the national seashore, although impacts would be limited due to the continued presence of flat-wake zones, offering protection to species in shallow nearshore habitats where impacts would be most likely to occur.

Conclusion. Alternative C would not result in a change to potential impacts on wildlife and wildlife habitat because there would be no change in PWC management compared to existing conditions. Therefore, current impacts on wildlife and wildlife habitat would continue. Ongoing impacts on wildlife and wildlife habitat may include direct impacts such as physical damage to habitats due to PWC landings or trampling during mounts and dismounts in shallow marine habitats, and potential PWC collisions with wildlife, although none have been documented in the national seashore. Indirect impacts on wildlife and

wildlife habitats could include auditory and visual disturbances due to the presence of PWC and noise generated by PWC engines. Impacted species may include marine mammals, birds, fish, and invertebrates and their associated habitats, including EFH. Underwater noise would continue at levels currently experienced by marine mammals. Cumulative impacts under alternative C would be adverse with the ongoing actions under alternative C contributing an adverse increment to the overall adverse cumulative impact because PWC would still be allowed to operate at the national seashore, although impacts would be limited due to the continued implementation of existing flat-wake zones, offering protection to species in shallow nearshore habitats where impacts are most likely to occur. There would be no new impacts to wildlife or wildlife habitat associated with the implementation of alternative C compared to existing conditions.

Alternative D

Impacts on wildlife and wildlife habitat under alternative D would be greater than those under existing conditions because flat-wake zones would be reduced. Flat-wake zones, although reduced under alternative D, would limit potential for impacts on wildlife and wildlife habitat by limiting the likelihood of collisions with wildlife, noise generated by PWC engines operating at full throttle, sediment disturbances, and temporary increases in turbidity. Alternative D would result in a slight increase in adverse impacts on birds compared to existing conditions because flat-wake zones in the Florida District would be reduced to 150 yards (450 feet). This is slightly less than the recommended buffer distance to avoid flushing for most bird species, which is 150 meters (approximately 500 feet) (Rodgers and Schwikert 2002). However, because the flat-wake zones would be nearly the recommended buffer distance, this slight increase in PWC engine noise near shorelines where birds may be present may not have a noticeable difference in impacts on birds compared to existing conditions. Alternative D would not have a noticeable difference in impacts on birds in the Mississippi District compared to existing conditions because although flat-wake zones around West Ship Island, Horn Island, and Petit Bois Island would be reduced from 0.5 mile to 300 yards, they would remain much larger than the recommended 150 meters. In the Mississippi District there would be beneficial impacts to terrestrial habitats, compared to existing conditions, because PWC landing would be prohibited on wilderness islands.

Potential for PWC collisions with marine mammals or temporary disturbances due to underwater noise would increase when compared to existing conditions because flat-wake zones would be reduced. Reduced flat-wake zones under alternative D would allow PWC to operate at full throttle closer to shore, where collisions are most likely to occur, and would result in an increase in underwater noise because PWC would be allowed to operate at full throttle throughout more areas of the national seashore. Effects of underwater noise from PWC engines could include panic responses in dolphins (rapid changes in swim speed and direction) resulting in stress to individual animals and potential disruption of feeding or other behaviors (Koschinski 2008). Because dolphins are common throughout seashore waters, disturbances would be likely to occur on occasion. Disturbances due to underwater noise from PWC engines would occur over a greater area under alternative D because flat-wake zones would be reduced. However, since dolphins are experiencing current levels of underwater noise from motorboats and other recreational activities under existing conditions, there is not expected to be a change in overall health or productivity of dolphins or other marine mammals. PWC collisions with dolphins are also possible, although unlikely due to the low draft of PWC when traveling at high speeds, the absence of a propeller, and the ability of PWC operators to change course to avoid collision. No PWC collisions with dolphins have been documented at the national seashore in the last 20 years (Nicholas pers. comm. 2018). Reduction of flat-wake zones under alternative D would not threaten the health or productivity of any of the wildlife species that occur within the national seashore, as flat-wake zone distances would still be large enough to provide adequate protection for these species.

Cumulative Impacts. Cumulative impacts on wildlife and wildlife habitat from past, present, and reasonably foreseeable future actions would be the same as described under alternative A. Collectively, these actions have contributed or would contribute overall adverse effects on wildlife and wildlife habitat. When the impacts on wildlife and wildlife habitat as a result of alternative D are combined with impacts

of other actions in study area, an overall adverse cumulative impact would be expected. Overall, wildlife and wildlife habitat at the national seashore would remain in close to current conditions. Alternative D would contribute an adverse increment to the overall adverse cumulative impact because PWC would be allowed to operate at full throttle closer to shore, where impacts are more likely to occur, compared to current conditions. However, the level of overall adverse effects on wildlife would most likely be driven by the impact of other motorized vessels due to the much larger number of motorboats in use compared to PWC.

Conclusion. PWC use under alternative D would result in direct and indirect adverse impacts on wildlife and wildlife habitat in the national seashore. Potential impacts on wildlife and wildlife habitat could include direct impacts such as physical damage to habitats due to landings or trampling during mounts and dismounts in shallow marine habitats, and potential collisions with wildlife. Indirect impacts on wildlife and wildlife habitats could include auditory and visual disturbances due to the presence of PWC and noise from PWC engines. Impacted species may include marine mammals, birds, fish, and invertebrates and their associated habitats, including EFH. Underwater noise would result in disturbances to marine mammals. Overall, potential adverse impacts on wildlife and wildlife habitat under alternative D would be slightly greater than those under existing conditions due to the reduced size of flat-wake zones. Direct and indirect impacts on wildlife and wildlife habitat under alternative D would not be expected to cause measurable population declines of any native species within the national seashore or result in destruction or substantial degradation of wildlife habitats including EFH compared to existing conditions. Reduction of flat-wake zones under alternative D would not threaten the health or productivity of any of the wildlife species that occur within the national seashore. Cumulative impacts under alternative D would be adverse with the ongoing actions under alternative D contributing an adverse increment to the overall adverse cumulative impact because PWC would be allowed to operate in shallow nearshore habitats where potential impacts are more likely to occur. However, flat-wake zone distances would still be large enough to provide adequate protection for these species. The prohibition on PWC landings on the wilderness islands would provide greater protection of wildlife habitat in those areas.

Alternative E

The PWC closures under alternative E in would include the majority of the SAV coverage within the national seashore, and would offer protection to wildlife species that utilize those habitats as well as adjacent marine and terrestrial habitats. Designated landing areas would further reduce the potential for adverse impacts on wildlife and wildlife habitat by limiting direct impacts on nearshore habitats caused by grounding or dragging PWC. Restricted landing areas, including prohibiting landing on the wilderness islands, may also limit the number of PWC users who enter shallow nearshore habitats, reducing impacts on wildlife and wildlife habitat due to noise, visual disturbances, and increases in turbidity. The implementation of flat-wake zones under alternative E would limit potential for impacts on wildlife and wildlife habitat by reducing the likelihood of collisions with wildlife, limiting noise generated by PWC engines operating at full throttle, and minimizing sediment disturbances and temporary increases in turbidity compared to existing conditions. Because PWC would still be allowed in some areas of the national seashore, some potential for adverse impacts on wildlife and wildlife habitat would persist, with noise being most common source of impact. Impacted species may include marine mammals, birds, fish, and invertebrates and their associated habitats, including EFH. The recommended buffer distance to avoid flushing for most bird species is 150 meters (approximately 500 feet) (Rodgers and Schwikert 2002). Although flat-wake zone distances would be reduced in some areas in the Mississippi District, they would remain larger than the recommended 150 meters to avoid flushing birds.

Alternative E would result in increased underwater noise in the Mississippi District compared to existing conditions because flat-wake zones would be reduced from 0.5 mile to 300 yards, resulting in an increase in areas open to full-throttle PWC use. Therefore, potential disturbances to dolphins and other marine mammals associated with underwater noise would increase under alternative E in the Mississippi District, when compared to current conditions. Effects of underwater noise from PWC engines could include panic responses in dolphins (rapid changes in swim speed and direction) resulting in stress to individual animals

and potential disruption of feeding or other behaviors (Koschinski 2008). Because dolphins are common throughout seashore waters, disturbances would be likely to occur on occasion. Disturbances due to underwater noise from PWC engines would occur throughout a greater portion of the Mississippi District under alternative E because flat-wake zones would be reduced. However, since dolphins are experiencing current levels of underwater noise from motorboats and other recreational activities under existing conditions, there is not expected to be a change in overall health or productivity of dolphins or other marine mammals at the national seashore. Also, the prohibition of PWC landings on the wilderness islands could result in even lower levels of PWC use in the area, which would reduce the potential for noise and disturbance. Noise from PWC engines would decrease as louder two-stroke models are phased out over two years, as required under alternative E.

Similarly, potential for PWC collisions with marine mammals would increase slightly under alternative E in the Mississippi District because PWC would be allowed to operate at full throttle closer to shore. However, this increase in collision risk would be minimal because flat-wake zones would extend 300 yards from shore, limiting full-throttle PWC use in shallow waters where collisions are most likely to occur. PWC collisions with dolphins or other marine mammals are unlikely due to the low draft of PWC when traveling at high speeds, the absence of a propeller, and the ability of PWC operators to change course to avoid collision. No PWC collisions with dolphins have been documented at the national seashore in the last 20 years (Nicholas pers. comm. 2018). In the Florida District, the potential for PWC collisions with marine mammals or temporary disturbances due to underwater noise would decrease slightly because of full PWC closures and continued 300-yard flat-wake zone distances. Under alternative E, the area where underwater noise could disturb dolphins and other marine mammals would be reduced, compared to current conditions, because PWC closures would be implemented. Overall, alternative E would result in a reduction of impacts compared to existing conditions at the national seashore.

Cumulative Impacts. Cumulative impacts on wildlife and wildlife habitat from past, present, and reasonably foreseeable future actions would be the same as described under alternative A. Collectively, these actions have contributed or would contribute adverse on wildlife and wildlife habitat. When the impacts on wildlife and wildlife habitat from alternative E are combined with impacts of other actions in study area, both beneficial and adverse cumulative impact would be expected. Overall, alternative E would contribute a beneficial increment to the overall adverse cumulative impact resulting in closer to natural conditions for wildlife and wildlife habitat at the national seashore.

Conclusion. Alternative E would result in beneficial impacts on wildlife and wildlife habitat. Beneficial effects would occur due to targeted PWC closures around sensitive habitats which would protect a combined total of 1,894 acres of SAV habitat, and additional adjacent habitats. Additional beneficial effects would occur as a result of designated PWC landing areas which would further limit disturbances to nearshore wildlife species and habitat. Because PWC would still be allowed to operate in some areas of the national seashore, some potential for adverse impacts on wildlife and wildlife habitats exists, but the likelihood and magnitude of adverse impacts under alternative E would be greatly reduced in comparison to existing conditions as well as alternatives B, C, and D due to targeted closures and other restrictions. Compared to existing conditions, potential for adverse impacts would be reduced. Alternative E would result in closer to natural conditions for wildlife and wildlife habitat. Cumulative impacts under alternative E would be adverse with the actions under alternative E contributing a beneficial increment to the overall adverse cumulative impact because targeted closures imposed under alternative E would protect sensitive habitats and species.

THREATENED AND ENDANGERED SPECIES AND SPECIES OF SPECIAL MANAGEMENT CONCERN

Methods and Assumptions

Potential impacts on special-status species and critical habitat were evaluated based on locations and patterns of PWC use relative to known locations of special-status species within the national seashore.

Numbers and locations of PWC used within the national seashore were evaluated during 2013 (NPS 2013b) and 2015 (NPS 2015a) PWC counts and are summarized in the "Visitor Use and Experience" section in chapter 3 and in the "General Assumptions" section at the beginning of this chapter. Information on special-status species known to occur or likely to occur within the national seashore was obtained during an extensive literature review (NPS 2015c) and in collaboration with USFWS. Additional information about special-status species and PWC use within the national seashore was acquired from existing NPS reports, NPS staff, Florida Fish and Wildlife Conservation Commission, Mississippi Wildlife, Fisheries and Parks, and other relevant public information resources. Specific known locations of individual species within the national seashore are provided in table 37, along with a generalized description of potential impacts of each species associated with PWC use.

TABLE 37. POTENTIAL IMPACTS OF PWC USE ON SPECIAL-STATUS SPECIES

Species	Potential Impacts	Location of Known Occurrences
Terrestrial Mammals		
Perdido Key Beach Mouse	None; this species has a limited range and occurs only in the Florida District. There would be no adverse impacts to this species or its critical habitat because it is found in upland dune habitats, and does not occur near shorelines where impacts associated with PWC use could occur.	Perdido Key
Marine Mammals		
West Indian Manatee	Collisions with PWC; temporary disturbances due to noise or presence of PWC; loss of SAV habitat	Throughout the national seashore, particularly in SAV habitats
Birds		
American Oystercatcher	Temporary disturbances due to noise and movement/presence of PWC	Beach habitat throughout the national seashore; Occasionally nests in Florida District
Bald Eagle	Temporary disturbances due to noise or presence of PWC	Throughout the national seashore; Nests on Mississippi District islands
Black Skimmer	Temporary disturbances due to noise or presence of PWC	Beach habitat throughout the national seashore; Nests at Santa Rosa and Fort Pickens areas
Brown Pelican	Temporary disturbances due to noise or presence of PWC	Throughout the national seashore; No documented nests
Least Tern	Temporary disturbances due to noise or presence of PWC	Nests at Perdido Key, Fort Pickens, Santa Rosa, East Ship Island, West Ship Island, Horn Island, Cat Island
Little Blue Heron	Temporary disturbances due to noise or presence of PWC	Naval live oaks; No documented nests
Marian's Marsh Wren	Temporary disturbances due to noise or presence of PWC	Marsh habitat throughout Florida District; Potentially nests in Florida District
Peregrine Falcon	Temporary disturbances due to noise or presence of PWC	Throughout the national seashore: Potentially nests on Mississippi District islands
Piping Plover	Temporary disturbances due to noise or presence of PWC	Coastal habitat throughout the national seashore; Critical Wintering Habitat at Perdido Key, Santa Rosa Island and all Mississippi District islands; No documented nests
Reddish Egret	Temporary disturbances due to noise or presence of PWC	Coastal habitats of the Florida District when present; rarely documented at the national seashore; No documented nests

Species	Potential Impacts	Location of Known Occurrences
Red Knot	Temporary disturbances due to noise or presence of PWC	Beach habitat throughout the national seashore during migratory stops; Wintering Habitat at Perdido Key, Santa Rosa Island and all Mississippi District islands; No documented nests
Southeastern Snowy Plover	Temporary disturbances due to noise or presence of PWC	Beach habitat throughout the national seashore; Nests at Perdido Key, Santa Rosa Island, Fort Pickens, and all Mississippi District islands
Tricolored Heron	Temporary disturbances due to noise or presence of PWC	Marsh habitat in Florida District; Rarely present; No documented nests
Wood Stork	Temporary disturbances due to noise or presence of PWC	Could make infrequent stops in marsh and wetland habitat in either district; Rarely present; No documented nests
Reptiles		
American Alligator	Temporary disturbances due to noise or presence of PWC; disturbance of prey	Wetlands near Fort Pickens, Naval Live Oaks, Mississippi District islands, and Davis Bayou
Green Sea Turtle	Collision with PWC; temporary disturbances due to noise or presence of PWC; loss of SAV habitat	Throughout the national seashore, particularly in SAV habitats; Nests on Florida District beaches
Hawksbill Sea Turtle	Collision with PWC; temporary disturbances due to noise or presence of PWC; loss of SAV habitat	Throughout the national seashore; No documented nests
Kemp's Ridley Sea Turtle	Collision with PWC; temporary disturbances due to noise or presence of PWC; loss of SAV habitat	Throughout the national seashore; Occasionally nests on Florida District beaches and Mississippi District islands
Leatherback Sea Turtle	Collision with PWC; temporary disturbances due to noise or presence of PWC; loss of SAV habitat	Throughout the national seashore but rare; Nests have been documented in Florida District
Loggerhead Sea Turtle	Collision with PWC; temporary disturbances due to noise or presence of PWC; loss of SAV habitat	Throughout the national seashore; Nests at Perdido Key, Fort Pickens, Santa Rosa Island, East Ship Island, Horn Island, Petit Bois Island, and Cat Island
Fish		
Gulf Sturgeon	Collision with PWC; temporary disturbances due to noise or presence of PWC; temporary increases in turbidity	Throughout the national seashore; Critical habitat occurs in both districts
Saltmarsh Topminnow	Temporary disturbances due to noise	*Spartina* marshes throughout the national seashore

The analysis of potential impacts on special-status species under each alternative assumes impacts on terrestrial species would only occur in areas immediately adjacent to shorelines and would extend no more than 200 feet inland. Resource-specific context for assessing impacts of the alternatives on special-status species includes:

- Potential for PWC use to directly or indirectly impact special-status species within the national seashore.
- Site-specific PWC traffic volumes relative to locations of where special-status species are known to occur or likely to occur and in proximity to critical habitat.

ESA Section 7 effects determinations were based on guidance documents published by USFWS (USFWS 2006) and National Oceanic and Atmospheric Administration (NOAA) NMFS, Southeast Regional Office (NMFS 2014a). Each federally listed species was assigned a determination of No effect; May affect, not likely to adversely affect; or May affect, likely to adversely affect; based on all direct and indirect effects

under each alternative. Effects determinations, as defined in USFWS 2006 and NMFS 2014a, are summarized below:

No effect – The species will not be affected (neither beneficially, nor adversely) by actions under the alternative.

May affect, not likely to adversely affect – Effects on the species will be beneficial, discountable, or insignificant. Discountable effects are adverse effects that are plausible, but extremely unlikely to occur. Insignificant effects are plausible adverse effects that are that are undetectable, not measurable, or so minor that they cannot be meaningfully evaluated.

May affect, likely to adversely affect – One or more individuals of the species will be adversely affected by actions under the alternative, potentially resulting in "take," as defined under ESA.

Area of Analysis

The area of analysis for impacts of the alternatives on special-status species includes all waters of the national seashore and all immediately adjacent shorelines.

Potential Impacts on Threatened and Endangered Species and Species of Special Management Concern

As described in chapter 3, the national seashore is home to 25 special-status species, i.e., listed as threatened, endangered, or species of special management concern at the federal or state level (table 37). These include terrestrial and marine mammals, birds, reptiles, and fish. Potential impacts on wildlife and wildlife habitat due to PWC use are described in the "Wildlife and Wildlife Habitat" section including specific impacts on each species group. Specific impacts on wildlife, including special-status species, vary widely depending on how and where PWC are operated and which species are present. Impacts typically include disruptions to species behavior and disturbances to habitat due to PWC engine noise, human intrusion of habitats, and increased turbidity due to sediment resuspension in shallow marine or aquatic habitats. PWC collisions with marine species including manatees, sea turtles, and gulf sturgeon are possible. Degradation of water quality due to PWC engines is not expected to have noticeable impacts on special-status species because estimated emissions to water would not exceed ecotoxicological or human health benchmarks, as described in the "Water Quality" section. Potential impacts on special-status species as a result of PWC use would generally be the same as those described for wildlife and may occur anywhere PWC are operated, when special-status species are present. Specific known locations of individual species and potential impacts from PWC use are provided in table 37. Impacts to special-status species under each alternative are described below.

Alternative A: No Action

Under alternative A, PWC use would be prohibited throughout the national seashore, and alternative A would result in beneficial effects on all special-status species and critical habitat (table 7). PWC use would end, eliminating the potential for impacts on these species. Initial impact determinations for ESA-listed species under alternative A are provided below in table 38, which will be reviewed through the ESA Section 7 consultation process with USFWS and NOAA NMFS if this alternative is selected.

TABLE 38. INITIAL IMPACT DETERMINATIONS FOR ESA-LISTED SPECIES UNDER ALTERNATIVE A

Species	Impact Determination	Potential Impacts
Terrestrial Mammals		
Perdido Key Beach Mouse	No effect; No Destruction or Adverse Modification of Critical Habitat	Prohibition of PWC would have no effect on Perdido Key beach mouse because this species occurs in dune habitats and is not found along shorelines where impacts associated with PWC use could occur. Prohibition of PWC would not result in destruction or adverse modification of critical habitat at Perdido Key because no actions would occur in terrestrial habitats.
Marine Mammals		
West Indian Manatee	May affect, not likely to adversely affect	Prohibition of PWC would have beneficial impacts on West Indian manatee because there would be no potential for collisions with PWC or temporary disturbances due to noise associated with PWC use.
Birds		
Piping Plover, Red Knot, Wood Stork	May affect, not likely to adversely affect; No Destruction or Adverse Modification of Critical Habitat	Prohibition of PWC would have beneficial impacts on threatened and endangered birds because temporary disturbances due to noise or presence of PWC would not occur. There would be no destruction or adverse modification of piping plover critical wintering habitat in either the Florida or Mississippi District because no actions would occur in terrestrial or intertidal habitats and seasonal closures would restrict public access to critical habitat in the Florida District.
Reptiles		
American Alligator	May affect, not likely to adversely affect	Prohibition of PWC would have beneficial impacts on American alligator because temporary disturbances to individuals or prey due to noise or presence of PWC would not have the potential to occur.
Sea turtles (Green, Hawksbill, Kemp's Ridley, Leatherback, Loggerhead)	May affect, not likely to adversely affect	Prohibition of PWC would have beneficial impacts on sea turtles because there would be no potential for collisions with PWC, temporary disturbances due to noise, or impacts to habitat associated with PWC use.
Fish		
Gulf Sturgeon	May affect, not likely to adversely affect; No Destruction or Adverse Modification of Critical Habitat	Prohibition of PWC would have beneficial impacts on gulf sturgeon because there would be no potential for collisions with PWC, temporary disturbances due to noise, or temporary increases in turbidity associated with PWC use. There would be no destruction or adverse modification of gulf sturgeon critical habitat in either the Florida or Mississippi District because there would be no changes to benthic habitats and there would be no PWC use in these habitats.
Saltmarsh Topminnow	May affect, not likely to adversely affect	Prohibition of PWC would have beneficial impacts on saltmarsh topminnow because temporary disturbances due to noise from PWC engines would not occur.

Cumulative Impacts. Past, present and reasonably foreseeable future actions with the potential to impact special-status species are generally the same as those described for wildlife and include continued boat traffic, ship channel dredging and maintenance activities, military-related activities, and various restoration projects associated with both the MsCIP and the DWH Oil Spill restoration efforts. All of these activities would result in adverse impacts from disturbances to special-status species due to engine noise, visual disturbances, increased turbidity, and shoreline erosion due to vessel wake from these various operations. Motorboats outnumber PWC about 5 to 1 in the Florida District and about 30 to 1 in the Mississippi District and therefore contribute the majority of the adverse cumulative impacts. Beneficial impacts would occur from ongoing restoration projects that restore habitat, but overall the impacts from these actions and their associated vessel use would be adverse.

When the impacts on special-status species as a result of alternative A are combined with impacts of actions in the study area, overall adverse cumulative impacts would occur. Alternative A would contribute

a beneficial increment to the overall cumulative impact, because of the beneficial effects associated with the prohibition on PWC use within the national seashore that would further protect special-status species and their critical and non-critical habitats.

Conclusion. Alternative A would result in beneficial effects on special-status species within the national seashore because prohibiting PWC use at the national seashore would eliminate potential for adverse impacts such as collisions, noise from PWC engines, visual disturbances, and damage to aquatic and terrestrial habitats associated with PWC landings. Alternative A would have the greatest benefit to special-status species of all considered alternatives, because no future impacts related to PWC use would have the potential to occur. Implementation of alternative A would result in a reduction of impacts compared to the existing condition at the national seashore. Alternative A would not result in destruction or adverse modification of critical habitat because there would be no PWC use at the national seashore, and therefore no actions occurring in critical habitats. Cumulative impacts under alternative A would be adverse with the actions under alternative A contributing a beneficial increment to the overall cumulative impact, because of the beneficial effects of prohibiting PWC use within the national seashore.

Alternative B

Under alternative B, impacts on special-status species and critical habitat could occur anywhere motorized vessels are allowed because PWC use would be allowed throughout the national seashore, except in areas where all watercraft are restricted. Flat-wake zones would be limited to within 100 feet of the shoreline. Impacts on special-status species due to PWC use under alternative B would be similar to those described for wildlife and would include both direct and indirect impacts from PWC use with noise being the most common and pervasive impact on special-status species throughout the national seashore. There would be no change in visitor access to terrestrial habitats in either district under alternative B, compared to existing conditions. Therefore, potential disturbances to birds and other species that use these habitats, due to the presence of humans, would not change compared to existing conditions. The greatest potential for impacts on special-status species would occur in the areas that receive the most PWC traffic (particularly around Perdido Key and Santa Rosa Island) when special-status species are present. Specific impacts of PWC use on each special-status species group at the national seashore under alternative B are described below.

Terrestrial Mammals. Perdido Key beach mouse is the only special-status terrestrial mammal at the national seashore. Reduction of flat-wake zones under alternative B would not result in impacts to this species because it is not found along shorelines where impacts associated with PWC use could occur. Alternative B would not result in destruction or adverse modification of critical habitat at Perdido Key because no actions would occur in terrestrial habitats.

Marine Mammals. The threatened West Indian manatee is the only ESA-listed marine mammal species known to occur at the national seashore. Potential impacts of PWC use on the manatee include behavioral disturbances due to PWC engine noise and human intrusion of habitat, particularly when PWC come within 10 m (approximately 32 feet) of manatees. Effects of underwater noise from PWC engines could include panic responses (increased changes in swim speed and direction and changes in respiration) resulting in stress to individual animals and potential disruption of feeding or other behaviors (Miksis-Olds et al. 2007). Manatees occur throughout the national seashore, thus impacts may occur in any location where they are present. However, impacts are most likely to occur in the Florida District where PWC use is the greatest (particularly around Perdido Key and Santa Rosa Island). Disturbances due to underwater noise from PWC engines would occur over a greater area under alternative B because flat-wake zones distances would be substantially reduced. However, since manatees are experiencing current levels of underwater noise from motorboats and other recreational activities under existing conditions, there is not expected to be a change in overall health or productivity of manatees at the national seashore.

PWC collisions with manatees are also possible, although unlikely due to the low draft of PWC when traveling at high speeds, the absence of a propeller, and the ability of PWC operators to change course to avoid collision. No PWC collisions with manatees have been documented at the national seashore in the

last 20 years (Nicholas pers. comm. 2018). Impacts on manatees may occur in either district of the national seashore and are most likely to occur in shallow SAV habitats where manatees forage. PWC use would continue to be restricted within the lagoons of Perdido Key within Big Lagoon, so there would be no potential for PWC collisions with manatees in these areas. Potential impacts to SAV habitat under alternative B due to reduction of flat-wake zones, as discussed under "SAV / Shoreline Vegetation," would not be expected to result in a noticeable decline in food resources for manatees because of the limited potential for PWC to destroy SAV habitat when traveling at high speeds, and the abundance of forage resources throughout the national seashore. Similarly, any impacts on SAV habitat may also indirectly affect manatees.

Birds. Fourteen species of special-status birds are known to occur at the national seashore (table 7). Impacts on special-status birds under alternative B would be the same as those described for non-listed birds under "Wildlife and Wildlife Habitat." Adverse impacts would be mostly indirect and would consist of localized temporary disturbances due to PWC engine noise and visual disturbances, which could disrupt feeding, mating, or nesting behaviors, especially given that flat-wake zones under alternative B would be substantially smaller than buffer distances that were recommended to avoid flushing for all 14 special-status bird species including the ESA-listed piping plover, red knot, and wood stork (table 39), and all state-listed species shown in table 7 (Rodgers and Schwikert 2002). Some of the special-status bird species, such as piping plover are only seasonally present; therefore, they would not be impacted year-round. Other listed species such as reddish egret, tricolored heron, and wood stork have only been documented at the national seashore on rare occasions, making impacts on these species less likely.

Piping plover critical wintering habitat has been designated within both districts of the national seashore. This designation includes tidal flat areas on Perdido Key and on the north side of Santa Rosa Island in the Florida District and Petit Bois Island, Cat Island, Horn Island, East Ship Island, and West Ship Island in the Mississippi District (66 FR 36038; USFWS 2001). Although temporary impacts on wintering plovers due to noise from PWC engines are possible, these impacts would be minimal because piping plover would only be present during winter months, which is typically the off season for PWC use. Alternative B would not result in destruction or adverse modification of piping plover critical wintering habitat because no actions would occur in terrestrial or intertidal habitats. Seasonal closures would restrict public access to piping plover critical habitat in the Florida District. Red knots are found in close association with piping plover and have similar habitats as piping plover for all but six weeks of the year. Therefore, seasonal closures would also limit impacts to red knot in the Florida District.

Noise from PWC engines under alternative B would increase compared to existing conditions because PWC would be allowed to operate at full throttle much closer to the shorelines, where impacts to birds are most likely to occur. Noise from PWC engines could cause birds to flush, potentially disrupting feeding or nesting behavior (Rodgers and Schwikert 2002). Increased noise along shorelines in high PWC use areas such as Perdido Key could cause birds to avoid these habitats entirely. A detailed discussion of the anticipated increase in noise from PWC engines under alternative B is provided above under "Acoustic Environment." Intensity of impacts on birds would be commensurate with the volume of PWC traffic in any given area. Seasonal closures for osprey, eagles, and shorebirds including piping plover would help minimize impacts on these and other species by restricting visitor access to nesting, loafing, and foraging habitats. Special-status bird species are known to occur throughout the national seashore. Therefore, impacts on special-status birds may occur anywhere PWC are operated near shorelines. Specific known locations of individual species and potential impacts due to PWC use are provided in table 37.

Reptiles. Five species of federally listed sea turtles are known to occur at the national seashore (table 7). Potential direct adverse impacts on sea turtles under alternative B include possible collisions with PWC. However, direct impacts are not likely because of the low draft of PWC when traveling at high speeds and the absence of a propeller. PWC users would likely be able to maneuver to avoid sea turtles that are visible. Furthermore, PWC have been shown to have little to no impact on sea turtles even in the event of a collision due to their shallow draft and the absence of a propeller (Work et al. 2010). Potential indirect impacts on sea turtles under alternative B include disturbances due to PWC engine noise, visual disturbances due to human presence, and damage to SAV habitats where sea turtles forage. Impacts

would be greatest in the Florida District where PWC use is highest. No PWC collisions with sea turtles have been documented at the national seashore in the last 20 years (Nicholas pers. comm. 2018). Therefore, while PWC collisions with sea turtles are possible, such impacts are not anticipated at current PWC use levels. PWC use under alternative B would not affect nesting sea turtles because there would be no change in visitor access to terrestrial habitats compared to existing conditions. Noise from PWC engines would not result in disturbances to nesting or hatching sea turtles because PWC use only occurs during daytime hours, whereas nesting and hatching most often occurs at night.

The American alligator is present in both districts of the national seashore but is typically found in wetland habitats near Fort Pickens and Naval Live Oaks and on the Mississippi District islands. Alligators are primarily freshwater animals and do not typically occur in open marine waters where PWC operate (NOAA 2018). Therefore, direct impacts due to collisions with PWC are extremely unlikely to occur. Because alligators are not typically present in areas where PWC are used and would likely move to avoid collision, direct impacts are not anticipated. Indirect impacts under alternative B may include disturbances due to noise or human presence and disturbance of prey, if PWC are operated at full throttle close to coastal wetland habitats where alligators are present. However, alligators are tolerant of disturbance and are not likely to be measurably impacted by PWC use under alternative B. PWC use under alternative B would not likely result in overall changes to the health or productivity of sea turtles or American alligator at the national seashore.

Fish. Special-status fish at the national seashore include gulf sturgeon and saltmarsh topminnow. The gulf sturgeon occurs in both districts of the national seashore and has designated critical habitat in the Florida District ranging from one nautical mile of the mainland from Pensacola Pass to Apalachicola Bay and the Perdido Key area and the area north of Santa Rosa Island. Gulf sturgeon critical habitat within the Mississippi District includes areas within one nautical mile offshore of the Mississippi District islands. Potential direct and indirect impacts on gulf sturgeon under alternative B include possible collisions with PWC, temporary disturbances due to PWC engine noise, and temporary increases in turbidity due to PWC wake or user mounts and dismounts in shallow areas. PWC collisions with gulf sturgeon are unlikely due to the low draft of PWC when traveling at high speeds, the absence of a propeller, and the ability of both the animal and the PWC operator to change course to avoid collision. Also, sturgeon spend most of their time near the sea floor, where collision is less likely to occur. Impacts on critical habitat would be temporary consisting of increases in turbidity, and would not result in destruction or adverse modification.

The saltmarsh topminnow occurs in both districts and is closely associated with *Spartina* marshes. Although temporary disturbances due to noise are possible, impacts on this species are not likely under alternative B because PWC users would likely avoid this habitat. *Spartina* marshes are composed of extremely dense, sharp, and rigid vegetation and are not suitable environments for PWC use. Special-status fish would not be impacted by degradation of water quality due to PWC engines because estimated emissions to water would not exceed ecotoxicological or human health benchmarks, as described in the "Water Quality" section.

PWC use under alternative B would not likely result in overall changes to the health or productivity of any of the special-status species that occur within the national seashore. Initial impact determinations for ESA-listed species under alternative B are provided below in table 39, which will be reviewed through the ESA Section 7 consultation process with USFWS and NOAA NMFS if this alternative is selected.

TABLE 39. INITIAL IMPACT DETERMINATIONS FOR ESA-LISTED SPECIES UNDER ALTERNATIVE B

Species	Impact Determination	Potential Impacts
Terrestrial Mammals		
Perdido Key Beach Mouse	No effect; No Destruction or Adverse Modification of Critical Habitat	Reduction of flat-wake zones under alternative B would have no effect on Perdido Key beach mouse because this species is not found along shorelines where impacts associated with PWC use could occur. Alternative B would not result in destruction or adverse modification of critical habitat at Perdido Key because no actions would occur in terrestrial habitats.
Marine Mammals		
West Indian Manatee	May affect, not likely to adversely affect	Reduction of flat-wake zones under alternative B would not be likely to adversely affect West Indian manatee because although there would be potential for collisions with PWC, temporary disturbances due to noise, or potential loss of SAV habitat would increase slightly compared to existing conditions due to the increased area of the park where full-throttle PWC operation would be allowed. Effects of underwater noise from PWC engines could include panic responses (increased changes in swim speed and direction and changes in respiration) resulting in stress to individual animals and potential disruption of feeding or other behaviors (Miksis-Olds et al. 2007). However, since manatees are experiencing current levels of underwater noise from motorboats and other recreational activities under existing conditions, there is not expected to be a change in overall health or productivity of manatees at the national seashore. Therefore, any potential adverse impacts would be insignificant.
Birds		
Piping Plover, Red Knot, Wood Stork	May affect, likely to adversely affect; No Destruction or Adverse Modification of Critical Habitat	Substantial reduction of flat-wake zone distances under alternative B would be likely to adversely affect threatened and endangered birds because temporary disturbances due to noise from high-speed PWC use much closer to shorelines would increase compared to existing conditions, potentially causing birds to flush. The recommended PWC buffer distance to avoid flushing for piping plover and red knot is 100 meters (approximately 330 feet) and the recommended distance for wood stork is 118 meters (approximately 390 feet) is a sufficient buffer distance to avoid flushing for wood stork (Rodgers and Schwikert 2002). Alternative B would not result in destruction or adverse modification of piping plover critical wintering habitat in either the Florida or Mississippi District because no actions would occur in terrestrial or intertidal habitats and seasonal closures would restrict public access to critical habitat in the Florida District.
Reptiles		
American Alligator	May affect, not likely to adversely affect	Reduction of flat-wake zones under alternative B would not be likely to adversely affect American alligator because although temporary disturbances due to noise from high-speed PWC use closer to shorelines and disturbance of prey would increase compared to existing conditions, impacts would be insignificant because they would not likely result in overall changes to the health or productivity of the species.
Sea turtles (Green, Hawksbill, Kemp's Ridley, Leatherback, Loggerhead)	May affect, not likely to adversely affect	Reduction of flat-wake zones under alternative B would not be likely to adversely affect sea turtles because although potential for collisions with PWC, temporary disturbances due to noise, or potential loss of SAV habitat would increase compared to existing conditions, impacts would be insignificant because they would not likely result in overall changes to the health or productivity of the species.

Species	Impact Determination	Potential Impacts
Fish		
Gulf Sturgeon	May affect, not likely to adversely affect; No Destruction or Adverse Modification of Critical Habitat	Reduction of flat-wake zones under alternative B would not be likely to adversely affect gulf sturgeon because although potential for collisions with PWC, temporary disturbances due to noise, and temporary increases in turbidity associated with PWC would increase compared to existing conditions, impacts would be insignificant because they would not likely result in overall changes to the health or productivity of the species. Alternative B would not result in destruction or adverse modification of gulf sturgeon critical habitat in either the Florida or Mississippi District because no actions would occur in benthic habitats and turbidity increases would be temporary.
Saltmarsh Topminnow	May affect, not likely to adversely affect	Reduction of flat-wake zones under alternative B would not be likely to adversely affect saltmarsh topminnow because this species is associated with *Spartina* marshes, which are located along shorelines and do not provide a suitable environment for PWC use. Temporary disturbances due to noise from PWC engines would increase compared to existing conditions, but adverse impacts on the species would be insignificant because they would not likely result in overall changes to the health or productivity of the species.

Cumulative Impacts. Cumulative impacts on special-status species from past, present, and reasonably foreseeable future actions would be the same as described under alternative A. Collectively, these actions have contributed or would contribute adverse and beneficial effects on special-status species, with overall adverse effect occurring from the operations of other motorized vessels. Motorboats outnumber PWC about 5 to 1 in the Florida District and about 30 to 1 in the Mississippi District and therefore contribute the majority of adverse cumulative impacts. When the impacts on special-status species as a result of alternative B are combined with impacts of other actions in study area, an adverse cumulative impact would be expected. Alternative B would contribute an adverse increment to the overall cumulative impact because PWC would be allowed to operate at full-speed in shallow nearshore habitats, up to 100 feet from shorelines, where impacts are most likely to occur.

Conclusion. Substantial reduction of flat-wake zone distances under alternative B would result in increased direct and indirect adverse impacts on special-status species (table 39) compared to existing conditions. Direct impacts would include increased potential PWC collisions with special-status species compared to existing conditions. Indirect impacts on special-status species would include noise, visual disturbances due to the presence of PWC, and turbidity pulses caused by PWC mounts and dismounts in shallow habitats. Noise would be the most common impact and could affect all assessed species to some extent, but impacts would be temporary and localized. Impacts would be most intense in the Florida District near Perdido Key, Santa Rosa Island, and Crab Island (Okaloosa area) where PWC activity is high.

Alternative B is likely to temporarily adversely affect species present in areas where PWC are used, resulting in increased adverse effects for affected individuals or species because flat-wake zone distances would be substantially reduced, allowing PWC to operate at full throttle much closer to the shore, where impacts are most likely to occur. However, these impacts would not likely result in overall changes to the health or productivity of any of the special-status species that occur within the national seashore. Impacts on special-status species due to PWC use under alternative B would not be expected to result in take of any listed species. Adverse impacts on special-status species would be limited by vessel restrictions prescribed by the Superintendent's Compendium and may further reduced by seasonal bird closures. Reduction of flat-wake zones under alternative B would not result in destruction or adverse modification of critical habitat for Perdido Key beach mouse in the Florida District, or gulf sturgeon or piping plover critical habitat in either the Florida or Mississippi District. Alternative B would contribute a noticeable adverse increment to the overall cumulative impact because PWC would only be subject to flat-wake zone provisions within 100 feet of the shoreline. Cumulative impacts under alternative B would be adverse with the actions under alternative B contributing a noticeable adverse increment to the overall

cumulative impact, because of the adverse effects associated with reducing the flat-wake zones for PWC within the national seashore.

Alternative C

Alternative C would have no new impacts on special-status species and critical habitat compared to existing conditions because there would be no change to PWC management compared to existing conditions. PWC closures and flat-wake zones would continue to be implemented in accordance with the current special regulation in 36 CFR 7.12. The existing flat-wake zone distances would limit the potential for direct and indirect impacts on special-status species and critical habitats by limiting the likelihood of collisions with special-status species, limiting noise generated by PWC engines, and minimizing temporary increases in turbidity. There would be no change in visitor access to terrestrial habitats in either district under alternative C, compared to existing conditions. Therefore, potential disturbances to birds and other species that use these terrestrial habitats, due to the presence of humans, would not change compared to existing conditions. In the Florida District, flat-wake zones would extend 300 yards from the shoreline around Perdido Key, and Santa Rosa and Okaloosa Islands, and within 500 feet of the fishing pier and ferry pier at Fort Pickens. PWC use would continue to be prohibited the lagoons of Perdido Key within the Big Lagoon area adjacent to Spanish Point. In the Mississippi District, flat-wake zones extending 0.5 mile from the shorelines of West Ship Island, Horn Island, and Petit Bois Island would continue to limit potential direct or indirect impacts on special-status species that may be present on or around these islands. Flat-wake zones would extend 300 yards from all other national seashore shorelines, including Davis Bayou, limiting impacts to special-status species in this area. Ongoing impacts of PWC use on each special-status species group at the national seashore under alternative C are described below.

Terrestrial Mammals. There would be no ongoing impacts on Perdido Key beach mouse because this species occurs in dune habitats and is not found along shorelines where impacts associated with PWC use could occur.

Marine Mammals. Ongoing impacts on marine mammals would include disturbances due to noise and presence of PWC. Effects of underwater noise from PWC engines could include panic responses (increased changes in swim speed and direction and changes in respiration) resulting in stress to individual animals and potential disruption of feeding or other behaviors (Miksis-Olds et al. 2007). However, existing flat-wake zones would continue to limit these impacts. PWC collisions with manatees are also possible, but unlikely due to the low draft of PWC when traveling at high speeds, the absence of a propeller, and the ability of PWC operators to change course to avoid collision. No PWC collisions with manatees have been documented at the national seashore in the last 20 years (Nicholas pers. comm. 2018). PWC use would continue to be restricted within the lagoons of Perdido Key within Big Lagoon, so there would be no potential for PWC collisions with manatees in these areas. No impacts related to changes in SAV abundance would occur because SAV habitat would remain in its current condition, as discussed under “SAV / Shoreline Vegetation.”

Birds. Flat-wake zones in the Florida and Mississippi Districts would continue to provide a sufficient buffer distance to avoid flushing due to noise from PWC engines for all 14 special-status birds including the ESA-listed piping plover, red knot, and wood stork (table 40), and all state-listed species shown in table 7 (Rodgers and Schwikert 2002), and there would be no change in visitor access to terrestrial habitats. Seasonal closures for osprey, eagles, and shorebirds including piping plover would help minimize impacts on these and other species by restricting public access to nesting, loafing, and foraging habitats. Seasonal closures would restrict public access to piping plover critical habitat in the Florida District. Red knots are found in close association with piping plover and have similar habitats as piping plover for all but six weeks of the year. Therefore, seasonal closures would also limit impacts to red knot in the Florida District.

Reptiles. Ongoing impacts to sea turtles would include potential disturbances due to noise and the presence of PWC. However, existing flat-wake zones would continue to limit these impacts. PWC collisions with sea turtles are also possible, but unlikely due to the low draft of PWC when traveling at

high speeds, the absence of a propeller, and the ability of both the animal and the PWC operator to change course to avoid collision. Also, PWC have been shown to have little to no impact on sea turtles even in the event of a collision due to their shallow draft and the absence of a propeller (Work et al. 2010). No PWC collisions with sea turtles have been documented at the national seashore in the last 20 years (Nicholas pers. comm. 2018). Therefore, while PWC collisions with sea turtles are possible, such impacts are not anticipated at current PWC use levels. There would be no change in visitor access to terrestrial habitats under alternative C, so there would be no increased potential for disturbances to nesting sea turtles compared to existing conditions. Noise from PWC engines would not result in disturbances to nesting or hatching sea turtles because PWC use only occurs during daytime hours, whereas nesting and hatching occurs most often at night. Ongoing impacts to American alligator would include occasional disturbances due to noise or human presence and disturbance of prey. However, alligators are primarily freshwater animals and do not typically occur in open marine waters where PWC operate (NOAA 2018). Therefore, existing flat-wake zones would continue to prevent most impacts to alligators.

Fish. Ongoing impacts on gulf sturgeon would include temporary disturbances due to PWC engine noise and temporary increases in turbidity due to PWC wake or user mounts and dismounts in shallow areas. PWC collisions with gulf sturgeon are also possible, although unlikely due to the low draft of PWC when traveling at high speeds, the absence of a propeller, and the ability of both the animal and the PWC operator to change course to avoid collision. Also, sturgeon spend most of their time near the sea floor, where collision is less likely to occur. Ongoing impacts on critical habitat would be temporary consisting of increases in turbidity, and would not result in destruction or adverse modification. Ongoing impacts to saltmarsh topminnow would include the potential for temporary disturbances due to noise. However, impacts on this species are unlikely because PWC users would likely avoid *Spartina* marsh habitat, where the species is found, because it does not provide a suitable environment for PWC use. The continuation of existing flat-wake zones under alternative C would continue to prevent most impacts to gulf sturgeon, gulf sturgeon critical habitat, and saltmarsh topminnow. Initial impact determinations for ESA-listed species under alternative C are provided below in table 40, which will be reviewed through the ESA Section 7 consultation process with USFWS and NOAA NMFS if this alternative is selected.

TABLE 40. INITIAL IMPACT DETERMINATIONS FOR ESA-LISTED SPECIES UNDER ALTERNATIVE C

Species	Impact Determination	Potential Impacts
Terrestrial Mammals		
Perdido Key Beach Mouse	No effect; No Destruction or Adverse Modification of Critical Habitat	Continuation of existing regulations under alternative C would have no effect on Perdido Key beach mouse because this species occurs in dune habitats and is not found along shorelines where impacts associated with PWC use could occur. Alternative C would not result in damage or adverse modification of critical habitat because no actions would occur in terrestrial habitats.
Marine Mammals		
West Indian Manatee	May affect, not likely to adversely affect	Continuation of existing regulations under alternative C would not likely adversely affect West Indian manatee because collisions with PWC are very unlikely due to the shallow draft of PWC, the absence of a propeller, and the ability of PWC users to change course to avoid collision. PWC collisions with manatees have not been documented at the national seashore in the last 20 years (Nicholas pers. comm. 2018). Ongoing temporary disturbances associated with underwater noise from PWC engines could include panic responses (increased changes in swim speed and direction and changes in respiration) resulting in stress to individual animals and potential disruption of feeding or other behaviors (Miksis-Olds et al. 2007). However, since there would be no change in the level of underwater noise manatees are experiencing from motorboats and other recreational activities, there is not expected to be a change in overall health or productivity of manatees at the national seashore.

Species	Impact Determination	Potential Impacts
Birds		
Piping Plover, Red Knot, Wood Stork	May affect, not likely to adversely affect; No Destruction or Adverse Modification of Critical Habitat	Continuation of existing regulations under alternative C would not be likely to adversely affect piping plover, red knot, or wood stork because existing flat-wake zone distances in the Florida and Mississippi Districts would be sufficient to avoid flushing due to noise from PWC engines [118 meters (approximately 390 feet) for wood stork; 100 meters (approximately 330 feet) for piping plover and red knot (Rodgers and Schwikert 2002)]. Therefore, any potential adverse impacts would be discountable because they are extremely unlikely to occur. Alternative C would not result in destruction or adverse modification of piping plover critical wintering habitat in either the Florida or Mississippi District because no actions would occur in terrestrial or intertidal habitats and seasonal closures would restrict public access to critical habitat in the Florida District.
Reptiles		
American Alligator	May affect, not likely to adversely affect	Continuation of existing regulations under alternative C would not be likely to adversely affect American alligator because flat-wake zones would continue to prevent disturbances to alligators or prey species due to noise from high-speed PWC use close to shorelines, where this species would be present. Therefore, any potential adverse impacts would be discountable because they are extremely unlikely to occur.
Sea turtles (Green, Hawksbill, Kemp's Ridley, Leatherback, Loggerhead)	May affect, not likely to adversely affect	Continuation of existing regulations under alternative C would not be likely to adversely affect sea turtles because collisions with PWC are very unlikely due to the shallow draft of PWC, the absence of a propeller, and the ability of both animals and PWC users to change course to avoid collision. PWC collisions with sea turtles have not been documented at the national seashore in the last 20 years (Nicholas pers. comm. 2018). Temporary disturbances due to noise would continue, but impacts would be insignificant because they would not likely result in overall changes to the health or productivity of sea turtles. PWC use under alternative C would not affect nesting sea turtles.
Fish		
Gulf Sturgeon	May affect, not likely to adversely affect; No Destruction or Adverse Modification of Critical Habitat	Continuation of existing regulations under alternative C would not be likely to adversely affect gulf sturgeon because collisions with PWC are very unlikely due to the shallow draft of PWC, the absence of a propeller, and the ability of both animals and PWC users to change course to avoid collision. Temporary disturbances due to noise would continue, but impacts would be insignificant because they would not likely result in overall changes to the health or productivity of the species. Alternative C would not result in destruction or adverse modification of gulf sturgeon critical habitat in either the Florida or Mississippi District because no actions would occur in benthic habitats.
Saltmarsh Topminnow	May affect, not likely to adversely affect	Continuation of existing regulations under alternative C would not be likely to adversely affect saltmarsh topminnow because this species is associated with *Spartina* marshes, which are located along shorelines and do not provide a suitable environment for PWC use. Flat-wake zones would continue to limit temporary impacts due to noise from PWC engines close to shore. Any potential adverse impacts would be discountable because they are extremely unlikely to occur.

Cumulative Impacts. Cumulative impacts on special-status species from past, present, and reasonably foreseeable future actions would be the same as described under alternative A. Collectively, these actions have contributed or would contribute adverse and beneficial effects on special-status species, with overall impacts being adverse from the use of other motorized vessels. Motorboats outnumber PWC about 5 to 1 in the Florida District and about 30 to 1 in the Mississippi District and therefore contribute the majority of cumulative impacts. When the impacts on special-status species are combined with impacts of other actions in the study area, overall adverse cumulative impacts would be expected. Alternative C would contribute a continued adverse increment to the overall cumulative impact because PWC would still be

allowed to operate at the national seashore, although impacts would be limited due to the implementation of existing flat-wake zone distances, offering protection to species in shallow nearshore habitats where impacts are most likely to occur.

Conclusion. Potential impacts on special-status species would continue at existing levels under alternative C and no new impacts would occur, as flat-wake zone distances and PWC closures would remain the same. Continued PWC use under alternative C would result in ongoing temporary direct and indirect adverse impacts on special-status species. Noise would likely be the most common impact, but impacts would be temporary and localized. Impacts would be most intense in the Florida District near the Perdido Key and Santa Rosa Island where PWC activity is high, but may impact special-status species anywhere PWC are operated, when special-status species are present. Under alternative C, special-status species and critical habitat at the national seashore would remain in close to current conditions because existing flat-wake zones would remain in place. Adverse impacts on special-status species would be limited by the continued implementation of existing flat-wake zone distances, PWC closures, and seasonal bird closures. Cumulative impacts under alternative C would be adverse with the actions under alternative C contributing a continued adverse increment to the overall cumulative impact because PWC would still be allowed to operate at the national seashore, although impacts would be limited due to the continued presence of flat-wake zones, offering protection to species in shallow nearshore habitats where impacts are likely to occur.

Alternative D

The primary change to PWC management under alternative D would involve the reduction of flat-wake zones in some areas of the national seashore. However, alternative D would not result in a noticeable increase in impacts on special-status species at the national seashore compared to existing conditions. The flat-wake zone distances under alternative D, although reduced compared to existing conditions, would continue to limit the potential for direct and indirect impacts on special-status species and critical habitats by reducing the likelihood of collisions with special-status species, limiting PWC noise impacts on areas close to the shoreline, and minimizing temporary increases in turbidity. There would be no increases in visitor access to terrestrial habitats in either district under alternative D, when compared to existing conditions. Restricted beaching of PWC on Horn and Petit Bois Islands under alternative D would eliminate the presence of PWC on the islands, reducing potential for disturbances to birds and other species that use these terrestrial habitats. In the Florida District, flat-wake zones would be reduced from 300 yards from the shoreline around Perdido Key, and Santa Rosa and Okaloosa Islands to 150 yards. In the Mississippi District, flat-wake zones would be reduced from 0.5 mile from the shorelines of West Ship Island, Horn Island, and Petit Bois Island to 300 yards. Specific impacts on each species group under alternative D are described below.

Terrestrial Mammals. Reduction of flat-wake zones under alternative D would not result in impacts to Perdido Key beach mouse because it is not found along shorelines where impacts associated with PWC use could occur. Alternative D would not result in destruction or adverse modification of critical habitat at Perdido Key because no actions would occur in terrestrial habitats.

Marine Mammals. Reduction of flat-wake zones under alternative D would result in increased noise from high-speed PWC use closer to shorelines compared to existing conditions, which may result in an increase in temporary disturbances to manatees. Effects of underwater noise from PWC engines could include panic responses (increased changes in swim speed and direction and changes in respiration) resulting in stress to individual animals and potential disruption of feeding or other behaviors (Miksis-Olds et al. 2007). Because manatees are common throughout seashore waters, disturbances would be likely to occur on occasion. Disturbances due to underwater noise from PWC engines would occur over a greater area under alternative D because flat-wake zones would be reduced. However, since manatees are experiencing current levels of underwater noise from motorboats and other recreational activities under existing conditions, there is not expected to be a change in overall health or productivity of manatees at the national seashore.

PWC collisions with manatees are also possible, although unlikely due to the low draft of PWC when traveling at high speeds, the absence of a propeller, and the ability of PWC operators to change course to avoid collision. No PWC collisions with manatees have been documented at the national seashore in the last 20 years (Nicholas pers. comm. 2018). PWC use would continue to be restricted within the lagoons of Perdido Key within Big Lagoon, so there would be no potential for PWC collisions with manatees in these areas. Potential impacts to SAV habitat under alternative D due to reduction of flat-wake zones, as discussed under "SAV / Shoreline Vegetation," would not be expected to result in a noticeable decline in food resources for manatees because of the limited potential for PWC to destroy SAV habitat when traveling at high speeds, and the abundance of forage resources throughout the national seashore. Flat-wake zones distances under alternative D would continue to protect shallow water SAV. Potential impacts to manatees under alternative D would not likely result in overall changes to the health or productivity of the species.

Birds. Reduction of flat-wake zones under alternative D would not result in an increase in disturbances to special-status birds at the national seashore compared to existing conditions because 150-yard flat-wake zones in the Florida District and 300-yard flat-wake zones in the Mississippi District would be sufficient to avoid flushing due to PWC engine noise for all 14 special-status bird species including the ESA-listed piping plover, red knot, and wood stork (table 41), and all state-listed species shown in table 7 (Rodgers and Schwikert 2002). Seasonal closures for osprey, eagles and shorebirds including piping plover would help minimize impacts on these and other species by restricting public access to nesting, loafing, and foraging habitats. There would be no change in visitor access to terrestrial habitats in either district under alternative D. Therefore, potential disturbances to birds and other species that use these habitats, due to the presence of humans, would not change compared to existing conditions. Alternative D would not result in destruction or adverse modification of piping plover critical wintering habitat in either the Florida or Mississippi District because no actions would occur in terrestrial or intertidal habitats, and flat-wake zones would limit noise from PWC engines. Seasonal closures would restrict public access to piping plover critical habitat in the Florida District. Red knots are found in close association with piping plover and have similar habitats as piping plover for all but six weeks of the year. Therefore, seasonal closures would also limit impacts to red knot in the Florida District.

Reptiles. Reduction of flat-wake zones under alternative D would result in increased noise and high-speed PWC use closer to shorelines compared to existing conditions, which may result in an increase in temporary disturbances to sea turtles. However, 150-yard flat-wake zones in the Florida District and 300-yard flat-wake zones in the Mississippi District would limit these impacts. PWC collisions with sea turtles are also possible, but unlikely due to the low draft of PWC when traveling at high speeds, the absence of a propeller, and the ability of both the animal and the PWC operator to change course to avoid collision. No PWC collisions with sea turtles have been documented at the national seashore in the last 20 years (Nicholas pers. comm. 2018). Also, PWC have been shown to have little to no impact on sea turtles even in the event of a collision due to their shallow draft and the absence of a propeller (Work et al. 2010). Therefore, while PWC collisions with sea turtles are possible, such impacts are not anticipated at current PWC use levels. There would be no change in visitor access to terrestrial habitats under alternative D, so there would be no increased potential for disturbances to nesting sea turtles compared to existing conditions. Noise from PWC engines would not result in disturbances to nesting or hatching sea turtles because PWC use only occurs during daytime hours, whereas nesting and hatching occurs most often at night. Potential impacts to sea turtles under alternative D would not likely result in overall changes to the health or productivity of sea turtles.

Potential impacts to the American alligator under alternative D would include occasional disturbances due to noise or human presence and disturbance of prey, if PWC are operated at full throttle close to coastal wetland habitats where alligators are present. However, alligators are tolerant of disturbance and 150-yard flat-wake zones in the Florida District and 300-yard flat-wake zones in the Mississippi District would likely prevent these impacts. PWC collisions with alligators would be extremely unlikely to occur because alligators are primarily freshwater animals and do not typically occur in open marine waters where PWC operate (NOAA 2018).

Fish. Reduction of flat-wake zones under alternative D would result in increased noise from high-speed PWC use closer to shorelines compared to existing conditions, which may result in an increase in temporary disturbances to gulf sturgeon and temporary increases in turbidity due to PWC wake or user mounts and dismounts in shallow areas. PWC collisions with gulf sturgeon are also possible, although unlikely due to the low draft of PWC when traveling at high speeds, the absence of a propeller, and the ability of both the animal and the PWC operator to change course to avoid collision. Also, sturgeon spend most of their time near the benthos, where collision is less likely to occur. Alternative D would not result in destruction or adverse modification of gulf sturgeon critical habitat in either the Florida or Mississippi District because no actions would occur in benthic habitats, and potential impacts related to PWC use would be limited to localized, temporary increases in turbidity. Reduction of flat-wake zones under alternative D would not be likely to result in impacts to saltmarsh topminnow because this species is associated with *Spartina* marshes, which are located along shorelines and do not provide a suitable environment for PWC use. There would be no change in temporary disturbances due to noise from PWC engines compared to existing conditions because flat-wake zones would limit noise impacts close to shore. Initial impact determinations for ESA-listed species under alternative D are provided in table 41, which have been reviewed through the ESA Section 7 consultation process with USFWS and NOAA NMFS, as described in chapter 5.

TABLE 41. INITIAL IMPACT DETERMINATIONS FOR ESA-LISTED SPECIES UNDER ALTERNATIVE D

Species	Impact Determination	Potential Impacts
Terrestrial Mammals		
Perdido Key Beach Mouse	No effect; No Destruction or Adverse Modification of Critical Habitat	Reduction of flat-wake zones under alternative D would have no effect on Perdido Key beach mouse because this species occurs in dune habitats and is not found along shorelines where impacts associated with PWC use could occur. Alternative D would not result in destruction or adverse modification of critical habitat at Perdido Key because no actions would occur in terrestrial habitats.
Marine Mammals		
West Indian Manatee	May affect, not likely to adversely affect	Reduction of flat-wake zones under alternative D would not likely adversely affect West Indian manatee because collisions with PWC are very unlikely due to the shallow draft of PWC, the absence of a propeller, and the ability of PWC users to change course to avoid collision. PWC collisions with manatees have not been documented at the national seashore in the last 20 years (Nicholas pers. comm. 2018). Temporary disturbances due to noise would increase slightly compared to existing conditions because PWC would be allowed to operate at full throttle throughout a greater portion of the national seashore. Effects of underwater noise from PWC engines could include panic responses (increased changes in swim speed and direction and changes in respiration) resulting in stress to individual animals and potential disruption of feeding or other behaviors (Miksis-Olds et al. 2007). However, since manatees are experiencing current levels of underwater noise from motorboats and other recreational activities under existing conditions, there is not expected to be a change in overall health or productivity of manatees at the national seashore. Therefore, any potential adverse impacts would be insignificant.

Species	Impact Determination	Potential Impacts
Birds		
Piping Plover, Red Knot	May affect, not likely to adversely affect; No Destruction or Adverse Modification of Critical Habitat	Reduction of flat-wake zones under alternative D would not likely adversely affect piping plover or red knot because although PWC would be able to operate at full throttle closer to shore than under current conditions, 150-yard flat-wake zones in the Florida District and 300-yard flat-wake zones in the Mississippi District would be sufficient to avoid flushing due to noise from PWC engines [100 meters (approximately 330 feet) (Rodgers and Schwikert 2002)]. Therefore, any potential adverse impacts would be discountable because they are extremely unlikely to occur. Alternative D would not result in destruction or adverse modification of piping plover critical wintering habitat in either the Florida or Mississippi District because no actions would occur in terrestrial or intertidal habitats, and seasonal closures would restrict public access to critical habitat in the Florida District.
Wood Stork	May affect, not likely to adversely affect	Reduction of flat-wake zones under alternative D would not likely adversely affect wood stork because although PWC would be able to operate at full throttle closer to shore than under current conditions, 150-yard flat-wake zones would be sufficient to avoid flushing due to noise from PWC engines [118 meters (approximately 390 feet) is a sufficient buffer distance to avoid flushing for wood stork (Rodgers and Schwikert 2002)]. Also, this species is unlikely to be present at the national seashore with any regular frequency. Therefore, any potential adverse impacts would be discountable because they are extremely unlikely to occur.
Reptiles		
American Alligator	May affect, not likely to adversely affect	Reduction of flat-wake zones under alternative D would not be likely to adversely affect American alligator because flat-wake zones would continue to prevent disturbances to alligators or prey species due to noise from high-speed PWC use close to shorelines, where this species would be present. Therefore, any potential adverse impacts would be discountable because they are extremely unlikely to occur.
Sea turtles (Green, Hawksbill, Kemp's Ridley, Leatherback, Loggerhead)	May affect, not likely to adversely affect	Reduction of flat-wake zones under alternative D would not be likely to adversely affect sea turtles because collisions with PWC are very unlikely due to the shallow draft of PWC, the absence of a propeller, and the ability of both animals and PWC users to change course to avoid collision. PWC collisions with sea turtles have not been documented at the national seashore in the last 20 years (Nicholas pers. comm. 2018). Temporary disturbances due to noise would increase slightly compared to existing conditions, but impacts would be insignificant because they would not likely result in overall changes to the health or productivity of sea turtles. PWC use under alternative D would not affect nesting sea turtles.
Fish		
Gulf Sturgeon	May affect, not likely to adversely affect; No Destruction or Adverse Modification of Critical Habitat	Reduction of flat-wake zones under alternative D would not be likely to adversely affect gulf sturgeon because collisions with PWC are very unlikely due to the shallow draft of PWC, the absence of a propeller, and the ability of both animals and PWC users to change course to avoid collision. Temporary disturbances due to noise would increase slightly compared to existing conditions, but impacts would be insignificant because they would not likely result in overall changes to the health or productivity of the species. Alternative D would not result in destruction or adverse modification of gulf sturgeon critical habitat in either the Florida or Mississippi District because no actions would occur in benthic habitats.

Species	Impact Determination	Potential Impacts
Saltmarsh Topminnow	May affect, not likely to adversely affect	Reduction of flat-wake zones under alternative D would not be likely to adversely affect saltmarsh topminnow because this species is associated with *Spartina* marshes, which are located along shorelines and do not provide a suitable environment for PWC use. There would be no change in temporary disturbances due to noise from PWC engines compared to existing conditions because flat-wake zones would limit noise impacts close to shore. Any potential adverse impacts would be discountable because they are extremely unlikely to occur.

Cumulative Impacts. Cumulative impacts on special-status species from past, present, and reasonably foreseeable future actions would be the same as described under alternative A. Collectively, these actions would contribute both adverse and beneficial effects on special-status species, with the overall impact being adverse, primarily from the use of other motorized vessels in the area. Motorboats outnumber PWC about 5 to 1 in the Florida District and about 30 to 1 in the Mississippi District and therefore contribute the majority of cumulative impacts. When the impacts on special-status species as a result of alternative D are combined with impacts of other actions in study area, adverse cumulative impacts would be expected. Alternative D would contribute a continued adverse increment to the overall cumulative impact because PWC would still be allowed to operate at the national seashore, although impacts would be limited due to the continued presence of flat-wake zones, offering protection to species in shallow nearshore habitats where impacts are likely to occur.

Conclusion. Alternative D would not result in a measurable increase in impacts on special-status species compared to existing conditions because flat-wake zone distances would remain large enough to provide adequate protection from engine noise and other disturbances associated with PWC use. Any potential impacts would be insignificant or discountable because they would be extremely unlikely to occur or would be so minor that they cannot be meaningfully evaluated. Noise would likely be the most common impact, particularly in the Florida District near the Perdido Key and Santa Rosa Island where PWC activity is high, but impacts would be temporary and localized, would not occur at night, and would not increase substantially compared to existing conditions. Reduction of flat-wake zones under alternative D would not threaten the health or productivity of any of the special-status species that occur within the national seashore. Alternative D would not result in destruction or adverse modification of critical habitat. Cumulative impacts under alternative D would be adverse with the actions under alternative D contributing a continued adverse increment to the overall cumulative impact because PWC would be allowed to operate in shallow nearshore habitats where impacts are likely to occur. However, alternative D would contribute only a small portion of the overall adverse cumulative effects on special-status species, primarily because PWC represent a small fraction of the overall motorized use in park waters.

Alternative E

The PWC closures under alternative E would include the majority of the SAV coverage within the national seashore, which would benefit special-status species that forage in these habitats, such as sea turtles and manatees. Because SAV is generally located in shallow nearshore waters, PWC closures would also reduce the potential for disturbances to special-status species in coastal habitats as a result of PWC engine noise. Designated PWC landing areas may also limit the number of PWC users who enter shallow nearshore habitats, reducing impacts due to noise, visual disturbances, and increases in turbidity in these areas. In the Florida District, 300-yard flat-wake zones would remain in place, in addition to PWC closures in key SAV habitats. In the Mississippi District, flat-wake zones would be reduced from 0.5 mile from the shorelines of West Ship Island, Horn Island, and Petit Bois Island to 300 yards, in addition to PWC closures in key SAV habitats. Specific impacts on each species group under alternative E are described below.

Terrestrial Mammals. PWC restrictions under alternative E would not result in impacts to Perdido Key beach mouse because this species is not found along shorelines where impacts associated with PWC use

could occur. Alternative E would not result in destruction or adverse modification of critical habitat at Perdido Key because no actions would occur in terrestrial habitats.

Marine Mammals. PWC restrictions under alternative E would have beneficial impacts on West Indian manatee because SAV habitats, where manatees forage, would receive additional protection compared to existing conditions. PWC closures would reduce noise and presence of PWC in SAV habitats where manatees are most likely to occur. 300-yard flat-wake zones under alternative E would further limit the potential for disturbances due to PWC engine noise or human presence near shorelines, similar to existing conditions. Effects of underwater noise from PWC engines could include panic responses (increased changes in swim speed and direction and changes in respiration) resulting in stress to individual animals and potential disruption of feeding or other behaviors (Miksis-Olds et al. 2007). Because manatees are common throughout seashore waters, disturbances would be likely to occur on occasion. Disturbances due to underwater noise from PWC engines would occur throughout a greater portion of the Mississippi District under alternative E because flat-wake zones would be reduced. However, since manatees are experiencing current levels of underwater noise from motorboats and other recreational activities under existing conditions, there is not expected to be a change in overall health or productivity of manatees at the national seashore.

PWC collisions with manatees are also possible, although unlikely due to the low draft of PWC when traveling at high speeds, the absence of a propeller, and the ability of PWC operators to change course to avoid collision. PWC closures targeting SAV habitat and flat-wake zones under alternative E would further reduce the likelihood of collisions compared to existing conditions. No PWC collisions with manatees have been documented at the national seashore in the last 20 years (Nicholas pers. comm. 2018). Overall, alternative E would result in a reduction of impacts to marine mammals compared to existing conditions at the national seashore.

Birds. PWC restrictions under alternative E would not result in an increase in disturbances to special-status birds at the national seashore compared to existing conditions because 300-yard flat-wake zones in both the Florida and Mississippi Districts would be sufficient to avoid flushing due to PWC engine noise for all 14 special-status bird species including the ESA-listed piping plover, red knot, and wood stork (table 41), and all state-listed species shown in table 7 (table 42; Rodgers and Schwikert 2002), similar to existing condition. PWC closures in nearshore SAV habitats would further limit the potential for impacts due to PWC engine noise. Seasonal closures for shorebirds, osprey, and eagles would help minimize impacts on these and other species. Designated PWC landing areas would also limit disturbances to special-status birds due to the presence of humans in terrestrial habitats. Alternative E would not result in destruction or adverse modification of piping plover critical wintering habitat in either the Florida or Mississippi District because no actions would occur in terrestrial or intertidal habitats, and PWC closures and flat-wake zones would limit noise from PWC engines. Seasonal closures would restrict public access to piping plover critical habitat in the Florida District. Red knots are found in close association with piping plover and have similar habitats as piping plover for all but six weeks of the year. Therefore, seasonal closures would also limit impacts to red knot in the Florida District.

Reptiles. PWC restrictions under alternative E would have beneficial impacts on sea turtles because SAV habitats, where sea turtles forage, would receive additional protection compared to existing conditions. PWC closures in SAV habitats would reduce noise and presence of PWC in SAV habitats where sea turtles are likely to occur. The 300-yard flat-wake zones in both the Florida and Mississippi Districts would further limit the potential for disturbances due to PWC engine noise or human presence near shorelines, similar to existing conditions. Noise from PWC engines would not result in disturbances to nesting or hatching sea turtles because PWC use only occurs during daytime hours, whereas nesting and hatching occurs most often at night. PWC collisions with sea turtles are also possible, but unlikely due to the low draft of PWC when traveling at high speeds, the absence of a propeller, and the ability of both the animal and the PWC operator to change course to avoid collision. PWC closures targeting SAV habitat and flat-wake zones under alternative E would further reduce the likelihood of collisions compared to existing conditions. No PWC collisions with sea turtles have been documented at the national seashore in

the last 20 years (Nicholas pers. comm. 2018). Therefore, while PWC collisions with sea turtles are possible, such impacts are not anticipated at current PWC use levels.

Under alternative E, PWC closures and flat-wake zones would prevent most impacts to the American alligator, which would be limited to occasional disturbances due to noise or human presence and disturbance of prey, if PWC are operated at full throttle close to coastal wetland habitats where alligators are present. PWC collisions would be extremely unlikely to occur because alligators are primarily freshwater animals and do not typically occur in open marine waters where PWC operate (NOAA 2018).

Fish. PWC restrictions under alternative E would have effects similar to those resulting from existing conditions for gulf sturgeon because 300-yard flat-wake zones in both the Florida and Mississippi Districts limit temporary disturbances due to PWC engine noise and temporary increases in turbidity due to PWC wake or user mounts and dismounts in shallow areas. PWC closures in SAV habitat would further limit these impacts. PWC collisions with gulf sturgeon are also possible, although unlikely due to the low draft of PWC when traveling at high speeds, the absence of a propeller, and the ability of both the animal and the PWC operator to change course to avoid collision. Also, sturgeon spend most of their time near the sea floor, where collision is less likely to occur. Alternative E would not result in destruction or adverse modification of gulf sturgeon critical habitat in either the Florida or Mississippi District because no actions would occur in benthic habitats, and potential impacts related to PWC use would be limited to localized, temporary increases in turbidity.

PWC restrictions under alternative E would not be likely to result in impacts to saltmarsh topminnow because this species is associated with *Spartina* marshes, which are located along shorelines and do not provide a suitable setting for PWC use. There would be no change in temporary disturbances due to noise from PWC engines compared to existing conditions because flat-wake zones and PWC closures would limit noise impacts close to shore. Initial impact determinations for ESA-listed species under alternative E are provided below in table 42, which will be reviewed through the ESA Section 7 consultation process with USFWS and NOAA NMFS if this alternative is selected.

TABLE 42. INITIAL IMPACT DETERMINATIONS FOR ESA-LISTED SPECIES UNDER ALTERNATIVE E

Species	Impact Determination	Potential Impacts
Terrestrial Mammals		
Perdido Key Beach Mouse	No effect; No Destruction or Adverse Modification of Critical Habitat	PWC restrictions under alternative E would have no effect on Perdido Key beach mouse because this species is not found along shorelines where impacts associated with PWC use could occur. Alternative E would not result in destruction or adverse modification of critical habitat at Perdido Key because no actions would occur in terrestrial habitats.
Marine Mammals		
West Indian Manatee	May affect, not likely to adversely affect	PWC restrictions under alternative E would have beneficial impacts on West Indian manatee because SAV habitats would receive additional protection compared to existing conditions. There would be no measurable increase in the risk of PWC collisions with manatees or temporary disturbances due to noise compared to existing conditions. Therefore, any potential adverse impacts would be discountable because they are extremely unlikely to occur.

Species	Impact Determination	Potential Impacts
Birds		
Piping Plover, Red Knot	May affect, not likely to adversely affect; No Destruction or Adverse Modification of Critical Habitat	PWC restrictions under alternative E would not be likely to adversely affect piping plover or red knot because flat-wake zones would remain greater than the recommended buffer distance to avoid flushing due to noise from PWC engines [100 meters (approximately 330 feet) is a sufficient buffer distance to avoid flushing for these species (Rodgers and Schwikert 2002)]. Designated PWC landing areas would limit the potential for disturbances from humans in terrestrial habitats. Therefore, any potential adverse impacts would be discountable because they are extremely unlikely to occur. Alternative E would not result in destruction or adverse modification of piping plover critical wintering habitat in either the Florida or Mississippi District because no actions would occur in terrestrial or intertidal habitats and seasonal closures would restrict public access to critical habitat in the Florida District.
Wood Stork	May affect, not likely to adversely affect	Alternative E would not be likely to adversely affect wood stork because flat-wake zones would remain would remain greater than the buffer distances that were recommended to avoid flushing due to noise from PWC engines [118 meters (approximately 390 feet) is a sufficient buffer distance to avoid flushing for wood stork (Rodgers and Schwikert 2002)]. Also, this species is unlikely to be present at the national seashore with any regular frequency, and designated PWC landing points would limit the potential for disturbances due to the presence of humans in terrestrial habitats. Therefore, any potential adverse impacts would be discountable because they are extremely unlikely to occur.
Reptiles		
American Alligator	May affect, not likely to adversely affect	PWC restrictions under alternative E would not be likely to adversely affect American alligator compared to existing conditions because flat-wake zones and PWC closures would limit the risk of disturbances to individuals or prey species in nearshore habitats due to noise or presence of PWC. Any potential adverse impacts would be discountable because they are extremely unlikely to occur.
Sea turtles (Green, Hawksbill, Kemp's Ridley, Leatherback, Loggerhead)	May affect, not likely to adversely affect	PWC restrictions under alternative E would have beneficial impacts on sea turtles because SAV habitats would receive additional protection compared to existing conditions. There would be no measurable increase in the risk of PWC collisions with sea turtles or temporary disturbances due to noise compared to existing conditions. Therefore, any potential adverse impacts would be discountable because they are extremely unlikely to occur.
Fish		
Gulf Sturgeon	May affect, not likely to adversely affect; No Destruction or Adverse Modification of Critical Habitat	PWC restrictions under alternative E would not be likely to adversely affect gulf sturgeon because flat-wake zones and PWC closures would limit the potential for collisions with PWC, temporary disturbances due to noise, and temporary increases in turbidity associated with PWC. Any potential adverse impacts would be discountable because they are extremely unlikely to occur. Alternative E would not result in destruction or adverse modification of gulf sturgeon critical habitat in either the Florida or Mississippi District because no actions would occur in benthic habitats.
Saltmarsh Topminnow	May affect, not likely to adversely affect	PWC restrictions under alternative E would not be likely to adversely affect saltmarsh topminnow because this species is associated with *Spartina* marshes, which are located along shorelines and do not provide a suitable setting for PWC use. There would be no change in temporary disturbances due to noise from PWC engines compared to existing conditions because flat-wake zones and PWC closures would limit noise impacts close to shore. Any potential adverse impacts would be discountable because they are extremely unlikely to occur.

Cumulative Impacts. Cumulative impacts on special-status species from past, present, and reasonably foreseeable future actions would be the same as described under alternative A. Collectively, these actions have contributed or would contribute adverse and beneficial effects on special-status species, with overall impacts being adverse from the use of other motorized vessels. Motorboats outnumber PWC about 5 to 1 in the Florida District and about 30 to 1 in the Mississippi District and therefore contribute the majority of cumulative impacts. When the impacts on special-status species as a result of alternative E are combined with impacts of other actions in study area, overall adverse cumulative impacts would be expected. Cumulative impacts under alternative E would be adverse with the actions under alternative E contributing a slight beneficial increment to the overall cumulative impact due to the restrictions and targeted PWC closures that would enhance protection of some special-status species compared to existing conditions.

Conclusion. Targeted PWC closures under alternative E would benefit special-status species such as sea turtles and manatees by enhancing protection of SAV habitats throughout the national seashore compared to existing conditions. Designated PWC landing areas may also limit the number of PWC users who enter shallow nearshore habitats, reducing impacts due to noise, visual disturbances, and increases in turbidity in these areas. The 300-yard flat-wake zones in both the Florida and Mississippi Districts would be sufficient to avoid causing birds to flush due to noise from PWC engines. Because PWC would still be allowed to operate at full throttle in some areas of the national seashore, some potential for adverse impacts on special-status species exists, consisting primarily of temporary disturbances due to noise or the presence of PWC. However, these impacts would not affect the overall health or productivity of any of the special-status species that occur within the national seashore. Potential for adverse impacts to special-status species in the Florida District would be reduced slightly compared to existing conditions, from implementing PWC closures. Potential for adverse impacts to special-status species in the Mississippi District would not noticeably increase because although flat-wake zones would be reduced from 0.5 mile to 300 yards, flat-wake zone distances would be sufficient to limit impacts to special-status species. Overall, the implementation of PWC restrictions under alternative E would result in similar, but slightly improved conditions, compared to existing conditions, for most special-status species at the national seashore. Cumulative impacts under alternative E would be adverse with the actions under alternative E contributing a slight beneficial increment to the overall cumulative impact from the restrictions and targeted closures under alternative E that would enhance protection of most special-status species compared to existing conditions.

VISITOR USE AND EXPERIENCE

Methods and Assumptions

To determine impacts, staff observations and visitor surveys were evaluated to determine visitor attitudes and satisfaction in areas where PWC were used. Data regarding registered PWC at the national seashore were taken from the Florida Fish and Wildlife Conservation Commission in 2014, along with PWC registration data provided by NMMA (FFWCC 2014d; NMMA 2018). The potential for change in visitor experience was evaluated by identifying projected changes in both PWC and other visitor uses, and determining whether these projected changes would affect the desired visitor experience or result in increased satisfaction or dissatisfaction among visitors to the national seashore. For alternative E, it is assumed that with the implementation of the 2010 EPA emissions standards, there would be no substantial change in the levels of visitation. Due to the generally short lifespan of PWC in saltwater environments, it is expected that over time, louder two-stroke PWC would be replaced under all action alternatives (see table 11 demonstrating fleet turnover of pre-2003 model year two-stroke PWC). The analysis of all alternatives assumes that existing federal PWC regulations would continue. These existing regulations require PWC and other motorized watercraft to slow down to flat-wake speed within 100 feet of people swimming or fishing along the shoreline and within 100 feet of all non-motorized vessels such as kayaks or canoes. Federal regulations also prohibit the use of PWC and other motorized watercraft within 500 feet of all designated swim beaches. These regulations would mitigate some impacts to visitor experience.

Area of Analysis

The area of analysis for impacts on visitor use and experience includes all waters of the national seashore, and additional areas not specifically analyzed in the 2004 EA (the area east of Navarre Beach, to the Okaloosa area of the Florida District).

Potential Impacts on Visitor Use and Experience from PWC Use

For some visitors, PWC use represents the best way to recreate at the national seashore. For other visitors, PWC represent a nuisance and can be a hindrance to their enjoyment at the national seashore. Both groups of visitors must be considered when analyzing the impacts of PWC use at the national seashore. For PWC users, operating a PWC within national seashore waters may be the only reason they visit the national seashore. More than 80% of the national seashore area is classified as submerged lands, and some areas can only be reached by water-borne vessels. This gives PWC users ample space to operate and enjoy their PWC. Thus, allowing PWC use within national seashore waters results in favorable impacts on PWC users; conversely, curtailing or prohibiting PWC use within national seashore waters could result in adverse impacts on PWC users. If the national seashore were to substantially limit the areas where PWC are able to operate, this could create crowding in areas that do allow PWC use, also resulting in adverse impacts on PWC users or resulting in PWC users to recreate outside the waters of the national seashore.

Boaters also may visit the national seashore with the sole intention of operating boats within national seashore waters, and traveling to the Mississippi District islands. PWC users and boaters may experience conflicts, particularly if there is crowding. The more available open water to operate a boat or a PWC, the more those user groups may enjoy recreating at the national seashore. Thus, if PWC operating areas are limited as a result of this plan/EIS, adverse impacts on boaters may result because PWC use would be limited to particular areas where boaters also recreate, possibly creating crowding conditions. However, if PWC use is prohibited throughout national seashore waters, beneficial effects for some boaters would likely result, because boaters would have increased areas to operate without interference with PWC users.

There is a potential for impacts on other water-based visitor groups (kayakers, canoers, swimmers, anglers, and scuba divers) from PWC use as well. Potential adverse impacts on kayakers and canoers could result from decreased PWC flat-wake zones, because PWC would be able to operate at full throttle closer to the shorelines, which is generally where kayakers and canoers recreate. This could create conflicts due to increased PWC wakes, which can decrease enjoyment for kayakers and canoers. This primarily applies to kayakers and canoers in the Florida district, as these users do not frequent the waters off of the Mississippi District islands. Conversely, where flat-wake zones are increased, beneficial impacts could occur as PWC wakes and noise would be reduced. Potential impacts to swimmers in the swim beach areas would likely be unnoticeable, because PWC are prohibited near these areas. PWC noise could be perceived as an annoyance to swimmers, anglers, and divers; that noise would be more perceivable the closer the PWC are, but less perceivable if the PWC are farther away. Anglers who are fishing from piers or shorelines within the national seashore would likely experience the same impacts as swimmers (slight increase in PWC-produced wakes, and noise). Anglers fishing from boats might experience greater adverse impacts than pier or shoreline anglers, because the potential for impacts from PWC would be greater in the open water. Impacts on visitors fishing from boats in the open water could be adverse because PWC could hinder their ability to catch fish (PWC activity could scare fish from the anglers' area), plus increased noise and wakes produced by PWC. However, because the national seashore encompasses approximately 114,000 acres of submerged lands, there is ample room for anglers and PWC to recreate without noticeable impacts or conflicts to either group. Impacts on scuba divers from PWC use would be similar as those to swimmers and anglers: increased wake and noise produced by PWC. These impacts are expected to be consistent with the current conditions.

The impacts from PWC use on shoreline users, such as hikers and beach goers, would likely be less noticeable than the impacts on water-based visitors. Visitors along the northern shorelines and further upland would likely only experience impacts from the noise that is produced from PWC. Depending on their location, some noise from PWC may not be perceptible at all. It should be noted, as explained in the

"Acoustic Environment" section in chapter 3, a dBA of 52 or higher is considered "annoying," and may result in interference with conversations (EPA 1974). PWC play behavior less than 100 feet from shore may approach or exceed 80 dBA L_{eq} if multiple PWC are involved, and this level of noise would be annoying to some visitors. Due to rougher conditions on the ocean facing (southern) coastline, the majority of PWC use occurs on the waters adjacent to the northern shores of the national seashore, meaning that non-PWC users on the northern shoreline would be more likely to encounter PWC than non-PWC users on the southern shoreline. Conversely, non-PWC users on the southern facing beaches would most likely not experience much, if any, adverse impact from PWC use. Lastly, PWC use would only be permitted during daytime hours so there would be no impacts to non-PWC using visitors between sunrise and sunset, when PWC operation is not permitted.

Alternative A: No Action

Impact on PWC Users. Prohibiting PWC use at the national seashore would not necessarily preclude a visit to the national seashore by PWC owners, although it would eliminate the ability to experience the national seashore waters on a PWC. PWC users could still use a motorboat or other watercraft, and some already experience the national seashore using both modes, and could continue to experience activities such as windsurfing, hiking, swimming, or camping. However, PWC users would be adversely impacted by the prohibition of PWC use at the national seashore under alternative A, as this specific visitor experience would no longer be available. Therefore, prohibiting PWC under alternative A would result in noticeable long-term adverse impacts on PWC users because they would not be allowed to operate PWC in national seashore waters. It should be noted, however, that areas immediately outside national seashore waters would continue to allow PWC use.

Impact on Boaters. Banning PWC use within national seashore waters would eliminate interactions and crowding between boaters and PWC operators. Boaters, including both motorized and non-motorized, would not have to avoid or be cautious of PWC users, resulting in long-term beneficial effects for this visitor group, with benefits being most noticeable on the northern shores of the national seashore, where the majority of PWC use currently occurs. Boaters would be able to recreate in national seashore waters without being distracted by or having to avoid PWC users.

Impact on Other Visitors. Prohibiting PWC use within the national seashore would eliminate interactions and crowding between PWC and other visitors, including swimmers, anglers, and divers. This would result in long-term beneficial effects for these visitors because some of these visitors might consider PWC use a hindrance to their enjoyment of the national seashore, as stated above under "Potential Impacts on Visitor Use and Experience from Personal Watercraft Use." The experiences of other shoreline users, such as hikers, anglers, and beach goers, would be positive because no PWC use would be permitted within the national seashore, resulting in less noise from motorized vessels. Beneficial impacts would be most noticeable on the northern shores of the national seashore, where the majority of PWC use currently occurs

Cumulative Impacts. Cumulative impacts on visitor use and experience from past, present, and reasonably foreseeable future actions would result from continued boat traffic, ship channel dredging and maintenance activities, military related operations and activities, and various restoration projects associated with both the MsCIP and the DWH oil spill restoration efforts.

Boat traffic at the national seashore may result in direct impacts on visitor use at the national seashore. However, in conjunction with current boat traffic levels, there would still be motorized and non-motorized boats in the water at the national seashore interacting with visitors using the national seashore for other purposes. Therefore, continued recreational boating opportunities would result in beneficial cumulative impacts on boaters. However, because motorized boats produce noise and wakes, continuation of motorized boat use at the national seashore may adversely impact non-boating visitors, non-motorized boat users, and visitors that prefer the natural sounds and sights at the national seashore.

Continued maintenance, dredging, and spoil disposal from three ship channels and the Intracoastal Waterway in Florida, in addition to military related operations and activities in waters around the national seashore, would result in increased large vessels and guard patrols interacting with visitors to the national seashore. Other boaters would be interacting with these vessels and patrols, and would therefore be negatively impacted due to increased crowding, the need to possibly avoid these large vessels, and potentially the sight and sounds of these vessels. As a result, there would be noticeable adverse cumulative impacts on visitor use and experience at the national seashore. In the Mississippi District, the reasonably foreseeable future actions associated with the MsCIP includes a barrier island restoration that would involve the placement of sediment near shorelines, which could adversely impact visitor use and experience in the short term due to noise, increased turbidity, or other impacts associated with the presence of construction or boats. However, shoreline restoration would improve the aesthetics and experience of the national seashore. As a result, there would be beneficial impacts on visitor use as a result of enhanced shoreline, and short-term adverse impacts during the restoration period.

Portions of the national seashore were impacted by the DWH Oil Spill. Associated restoration and cleanup efforts were initiated which would result in direct impacts on visitor use and experience for all visitors. Visitors could experience negative impacts from restoration efforts if portions of the national seashore are closed to visitors, or if certain activities are prohibited during restoration efforts. Conversely, the restoration of the shorelines would result in beneficial effects due to stabilizing and cleaning up the national seashore. Four boat ramps in Florida will undergo construction to improve access for boaters. Although there would be long-term beneficial impacts on boaters from the availably of additional ramps for launching their boats into the foreseeable future, there would be short-term adverse impacts on boaters due to the inconvenience of seeking out new boat ramps during the construction period.

Another action associated with the DWH Oil Spill is the operation of a new passenger ferry at the national seashore. This could slightly disrupt boating at the national seashore due to temporarily and sporadically restricting the waters where boats would be able to access (the ferry's passageway during operation). However, this would also provide additional access for other users and potentially increase visitation. As a result, there would be long-term adverse impacts associated with restricted boating waters, and long-term beneficial impacts on visitor use associated with increased access at the national seashore. Additional actions associated with DWH NRDA include the construction of several erosion control structures as well as the construction of two new embayments that will provide additional swimming areas and more space for boats and kayaks to gain access. NRDA restoration projects such as the transplanting of seagrasses, installation of bird stakes to enhance nutrient supply to SAV beds, long-term SAV monitoring, and visitor education are also ongoing efforts within the study area.

Together the past, present and reasonably foreseeable future actions would increase programming and infrastructure, provide additional access for swimmers, kayakers, and boaters, and enhance the surrounding natural beauty of the national seashore, resulting in an overall beneficial impact on visitor use and experience. When the impacts on visitor use and experience under alternative A are combined with the impacts of other cumulative actions in the study area, beneficial cumulative impacts would be expected. For non-PWC users, alternative A would contribute a noticeable beneficial increment to the overall cumulative impact, because of the beneficial effects associated with the prohibition of PWC use within the national seashore.

Conclusion. Alternative A would result in beneficial effects on visitor use and experience within the national seashore because eliminating PWC use would enhance the visitor experience of boaters and non-PWC visitors with benefits being the greatest along the northern shoreline of the national seashore; they would not be distracted by PWC or need to avoid PWC in the water, and the natural sounds and sights of the national seashore would be improved. There would, however, be noticeable long-term adverse impacts on PWC users because they would not be able to use PWC at the national seashore. Overall beneficial cumulative impacts would be expected under alternative A, mainly due to recreational enhancements and other projects in the areas that benefit visitor use. For non-PWC users, alternative A would contribute a noticeable beneficial increment to the overall cumulative impact because of the beneficial effects associated with the prohibition of PWC use within the national seashore.

Alternative B

Impacts on PWC Users. Alternative B would have long-term beneficial effects on the visitor experience of PWC users at the national seashore, as these users would be able to continue to operate PWC, but with substantially reduced flat-wake zone distances compared to existing conditions. With the exception of the Davis Bayou launch ramps, posted areas on the north side of Perdido Key, and the piers at West Ship Island, Horn Island and Fort Pickens, existing flat-wake zones would be reduced to 100 feet from all other shorelines. These minimal restrictions would have notable beneficial impacts for PWC use and PWC enjoyment at the national seashore as larger areas would be available for full-throttle PWC use.

Impacts on Boaters. In the Florida District, the majority of motorized boating occurs in the Perdido Key, and Okaloosa portion of Santa Rosa Island of the national seashore. PWC users tend to concentrate in along the eastern portion of Perdido Key, Pensacola Beach and Navarre Beach areas of Santa Rosa Island, as well as the east end of Santa Rosa Island, with the most notable concentrations of PWC use occurring in the Okaloosa Island and Crab Island area[3]. With more areas open to full-throttle PWC use, there could be adverse impacts to boaters in these areas of high PWC use. Impacts on boaters in the Florida District would most likely be highest in the Okaloosa Island area, where as many as 67 PWC are likely to concentrate on an average use day, which increases to 202 PWC on a high-use day (Volkert 2015) and would be operating at full throttle in larger areas than existing conditions. Therefore, this would result in slightly adverse impacts on visitor experience, because of potential crowding conditions for both boaters and PWC users in the Okaloosa Island area. Boaters and PWC users are currently experiencing some crowding conditions. However, PWC would be able to operate at full throttle outside of 100 feet from most shorelines under alternative B. Therefore impacts on boaters would likely be noticeably adverse due to increased high-speed PWC activity near other boaters.

PWC, as well as other motorized vessels, are less prevalent in the Mississippi District, primarily due to the open-water nature of the district that deters PWC users from operating there. On an average day, 5 PWC are expected to be operating in the Mississippi District, while a high-use day may have up to 38 PWC. While PWC use is often heavy near Horn Island, the most concentrated boating use is within the vicinity of the east and west tips of the barrier islands. Under alternative B, all vessels would be restricted to 5 mph within 500 feet of the West Ship Island Pier and the flat-wake zone at West Petit Bois Island, which would benefit both PWC users and boaters. PWC are not typically used for transportation to these islands, but are towed behind other boats for recreational use at the islands, so some boaters would likely view PWC use as compatible with boating. Similar to the Florida District, impacts on motorized boaters in the Mississippi District would be long-term and slightly adverse because slightly more watercraft operating in the same areas.

Generally, few non-motorized watercraft (sea kayaks, canoes, and windsurfers) are used at the Mississippi District islands; however, in the Florida District there is a larger proportion of kayakers (Volkert 2015). There is an NPS-owned boat launch for kayaks near Perdido Key. Because this is the most concentrated non-motorized watercraft use area, and PWC users prefer similar waters (calmer waters along the northern shore), increased interactions between these two user groups would occur in these areas with PWC operating at full throttle in larger areas than currently occurring. Under alternative B, there would be smaller flat-wake zones that restrict PWC from operating at more than 5 mph. The flat-wake zones in the area around Perdido Key are restricted to posted areas such as swimming beaches and lagoons, and therefore, would result in an increased potential for interactions between PWC users and non-motorized boaters. The distance of flat-wake zones from various shorelines would also be reduced from 300 yards to 100 feet. This could result in adverse impacts for non-motorized watercraft users in the Florida district mainly along the northern shoreline, where kayaking is popular, as there may be increased disturbances in the calm waters in these areas. Because few canoeists and kayakers frequent the Mississippi District of

[3] Okaloosa Island is part of Santa Rosa Island, and is located on the eastern portion of the island.

the national seashore, it is likely that these non-motorized watercraft users would not experience noticeable impacts from PWC operations under alternative B (Volkert 2015).

Impacts on Other Visitors. Swimmers, divers, anglers, hikers, beach goers, and other shoreline visitors would be impacted by PWC use as described above under "Potential Impacts on Visitor Use and Experience from Personal Watercraft Use," with impacts being greatest along the northern shorelines of the national seashore where the majority of PWC use occurs. Shoreline areas that are popular with both PWC users and other users include the Perdido Key area in Florida and the north sides of the Mississippi District islands. Interactions between PWC users and swimmers inside designated swimming areas would remain unchanged from existing conditions (PWC prohibited within 500 feet from all designated swimming areas). However, swimmers that are outside of the designated swimming areas would experience noticeable adverse impacts because PWC would be able to operate at full throttle outside of 100 feet from most shorelines, potentially creating wakes and increased noise near swimmers. These impacts would be more adverse along the northern shoreline of the Florida District when compared to the Mississippi District, as there are more PWC used in the Florida District overall. Impacts in the Mississippi District for swimmers outside of designated swim areas are most likely to be felt by those visiting West Ship Island (the most popular swimming location). This visitor group may experience some adverse impacts from PWC operating at full throttle up to 100 feet from the shoreline at nearby Horn Island, where PWC use tends to be concentrated.

Snorkeling is popular on the bay side of Santa Rosa Island and scuba diving is popular near the jetties at the northwest corner of the Fort Pickens seawall. PWC users prefer the calm waters of Santa Rosa Sound, which is north of the island, therefore divers in this area would be adversely impacted because PWC would be allowed to operate with flat-wake zones reduced compared to current conditions, which could create wakes, noise, and adverse diving conditions. Surf anglers commonly fish along a sand bar off the south shore (Gulf side) of Santa Rosa Island. Most PWC operation in the Florida District occurs north of Santa Rosa Island in the sound or bay, minimizing the amount of interaction between these two groups. Therefore, surf anglers in this area would likely not experience any impacts from PWC use. A fishing pier near the government boat dock within the Davis Bayou portion of the Mississippi District also provides access for anglers to fish. Under alternative B, flat-wake zones would be reduced from 0.5 mile to 500 feet. Although reduced from current conditions, alternative B would still maintain a flat-wake zone around the dock, therefore, there would be no impacts to anglers in this area. Overall impacts on all anglers would be not be noticeable over the life of the plan compared to exiting conditions because, although reduced when compared to current conditions, flat-wake zones would be maintained around docks and piers.

Visitor use occurs on all open shorelines within the national seashore, including picnicking, sunbathing, running, beachcombing, observing wildlife, and other waterside activities. PWC users in the Florida District tend to favor the calmer waters in the Pensacola Bay, so visitors on the north side of Santa Rosa Island, including Santa Rosa Sound and the Naval Live Oaks Area, would experience the most impacts from PWC use, primarily due to PWC disturbances to the soundscape. Visitors near the Fort Pickens Pier and the north side of Perdido Key near Fort McRee would experience fewer disturbances from PWC because of the posted flat-wake zones and other restrictions on motorized vessels in these areas. To visitors on the beach, a two-stroke PWC operating 100 feet from shore (the closest a PWC would be allowed to operate at full throttle under alternative B) would result in a L_{max} of 76.9 dBA, which is an increase of 34.9 dBA over the existing ambient noise at the national seashore, potentially causing speech interference for the duration of the PWC event. A four-stroke PWC operating 100 feet from shore would result in a L_{max} of 67.6 dBA, which is an increase of 25.6 dBA over the existing ambient noise at the national seashore, also potentially causing speech interference for the duration of the PWC event. For a PWC travelling parallel to shore, the duration of the PWC noise would be shorter than a PWC operating in a single area for a period of time, with the PWC sound level decreasing as it travels further away. In either case, the impacts from noise to visitor experience would be adverse and would be noticeably more adverse than current conditions on northern facing shorelines, with

users on southern facing shorelines experiencing minimal, if any impacts as PWC are not often used in the Gulf of Mexico.

Adverse impacts would be particularly notable for visitors recreating on the wilderness islands in the Mississippi District, as opportunities for solitude and unconfined recreation would decrease as PWC would be permitted to operate much closer to these shorelines at full throttle, increasing noise levels that visitors in these areas would experience. That would adversely impact the natural quality of wilderness as PWC noise levels would increase in wilderness areas on Horn and Petit Bois Islands. Such impacts could reduce the ability for visitors to quietly enjoy and observe wilderness, especially on Horn Island where PWC use is more popular.

Cumulative Impacts. Cumulative impacts on visitor use and experience from past, present, and reasonably foreseeable future actions would be the same as described under alternative A. Collectively, these actions have contributed or would contribute overall beneficial effects on visitors at the national seashore. When the impacts on visitor use and experience as a result of alternative B are combined with impacts of these other projects in the study area, both beneficial and adverse cumulative impacts would be expected. For non-PWC users, alternative B would contribute a noticeable adverse increment to the overall cumulative impact, specifically on the northern facing shorelines of the national seashore, because of the adverse impacts associated with PWC use within the national seashore, including increased noise, wakes, and concentrations of visitor uses compared to existing conditions because of the decrease in flat-wake zones. For PWC users, alternative B would contribute a noticeable beneficial increment as flat-wake zones would be reduced, allowing additional areas open to full-throttle PWC use when compared to current conditions.

Conclusion. Alternative B would result in both beneficial and adverse impacts on visitor experience within the national seashore because of reduced flat-wake zones of 100 feet from shorelines. This would enhance the visitor experience for PWC users, due to a larger area for full-throttle PWC use compared to existing conditions. For other users (boaters, swimmers, and other visitors) adverse impacts would occur because the natural sounds and sights at the national seashore, particularly at the wilderness islands in the Mississippi District, would be diminished and operation of PWC at full throttle in larger areas compared to existing conditions may result in conflicts with some of these other user groups. In addition to the wilderness islands, adverse impacts would mostly occur on the northern facing shorelines of the national seashore, where most PWC use occurs. Users on southern facing shorelines would not likely notice a difference from existing conditions. Overall beneficial cumulative impacts would be expected under alternative B, mainly due to recreational enhancements and other projects in the areas that benefit visitor use. For non-PWC users on the northern facing shorelines of the national seashore, alternative B would contribute a slightly noticeable adverse increment to the overall cumulative impact, because of the adverse impacts associated with PWC use within the national seashore, including increased noise, wakes, and concentrations of visitor uses. Conversely, for PWC users, alternative B would contribute a beneficial increment to the overall cumulative effect as the actions under alternative B would provide more areas for full-throttle PWC use than existing conditions.

Alternative C

Impacts on PWC Users. Under alternative C, PWC flat-wake zones, access, and landing points would be consistent with existing conditions, thus, there would be no new impacts to PWC users.

Impacts on Boaters. Under alternative C, there would be no measurable impacts to boaters, as flat-wake zones, landing points, and access areas for PWC would generally remain the same as current and existing conditions.

Impacts on Other Visitors. Swimmers, divers, anglers, beach goers, hikers, and other shoreline visitors would generally not be impacted by PWC use as conditions with regards to PWC operating distance from people and vessels would remain consistent with existing conditions.

Cumulative Impacts. Cumulative impacts on visitor use and experience from past, present, and reasonably foreseeable future actions would be the same as described under alternative A. Collectively, these actions have contributed or would contribute beneficial effects on visitors at the national seashore. Because areas of operation and flat-wake zones for PWC would remain consistent with existing conditions, alternative C would have a minimal contribution to the overall cumulative impacts.

Conclusion. Alternative C would represent no change from existing conditions for most users at the national seashore. Cumulative impacts under alternative C would be beneficial, mainly due to recreational enhancements and other projects in the areas that benefit visitor use. Alternative C would not contribute meaningfully to cumulative effects for all user groups because on the whole it would be a continuation of existing conditions.

Alternative D

Impacts on PWC Users. Implementation of alternative D would result in long-term beneficial effects on PWC users at the national seashore, as these users would be able to continue using PWC with a set of regulations that are similar to existing conditions, but with the additional ability to navigate closer to shorelines at full throttle, as flat-wake areas would be reduced from existing conditions. The 150-yard flat-wake zones in the Florida District would permit PWC users to operate at full throttle closer to the shoreline than the current conditions permit, resulting in beneficial effects to that user group. The 300-yard flat-wake zones throughout the Mississippi District would be consistent with existing conditions except at Horn and Petit Bois Islands. For these islands, current regulations have a flat-wake zone of 0.5 mile from the shoreline. Alternative D would reduce this distance to 300 yards, resulting in beneficial effects for PWC users. However, PWC users would be restricted from landing or beaching on these islands, resulting in noticeable adverse impacts to PWC user that want to land on the wilderness islands. Alternative D would allow PWC to operate at full throttle closer to the pier at West Ship Island by reducing the current distance of 0.5 mile (880 yards) from the pier to 300 yards, resulting in beneficial effects for PWC users. The flat-wake zones would be made consistent within each district of the national seashore, resulting in less confusion about how far from various shorelines PWC must operate at flat-wake speeds. While there would be variation in flat-wake zones between neighboring seashore districts, the overall consistency within each district would allow for more ease of navigation for PWC users when compared to alternatives B and C.

Impacts on Other Boaters. In the Florida District, the reduction in PWC flat-wake zones from 300 yards (900 feet) to 150 yards (450 feet) would result in some adverse impacts to motorized boaters due to higher speed PWC activity in areas where PWC were formerly required to operate at flat-wake. The types of impacts to motorized boaters near the Okaloosa Island area would be similar to those described under alternative B, except the potential for conflicts with full-throttle PWC users would be reduced due to the greater flat-wake zones under alternative D. In the Mississippi District, there would be some noticeable impacts to motorized boaters as well. PWC flat-wake zones would remain at 300 yards in most areas but would be reduced from 0.5 mile to 300 yards adjacent to the wilderness islands and West Ship Island, resulting in an increased potential for PWC and other boats to interact in these areas at higher speeds. However, these impacts would be less adverse when compared to alternative B because the reduction in flat-wake zone compared to existing conditions is less. Generally, few non-motorized watercraft (kayaks, canoes, and windsurfers) use the Mississippi District islands. However, in the Florida District there is a larger proportion of kayakers. Because there would be smaller flat-wake zones in the Florida District when compared to existing conditions, there would be less space for kayakers and other non-motorized watercraft users to recreate without disturbance from high-speed PWC use, resulting in adverse impacts along northern facing shorelines, where the majority of PWC use occurs. In the Mississippi District, the flat-wake zones around the wilderness islands would be moderately reduced when compared to existing conditions, resulting in slightly adverse impacts to non-motorized boaters at Horn and Petit Bois Islands. Overall, motorized watercraft use, including PWC use, is less in the Mississippi District than the Florida District. Because the level of use is lower, impacts to other boaters would be expected to be less in the Mississippi District than Florida District. Overall, there would be some adverse impacts on non-motorized

watercraft users in both districts, but these impacts would be less pronounced when compared to alternative B and greater than existing conditions.

Impacts on Other Visitors. Under alternative D, swimmers, divers, anglers, beach goers, hikers, and other national seashore visitors in the Mississippi District would generally be adversely impacted by PWC use. While alternative D is similar to existing conditions with regard to a flat-wake zone of 300 yards from all shorelines, there would be notable adverse impacts for visitors recreating at the wilderness islands and West Ship Island. The reduced flat-wake zone (from 0.5 mile (880 yards) to 300 yards) would create adverse impacts for visitors recreating in these areas, as those seeking a natural and quiet landscape to observe wildlife would encounter adverse effects from the visual disturbance and noise from full-throttle PWC use closer to these areas. However, alternative D would also prohibit PWC from beaching or landing on wilderness islands, creating a beneficial effect for wilderness island visitors. Reduced flat-wake zones compared to existing conditions at West Ship Island would also result in increased disturbances for anglers in this area seeking calm, quiet, open waters ideal for fishing. PWC activity could also scare fish from the anglers' fishing area. As a result, anglers at West Ship Island would experience adverse impacts from a reduction of recreational space with favorable fishing conditions.

Divers and surf anglers utilizing the northern shoreline in the Florida District would experience adverse impacts similar to those described above in the Mississippi District. However, impacts would be more adverse due to the reduction of the flat-wake zone to 150 yards, thereby permitting PWC to operate at full-throttle closer to shorelines. Under this alternative, Perdido Key and Santa Rosa Island would have a 150-yard flat-wake zone, resulting in slightly adverse impacts on swimmers visiting those beaches, with most notable impacts likely to users on the northern shoreline of Pensacola Beach, Navarre Beach, and the Okaloosa Island Area, with no impacts expected for users on the southern shoreline. Opal Beach and Langdon Beach, located on the south side of Santa Rosa Island, would not be expected to experience impacts from a reduced flat-wake zone because PWC use does not typically occur along the southern shoreline. For visitors on the northern shoreline on beaches within the Florida District, under alternative D, a two-stroke PWC operating at a point 150 yards from shore at full throttle would result in a L_{max} of 65.1 dBA, which is 23.1 dBA greater than the existing conditions of 42 dBA and potentially causing speech interference for the duration of the PWC event. A single four-stroke PWC operating at 150 yards results in a L_{max} of 55.8 dBA, which is 13.8 dBA greater than the existing conditions of 42 dBA and also potentially causing speech interference for the duration of the PWC event.

The permissible distance between PWC and designated swim areas would remain the same. The interactions between PWC users and swimmers outside designated swimming areas in either district would be similar to current conditions, which would offer slightly greater benefits to this user group than alternative B. Overall, impacts on other visitors in both districts would be primarily adverse for the life of the plan from reduced flat-wake zones that allow PWC to operate at higher speeds in more areas of the national seashore when compared to existing conditions. However, as stated above under "Methodology," state and federal regulations related to the safe operation of PWC would remain under all action alternatives and mitigate some of the potential impacts from reducing existing flat-wake zones.

Cumulative Impacts. Cumulative impacts on visitor use and experience from past, present, and reasonably foreseeable future actions would be the same as described under alternative A. Collectively, these actions have contributed or would contribute beneficial effects on visitors at the national seashore. When the impacts on visitor use and experience as a result of alternative D are combined with impacts of these other actions in the study area, beneficial cumulative impacts would be expected for PWC users. For non-PWC users, alternative D would contribute a minimal adverse increment to the overall cumulative impact, because of the adverse impacts associated with increased noise, wakes, and concentrations of visitor uses in some areas, with the impact occurring mostly along the northern shoreline of the national seashore where most PWC use occurs. Conversely, PWC users would experience a beneficial effect under alternative D because of the additional areas where users are permitted to operate at full throttle.

Conclusion. Alternative D would result in noticeable adverse and beneficial effects on visitor experience within the national seashore. Adverse impacts on PWC users would result from prohibiting PWC landings on the shores of the wilderness islands. PWC users operating in the Mississippi District would experience some beneficial effects from the ability to operate closer to wilderness areas and the pier at West Ship Island at full throttle. PWC users operating in the Florida District would experience beneficial effects from the reduced size of the flat-wake zones. Overall, impacts on PWC users would be beneficial, more notably in the Florida district. The new flat-wake zones would result in adverse impacts for other boating (motorized and non-motorized) and non-boating users in the Florida District as a result of an increase in noise disturbance due to the reduced flat-wake zone distances, with these impacts being focused mainly along the northern shoreline of the national seashore, where the majority of PWC use occurs. In the Mississippi District, there would be adverse impacts for both boating and non-boating users in wilderness from PWC noise, but beneficial impacts from restrictions on PWC beaching on wilderness islands.

Cumulative impacts under alternative D would be beneficial, mainly due to recreational enhancements and other projects in the area that would benefit the visitor experience. For non-PWC users, alternative D would contribute a minimal adverse increment to the overall cumulative impact specifically along the northern shorelines of the national seashore and in the wilderness areas, because of the adverse impacts associated with increased noise, wakes, and concentrations of visitor uses as a result of reduced PWC flat-wake zones in some areas. Conversely, PWC users may feel that alternative D contributes a beneficial increment because of the additional areas where users are permitted to operate at full throttle.

Alternative E

Impacts on PWC Users. Implementation of alternative E would result in long-term, noticeable adverse effects for PWC users due to additional restrictions on PWC use. Alternative E would implement full PWC closures near a number of beach and island shorelines in both districts where SAV habitat and cultural resources have been identified. In the Mississippi District, these areas include Davis Bayou, the northern shores of Ship Island, and 300 yards around Horn and Petit Bois Islands. In the Florida District, full PWC closures would be implemented along the northern shores of Perdido Key, Santa Rosa Island, Naval Live Oaks, and the Santa Rosa area, as well as around Crab Island. Impacts would be particularly noticeable in the Crab Island area, which typically has high levels of PWC use. Alternative E would also implement more restrictive landing areas for PWC, thus limiting where PWC would be able to beach to two areas in the Mississippi District (the southern shores of Ship Island, and West Petit Bois Island), and the southern shores of Perdido Key and Santa Rosa Island in the Florida District. As a result, there would be highly noticeable, adverse impacts on PWC users.

Implementation of alternative E would result in slightly adverse impacts on PWC users at the national seashore, because PWC would be required to meet 2010 EPA emissions standards within two years of the publication of the final rule. The requirement to meet the 2010 EPA emissions standards would present noticeable adverse impacts on some PWC users whose watercraft does not meet those standards. However, as time progresses, more PWC that meet or exceed the 2010 EPA emissions standards have been and will continue to be manufactured, and older models will be retired and removed from service. As stated in chapter 3, registration data for counties adjacent to the national seashore indicate that the number of older model PWC declined between 2014 and 2018. This phase-out over time combined with the replacement of older PWC with new models would decrease the overall negative impacts on these PWC users. Further, the two-year grace period would allow users additional time to ensure equipment compliance.

Impacts on Other Boaters. Because of PWC closures under alternative E, PWC users would be displaced from certain areas, resulting in PWC occupying areas where they may not typically recreate. As a result, there would be distinctive adverse impacts on other motorized boaters in national seashore waters because of the reduction of areas where PWC would be allowed to operate, with impacts mostly occurring along the northern shorelines of the national seashore where the majority of PWC use occurs. As described above, generally, few non-motorized watercraft use the Mississippi District islands. However, in the Florida District there is a larger proportion of kayakers. This alternative would have the most

amount of restrictions for PWC, and therefore, result in long-term beneficial effects for non-motorized watercraft users at the national seashore, due to an increase in areas that would prohibit PWC but permit non-motorized watercraft.

Impacts on Other Visitors. Swimmers, divers, anglers, beach goers, hikers, and other national seashore visitors would be impacted by PWC use, as similarly described under alternative D, with impacts being notably adverse for users recreating at the wilderness islands or the west side of Ship Island due to the reduced flat-wake zones and any users along the northern shoreline in the Florida District of the national seashore where PWC use is also permitted.

Shoreline areas that are popular with both PWC users and other visitors include the Perdido Key area in Florida and the north sides of the Mississippi District islands. Under this alternative, impacts to swimmers within designated areas would be the same as alternative D; however, there would be the greater restrictions on PWC use, and thus result in long-term beneficial effects for swimmers both within and outside designated areas at the national seashore. Beneficial effects would be particularly experienced at high-density beaches such as the west side of Ship Island and in the Okaloosa Swim Beach area, where PWC would be prohibited. As PWC do not typically operate on the southern shorelines in the Florida District, there would not be a noticeable impact to visitors in areas such as Opal Beach at Santa Rosa, Langdon Beach at Fort Pickens, or Johnson Beach at Perdido Key. Under alternative E, popular diving areas, such as the jetties at the northwest corner of the Fort Pickens seawall, would fall within designated PWC flat-wake zones. The northern shores of Santa Rosa Island, a popular diving and snorkeling area, would be closed to PWC use, and, with the exception of the east and west tips of the west side of Ship Island, PWC would be prohibited from operating near this island as well. As a result, there would be beneficial effects for both divers and snorkelers due to the increased protections in these recreation areas. Visitors recreate on all open shorelines within the national seashore, and enjoy picnicking, sunbathing, running, beachcombing, observing wildlife, and other waterside activities. Visitors near the Fort Pickens Pier and the north side of Perdido Key near Fort McRee would experience fewer disturbances due to increased flat-wake restrictions or prohibition of PWC in these areas. Beach goers, hikers, and others would also experience noticeable beneficial impacts throughout the national seashore, but mostly on the northern shorelines in the Florida District where most PWC use occurs, from a reduction of noise, wakes, and crowding in certain areas due to the limited number of PWC landing areas permitted under alternative E. Overall, impacts on other visitors in both districts would be primarily beneficial from the additional areas where PWC use would not be permitted.

As described in the “Acoustic Environment” section, after the two-year transition period for PWC compliance with 2010 EPA emissions standards, the elimination of the two-stroke PWC would have substantial benefits to the acoustic environment. The modern four-stroke PWC that would be required would be 9 dBA less noisy than older two-stroke PWC, reducing the geographic impact of PWC noise for other visitors, thereby contributing a beneficial impact for visitors seeking a natural and quiet landscape.

Cumulative Impacts. Cumulative impacts on visitor use and experience from past, present, and reasonably foreseeable future actions would be the same as described under alternative A, collectively, would contribute beneficial effects on visitors at the national seashore. When the impacts on visitor use and experience as a result of alternative E are combined with impacts of these other projects in the study area, beneficial cumulative impacts would be expected. For non-PWC users, alternative E would contribute a noticeable beneficial increment to the overall cumulative impact, due to the closure of areas to PWC use. Conversely, for PWC users alternative E would contribute a noticeable adverse increment because of the additional PWC closures and the requirement to meet the 2010 EPA emissions standards.

Conclusion. Alternative E would result in noticeable adverse and beneficial effects on visitor use and experience within the national seashore. Adverse impacts on PWC users would result due to the regulatory requirement to meet the 2010 EPA emissions standards (within 2 years of publication of the final rule). However, these impacts would be temporary and would lessen over time, and a two-year grace period would be in effect for this user group. Additional adverse impacts on PWC users would result due restrictions prohibiting PWC in certain areas, the creation of several designated landing areas, and the

displacement of PWC use which would result in increased concentrations of PWC and motorized boats. While PWC users would experience marginal beneficial effects due to the ability to operate closer to the wilderness islands, with the implementation of new restrictions, overall impacts on PWC users would be primarily adverse. The implementation of alternative E would result in some adverse impacts to other visitors from the reduction of flat-wake zones around the wilderness islands, as well as beneficial effects on non-motorized boat users and non-boating users due to an increase in areas closed to PWC use, particularly on the northern shorelines of the Florida District where PWC use mostly occurs.

Cumulative impacts under alternative E would be beneficial, mainly due to recreational enhancements and other projects in the areas that benefit visitor experience. For non-PWC users, alternative E would contribute a noticeable beneficial increment to the overall cumulative impact, because the prohibition of PWC in many areas of the national seashore would reduce noise and visual intrusions, specifically on the northern shorelines where most of the PWC use currently occurs. Conversely, PWC users may feel that alternative E contributes a noticeable adverse increment because of the restrictions in use associated with these closures and the requirement to meet the 2010 EPA emissions restrictions.

SOCIOECONOMICS

Methods and Assumptions

The methodology for determining the level of potential socioeconomic impact was based on area economic data and data on overall visitor spending and economic contribution provided by NPS. In addition, interviews were conducted with eight PWC rental companies to discuss the area within which their businesses operate, their operational season and level of business, and any restrictions or guidance they give to PWC renters for operating PWC both in and around the national seashore. A qualitative analysis, based on professional expertise by qualified team members, was included to provide a comparison of impacts associated with the alternatives.

This socioeconomic impact analysis considers direct and indirect impacts on local and regional economies. Direct impacts are defined as those that occur when individuals make expenditures to support their recreational activity within the local economy, including purchase or rental of vehicles and related equipment, as well as lodging, restaurants, groceries, and souvenirs. Indirect impacts occur when suppliers of these goods and services purchase goods and services, and hire personnel, to meet demand. Additionally, employees of directly affected businesses and input suppliers use their income to purchase goods and services in the local economy, generating further induced impacts of visitor spending.

The economic contribution of visitor spending is a function of how many visitors arrive and how much money they spend while visiting. In 2016, visitor spending at the national seashore totaled $206,607,700. In 2015, the last year for which local and non-local visitor spending was reported, total non-local visitor spending for Gulf Islands National Seashore was estimated at $149.6 million (NPS 2015b). Non-local visitor spending supported an estimated 2,220 jobs (NPS 2015b). If an alternative that restricts where and how PWC can be operated in the national seashore results in reduced visitor spending within the national seashore by local visitors, it is assumed these visitors would spend their money elsewhere in the ROI. Because these dollars would continue to flow to other businesses locally, there would be no change to the overall economy in the ROI. Therefore, the analyses below focus primarily on impacts to non-local visitors that inject new dollars into the ROI.

Area of Analysis

The ROI includes counties in the vicinity of the national seashore in Florida, Alabama, and Mississippi. These include Escambia, Okaloosa, and Santa Rosa counties in Florida; Jackson and Harrison counties in Mississippi; and Baldwin and Mobile Counties in Alabama. These counties contain communities likely to be affected by potential actions taken under the proposed alternatives.

Alternative A: No Action

Local residents make 60% of recreation visits to the national seashore (NPS 2014a). PWC users do not make up a large portion of visitors to the national seashore, as shown in the visitor use and experience section above. Because of this, it is not anticipated that the prohibition of PWC within the national seashore would cause a noticeable decrease in non-local visitor spending (NPS 2014a). Additionally, PWC would still be allowed outside the national seashore, thereby lessening impacts on local visitation and visitor spending. In the near term, a decrease in PWC sales and rentals may occur, resulting in adverse impacts on businesses that sell and rent these watercraft. Specifically, this prohibition would impact the following PWC rental companies that operate directly into national seashore waters or within close proximity to these waters: Bonifay Water Sports, Key Sailing, Radical Rides, Portofino Island Resort, located in Pensacola Beach, Florida; Navarre Family Watersports, Navarre Beach Ski and Sail, Juana's Pagodas, located on Navarre Beach, Florida; Captain Nemo Watersports, Crab Island Watersports, Adventure Marina, Fudpuckers Watersports, located on Okaloosa Island, Florida; and Xtreme Watersports and WaterWorld at Crab Island, located in the Choctawhatchee Bay area in Florida. However, there would be opportunities for these PWC rental companies to maintain their business, as long as they launch their PWC outside of the national seashore boundaries and these PWC stay outside of national seashore waters. Alternatively, some of these PWC rental companies may be forced to close their businesses under this alternative if they are not able to relocate outside the national seashore, or if they are able to relocate outside the national seashore but unable to sustain their businesses after relocation. As PWC would still be allowed outside the national seashore, and other types of watercraft would still be allowed within the national seashore, the impacts would be minimally noticeable to some visitors and PWC rental companies that would be able to engage in PWC use in other nearby areas, or other water sports both inside and outside national seashore boundaries.

For other visitors that primarily use these PWC rental companies to recreate on PWC inside the national seashore boundaries, and for the PWC users that prefer to recreate inside the national seashore, the impacts of this alternative would be readily noticeable and adverse. This alternative would lead to direct impacts to PWC those users that rent PWC and PWC rental companies, as well as a potential loss in jobs, sales, and income that their spending or operation support in the ROI. Additionally, it is possible that there could be increased visitation to the national seashore by non-PWC users who previously did not visit or infrequently visited the national seashore, as they prefer to recreate in areas without PWC use, which would be removed under this alternative. Any additional spending in the local economy by a boost in non-local visitors in this group would have a beneficial impact on the local economy by supporting additional sales, income, and jobs. Therefore, there are likely to be mixed socioeconomic impacts under this alternative, depending on the total number of non-local PWC users impacted, the willingness of non-local PWC users to operate PWC outside the national seashore boundaries but still in the ROI, the ability of PWC rental companies to relocate their operations within the ROI, and the potential increase in visitation by those who prefer to recreate in an area without PWC use.

Cumulative Impacts. Cumulative impacts from past, present, and reasonably foreseeable future actions would result from continued boat traffic and various restoration projects associated with the DWH oil spill restoration efforts. Under alternative A, PWC use would be prohibited at the national seashore, but would continue outside the national seashore boundaries. Under this alternative, boat use within the national seashore may increase in the long term, because those visitors that would have used PWC and may use other boats in lieu of PWC. Because a majority of visitors to the national seashore are local visitors, and PWC use would continue outside the national seashore, direct and indirect effects associated with any increased boat activity would be minimal. Under the DWH NRDA Early Restoration Projects, boat ramps would be constructed near the Florida District at four locations: Galvez Landing, Navy Point, Mahogany Mill, and Big Lagoon State Park. Boat use would continue at the national seashore, and these four additional boat ramps would increase access to the national seashore waterways, which may contribute slight, long-term beneficial effects on businesses in the immediate vicinity of these additional boat ramps. These cumulative actions would contribute a minimal benefit. The addition of a passenger ferry to the national seashore was a DWH NRDA Early Restoration project. An NPS concessioner

operates two ferries from Pensacola to Fort Pickens and Pensacola Beach. Because the ferry operates as an alternative to existing infrastructure, no socioeconomic impacts associated with local or non-local visitor spending are anticipated. To support ferry operations at the City of Pensacola, floating docks and a small ticketing facility have been constructed as additions to existing infrastructure. Jobs and income associated with construction activity of these facilities provided short-term beneficial direct and indirect economic impacts during the construction period; because of the small size and scope of this project, beneficial impacts would be minimal.

Overall, the impact of past, present, and reasonably foreseeable future actions would be beneficial as many of these actions include job creation and activities that benefit the socioeconomics of the area into the future. When combined with the actions under alternative A, beneficial cumulative impacts would be expected. Alternative A would be expected to contribute a minimal adverse increment. While the implementation of alternative A could have adverse impacts for some local businesses, some of the lost business would be expected to relocate or occur in other areas near the national seashore.

Conclusion. Under alternative A, there could be some adverse impacts to PWC rental companies that currently operate in the national seashore should they be unable to secure a profitable location to run their business elsewhere in the ROI. There could also be adverse impacts to PWC users who are unable to find a viable alternative location to rent PWC in the ROI. Any non-local visitor spending associated with this group would impact the ROI in the form of losses of jobs, sales, and income supported by this spending. In the near term, there may be a decline in demand for PWC sales and rentals as a result of PWC no longer being permitted within the national seashore. This would result in adverse impacts on businesses in the ROI that sell and rent these craft. However, PWC use would continue outside the national seashore; therefore, these short-term impacts would likely be minimal.

Overall, cumulative impacts would be beneficial due to other actions occurring in the area that include job creation and activities that benefit the local economy. Alternative A would be expected to contribute a minimal adverse increment. While the implementation of alternative A could have adverse impacts for some local businesses, some of the lost business would be expected to relocate or occur in other areas near the national seashore.

Alternatives B, C, D, and E

PWC are currently permitted within the national seashore, and under the four action alternatives PWC use would continue to be permitted to varying degrees. Under these alternatives, the slight beneficial effects associated with PWC use would continue with adverse impacts to some groups of visitors or companies depending on the alternative. There are no PWC rental companies that have been identified in the Mississippi District; therefore, changes to the flat-wake zones in this district would not impact PWC rental companies and the following analysis focuses on the Florida District.

All PWC rental companies interviewed reported that they do not allow PWC renters to operate with a wake within 100 yards (300 feet) of the shoreline. Further, current PWC regulations at the national seashore require a 300-yard flat-wake zone distance from shorelines, which PWC rental companies and their users must abide by. Alternative B, the alternative with the least amount of flat-wake distance, would institute a 100 foot (33 yard) flat-wake zone from all shorelines, and would result in a reduction from the current flat-wake zone of 300-yards. Under alternative B, PWC rental company users would have more area to operate at full throttle than the current condition. Alternative C would maintain the current flat-wake zone of 300 yards, and would not represent a change from existing conditions for PWC rental companies and their users. Under alternative D, a reduced flat-wake zone distance of 150 yards would allow users of rental PWC to operate at fuller throttle in a larger area than currently permitted.

While alternative C would have flat-wake zones that are the same as existing conditions, based on interviews with PWC rental companies, two of these PWC rental companies would likely be the most affected by continuation of the 300 yards flat-wake zone. There are two PWC rental companies that currently launch into the existing 300 yard flat-wake zone and require their riders to remain relatively

close to shore while they operate PWC. These PWC rental companies instruct users to maintain a 100-yard flat-wake zone from the shoreline, a lesser distance than the required 300 yards. Continued implementation of the 300 yards flat-wake zone would result in the continued need for these PWC rental companies to ask their users to travel further away from the beach to operate at full throttle. This could result in potential losses to these PWC rental companies if riders visit other businesses that do not have these constraints. These PWC rental companies may also mitigate this issue by relocating their launch or operations areas outside of the national seashore, or by extending the boundaries where they allow their PWC riders to operate at full throttle. If these businesses find these options unsustainable it is possible that they may choose to close. Regardless, any movement of these PWC rental companies to different locations outside the national seashore would have an adverse impact on the finances of these operations.

Impacts from a change in the distance of flat-wake zones at the national seashore would likely be specific to each PWC rental company, with PWC rental companies who generally rent their PWC for an hour or more being relatively unaffected, while PWC rental companies who rent their PWC more regularly by the half hour and who require that those PWC stay close to shore would be more impacted. Alternatives where the flat-wake zone is reduced from current conditions, such as alternative D, would allow more areas for full throttle use and would result in beneficial impacts. It is not anticipated that these restrictions would lead to any substantial consumer behavior changes or impacts, because PWC use would continue to be allowed outside the national seashore.

Similar to alternative C, alternative E would also have a 300-yard flat-wake zone distance from the shoreline, but would include additional PWC closures throughout the Florida District. However, under alternative E, four primary PWC rental companies listed above (Radical Rides, Bonifay Water Sports, Key Sailing, and Portofino Island Resort), all located in Pensacola Beach, Florida, would be directly impacted because these PWC rental companies currently launch rental PWC directly into national seashore waters where PWC use would be prohibited due to PWC closures. Specifically, the prohibition of PWC in SAV habitat under alternative E would prohibit these PWC rental companies from launching PWC in their current location. However, there would be opportunities for these PWC rental companies to maintain their businesses, as long as they launch their PWC outside of the national seashore boundaries or outside of SAV habitat. Some or all of these PWC rental companies may be forced to close their businesses under alternative E if their businesses are no longer viable, either by launching at other locations or by moving their businesses to a new location where there is no SAV habitat. Regardless, movement of these PWC rental companies to different locations outside SAV habitat would have an adverse impact on the finances of these businesses. Of these four PWC rental companies, under alternative E, impacts on Portofino Resort would be relatively minimal because PWC rentals are likely not the primary source of revenue for this business. However, a reduction in an amenity such as PWC operation at their business could be expected to adversely impact their operations. Additionally, any reductions in PWC use under alternative E because of the limitations on where PWC can be used may also result in beneficial impacts to the national seashore if non-local visitors prefer to recreate in areas without PWC use and visit the national seashore more frequently.

Under alternative E, PWC would be required to meet 2010 EPA emissions standards within two years of the publication of the final rule. The requirement to meet the 2010 EPA emissions standards would not adversely impact PWC users whose watercraft meet these standards. However, any visitor using a two-stroke PWC would be barred from operating this PWC in national seashore waters. These visitors could use their PWC outside national seashore waters, upgrade their existing PWC, or purchase newer PWC that meet the new emissions standards to mitigate these impacts. Between 2014 and 2018, the percentage of PWC registered that were model year 2010 or newer increased from 23% to 45%. Likewise, those that were model year 2003 or newer also increased from 64% to 76% (table 12). Both of these trends indicate that the number of older model PWC is being reduced over time. While requiring 2010 EPA emission standards for PWC at the national seashore could have an adverse economic impact, some PWC users may purchase upgrades for their PWC or new PWC from outside the study area, resulting in leakage of dollars from the local economy. Any PWC rental companies located within the national seashore that do not have PWC that meet the 2010 standards would be required to upgrade their PWC or relocate their

operations outside of the national seashore. PWC rental companies with newer PWC fleets would be less impacted than PWC rental companies with older fleets. Overall economic losses to the study area as a result of the implementation of this requirement are expected to be adverse, with some potential adverse impacts to sales, employment, or income in the study area depending on where PWC users purchase upgrades or new PWC.

Overall, the impacts under alternative B, C, and D may be long-term and adverse to PWC rental companies if they are located in an area where flat-wake zones limit their operations, but on the whole, flat-wake distances proposed under alternatives B, C, and D would be consistent with or less than existing conditions. Where flat-wake zone distances would be reduced from existing conditions (alternatives B and D) PWC rental companies may experience beneficial impacts from their users being able to operate at full throttle in larger areas. Alternative E would have similar impact as current conditions from flat-wake zone distances, but the implementation of additional closures as well as the requirement for PWC to meet EPA 2010 emission requirements would have the potential for long-term adverse impacts as users may be required to upgrade their PWC and would not be able to operate in many areas of the national seashore. Both the use restrictions and emissions requirements under alternative E may cause PWC users and PWC rental companies to consider operating in area outside of the ROI, and result in dollars lost from the local economy in and around the national seashore.

Cumulative Impacts. Cumulative impacts from past, present, and reasonably foreseeable future actions would be the same as described under alternative A and would be beneficial as many of these actions include job creation and activities that benefit the socioeconomics of the area into the future. Under the action alternatives, continuation of flat-wake distances that are equal to or less than current conditions would have beneficial impacts on PWC rental companies and their users while additional restrictions under alternative E would result in long-term adverse impacts. When the impacts on socioeconomics as a result of alternatives B, C, and D, and E are combined with impacts of these other actions in the study area, overall beneficial cumulative impacts would be expected. Alternatives B and D would contribute a beneficial incremental impact to the overall cumulative impact from the reduced flat-wake zone distances that allow PWC rental company users to operate at full throttle in greater areas of the national seashore when compared to existing conditions. Alternative C would continue to contribute an adverse incremental impact from the continuation of the current flat-wake zone distances. There would be an adverse increment of impact under alternative E due to PWC closures and 300-yard flat-wake zones, as well as the need for PWC rental companies and PWC users to upgrade their PWC to meet 2010 EPA standards. Under all action alternatives, PWC would continue to operate within national seashore waters, which would contribute beneficial effects on local visitation and visitor expenditures.

Conclusion. Under the four action alternatives, there would be mixed socioeconomic impacts to PWC operations based on the specifics of each alternative. Alternatives B and D would have a beneficial impact from the reduction of flat-wake zones, with alternative C continuing to have an adverse impact from continuation of the existing 300-yard flat-wake zone. Alternative E has the highest potential for adverse socioeconomic impacts amongst the action alternatives due to prohibitions on PWC use in SAV habitat, which could result in the closure of several PWC rental companies that launch primarily within SAV habitat, coupled with the requirement to meet the 2010 EPA emissions standards. Any reductions in PWC use under the action alternatives, specifically alternative E, may also result in beneficial impacts to the national seashore, if non-local visitors who prefer to recreate in areas without PWC use visit the seashore more frequently. Overall, cumulative impacts would be beneficial, mainly from other actions occurring in the area, that include job creation and activities that benefit the current and future socioeconomics of the area, as well as the continued use of PWC under all action alternatives. Alternatives B and D would contribute a beneficial increment to the overall cumulative impact. Alternatives C and E would contribute an adverse incremental impact to the overall cumulative impact. Under alternative E, some PWC rental companies could be forced to close, and some PWC visitors may recreate elsewhere, spending money outside the ROI instead of within it. Under the action alternatives, PWC would continue to be allowed within national seashore waters, which would contribute beneficial effects on local visitation and visitor expenditures.

WILDERNESS

Guiding Regulations and Policies

In considering environmental impacts on wilderness, NPS must consider the tangible qualities of wilderness character, and how potential actions may impact these five qualities. These qualities are described in detail in chapter 3. None of the alternatives analyzed in this plan/EIS propose any permanent improvements or permanent sights and sounds of modern human occupation within wilderness. Therefore, analyzing the impacts for the Untrammeled, Undeveloped, and other features of value criteria above have been dismissed.

Methods and Assumptions

During internal scoping and subsequent consultations with NPS staff, it was determined that, under the proposed actions in this plan/EIS, the presence of PWC on wilderness islands and noise from PWC operating in the Mississippi District in areas surrounding Horn and Petit Bois Islands would be the primary impacts on wilderness under all action alternatives. Noise from motorized watercraft has the potential to disturb wilderness characteristics and values, primarily the potential for visitors to experience solitude and a natural setting. Based on the assumptions described in the "Acoustic Environment" section, it takes 1,980 feet for the noise from an average four-stroke PWC to drop down to be within 3 dBA of the existing ambient level of 40 dBA, and 4,575 feet for the noise from an average two-stroke PWC to drop down to be within 3 dBA of the existing ambient level of 40 dBA. Within those distances, noise from PWC would result in a 3 dBA or greater increase in sound levels over the existing ambient level. A 3 dBA increase in the existing ambient level is an important indicator because it results in a 50% reduction in listening area.

The focus of the impact analyses was on determining the impact of PWC and other motorized watercraft use on soundscapes within national seashore boundaries as well as the ability to see PWC while in designated wilderness. Given the prevalence of motorized watercraft use in areas outside of national seashore boundaries, and the already elevated noise levels associated with such uses, analysis of impacts on areas outside the boundaries of the national seashore was not the focus of this study. Similar to the acoustic environment analysis, the analysis for wilderness includes direct and cumulative impacts. Direct impacts on wilderness includes PWC noise that impacts sound levels within designated wilderness areas and visitors being able to see a motorized vessel (PWC) while in wilderness. A separate analysis was performed for purposes of analyzing cumulative impacts to wilderness from motorized watercraft noise sources within the national seashore's boundaries. For all alternatives, the analysis of impacts on soundscapes evaluates the change from the alternative relative to existing conditions. The wilderness quality of solitude or a primitive and unconfined type of recreation is degraded by settings or management actions that increase visitor encounters, signs of modern civilization, and recreation facilities. Therefore, allowing PWC to beach within the wilderness area would impact visitor experience related to the ability to maintain an experience of solitude and unconfined recreation, one of the five qualities of wilderness.

Area of Analysis

The area of analysis for impacts of the alternatives on wilderness includes the waters of the national seashore surrounding the designated wilderness islands of Horn and Petit Bois in the Mississippi District.

Potential Impacts on Wilderness from PWC Use

Researchers have determined that sounds play a key role in determining environmental quality, especially in places with a distinct environmental identity. In these situations, any non-natural or anthropogenic sound resulted in decreased quality rating of a landscape (Carles, Lopez Barrio, and Vicente de Lucio 1999; Benfield et al. 2009). The concept of tranquility exhibits a context-specific sound and visual correlation. Tranquility was considered highest in places with more natural features and reduced sound

levels (Pheasant et al. 2008). These findings are relevant when considering non-natural sounds in protected natural spaces whose purpose and use imply the presence of natural sounds and minimal non-natural sounds. These types of settings include wilderness areas.

PWC use may impact wilderness character directly by operating in close enough proximity to designated wilderness areas for sounds associated with their operation to reach wilderness areas. Noise from PWC use could impact the wilderness experience (e.g., solitude and quiet) at Horn and Petit Bois Islands, depending on how far away the PWC is operating, how far the noise from the PWC travels (appendix D, figure D-28), the number of PWC in the area, the speed at which PWC are traveling, and the behavior of the PWC (whether it is traveling in a straight path, or continually changing speeds and direction). PWC use may also impact wilderness character directly if PWC are beached on, or immediately adjacent to, the wilderness boundary. The visual intrusion alone impacts wilderness character, primarily the natural quality and opportunity for solitude and primitive recreation.

Alternative A: No Action

Under the alternative A, PWC use would be prohibited throughout the national seashore. Consequently, alternative A would result in beneficial effects on wilderness because the prohibition on PWC use would remove the potential for direct impacts on qualities of wilderness character as a result of noise produced by PWC use in surrounding waters and the visual intrusion of seeing PWC on or adjacent to the wilderness islands. The natural quality would be enhanced as PWC noise would no longer be audible from wilderness areas on Horn and Petit Bois Islands. Without this noise, the area would better represent an area free from modern civilization. Likewise, opportunities for solitude and unconfined recreation would increase as PWC would not be able to access the shorelines and these vessels would not be visible to those experiencing wilderness. Management activities that require use of all-terrain vehicles and other tools that are not considered appropriate in wilderness would continue at the national seashore, resulting in short-term adverse impacts. However, overall wilderness character would experience benefits from the prohibition of PWC.

Cumulative Impacts. Cumulative impacts on wilderness from past, present, and reasonably foreseeable future actions would result from sound produced by continued motorized boat traffic. Operation of motorized vessels other than PWC would contribute to long-term noise impacts on wilderness areas. Similar to PWC, the L_{max} of a typical small outboard motorboat at full throttle is in the range of 75 to 80 dBA at a distance of 50 feet (HMMH 2002). High performance motorboats can generate noise levels substantially higher than PWC. For example, the V-8 muscle boat studied in the Glen Canyon study generated a L_{max} level of 90 dBA at 50 feet, 10 dBA higher than a PWC (HMMH 2002). As with PWC, the degree of impact from motorboat use would depend on the number and location of boats, the type of activity engaged in, and the distance of the boat operations from the wilderness areas. However, continued boat use near the wilderness islands would be expected to contribute noticeable adverse impacts on wilderness during daylight hours when boats operate adjacent to those islands because boats are not subject to flat-wake zones. Further, motorboats outnumber PWC about 5 to 1 in the Florida District and about 30 to 1 in the Mississippi District and therefore contribute the majority of cumulative impacts.

When the impacts on wilderness as a result of alternative A are combined with impacts of other actions in the study area, there would be adverse cumulative impacts to the natural quality of wilderness and the opportunity for solitude and primitive recreation in wilderness due to noise and visual intrusions of motorboats. Alternative A would contribute a noticeable beneficial increment to the overall cumulative impact, because of the beneficial effects associated with the prohibition on PWC use within the national seashore that would improve the natural and opportunities for solitude and primitive recreation qualities of wilderness character.

Conclusion. Alternative A would result in beneficial effects on wilderness qualities because eliminating PWC use at the national seashore would remove the associated noise and visual intrusion of PWC. This would create a beneficial impact to the natural quality of the wilderness, and improve opportunities for

solitude or primitive recreation compared to the current condition. Alternative A would have the greatest benefit to qualities of wilderness character of all alternatives, eliminating all sound produced by recreational PWC use at the national seashore. Although there would still be impacts to wilderness character due to management activities, manmade structures and equipment, and other motorized vessels, the wilderness character of Horn and Petit Bois Islands would be improved under alternative A. Overall cumulative impacts under alternative A would be adverse due to other motorized vessels operating adjacent to and landing on the wilderness islands.

Alternative B

Under alternative B, NPS would allow PWC to operate in the same manner as all other motorized watercraft per the Superintendent's Compendium (NPS 2019), including operating near the designated wilderness areas on Horn and Petit Bois Islands. PWC would be allowed to beach on wilderness islands, resulting in adverse impacts. Alternative B would result in adverse impacts because PWC would be operating closer to shore than current conditions with the substantial reduction of flat-wake zones. For example, table 34 shows that a single two-stroke PWC operating at 100 feet from the shoreline results in a L_{max} of 76.9 dBA, compared to 48.2 dBA L_{max} when the PWC is operating 0.5 mile from shore. A single four-stroke PWC operating at 100 feet from the shoreline generates a L_{max} of 67.6 dBA onshore, compared to 39 dBA when the PWC is operating 0.5 mile from shore. This represents an increase of approximately 29 dBA during the instant of the PWC pass-by, which would be very noticeable to an observer onshore (for reference, a 10-dB increase is generally perceived as a doubling of loudness, a 20-dBA increase is perceived as four times as loud). Implementation of alternative B would adversely impact the natural quality of wilderness. Since PWC noise would be audible from wilderness areas on Horn and Petit Bois Islands, opportunities for solitude and unconfined recreation would decrease because PWC would be allowed to operate at full throttle 100 feet from shorelines and would be allowed to land on the wilderness islands.

Given the substantially reduced flat-wake zones under alternative B compared to current conditions, impacts to wilderness quality would be noticeably adverse. However, PWC noise impacts would lessen over time from the replacement of older, louder two-stroke PWC, and PWC use is much less abundant in the Mississippi District compared to Florida. Results of 2013 PWC counts indicated that the majority of PWC use in the Mississippi District occurred near Horn Island (NPS 2013b). Petit Bois Island very low PWC numbers were observed (some days there were zero PWC observed near Petit Bois Island) (NPS 2013b).

Cumulative Impacts. Cumulative impacts on wilderness from past, present, and reasonably foreseeable future actions would be the same as described under alternative A. Collectively, these actions have contributed or would contribute adverse impacts on the qualities of wilderness character, mainly from motorboat use adjacent to the wilderness islands which degrades the natural quality and reduces the opportunities for solitude and primitive recreation in wilderness. When the impacts on the qualities of wilderness character as a result of alternative B are combined with impacts of these other actions, adverse cumulative impacts would be expected. Alternative B would contribute a noticeable adverse increment to the overall cumulative impact because full-throttle PWC use would be allowed 100 feet from the wilderness boundary and PWC would also be able to land on wilderness islands, which would result in visual and noise intrusions into wilderness areas, further diminishing the natural quality and reducing opportunities for solitude and primitive recreation quality of wilderness character. Motorboats outnumber PWC about 5 to 1 in the Florida District and about 30 to 1 in the Mississippi District and would continue to contribute the majority of cumulative impacts.

Conclusion. PWC use under alternative B would result in short- and long-term direct adverse impacts on the qualities of wilderness character compared to the existing conditions by continuing the adverse impacts that are currently occurring, and exacerbating adverse impacts beyond current levels by allowing full-throttle PWC use 100 feet from designated wilderness areas. While all areas of the designated wilderness islands could potentially be impacted by PWC use under alternative B, PWC use has been observed primarily near the northern shores of the islands. Under alternative B, full-throttle PWC noise

would be audible at higher than existing ambient levels, which would result in substantial direct adverse impacts on wilderness areas (appendix D, figure D-40). Alternative B would have the greatest potential for sound and visual intrusions to impact the qualities of wilderness character; therefore, of all action alternatives, alternative B would contribute the greatest adverse impacts on qualities of wilderness character when compared to existing conditions.

Cumulative impacts under alternative B would be adverse primarily from other motorized vessels operating along the wilderness islands. Because alternative B reduces flat-wake zones, it would contribute a noticeable adverse increment from the use of PWC at the national seashore in a similar manner as boats. Reduced flat-wake zone distances would increase noise and further degrade the natural and opportunities for solitude and primitive recreation qualities of wilderness character. However, with boats outnumbering PWC approximately 30 to 1 in the Mississippi District, motorboats would continue to be the largest contributor to cumulative impacts.

Alternative C

Under alternative C, continued implementation of 0.5-mile flat-wake zones from the shorelines on the designated wilderness islands of Horn and Petit Bois would not create any additional impacts on the qualities of wilderness character compared to existing conditions. Beaching of PWC on wilderness islands would continue. The 0.5-mile flat-wake zone would continue to limit impacts to wilderness character by keeping PWC noise levels between a range of 39.0 and 48.2 dBA L_{max}, for four-stroke and two-stroke PWC operating 0.5 mile from shore, respectively (see table 34), Likewise, opportunities for solitude and unconfined recreation would remain the same as current conditions, because PWC would continue to be allowed to operate at full throttle within 0.5 mile from shorelines and land on shorelines, and would be viable to visitors in wilderness. Given the low abundance of PWC activity near Horn and Petit Bois Islands, impacts are not expected to be substantial. Furthermore, PWC noise impacts would lessen over time as older, louder two-stroke PWC are replaced.

Cumulative Impacts. Cumulative impacts on wilderness from past, present, and reasonably foreseeable future actions would be the same as described under alternative A. Collectively, these actions have contributed or would contribute adverse impacts to the qualities of wilderness character, mainly from the use of motorized vessels adjacent to the wilderness islands, which degrades the natural quality and the opportunities for solitude and primitive recreation quality of wilderness character. When the impacts on the qualities of wilderness as a result of alternative C are combined with impacts of these other actions in the study area, adverse cumulative impacts would be expected. Overall, qualities of wilderness character at the national seashore would be similar to current conditions. Alternative C would continue to contribute a small increment to the overall cumulative impact because PWC would be allowed to operate in areas surrounding designated wilderness, but with current restrictions would minimize visual and noise intrusions into wilderness. Additionally, motorboats do not have flat-wake zone requirements and outnumber PWC about 30 to 1 in the Mississippi District; therefore, motorboats would continue to contribute the majority of cumulative impacts.

Conclusion. PWC use under alternative C would result in continued short- and long-term adverse impacts on the qualities of wilderness character in the Mississippi District. Adverse impacts on qualities of wilderness character under alternative C would be much less intense compared to those described under alternative B because the wilderness islands would continue to receive protection from the 0.5-mile flat-wake zones, which would limit PWC noise. However, PWC users would be able to land on the wilderness islands below the mean high tide line under alternative C. Impacts would include noise produced by PWC use in areas surrounding designated wilderness. Under alternative C, full-throttle PWC noise would continue to be slightly audible within 0.5 mile from the shoreline, which would result in direct impacts on wilderness areas (appendix D, figure D-40). Under alternative C, wilderness character at the national seashore would resemble current conditions. Cumulative impacts under alternative C would be adverse from other motorized vessels operating in the area without being subject to flat-wake zones. Alternative C would continue to contribute a small adverse increment from the use of PWC at the national seashore in a manner that is similar to current conditions.

Alternative D

Under alternative D, wilderness areas would be exposed to more PWC noise than under current conditions due to the reduced flat-wake zones. However, the wilderness islands would be more physically protected under alternative D because PWC would not be able to land anywhere on the islands under alternative D. Because the shores of Horn and Petit Bois Islands would be closed to PWC landings, physical intrusions into wilderness by PWC would be eliminated, and opportunities for solitude and unconfined recreation would increase, resulting in beneficial impacts to wilderness. The quality of solitude or a primitive and unconfined type of recreation is degraded by settings or management actions that increase visitor encounters, signs of modern civilization, and recreation facilities, which includes the presence of PWC. The natural quality of wilderness would be adversely impacted because PWC noise would be audible from wilderness areas on Horn and Petit Bois Islands. Although PWC use around the wilderness islands is not common, when it does occur the reduction in flat-wake zone distance could increase the PWC noise level experienced onshore. In terms of L_{max}, the impact from the reduction of the 0.5-mile flat-wake zone around the wilderness islands would be an increase of approximately 10 dBA (for both two-stroke and four-stroke PWC), which generally would be perceived as a doubling of loudness relative to existing conditions during the instant of the PWC pass-by. The L_{max} of a two-stroke PWC 300 yards from shore is approximately 59 dBA (17 dBA above existing ambient), compared to 48 dBA (6 dBA above existing median ambient) at 0.5 mile. The L_{max} of a four-stroke PWC 300 yards from shore is approximately 50 dBA (8 dBA above existing ambient), compared to 39 dBA (which is below the existing median ambient) at 0.5 mile. Impacts would decline towards the four-stroke PWC level over time as two-stroke PWC are replaced (see table 10). Although an individual noise event from a PWC could be twice as loud, these events would not be frequent due to the low level of PWC use around the wilderness islands and the closure of the shores to PWC landings.

Cumulative Impacts. Cumulative impacts on qualities of wilderness character from past, present, and reasonably foreseeable future actions would be the same as described under alternative A. Collectively, these cumulative actions have contributed or would contribute adverse impacts on qualities of wilderness character. When the impacts on the qualities of wilderness character as a result of alternative D are combined with impacts of these other actions in the study area, adverse cumulative impacts would be expected. Alternative D would contribute a minimal adverse increment to the overall cumulative impact because PWC would be allowed to operate at full speed closer to the shorelines of the wilderness islands than under current conditions. Additionally, motorboats do not have flat-wake zone requirements and outnumber PWC about 30 to 1 in the Mississippi District; therefore, motorboats would continue to contribute the majority of cumulative impacts.

Conclusion. PWC use under alternative D would result in long-term adverse impacts on the natural character of designated wilderness compared to existing conditions. However, PWC use under alternative D would also result in long-term beneficial impacts on the ability to achieve solitude and unconfined recreation within designated wilderness compared to existing conditions because of the prohibition on landing on wilderness islands that would remove the visual presence of motorized vessels in wilderness. Intensity of impacts on wilderness character would be reduced compared to alternative B but increased compared to current conditions because flat-wake zones would be reduced to 300 yards from 0.5 mile. Prohibiting PWC from landing on the shores of the wilderness islands would result in a beneficial impact on wilderness character (solitude and unconfined recreation) compared to current conditions because physical intrusions into wilderness by PWC would be eliminated, and opportunities for solitude and unconfined recreation would increase. Potential adverse impacts on wilderness character under alternative D would be slightly increased compared to current conditions.

Under alternative D, noise from full-throttle PWC use would be audible within 300 yards from the shoreline, which would result in direct impacts on the natural character of wilderness areas (see appendix D, figure D-40). However, given the low level of PWC use near Horn and Petit Bois Islands, impacts are not expected to be substantial. Cumulative impacts under alternative D would be adverse from other motorized vessels operating in the area, to which alternative D would continue to contribute a minimal

adverse increment from the use of PWC at the national seashore with reduced flat-wake zones that allow PWC to operate at a faster speed, and louder operation, near wilderness islands. These changes in PWC management would result in an increase of noise that can be heard on the wilderness islands, and would add to the adverse cumulative impacts for the natural and solitude or primitive and unconfined qualities of wilderness. However, prohibitions on landing PWC on wilderness islands under alternative D would provide a benefit to the undeveloped quality of wilderness due to the removal of PWC along the beaches of the wilderness islands.

Alternative E

Alternative E would prohibit all PWC use within 300 yards of the designated wilderness areas on Horn and Petit Bois Islands. As with alternative D, landing of PWC on designated wilderness islands would be prohibited and opportunities for solitude and unconfined recreation would increase, resulting in beneficial impacts. In other words, PWC would not be allowed to land within the wilderness area, so visitors would maintain the ability to experience solitude and unconfined recreation, one of the five qualities of wilderness. The quality of solitude or a primitive and unconfined type of recreation is degraded by settings or management actions that increase visitor encounters, signs of modern civilization, and recreation facilities, which includes the presence of PWC. Alternative E would result in some impacts on the qualities of wilderness character due to PWC activity adjacent to closed areas, which would produce enough noise to be audible on Horn and Petit Bois Islands, thus impacting the natural character of wilderness. Although PWC would be prohibited within 300 yards of Horn and Petit Bois Islands, PWC would still be able to operate at full throttle outside of the 300-yard closure. This would result in impacts very similar to those under alternative D. The natural quality of wilderness would be adversely impacted because PWC noise would be more audible from wilderness areas on Horn and Petit Bois Islands than under current conditions. Overall, alternative E would result in impacts on wilderness character very similar to those described under alternative D. Impacts from PWC noise would be greater under alternative E than under current conditions, as a result of the replacement of the 0.5-mile flat-wake zone with a 300-yard PWC closure. Observing anything manmade within wilderness adversely impacts that ability; therefore, prohibiting PWC from landing in wilderness would have beneficial impacts to wilderness, most notably opportunities for solitude and unconfined recreation.

Cumulative Impacts. Cumulative impacts on the qualities of wilderness character from past, present, and reasonably foreseeable future actions would be the same as described under alternative A. Collectively, these actions have contributed or would contribute adverse impacts on the qualities of wilderness character. When the impacts on the qualities of wilderness character as a result of alternative E are combined with impacts of these other actions in the study area, adverse cumulative impacts would be expected. Alternative E would contribute slightly to the overall adverse cumulative impacts because recreational PWC use would still be allowed beyond 300 yards from designated wilderness areas, which would likely result in noise intrusions into wilderness. These noise intrusions would be small compared to other noise sources in the areas that impact the qualities of wilderness character. Additionally, prohibiting PWC landings on wilderness islands would result in benefits to wilderness. Also, motorboats do not have flat-wake zone requirements and outnumber PWC about 30 to 1 in the Mississippi District; therefore, motorboats would continue to contribute the majority of cumulative impacts.

Conclusion. Alternative E would result in slightly adverse impacts on the qualities of wilderness character. Long-term adverse impacts would occur due to noise produced by PWC operating beyond 300 yards from designated wilderness areas, which would be a reduction from the current 0.5-mile flat-wake zone under the existing condition. Prohibiting PWC from landing on the shores of the wilderness islands would reduce impacts on wilderness character. Under alternative E, full-throttle PWC noise would be audible within 300 yards from the shoreline, which would result in direct impacts on wilderness areas (see appendix D, figure D-40). Under alternative E, wilderness character at the national seashore would be slightly more impacted compared to current conditions. Cumulative impacts under alternative E would be adverse from other motorized vessels operating in the area, to which alternative E would continue to contribute a slight adverse increment from the use of PWC 300 yards from shore.

UNAVOIDABLE ADVERSE IMPACTS

NPS is required to consider if the alternative actions would result in impacts that could not be fully mitigated or avoided (NEPA section 101(c)(ii)).

Alternative A: No Action. Under alternative A, there would be long-term, unavoidable adverse impacts on visitor use and experience and socioeconomics, due to the prohibition of PWC use within national seashore waters. The prohibition of PWC in national seashore waters could discourage a segment of visitors from visiting the national seashore, would eliminate a popular visitor activity within national seashore waters, and could adversely impact PWC outfitters, rental companies, and other businesses in the area that rely on PWC-related activities.

Alternative B. Under alternative B, there would be unavoidable adverse impacts on water quality and air quality, as PWC use would contribute to pollutants in the water and air within the national seashore. SAV, wildlife and wildlife habitat, and threatened and endangered species would also be adversely impacted under alternative B, as PWC would contribute to potential impacts to SAV within national seashore boundaries in shallows waters. The acoustic environment and wilderness would continue to be adversely impacted due to PWC-related noise, with impacts increasing over existing conditions. Substantial reductions in current PWC flat-wake zones under alternative B would result in adverse impacts on visitor experience at the national seashore, for those visitors who desire a more primitive experience. The impact from substantially reduced flat-wake zones under B would be the greatest level of impact compared to other action alternatives.

Alternative C. Unavoidable impacts under alternative C would be similar to those discussed under alternative B. However, unavoidable impacts to the acoustic environment, SAV, wildlife and wildlife habitat, threatened and endangered species, and wilderness would be reduced due to the increased PWC-related restrictions, including larger flat-wake zones. Impacts under alternative C would be the same as the existing condition.

Alternative D. Under alternative D there would be unavoidable adverse impacts on water quality and air quality, as PWC use would contribute to pollutants in the water and air within the national seashore. However, impacts to water and air quality would not increase when compared to existing conditions. Unavoidable impacts could also occur to SAV, wildlife and wildlife habitat, acoustic environment, and threatened and endangered species as PWC operating in the national seashore have the potential to impact these resources. These adverse impacts would be minimized due to the presence of flat-wake zones that would require PWC to operate slower in areas closer to the shoreline. However, because flat-wake zones would be reduced in certain areas under alternative D, there would be a greater potential for unavoidable adverse impacts to these resources than currently exists. Unavoidable impacts on wilderness would be reduced to a certain extent when compared to existing conditions due to the prohibition on PWC landings on wilderness islands under alternative D.

Alternative E. Under alternative E, unavoidable impacts on air quality, the acoustic environment, SAV, wildlife and wildlife habitat, threatened and endangered species, and wilderness would be reduced due to the increased PWC-related restrictions, including the flat-wake zones, additional restrictions including requirements for the EPA 2010 emissions standards, and areas where PWC would be prohibited. Alternative E would have the least impact compared to other action alternatives, as more areas of the national seashore would be closed to PWC use due to the SAV closures.

SUSTAINABILITY AND LONG-TERM MANAGEMENT

In accordance with NEPA, consideration of long-term impacts and the effects of foreclosing future options should be included in any NEPA document. According to the World Commission on Environment and Development, “sustainable development is that which meets the needs of the present without compromising the ability of future generations to meet their needs.” For each alternative

considered in a NEPA document, considerations of sustainability must demonstrate the relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity, described below for each alternative. The agency must consider if the effects of the alternatives involve tradeoffs of the long-term productivity and sustainability of resources for the immediate short-term use of those resources. It must also consider if the effects of the alternatives over the long term without causing adverse environmental effects for future generations (NEPA section 102(C)(iv)).

Alternatives B, C, D, and E. Under all action alternatives, ongoing PWC use would have a long-term commitment of human resources and long-term impacts on the national seashore's natural resources, as well as visitor experience and socioeconomics. Alternatives C, D, and E would allow for a more sustainable use of national seashore resources. Alternative E would be the most sustainable through the prohibition of PWC access in sensitive resource areas, and the requirement for PWC to meet 2010 EPA emission standards. In all action alternatives, flat-wake zones and other PWC management tools would ensure the overall sustainable use of national seashore natural resources. Human resources under all alternatives would require the management and enforcement of flat-wake zones, as well as emission standards under alternative E. This could include tradeoffs with other national seashore management duties to ensure that the use of human resources under the action alternatives is sustainable.

IRREVERSIBLE OR IRRETRIEVABLE COMMITMENTS OF RESOURCES

Federal agencies must consider if the effects of the alternatives cannot be changed or are permanent (that is, the impacts are irreversible). NPS must also consider if the impacts on national seashore resources would mean that once gone, the resource could not be replaced; in other words, the resource could not be restored, replaced, or otherwise retrieved (NEPA section 102(c)(V)).

Alternative A: No Action. Under alternative A, complete prohibition of PWC use within national seashore boundaries would result in irretrievable impacts on the visitor experience of PWC users. However, visitors would be able to recreate within national seashore boundaries using many other types of watercraft and other activities. Furthermore, PWC use would be allowed outside of the national seashore boundaries and this recreational experience would still be available to visitors in the vicinity of the national seashore.

Alternatives B, C, D, and E. Under alternatives B, C, D, and E, allowing PWC use with various restrictions would result impacts to park resources. While PWC use would result in impacts on water quality, air quality, acoustic environment, SAV / shoreline vegetation, wildlife and wildlife habitat, threatened and endangered species and species of special management concern, and wilderness, none of these impacts would be irreversible, as the NPS could temporarily close areas to PWC use for resource protection purposes or revisit the decision to allow PWC use in the park.

CHAPTER 5: CONSULTATION AND COORDINATION

THE SCOPING PROCESS

Internal Scoping. Internal scoping for the plan/EIS was held November 14–15, 2012, to discuss the development of the plan/EIS with staff members from the national seashore, NPS's Environmental Quality Division, and NPS's Southeast Region. This group is collectively referred to as the Project Team. Contractor personnel assisted in facilitating the internal scoping meetings. During the meeting, the Project Team discussed the 2010 court decision that preceded this planning effort, identified the purpose of and need for action, management objectives, issues, and potential impact topics. The Project Team also discussed possible alternative elements, cumulative impacts, interagency consultation, strategies for public involvement, project schedule, and data collection.

Public Scoping. The *Federal Register* publication of the Notice of Intent to prepare an EIS (78 FR 8189) was published on February 5, 2013. The Notice of Intent summarized the purpose and need for taking action, plan objectives, the history of PWC management at the national seashore, issues related to PWC management, and preliminary alternatives. Public scoping began October 31, 2013, with the release of the public scoping newsletter. The national seashore posted the public scoping newsletter on NPS's Planning, Environment, and Public Comment (PEPC) website at http://parkplanning.nps.gov/guis, sent copies of the newsletter to a list of national seashore stakeholders, and issued a news release inviting the public to comment at the public scoping meetings. The public was invited to submit comments on the scope of the planning process and potential alternative elements from October 31, 2013, through December 15, 2013. During the scoping period, two public scoping open houses were held at the Naval Live Oaks Visitor Center in Gulf Breeze, Florida on November 18, 2013, and Davis Bayou Visitor Center in Ocean Springs, Mississippi on November 19, 2013. Posters and handouts provided information about the purpose and need for taking action, plan objectives, the history of PWC management at the national seashore, issues related to PWC management, and preliminary alternatives. NPS staff members were available to answer questions, provide additional information about the plan, and describe how to submit comments.

Public Scoping Comments. During the scoping period, 144 pieces of correspondence were received from commenters in 27 states. A total of 328 specific comments were derived from the correspondence. A substantial number of commenters were in support of managing PWC use in the same manner as other watercraft. Several commenters suggested that the impacts of PWC use are not as damaging as the impacts from conventional boats (particularly those with outboard motors), that a ban on PWC use at the national seashore would be unacceptable, and that there have been substantial improvements to PWC technology in recent years. Other commenters noted potential impacts of PWC use or provided alternative elements to be considered in addition to those included in the scoping newsletter. Public comment analysis assists the Project Team in organizing, clarifying, and addressing technical information pursuant to NEPA regulations. It also aids in identifying the topics and issues to be evaluated and considered throughout the planning process. All scoping comments were considered to be important as useful guidance in the development of the plan/EIS. The results of the public scoping, the Public Scoping Comment Analysis Report, was posted on the PEPC website in March 2014.

Public Review of the Draft Plan/EIS. The notice of availability for the draft plan/EIS was published in the *Federal Register* (82 FR 140) on August 3, 2018. The draft plan/EIS was posted online at the NPS PEPC website and a press release was issued by the national seashore. The NPS hosted three public open house meetings to discuss the proposed draft plan/EIS for PWC use at the national seashore. This list shows the times and locations of these meetings, as well as the number of attendees at each meeting.

Tuesday, August 21, 2018: Florida Park Headquarters (Naval Live Oaks), 1801 Gulf Breeze Parkway, Gulf Breeze Florida, 4:00 pm–7:00 pm CST; 15 people attended.

Wednesday, August 22, 2018: Perdido Key Community Center, 15500 Perdido Key Drive, Pensacola, Florida, 4:00 pm–7:00 pm CST; 16 people attended.

Thursday, August 23, 2018: Mississippi Davis Bayou Visitor Center, 3500 Park Road, Ocean Springs, Mississippi, 4:00 pm–7:00 pm CST; 14 people attended.

A total of 324 pieces of unique correspondence were received during the public comment period (August 3, 2018 through September 17, 2018) on the draft plan/EIS. In addition to the unique correspondence an additional 9,004 form letters were received, resulting in 9,328 total pieces of correspondence. Agency responses to all substantive public concerns raised during the public review period for the draft plan/EIS are provided in appendix J.

Agency Consultation. Consultation and coordination with local and federal agencies occurred throughout the NEPA process. In accordance with ESA Section 7, consultation with the USFWS and NOAA NMFS concerning impacts on federally listed threatened and endangered species was conducted by NPS. Section 7 consultation with the USFWS and NOAA NMFS was first initiated in 2003 and 2005, respectively. During the consultation process the USFWS and NOAA NMFS provided lists of threatened and endangered species that occur in or close to the national seashore. These species were included in this plan/EIS with initial findings of impacts under each alternative. USFWS and NOAA NMFS concurred that the preferred action alternative (alternative D) was not likely to adversely affected any ESA-listed species or result in destruction or adverse modification of their critical habitat. The NPS sent additional letters to the USFWS and NOAA NMFS in July 2018 and December 2018, respectively, to provide notice of the availability of the draft EIS for agency review and comment, and to reaffirm agency concurrence regarding impacts to ESA-listed species as a result of the preferred action alternative (alternative D). The USFWS responded via letter in February 2019, and confirmed agency concurrence with the NPS' determination that the preferred action alternative (alternative D) was not likely to adversely affected any ESA-listed species or result in destruction or adverse modification of their critical habitat. NOAA NMFS did not respond in writing but confirmed via phone that the 2005 written concurrence determination still applies. If another alternative is selected, the NPS will re-initiate consultation with USFWS and NOAA NMFS. The project team has already consulted with the Florida Fish and Wildlife Conservation Commission, and the Mississippi Department of Wildlife, Fisheries, and Parks. Information provided by these two agencies regarding state listed species has been incorporated into this plan/EIS.

Section 106 and Tribal Consultation. NPS has initiated consultation with several groups under section 106 of the National Historic Preservation Act. The Florida State Historic Preservation Officer responded that the Area of Potential Effect is appropriate, and that the proposed plan will have no effect on historic properties listed, or eligible for listing, on the National Register of Historic Places. In addition, NPS has submitted a letter to the following groups:

- Alabama-Coushatta Tribe of Texas
- Alabama-Quassarte Tribe of Texas
- Chickasaw Nation
- Choctaw Nation of Oklahoma
- Jena Band of Choctaw Indians
- Kialegee Tribal Town
- Miccosukee Tribe of Indians of Florida
- Mississippi Band of Choctaw Indians
- Muscogee Creek Nation
- Poarch Band of Creek Indians
- Seminole Nation of Oklahoma
- Seminole Tribe of Florida
- Thlopthlocco Tribal Town
- Tunica-Biloxi Tribe of Louisiana
- State Historic Preservation Officer, Florida Department of State
- State Historic Preservation Officer, Mississippi Department of Archives and History

The Choctaw Nation of Oklahoma responded that the locations that have been considered in the plan/EIS are within the Choctaw Nation of Oklahoma's area of historic interest. They note that added wave action from PWC use may potentially adversely impact coastal sites that are of cultural and historic significance to the Choctaw Nation and requested to be a consulting party in this project. In a conference call between NPS staff, Emman Spain (Muscogee Creek Nation), Dana Masters (Jena Band of Choctaw Indians), and Ian Thompson (Choctaw Nation of Oklahoma), NPS staff briefed these three tribal representatives on the status of the proposed plan and initiated discussion on any concerns they may have. In general, the tribes had concerns about looting and vandalism by visitors who have access to cultural sites. These tribes were

not notably concerned about wakes from PWC damaging resources. NPS staff indicated that national seashore rangers patrol Horn Island regularly and the west side of Ship Island every day of the summer, in addition to patrols on the land. National seashore resource management staff are also in the field looking for potential violations. NPS staff stressed that this plan would not propose any new uses in the national seashore. The scope of this plan is limited to PWC use, so even if areas are closed to PWC use, there will still be access by boats and pedestrians. National seashore staff indicated that they will alert law enforcement rangers if the tribes know of any special areas of concern that need additional protection. The national seashore can also issue a superintendent's compendium closure to protect cultural and natural resources.