National Park Service
U.S. Department of the Interior

Fire Island National Seashore
New York

FIRE ISLAND
NATIONAL SEASHORE

Personal Watercraft Use
Environmental Assessment

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August 2002

SUMMARY

The purpose of and the need for taking action is to evaluate a range of alternatives and strategies for the management of PWC use at Fire Island National Seashore in order to ensure the protection of park resources and values while offering recreational opportunities as provided for in the national seashore's enabling legislation, purpose, mission, and goals. Upon completion of this process in accordance with the National Environmental Policy Act (NEPA), the National Park Service (NPS) may either take action to adopt special regulations to manage PWC use, or it may discontinue PWC use at this park unit.

BACKGROUND

More than one million personal watercraft are estimated to be in operation today in the United States. Sometimes referred to as "Jet Skis" or "Wet Bikes," these vessels use an inboard, internal combustion engine powering a water jet pump as its primary source of propulsion. They are used for enjoyment, particularly for stunt-like maneuvers, and they are designed for speeds up to 70 mph. PWC recreation is the fastest growing segment of the boating industry, representing over one-third of total sales. While PWC use remains a relatively new recreational activity, it has occurred in 32 of the 87 national park system units that allow motorized boating.

After studies in Everglades National Park showed that PWC use resulted in damage to vegetation, adverse impacts to shorebirds, and disturbed life cycles to other wildlife, the National Park Service prohibited PWC use by a special regulation at the park in 1994. In recognition of its duties under its Organic Act and NPS *Management Policies,* as well as increased awareness and public controversy about PWC use, the National Park Service subsequently reevaluated its methods of PWC regulation. Historically, the National Park Service had grouped personal watercraft with all vessels; thus, PWC use was allowed when the unit's superintendent's compendium allowed the use of other vessels. Later the Park Service closed seven units to PWC use through the implementation of horsepower restrictions, general management plan revisions, and park-specific regulations such as those promulgated by Everglades National Park.

In May 1998 the Bluewater Network filed a petition urging the National Park Service to initiate a rulemaking process to prohibit PWC use throughout the national park system. In response to the petition, the Park Service issued an interim management policy requiring superintendents of parks where PWC use can occur but had not yet occurred to close the unit to such use until the rule was finalized. The Park Service envisioned the servicewide regulation as an opportunity to evaluate impacts from PWC use before authorizing the use. On March 21, 2000, the National Park Service issued a regulation prohibiting PWC use in most units and required 21 units to determine the appropriateness of continued PWC use.

In response to the PWC final regulation, Bluewater Network sued the National Park Service, challenging the National Park Service's decision to allow continued PWC use in 21 units while prohibiting PWC use in other units. In response to the suit, the National Park Service and the Bluewater Network negotiated a settlement. While 21 units can continue PWC use in the short term, each of those parks desiring to continue long-term PWC use must promulgate a park-specific special regulation in 2002. In addition, the settlement stipulates that the National Park Service must base its decision to issue a park-specific special regulation to continue PWC use through an environmental analysis conducted in accordance with the National Environmental Policy Act (NEPA). The NEPA analysis at a minimum,

according to the settlement, must evaluate PWC impacts on water quality, air quality, soundscapes, wildlife, wildlife habitat, shoreline vegetation, visitor conflicts, and visitor safety.

With the settlement deadlines approaching and the units preparing to no longer allow PWC use, the National Park Service, Congress, and PWC user groups sought legal methods of keeping parks open for PWC use. However, no method was successful. Thus, on April 22, 2002 the following units closed for PWC use: Assateague Island National Seashore, Big Thicket National Preserve, Pictured Rocks National Lakeshore, Fire Island National Seashore, Gateway National Recreation Area, Gulf Islands National Seashore, and Cape Lookout National Seashore. Some of the units continue to draft environmental assessments to analyze alternatives for PWC use. Units that identify a preferred alternative that continues PWC use will draft a special regulation to authorize PWC use.

ALTERNATIVES CONSIDERED

This environmental assessment evaluates four alternatives concerning the use of personal watercraft at Fire Island National Seashore. The alternatives considered include three alternatives to continue PWC use under certain conditions: alternative A would continue use as currently managed under a special regulation; alternative B would limit PWC use to areas adjacent to beach communities; and alternative C would limit PWC use to areas adjacent to the beach communities while enforcing a 1,000-foot buffer around all shorelines in the national seashore. In addition, a no-action alternative is considered that would discontinue all PWC use within the national seashore. Alternative C is the preferred alternative.

Based on the analysis prepared for PWC use at Fire Island National Seashore, alternative C is the environmentally preferred alternative, best fulfilling park responsibilities as trustee of this sensitive habitat; ensuring safe, healthful, productive, and aesthetically and culturally pleasing surroundings; and attaining a wider range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences. Alternative C is the preferred alternative for fulfilling the park's environmental mission without restricting valid and lawful use.

ENVIRONMENTAL CONSEQUENCES

Impacts of the three PWC management alternatives were assessed in accordance with *Director's Order #12: Conservation Planning, Environmental Impact Analysis and Decision-making.* The *Director's Order #12 Handbook* requires that impacts to park resources be analyzed in terms of their context, duration, and intensity. It is crucial for the public and decision-makers to understand the implications of those impacts in the short and long term, cumulatively, and within context, based on an understanding and interpretation by resource professionals and specialists.

To determine impacts, methodologies were identified to measure the change in park resources that would occur with the implementation of the PWC management alternatives. Thresholds were established for each impact topic to help understand the severity and magnitude of changes in resource conditions, both adverse and beneficial.

Each PWC management alternative was compared to a baseline to determine the context, duration, and intensity of resource impacts. For purposes of impact analysis, the baseline (alternative A) is the continuation of PWC use and current management projected over the next 10 years.

Table A summarizes the results of the impact analysis for the impact topics that were assessed. The analysis considered a 10-year period (2002–2012).

TABLE A: SUMMARY OF THE IMPACT ANALYSIS

Impact Topic	Alternative A: Continue PWC Use as Currently Managed under a Special Regulation	Alternative B: Continue PWC Use, but Limit Use to Areas Adjacent to Beach Communities	Alternative C: Continue PWC Use, but Limit Use to Adjacent Beach Communities and Enforce 1,000-foot Buffer around the National Seashore	No-Action Alternative
Water Quality	Moderate to negligible impacts due to PWC emissions of organic pollutants in 2002, becoming negligible by 2012 due to reduced emission rates and the ban on MTBE in gasoline in 2004. Cumulative effects: Negligible ecotoxicological impacts. For human health benchmarks, negligible to possibly major impacts depending on location. Water quality monitoring needed in high use areas to verify the estimation of impacts.	Beneficial impact from closing the eastern section (area III) to PWC use; other impacts similar to alternative A. Cumulative effects: Negligible ecotoxicological impacts. For human health benchmarks, impacts similar to but slightly less than alternative A.	Beneficial effect in shoreline areas and for humans swimming in these areas, but an adverse effect on water quality in areas farther offshore. Impacts similar to alternative B. Cumulative effects: Negligible ecotoxicological impacts. For human health benchmarks, impacts similar to but slightly less than alternative A.	Beneficial impacts from improved water quality conditions in areas currently open to PWC use. Cumulative effects: Negligible ecotoxicological impacts. For human health benchmarks, similar to but slightly less than alternative A.
Air Quality				
▪ Impacts on Human Health	Negligible to major impacts, with some decrease by 2012 due to improved emission controls. Cumulative effects: Negligible to major impacts.	Negligible to major impacts, decreasing to moderate (for volatile organic compounds [VOC]) by 2012. Cumulative effects: Negligible to major impacts.	Negligible to major impacts, decreasing to moderate (for VOC) by 2012. Cumulative effects: Negligible to major impacts.	Beneficial impacts because of banning PWC use. Cumulative effects: Negligible to major impacts.
▪ Impacts on Air Quality Related Values	Moderate impacts for ozone exposure and negligible impacts to visibility. (No perceptible visibility impacts or observed ozone injury on plants.) Cumulative effects: Moderate impacts for ozone; negligible visibility impacts.	Moderate impacts for ozone and negligible impacts to visibility. Cumulative effects: Moderate impacts for ozone; negligible impacts for visibility.	Moderate impacts for ozone and negligible impacts for visibility. Cumulative effects: Moderate impacts for ozone; negligible impacts for visibility.	Beneficial impacts on the air quality. Cumulative effects: Moderate impacts for ozone; negligible impacts for visibility.
Soundscapes	Negligible to minor impacts to visitors throughout the national seashore. Cumulative effects: Negligible to moderate impacts depending on the location and time of year.	Negligible to minor impacts, with beneficial impacts in areas where PWC use was banned. Cumulative effects: Negligible to minor impacts.	Negligible impacts. Cumulative effects: Negligible to minor adverse impacts.	Beneficial impacts. Cumulative effects: Negligible to minor impacts.
Wildlife and Wildlife Habitat				
• **Impacts of PWC Use**	Minor impacts near areas of high PWC use because wildlife likely habituated to noise. Moderate impacts near low PWC use areas because species likely less accustomed to high levels of human activity and noise. Moderate impacts on wading and shorebirds, waterfowl, and other wildlife. Cumulative effects: Minor to moderate impacts.	Minor impacts in areas open to PWC use. Beneficial impacts from banning PWC use over a large area of the national seashore. Cumulative effects: Minor to moderate impacts in areas open to PWC use; beneficial impacts in areas closed to PWC use; negligible impacts from PWC use in adjacent areas	Minor impacts in areas open to PWC use; long-term, beneficial impacts in closed areas; beneficial impact from restricting PWC access to most shallow water fish habitats. Cumulative effects: Minor to moderate impacts in areas open to PWC use; beneficial impacts in areas closed to PWC use; negligible impacts from PWC use in adjacent areas.	Beneficial impacts from eliminating PWC use within the national seashore. Cumulative effects: Minor impacts.

Impact Topic	Alternative A: Continue PWC Use as Currently Managed under a Special Regulation	Alternative B: Continue PWC Use, but Limit Use to Areas Adjacent to Beach Communities	Alternative C: Continue PWC Use, but Limit Use to Adjacent Beach Communities and Enforce 1,000-foot Buffer around the National Seashore	No-Action Alternative
• **Impacts on Aquatic Fauna**	Minor to possibly major impacts, particularly in the western section of the national seashore. Cumulative effects: Moderate to possibly major, adverse impacts.	Beneficial impact from reducing underwater noise in the eastern section of the national seashore; minor to possibly major impacts in other areas. Cumulative effects: Moderate to possibly major impacts; beneficial impacts in the eastern section of the national seashore.	Beneficial impact from reducing underwater noise in the eastern section of the national seashore and in nearshore waters around the island; minor to moderate impacts in nearshore waters; and minor to possibly major impacts in areas open to PWC use. Cumulative effects: Moderate to possibly major impacts.	Beneficial impacts. Cumulative effects: Moderate to possibly major impacts, with no contribution from PWC use in NPS waters.
Threatened, Endangered, or Special Concern Species	Threatened or endangered species not likely to be adversely affected. Cumulative effects: Impacts not likely to adversely affect threatened or endangered species.	Threatened or endangered species not likely to be adversely affected. Beneficial impacts from discontinuing PWC use over a large portion of the national seashore. Cumulative effects: Impacts not likely to adversely affect threatened or endangered species. No PWC contribution to any impacts in areas where use was banned.	Threatened or endangered species not likely to be adversely affected. Beneficial impacts to sensitive shorebirds from restricting PWC use within 1,000 feet of any shoreline. Cumulative effects: Impacts not likely to adversely affect threatened or endangered species. No PWC contribution to any impacts in areas where use was banned.	No impacts to threatened and endangered species. Cumulative effects: Impacts not likely to adversely affect threatened or endangered species. No contribution to impacts from PWC use.
Shoreline Vegetation / Wetland Habitats (Also see Submerged Aquatic Vegetation)	Minor to moderate impacts because of low levels of PWC use in affected areas. Cumulative effects: Minor to moderate impacts from continued foot traffic around landing areas and limited access to shallow water habitats.	Minor to moderate impacts to shoreline vegetation; minor impacts to tidal wetland habitats from restricting PWC access. Cumulative effects: Minor impacts to shoreline and wetland vegetation.	Minor impacts to shoreline vegetation; beneficial impacts to tidal wetland habitats from restricting PWC use within 1,000 feet of any shoreline. Cumulative effects: Minor impacts to shoreline vegetation; beneficial impacts to vegetation associated with wetland habitats.	Beneficial impacts. Cumulative effects: Minor impacts to shoreline vegetation; beneficial impacts to vegetation associated with wetland habitats.
Submerged Aquatic Vegetation	Moderate impacts. Cumulative effects: Moderate impacts.	Minor impacts due to restricting PWC access to large areas of shallow flats along must of the shoreline. Cumulative effects: Minor impacts because large areas closed to PWC use and shallow areas not accessible to other watercraft.	Minor impacts due to PWC use restrictions around most of the seashore. Cumulative effects: Minor impacts because nearshore areas closed to PWC use and shallow areas not accessible to other watercraft.	Beneficial impact. Cumulative effects: Minor impacts.
Visitor Experience	Negligible to moderate adverse impacts, depending on the location and seasonal variations in visitor use. Cumulative effects: Negligible impacts.	Beneficial impacts to most visitors; negligible to minor impacts to PWC users from closing certain areas to use. Cumulative effects: Negligible impacts.	Beneficial impacts to most visitors; minor to moderate impacts to PWC users from closing areas to use, prohibiting use within the 1,000-foot buffer zone, and requiring no-wake speed limits in ferryways. Cumulative effects: Negligible impacts for most visitors; minor impacts for PWC users.	Major impacts on PWC users; beneficial impacts to other boaters and visitors. Cumulative effects: Minor impact from possibly sending PWC users to other regional areas; negligible impacts for all other visitors.

Impact Topic	Alternative A: Continue PWC Use as Currently Managed under a Special Regulation	Alternative B: Continue PWC Use, but Limit Use to Areas Adjacent to Beach Communities	Alternative C: Continue PWC Use, but Limit Use to Adjacent Beach Communities and Enforce 1,000-foot Buffer around the National Seashore	No-Action Alternative
Visitor Safety	Moderate impacts as use increased for all activities. Cumulative effects: Negligible to minor impacts.	Negligible to moderate impacts. Cumulative effects: Negligible to minor impacts; beneficial impacts in areas closed to PWC use.	Negligible to possibly minor impacts. Cumulative effects: Beneficial impacts in areas closed to PWC use.	Negligible to minor impacts. Cumulative effects: Some beneficial impacts from restricting PWC use within the national seashore. Negligible to minor impacts in adjacent non-NPS waters.
Socioeconomic Environment	No measurable impacts expected on the regional economy or the local communities.	Same as alternative A.	Same as alternative A.	Although no measurable regional economic impacts are expected, possible decrease in revenue for PWC dealers.
National Seashore Operations and Management				
Enforcement Needs	Minor to moderate impacts due to additional law enforcement needs to enforce federal and state boating regulations.	Same as alternative A.	Same as alternative A.	Same as alternative A.
Conflict with State and Local Ordinance	No effect on state or local ordinances.	Same as alternative A.	Same as alternative A.	Same as alternative A.

No natural or cultural resources would be impaired by implementing any of the alternatives being considered. Even though major adverse impacts are predicted for air quality, air pollution sources in the Fire Island area do not contribute to the deterioration of air quality to the extent that the park's purpose is not being or will not be met, and no key resource damage has been identified due to air quality impacts.

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PURPOSE OF AND NEED FOR ACTION

Fire Island National Seashore is a vital part of America's national system of parks, monuments, battlefields, recreation areas, and other natural and cultural resources. Located on a 32-mile long barrier island off the south shore of Long Island, New York, Fire Island National Seashore encompasses approximately 19,500 acres — many of which are bay and ocean waters — available to more than 4 million visitors each year. The national seashore is interspersed with 17 local private communities, the William Floyd Estate, a maritime forest known as the Sunken Forest, and the Otis Pike Wilderness Area — the only federal wilderness area in New York State (see Location map). Together, these components comprise a seashore ecosystem of wildlife, private communities, and outdoor recreational activities, including the use of personal watercraft (PWC).

More than one million personal watercraft* are estimated to be in operation today in the United States. Sometimes referred to as "Jet Skis" or "Wet Bikes," these vessels use an inboard, internal combustion engine powering a water jet pump as its primary source of propulsion. They are used for enjoyment, particularly for stunt-like maneuvers, and they are designed for speeds up to 70 mph. PWC recreation is the fastest growing segment of the boating industry, representing over one-third of total sales.

The National Park Service (NPS) maintains that personal watercraft emerged and gained popularity in park units before it could initiate and complete a "full evaluation of the possible impacts and ramifications." While PWC use remains a relatively new recreational activity, it has occurred in 32 of the 87 park units that allow motorized boating.

The National Park Service first began to study PWC use in Everglades National Park. The studies showed that PWC use over emergent vegetation, shallow grass flats, and mud flats commonly used by feeding shorebirds damaged the vegetation, adversely impacted the shorebirds, and disturbed the life cycles of other wildlife. Consequently, managers at Everglades determined that PWC use remained inconsistent with the resources, values, and purposes for which the park was established. In 1994 the National Park Service prohibited PWC use by a special regulation at the park (59 FR 58781).

Other public entities have taken steps to limit and even to ban PWC use in certain waterways as national researchers study more about the effects of PWC use. At least 34 states have either implemented or have considered regulating the use and operation of personal watercraft (63 FR 49314). Similarly, various federal agencies, including the U.S. Fish and Wildlife Service and the National Oceanic and Atmospheric Administration, have managed personal watercraft differently than other classes of motorized watercraft.

Specifically, the National Oceanic and Atmospheric Administration regulates PWC use in most national marine sanctuaries. The regulation resulted in a court case where the Court of Appeals for the District of Columbia declared such PWC-specific management valid. In *Personal Watercraft Industry*

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* Personal watercraft, as defined in 36 CFR 1.4(a) (2000), refers to a vessel, usually less than 16 feet in length, which uses an inboard, internal combustion engine powering a water jet pump as its primary source of propulsion. The vessel is intended to be operated by a person or persons sitting, standing, or kneeling on the vessel, rather than within the confines of the hull. The length is measured from end to end over the deck excluding sheer, meaning a straight line measurement of the overall length from the foremost part of the vessel to the aftermost part of the vessel, measured parallel to the centerline. Bow sprits, bumpkins, rudders, outboard motor brackets, and similar fittings or attachments, are not included in the measurement. Length is stated in feet and inches.

Association v. Department of Commerce, 48 F.3d 540 (D. C. Cir. 1995), the court ruled that an agency can discriminate and manage one type of vessel (specifically personal watercraft) differently than other vessels if the agency explains its reasons for the differentiation.

In February 1997 the Tahoe Regional Planning Agency (TRPA), the governing body charged with ensuring no derogation of Lake Tahoe's water quality, voted unanimously to ban all two-stroke, internal combustion engines, including personal watercraft, because of their effects on water quality. Lake Tahoe's ban began in 2000.

In July 1998 the Washington State Supreme Court in *Weden v. San Juan County* (135 Wash. 2d 678 [1998]) found that the county had the authority to ban the use of personal watercraft as a proper use of its police power in order to protect the public health, safety, or general welfare. Further, personal watercraft are different from other vessels, and Washington counties have the authority to treat them differently.

In recognition of its duties under its Organic Act and its *Management Policies,* as well as increased awareness and public controversy, the National Park Service reevaluated its methods of PWC regulation. Historically, the National Park Service had grouped personal watercraft with all vessels; thus, people could use personal watercraft when the unit's superintendent's compendium allowed the use of other vessels. Later the Park Service closed seven units to PWC use through the implementation of horsepower restrictions, general management plan revisions, and park-specific regulations such as those promulgated by Everglades National Park.

In May 1998 the Bluewater Network, a coalition of more than 70 organizations representing more than 4 million Americans, filed a petition urging the National Park Service to initiate the rulemaking process to prohibit PWC use throughout the national park system. In response to the petition, the Park Service issued an interim management policy requiring superintendents of parks where PWC use can occur but where the use had never occurred to close the unit to such use until the rule was finalized. In addition, the National Park Service proposed a specific PWC regulation premised on the notion that personal watercraft differ from conventional watercraft in terms of design, use, safety record, controversy, visitor impacts, resource impacts, horsepower to vessel length ratio, and thrust capacity (63 FR 49312–17, Sept. 15, 1998).

The National Park Service envisioned the servicewide regulation as an opportunity to evaluate impacts from PWC use before authorizing the use. The preamble to the servicewide regulation calls the regulation a "conservative approach to managing PWC use" considering the resource concerns, visitor conflicts, visitor enjoyment, and visitor safety. During a 60-day comment period the National Park Service received nearly 20,000 comments.

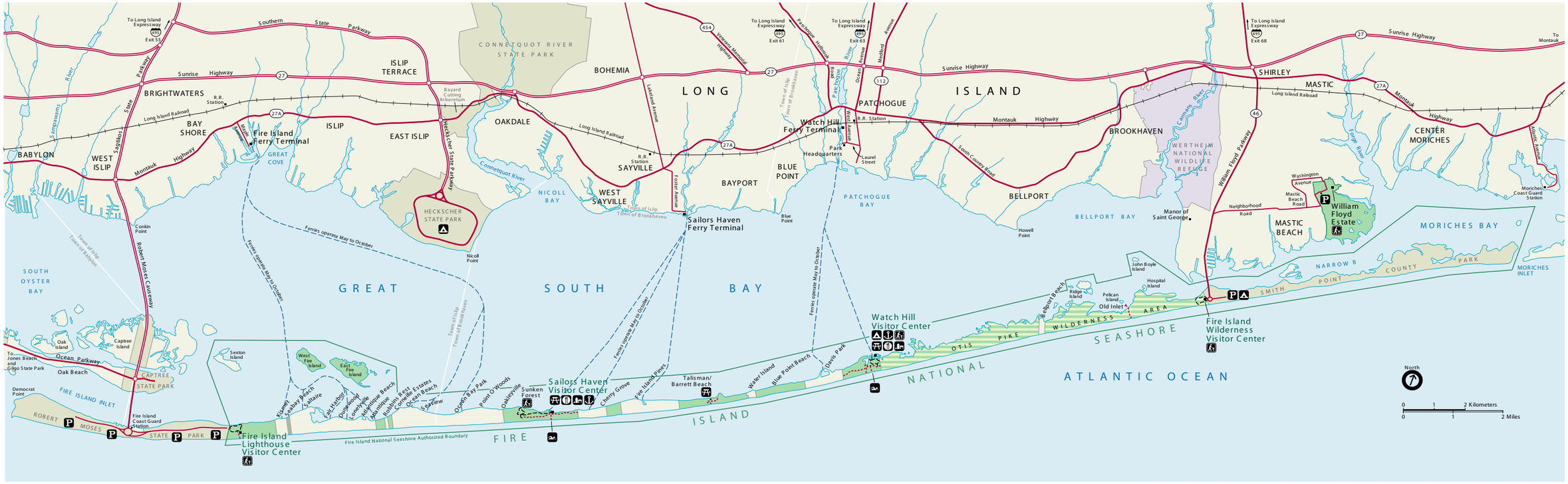
As a result of public comments and further review, the National Park Service promulgated an amended regulation that prohibited PWC use in most units and required the remaining units to determine the appropriateness of continued PWC use (36 CFR 3.24(a), 2000); 65 FR 15077–90, Mar. 21, 2000). Specifically, the regulation allowed the National Park Service to designate PWC use areas and to continue their use by promulgating a special regulation in 11 units and by amending the superintendent's compendium in 10 units (36 CFR 3.24(b), 2000). The National Park Service based the distinction between designation methods on the unit's degree of motorized watercraft use.

In response to the PWC final regulation, Bluewater Network sued the National Park Service under the Administrative Procedures Act and its Organic Act. The organization challenged the National Park Service's decision to allow continued PWC use in 21 units while prohibiting PWC use in other units. In addition, the organization also disputed the National Park Service's decision to allow 10 units to

Fire Island National Seashore

New York

Location Map



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- Food service
- Store
- Picnic area
- Campground
- Lifeguarding swimming area
- Marina
- Parking
- National Park Service lands
- Wilderness area
- Trail
- Self-guiding nature trail

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continue PWC use after 2002 by making entries in superintendents' compendiums, which would not require the opportunity for public input through a notice and comments on the rulemaking process. Further, the environmental group claimed that because PWC use causes water and air pollution, generates increased noise levels, and poses public safety threats, the National Park Service acted arbitrarily and capriciously when making the challenged decisions.

In response to the suit, the National Park Service and the environmental group negotiated a settlement. The resulting settlement agreement, signed by the judge on April 12, 2001, changed portions of the National Park Service's PWC rule. While 21 units can continue PWC use in the short term, each of those parks desiring to continue long-term PWC use must promulgate a park-specific special regulation in 2002. In addition, the settlement stipulates that the National Park Service must base its decision to issue a park-specific special regulation to continue PWC use through an environmental analysis conducted in accordance with the National Environmental Policy Act (NEPA). The NEPA analysis at a minimum, according to the settlement, must evaluate PWC impacts on water quality, air quality, soundscapes, wildlife, wildlife habitat, shoreline vegetation, visitor conflicts, and visitor safety.

In 2001 the National Park Service adopted its new management policy for personal watercraft. The policy prohibits PWC use in national park system units unless their use remains appropriate for the specific park unit (*Management Policies 2001,* sec. 8.2.3.3). The policy statement authorizes the use based on the park's enabling legislation, resources, values, other park uses, and overall management strategies.

With the settlement deadlines approaching and the units preparing to close for personal watercraft use, NPS, Congress, and the PWC user groups sought legal methods to keep parks open for PWC use. However, no method was successful. Thus, on April 22, 2002 the following units closed for PWC use: Assateague Island National Seashore, Big Thicket National Preserve, Pictured Rocks National Recreation Area, Fire Island National Seashore, Gateway National Recreation Area, Gulf Islands National Seashore, and Cape Lookout National Seashore. Some of the units continue to draft environmental assessments to analyze alternatives for PWC use. Units that identify a preferred alternative that continues PWC use will draft a special regulation to authorize PWC use.

PURPOSE OF AND NEED FOR ACTION

The purpose of and need for taking action is to evaluate a range of alternatives and strategies for the management of PWC use at Fire Island National Seashore in order to ensure the protection of park resources and values while offering recreational opportunities as provided for in the national seashore's enabling legislation, purpose, mission, and goals. Upon completion of the NEPA process, the National Park Service may either take action to adopt special regulations to manage PWC use at Fire Island National Seashore, or it may discontinue PWC use at this park, as allowed for in the March 2000 rule.

This environmental assessment evaluates four alternatives concerning the use of personal watercraft at Fire Island National Seashore. The alternatives considered include three alternatives to continue PWC use under certain conditions: alternative A would continue use as currently managed under a special regulation; alternative B limits PWC use to areas adjacent to beach communities; and alternative C would limit PWC use to areas adjacent to beach communities and enforce a 1,000-foot buffer around all shorelines in the national seashore. In addition, a no-action alternative is considered that would discontinue all PWC use within the national seashore.

SCOPE OF THE ANALYSIS

Watercraft use in Fire Island National Seashore has occurred since the national park system unit was established in 1964. Since some effects of PWC use are similar to those associated with other watercraft, and therefore are difficult to distinguish, the focus of this action is in support of decisions and rulemaking specific to PWC use. However, while the settlement agreement and need for action have defined the scope of this environmental assessment, NEPA regulations require an analysis of cumulative effects on resources of all past, present, and reasonably foreseeable actions when added to the effects of the proposal (40 CFR 1508.7, 2000). The scope of this analysis, therefore, is to define management alternatives specific to PWC use, in consideration of other uses, actions, and activities cumulatively affecting park resources and values.

PURPOSE AND SIGNIFICANCE OF FIRE ISLAND NATIONAL SEASHORE

National park system units are established by Congress to fulfill specified purposes, based on the park's unique and "significant" resources. A park's purpose, as established by Congress, is the fundamental building block for its decisions to conserve resources while providing for the "enjoyment of future generations."

The enabling legislation for Fire Island National Seashore, its purpose and significance, and its broad mission goals are summarized in this section and are taken from the national seashore's enabling legislation, the 1977 *General Management Plan,* and the 2000 *Strategic Plan* (NPS 1977; NPS 2000d). In addition, the national seashore's purpose, significance, and management objectives are all linked to the impairment findings that are made in the NEPA process, as stated in section 1.4.5 of the National Park Service *Management Policies 2001* (NPS 2000c).

Establishment — Congress established Fire Island National Seashore on September 11, 1964 (Public Law [PL] 88-587). The enabling legislation authorizes the establishment of Fire Island National Seashore:

> For the purpose of conserving and preserving for the use of future generations certain relatively unspoiled and undeveloped beaches, dunes, and other natural features within Suffolk County, New York, which possess high values to the Nation as examples of unspoiled areas of great natural beauty in close proximity to large concentrations of urban population, the Secretary of the Interior is authorized to establish an area to be known as the "Fire Island National Seashore." (16 USC 459e(a))

The national seashore extends from the easterly boundary of the main unit of Robert Moses State Park eastward to Moriches Inlet and includes Fire Island proper and the surrounding islands and marshlands in the Great South Bay, Bellport Bay, and Moriches Bay adjacent to Fire Island. Sexton Island, West Fire and East Fire Islands, Hollins Island, Ridge Island, Pelican Island, Pattersquash Island, and Reeves Island and other small and adjacent islands, marshlands, and wetlands that lend themselves to contiguity and reasonable administration within the national seashore; and in addition the waters surrounding the national seashore to distances of 1,000 feet in the Atlantic Ocean and up to 4,000 feet in Great South Bay and Moriches Bay (see Location map). The mainland terminal and headquarters are on the Patchogue River within Suffolk County, New York.

Administration — Fire Island National Seashore is fragmented among public, private, and county parks and beaches. National seashore staff maintain and administer the Otis Pike Wilderness Area established in 1981, the Sunken Forest, Watch Hill, Sailors Haven, the Fire Island Lighthouse (placed

on the National Register of Historic Places in 1981), and the William Floyd Estate (placed on the National Register of Historic Places in 1980).

The national seashore enabling legislation states "the Secretary shall administer and protect the Fire Island National Seashore with the primary aim of conserving the natural resources located there (16 USC 459e-6(a))." The legislation further states,

> The area known as the Sunken Forest Preserve shall be preserved from bay to ocean in as nearly its present state as possible, without developing roads therein, but continuing the present access by those trails already existing and limiting new access to similar trails limited in number to those necessary to allow visitors to explore and appreciate this section of the seashore (16 USC 459e-6(a)).
>
> Access to [the Davis Park-Smith Point County Park area] of the seashore lying between the easterly boundary of the Ocean Ridge portion of Davis Park and the westerly boundary of the Smith Point County Park shall be provided by ferries and footpaths only, and no roads shall be constructed in this section except such minimum roads as may be necessary for park maintenance vehicles. No development or plan for the convenience of visitors shall be undertaken therein which would be incompatible with the preservation of the flora and fauna or the physiographic conditions now prevailing, and every effort shall be exerted to maintain and preserve this section of the seashore as well as that set forth in the preceding paragraph in as nearly their present state and condition as possible (16 USC 459e-6(b)).
>
> In administering, protecting, and developing the entire Fire Island National Seashore, the Secretary shall be guided by the provisions of sections 459e to 459e-9 of [Title 16] and the applicable provisions of the laws relating to the national park system, and the Secretary may utilize any other statutory authority available . . . for the conservation and development of natural resources to the extent . . . that such authority will further the purposes of sections 459e to 459e-9 of [Title 16]. Appropriate user fees may be collected notwithstanding any limitation on such authority by any provision of law (16 USC 459e-6(c)).
>
> Upon expiration or surrender of the [William Floyd Estate] lease the property shall become a detached unit of the Fire Island National Seashore, and shall be administered, protected, and developed in accordance with the laws applicable thereto subject, with respect to said main dwelling and the furnishings therein, to such terms, covenants, and conditions which the Secretary shall have accepted and approved upon the donation thereof as in the public interest (16 USC 459e-12).

Mission — The NPS mission statement at Fire Island National Seashore grows from the park's legislated mandate and is a synthesis of the park's mandated purpose and its primary significance (NPS 2000d):

> The National Park Service is committed to preserving Fire Island National Seashore's cultural and natural resources, its values of maritime and American history, barrier island dynamics and ecology, biodiversity, museum collection objects, and wilderness. The National Park Service is committed to providing access and recreational and educational opportunities to Fire Island National Seashore visitors in this natural and cultural setting close to densely populated urban and suburban areas, and to maintaining and exemplifying the policies of the National Park Service.

Purpose — The purposes of Fire Island National Seashore, as stated in its *Strategic Plan* (NPS 2000d), are as follows:

- Preserve the natural and cultural resources within administrative boundaries.

  Natural resources include Fire Island proper, a 32-mile barrier island off the south shore of Long Island, NY; surrounding waters (1,000 feet into Atlantic Ocean and 4,000 feet into

Great South and Moriches Bay); and 26 smaller bay islands. Cultural resources include the park museum collection, the William Floyd Estate, and land and structures comprising the Fire Island Light Station.

- Permit hunting, fishing, and shellfishing within boundaries in accordance with U.S. and New York State laws.
- Preserve the Sunken Forest tract from bay to ocean without developing roads therein.
- Preserve the main dwelling, furnishings, grounds, and outbuildings of the William Floyd Estate, home of the Floyd family for eight generations.
- Administer mainland ferry terminal and headquarters sites not to exceed 12 acres on the Patchogue River.
- Preserve the Otis Pike Fire Island High Dunes Wilderness.
- Provide for public access, use, and enjoyment.
- Work with the communities within the park to mutually achieve the goals of both the park and the residents.

Significance — Fire Island National Seashore's primary significance is stated in its *Strategic Plan* as follows:

- Fire Island National Seashore is a relatively natural seashore comprised of relatively unspoiled and undeveloped beaches, dunes, other natural features, and a diverse barrier island ecosystem. The seashore is near large concentrations of urban populations and contains no paved road.
- Seventeen communities help define the cultural character of Fire Island National Seashore.
- The Fire Island Light Station tells the story of the lifesaving ethic embodied in the U.S. Lighthouse Service, the U.S. Life Saving Service, and the U.S. Coast Guard.
- The William Floyd Estate, associated with General William Floyd, a signer of the Declaration of Independence, was owned and occupied by the Floyd family for 250 years; tangible features from all periods are preserved and interpreted there.
- The Sunken Forest is a 250–300 year old American holly-shadblow-sassafras maritime forest considered to be at or near climax.
- The Otis Pike Wilderness Area contains a variety of barrier island ecosystems in a relatively natural state and is the only federal wilderness in the state of New York.

BACKGROUND

NPS ORGANIC ACT AND MANAGEMENT POLICIES

By enacting the National Park Service Organic Act of 1916, Congress directed the U.S. Department of the Interior and the National Park Service to manage units of the national park system "to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations" (16 USC 1). The Redwood National Park Expansion Act of 1978 reiterates this mandate by stating that the National Park Service must conduct its actions in a manner that will ensure no "derogation of the values and purposes for which these various areas have been established, except as may have been or shall be directly and specifically provided by Congress" (16 USC 1a-1).

Despite these mandates, the Organic Act and its amendments afford the National Park Service latitude when making resource decisions that balance visitor recreation and resource preservation. By these acts Congress "empowered [the National Park Service] with the authority to determine what uses of park resources are proper and what proportion of the parks resources are available for each use" (*Bicycle Trails Council of Marin v. Babbitt,* 82 F.3d 1445, 1453 (9th Cir. 1996)).

Yet, courts consistently interpreted the Organic Act and its amendments to elevate resource conservation above visitor recreation. *Michigan United Conservation Clubs v. Lujan,* 949 F.2d 202, 206 (6th Cir. 1991) states, "Congress placed specific emphasis on conservation." The *National Rifle Ass'n of America v. Potter,* 628 F. Supp. 903, 909 (D.D.C. 1986) states, "In the Organic Act Congress speaks of but a single purpose, namely, conservation." The NPS *Management Policies* also recognize that resource conservation takes precedence over visitor recreation. The policy dictates "when there is a conflict between conserving resources and values and providing for enjoyment of them, conservation is to be predominant" (*Management Policies 2001,* sec. 1.4.3).

Because conservation remains predominant, the National Park Service seeks to avoid or to minimize adverse impacts on park resources and values. Yet, the National Park Service has discretion to allow negative impacts when necessary (*Management Policies 2001,* sec. 1.4.3). However, while some actions and activities cause impacts, the National Park Service cannot allow an adverse impact that constitutes a resource impairment (*Management Policies 2001,* sec. 1.4.3). The Organic Act prohibits actions that permanently impair park resources unless a law directly and specifically allows for the acts (16 USC 1a-1). An action constitutes an impairment when its impacts "harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values" (*Management Policies 2001,* sec. 1.4.4). To determine impairment, the National Park Service must evaluate "the particular resources and values that would be affected; the severity, duration, and timing of the impact; the direct and indirect effects of the impact; and the cumulative effects of the impact in question and other impacts" (*Management Policies 2001,* sec. 1.4.4).

Because park units vary based on their enabling legislation, natural resources, cultural resources, and missions, the recreational activities appropriate for each unit and for areas within each unit vary. An action appropriate in one unit may impair resources in another unit. Thus, this environmental assessment analyzes the context, duration, and intensity of impacts related to PWC use at Fire Island National Seashore, as well as potential for resource impairment, as required by *Director's Order #12: Conservation Planning, Environmental Impact Analysis and Decision-making* (DO #12) (NPS 2001a).

SUMMARY OF RESEARCH ON THE EFFECTS OF PERSONAL WATERCRAFT

Over the past two decades PWC use in the United States increased dramatically. However, there are conflicting data about whether PWC use is continuing to increase. While the National Transportation Safety Board (NTSB) estimates that retailers sell approximately 200,000 personal watercraft each year and another 1 million are currently in use (NTSB 1998), the PWC industry argues that PWC sales have decreased by 50% from 1995 to 2000 (American Watercraft Association [AWA] 2001).

Environmental groups, PWC users and manufacturers, and land managers express differing opinions about the environmental consequences of PWC use, and about the need to manage or to limit this recreational activity. Research conducted on the effects of PWC use is summarized below for water pollution, air pollution, noise, wildlife, vegetation and shoreline erosion, and health and safety.

Water Pollution

The vast majority of PWC in use today are two-stroke, non-fuel-injected engines, which discharge as much as 25% of their gas and oil emissions directly into the water. Hydrocarbons, benzene, toluene, and xylene are also released, as well as methyl tertiary-butyl ether (MTBE) in states that use this additive. The amount of pollution correctly attributed to PWC use compared to other motorboats and the degree to which PWC use affects water quality remains debatable. As noted in a report by the Oregon Department of Environmental Quality (ODEQ), every waterbody has different conditions (e.g., water temperature, air temperature, water mixing, motorboating use, and winds) that affect the pollutants' impacts (ODEQ 1999).

A recent study conducted by the California Air Resources Board (CARB) consisted of a laboratory test designed to comparatively evaluate exhaust emission from marine and PWC engines, in particular two- and four-stroke engines (CARB 2001). The results of this study showed a difference in emissions (in some cases 10 times higher total hydrocarbons in two-stroke engines) between these two types of engines. An exception was air emissions of nitrogen oxides ($NO_{x)}$ which was higher in four-stroke than in two-stroke engines. Concentrations of pollutants (MTBE, benzene, toluene, ethylbenzene, and xylene) in the tested water were consistently higher for two-stroke engines.

In 1996 the Environmental Protection Agency promulgated a rule to control exhaust emissions from new marine engines, including outboards and personal watercraft. Emission controls provide for increasingly stricter standards beginning in model year 1998 (US EPA 1996b). As a result of the rule, the agency expects a 50% reduction in hydrocarbon emissions from marine engines from present levels by 2020 and a 75% reduction in hydrocarbon emissions by 2025 (US EPA 1996b).

Discharges of MTBE and polyaromatic hydrocarbons (PAHs) particularly concern scientists because of their potential to adversely affect the health of people and aquatic organisms. Scientists need to conduct additional studies on PAHs (Allen et al. 1998) and MTBE (NPS 1999a), as well as long-term studies on the effect of repeated exposure to low levels of these pollutants (Asplund 2001).

At Lake Tahoe concern about the negative impact on lake water quality and aquatic life caused by the use of two-stroke marine engines led to at least 10 different studies relevant to motorized watercraft in the Tahoe Basin in 1997 and 1998. The results of these studies (Allen et al. 1998) confirmed that (1) petroleum products are in the lakes as a result of motorized watercraft operation, and (2) watercraft powered by carbureted two-stroke engines discharge pollutants at an order of magnitude greater than do watercraft powered by newer technology engines (Tahoe Regional Planning Agency 1999).

On June 25, 1997, the Tahoe Regional Planning Agency adopted an ordinance prohibiting the "discharge of unburned fuel and oil from the operation of watercraft propelled by carbureted two-stroke engines" beginning June 1, 1999. Following the release of an environmental assessment in January 1999, this prohibition was made permanent.

Air Pollution

Two-stroke engines that have been conventionally used in personal watercraft emit pollutants such as nitrogen oxides and volatile organic compounds (VOCs) that may adversely affect air quality. In areas with high PWC use some air quality degradation likely occurs (US EPA 1996a, 2000a). Kado et al. (2000) found that two-stroke engines had considerably higher emissions of airborne particulates and PAHs than four-stroke engines tested. It is assumed that the 1996 EPA rule concerning marine engines will substantially reduce air emissions from personal watercraft in the future (US EPA 1996a).

Noise

PWC-generated noise varies from vessel to vessel depending upon many factors. Some literature states that all recently manufactured watercraft emit fewer than 80 decibels (dB) at 50 feet from the vessel, while other sources attribute levels as high as 102 decibels without specifying distance. None of this literature fully describes the methodology for collecting the data to determine those levels. Because of this, the National Park Service contracted noise measurements of personal watercraft and other boat types in 2001 at Glen Canyon National Recreation Area; the preliminary analysis of these data indicates that maximum PWC noise levels at 50 feet were approximately 68 to 78 A-weighted decibels (dBA). Noise levels for other motorboat types measured during that study were approximately 65 to 86 dBA at 50 feet.

Regulations for boating and water use activities established by the National Park Service prohibit vessels from operating at more than 82 dB measured at 82 feet from the vessel (36 CFR 3.7). However, this regulation does not imply that there are no noise impacts from vessels operating below that limit. Noise impacts from PWC use are caused by a number of factors. Noise complaints against PWC use seem to focus as much or more on frequent changes in pitch and sound energy levels due to rapid acceleration, deceleration, jumping into the air, and change of direction, as on noise levels themselves.

PWC users tend to operate close to shore, to operate in confined areas, and to travel in groups, making noise more noticeable to other recreationists. Motorboats traveling back and forth in one area at open throttle or spinning around in small inlets also generate complaints about noise levels; however, most other motorboats tend to operate away from shore and to navigate in a straight line, thus being less noticeable (Vlasich 1998).

Research conducted by the Izaak Walton League (IWL) indicates that one PWC unit can emit between 85 and 105 dB of sound, and that wildlife or humans located 100 feet away may hear sounds of 75 dB. This study also stated that rapid changes in acceleration and direction may create a greater disturbance and emit sounds of up to 90 dB (IWL 1999). Other studies conducted by the New Jersey State Police indicate that a PWC unit with a 100-horsepower (hp) engine emits up to 76 dBA, while a single, 175-hp outboard engine emits up to 81 dBA. Sea-Doo research indicates that in three out of five distances measured during a sound level test, PWC engines were quieter than an outboard motorboat. Sea-Doo also found that it would take approximately four PWC units, 50 feet from the shore to produce 77 dBA, and it would take 16 PWC vessels operating at 15 feet from the shore to emit 83 dBA of sound, which is equal to one open exhaust boat at 1,600 feet from the shore. In response to public complaints, the PWC industry has employed new technologies to reduce sound by about 50% to 70% on 1999 and newer models (Sea-Doo 2000). EPA research also indicated that one PWC unit operating 50 feet from an onshore observer emits a sound level of 71 dBA, and studies conducted using the Society of Automotive Engineers (2001) found that two PWC units operating 50 feet from the shore emit similar sound levels of about 74 dBA (Personal Watercraft Industry Association [PWIA] 2000).

Wildlife Impacts

Although relatively few studies have specifically examined PWC effects on wildlife, several researchers have documented wildlife disturbances from personal watercraft and motorboats. A study recently completed in Florida examined the distance at which waterbirds are disturbed by both personal watercraft and outboard-powered boats (Rodgers and Schwikert 2002). Flush distances varied from 65 to 160 feet for personal watercraft, and flush distances for most species were greater for motorboats than personal watercraft 80% of the time. The authors note that PWC use may be more

threatening to waterbirds since they can navigate in shallow, secluded waterways where birds typically eat and rest.

Shoreline and Aquatic Vegetation

The effects of personal watercraft on shoreline, wetland, and aquatic communities have not been fully studied, and scientists disagree about whether PWC use adversely impacts shoreline, wetland, or aquatic vegetation. The majority of concern arises from the shallow draft of personal watercraft, allowing them access to shallow areas that conventional motorboats cannot reach. Like other vessels, personal watercraft may destroy grasses that occur in shallow water ecosystems.

Erosion Effects

Some studies have examined the erosion effects of personal watercraft waves, and other studies suggest that personal watercraft may disturb sediments on river or lake bottoms and cause turbidity. Conflicting research exists concerning whether PWC-caused waves result in erosion and sedimentation. PWC-generated wave sizes vary depending on the environment, including the driver's weight, the number of passengers, and speed.

Health and Safety Concerns

While PWC industry representatives report that PWC accidents decreased in some states in the late 1990s, no other research supports their contention. To the contrary, two national studies of PWC accidents and injuries report that personal watercraft pose a clear health and safety risk, primarily to the operators. In the 1990s PWC accidents increased as the popularity of the craft increased. The National Transportation Safety Board reported that in 1996 personal watercraft represented 7.5% of state-registered recreational boats but accounted for 36% of recreational boating accidents. In the same year PWC operators accounted for more than 41% of people injured in boating accidents. PWC operators accounted for approximately 85% of the persons injured in accidents studied in 1997 (NTSB 1998). Some manufacturing changes on throttle and steering may reduce the potential for accidents. For example, on more recent models, Sea-Doo developed an "off-power assisted steering technology" system that assists steering during off-power as well as off-throttle situations. This system, according to company literature, is designed to provide additional maneuverability and improve the rate of deceleration (Sea-Doo 2001a).

PWC USE AND REGULATION AT FIRE ISLAND NATIONAL SEASHORE

National Seashore Visitation and Uses

Located less than one hour from New York City, Fire Island contains 17 private communities. Access to these communities is by ferry from terminals at one of three mainland ports: Bay Shore, Sayville, and Patchogue. At the western end of Fire Island, the Robert Moses Causeway leads into Robert Moses State Park, while on the island's eastern end, the William Floyd Parkway leads into Smith Point County Park. Beyond these two parks, motor vehicle use is limited.

Fire Island National Seashore is open year-round, although the Sailors Haven and Watch Hill units are only open between May 15 and October 15. Peak visitation typically occurs May through September.

There are no entrance fees; however, permits are required for camping in the Otis Pike Wilderness Area and the Watch Hill campground. Permits are also needed for driving, hunting, and sport fishing. Although the villages of Ocean Beach and Saltaire have small year-round populations, the majority of the population is seasonal. The seasonal population is comprised of both "day-trippers" and others who stay for periods ranging from one week to the entire season. Apart from several small hotels, inns and boardinghouses, most of the seasonal housing is either rental or time-shared. The majority of the park's visitors come from either Long Island or elsewhere in the New York metropolitan area.

PWC Use

PWC use within Fire Island National Seashore has probably occurred since personal watercraft were introduced to the public. More than 99% of the boat users within the national seashore boundaries are from New York State. Of these, approximately 5% to 7% use personal watercraft. The majority (90%) of the boating visitors travel from within 30 miles of Fire Island.

Most PWC use occurs on the bayside of the island and is prevalent along the western boundary from the Fire Island Lighthouse to Point O'Woods and along on the park's eastern boundary off Smith Point County Park. Personal watercraft that are primarily launched within Fire Island National Seashore do so from the communities, private homes, or larger vessels visiting Fire Island. Personal watercraft entering the park from outside the boundary usually launch from Captree State Park in the west, Smith Point Marina/boat ramp, or the Moriches Town ramps in the east.

Visitors use personal watercraft to explore Great South Bay, as transportation to island communities, for racing, to go to the islands, and as dinghies between large vessels and shore. Increased instances of larger personal watercraft traveling through the inlets to the Atlantic Ocean have occurred, but use from launches on the oceanside beaches is minimal.

Public Safety and Resource Concerns

There have been 11 PWC-related accidents or incidents reported to the National Park Service at Fire Island National Seashore over the past five years. There have been increasing complaints, however, concerning PWC users jumping ferry wakes and speeding through the anchorage areas. Nationally, personal watercraft comprise 9% of all registered "vessels" in the United States, but they are involved in 36% of all boating accidents. In part, this is believed to be a boater education issue (i.e., inexperienced riders lose control of the craft), but it also is a function of the PWC operation itself (i.e., no brakes or clutch; when drivers let up on the throttle to avoid a collision, steering becomes difficult).

OBJECTIVES IN TAKING ACTION

Objectives are what must be achieved to a large degree for an action to be considered a success. All alternatives selected for detailed analysis must meet all objectives to a large degree and must also resolve the purpose of and need for action.

Relevant statements from the national seashore's enabling legislation, the *Strategic Plan*, and other management documents are shown below in italics. These statements are followed by management objectives for personal watercraft, which are derived from the legislation and mandates, and are compatible with the purpose and significance statements of Fire Island National Seashore presented above.

Water Quality

Fire Island National Seashore is a relatively natural seashore comprised of relatively unspoiled and undeveloped beaches, dunes, other natural features, and a diverse barrier island ecosystem.

Management Objectives:

- Maintain acceptable water quality in marinas and adjacent waters through management of visitor use.
- Achieve unimpaired water quality by 2005.
- Manage PWC use so that it will not contribute to the degradation of the Great South Bay and/or ocean resources.
- Address nonpoint source pollution on Long Island.
- Evaluate sediment disturbances from surface activities.

Air Quality

Visitors safely enjoy and are satisfied with the availability, accessibility, diversity, and quality of park facilities, services, and appropriate recreational opportunities.

Provide enjoyment of the resources in such manner and by such means as will leave them unimpaired for the enjoyment of future generations.

Management Objective:

- Control future PWC air emissions of ozone released in the New York metropolitan non-attainment area so that PWC activity will comply with the federal conformity rules.

Soundscapes

Management Objectives:

- Manage noise from PWC use in affected areas so that visitor health, safety, and experiences are not adversely affected.
- Protect avian species from the effects of PWC-generated noise, especially during nesting season.

Wildlife and Wildlife Habitat, including Threatened and Endangered Species

Fire Island National Seashore is a relatively natural seashore comprised of relatively unspoiled and undeveloped beaches, dunes, other natural features, and a diverse barrier island ecosystem.

The Sunken Forest is a 250–300 year old American holly-shadblow-sassafras maritime forest considered to be at or near climax.

The Otis Pike Fire Island Wilderness contains a variety of barrier island ecosystems in a relatively natural state and is the only federal wilderness in the State of New York.

Management Objectives:

- Protect fish and wildlife from the impacts of bioaccumulation and contaminants emitted by personal watercraft.

- Protect the federally listed piping plover and roseate tern, and the state listed common tern and least tern.

Shoreline and Submerged Aquatic Vegetation

Manage PWC use to protect sensitive shoreline areas (vegetation/erosion) from PWC activity and access.

Management Objective:

- Regulate PWC use to prevent erosion in areas where shoreline vegetation is extremely sensitive, such as Sunken Forest, Otis Pike Wilderness Area, and the backbay islands.
- Protect submerged aquatic vegetation and the salt marshes from PWC use.

Visitor Experience

Provide opportunities for forms of enjoyment that are uniquely suited and appropriate to the superlative natural and cultural resources found in the parks.

Defer to local, state, and other federal agencies, private industry, and non-governmental organizations to meet the broader spectrum of recreational needs and demands.

Management Objectives:

- Manage the potential conflicts between PWC users and other park visitors.
- Cooperate with local and state entities that manage or regulate PWC use.

Visitor Safety

Ensure visitors safely enjoy and are satisfied with the availability, accessibility, diversity, and quality of park facilities, services, and appropriate recreational opportunities.

Management Objective:

- Minimize or reduce the potential for PWC user accidents.
- Minimize or reduce the potential for PWC user accidents and conflicts with other recreationists.

Socioeconomic Environment

- Minimize adverse impacts to local businesses that may be affected by PWC regulation.
- Protect vendors on Fire Island when placing regulations and restrictions on access and use.

National Seashore Management and Operations

- Minimize impacts to NPS operations from potential increased enforcement needs.

ISSUES AND IMPACT TOPICS

Issues associated with PWC use at Fire Island National Seashore were identified during scoping meetings with NPS staff and as a result of public comments. Many of these issues were identified in the settlement agreement with the Bluewater Network, which requires that, at a minimum, the effects of PWC use be analyzed for the following: water quality, air quality, soundscapes, wildlife and wildlife habitat, shoreline vegetation, visitor conflicts and visitor safety. Potential impacts to other resources were considered as well. The following impact topics are discussed in the "Affected Environment" chapter and are analyzed in the "Environmental Consequences" chapter. If no impacts are expected, based on available information, then the issue was eliminated from further discussion, as discussed beginning on page 19.

WATER QUALITY

The main issues associated with PWC use and water resources at Fire Island National Seashore are those related to water quality. Impacts to water quality result from emissions of hydrocarbons directly into the water. Discharges from PWC two-stroke engines have the potential to adversely affect water quality in Fire Island National Seashore, especially in areas of poor circulation and low flushing, which include most of the national seashore's inshore waters. Other water quality issues may include indirect effects on fish, marine mammals, submerged aquatic vegetation, and any threatened and endangered species that are sensitive to water quality changes and degradation.

AIR QUALITY

Pollutant emissions, particularly nitrogen oxides and volatile organic compounds from personal watercraft, may adversely affect air quality. These compounds react with sunlight to form ozone. Fire Island National Seashore is in an area classified by the Environmental Protection Agency as non-attainment for ozone.

SOUNDSCAPES

Impact on Visitors from Noise Generated by PWC Use

All motorized watercraft, including personal watercraft, produce noise that may impact park soundscapes, wildlife, and visitor experiences. Any watercraft that does not meet the NPS watercraft noise regulation of 82 dB at 82 feet at full acceleration is subject to fine and removal from the park. Visitor complaints or comments about the noise associated with PWC use is increasing. The Great South Bay is frequented by a large variety of motorized boats, all of which contribute to the ambient noise level.

Impact on Avian Species from Noise Generated by PWC Use

Personal watercraft may have a greater impact on nesting birds than other types of watercraft because of their noise, speed, and ability to access shallow-water areas. This may force nesting birds at Fire Island National Seashore, such as the threatened piping plover, to abandon eggs during crucial embryo development stages and flush other waterfowl from habitat, causing stress and associated behavior

changes. Noise from personal watercraft and other boats, as well as the physical presence of the craft, might affect the distribution of birds such as shorebirds, raptors, and waterfowl.

Impact on Marine Mammals from Noise Generated by PWC Use

PWC use may have a greater impact on marine mammals, specifically dolphins and whales that frequent the waters of the park, because of the craft's noise, speed, and ability to access shallow-water areas. Although the full impact that noise has on marine mammals is not completely understood, the increase in human-caused underwater noises could be a serious problem to marine mammals' survival because noise can interfere with their methods of communication and hunting strategy.

WILDLIFE AND WILDLIFE HABITAT

Impact of PWC Use on Wildlife and Habitat

Personal watercraft may impact wildlife through a combination of PWC speed, noise, and ability to access sensitive areas, especially where water is shallow. This may affect marine mammals prevalent at Fire Island National Seashore by interrupting normal activities, causing alarm or flight, causing animals to avoid habitat, displacing habitat, and affecting reproductive success. Numerous shorebirds, waterfowl, and other birds, including many migratory bird species that utilize Fire Island National Seashore, are most likely to be affected by PWC activities.

Impact of PWC Use on Threatened and Endangered Species

At Fire Island National Seashore, PWC users may affect federally listed sea turtles and marine mammals that access the Great South Bay through the ocean inlets by colliding with and harassing them, resulting in harm to the animals and decreased distribution.

While foraging for food, roseate and least terns may be affected by the physical presence of personal watercraft and noise from them. Other threatened or endangered bird species that occur on the island, including the piping plover, might be affected by PWC noise and presence.

VEGETATION

Impacts to Shoreline Vegetation from PWC Use

Shoreline vegetation, critical to the juvenile stages of fish and general overall habitat for a variety of aquatic and waterfowl species, occurs in the backbay areas of Fire Island National Seashore. PWC use can adversely affect shoreline vegetation by creating wakes and trenches from water propulsion, as well as by users landing in these habitats.

Impacts to Submerged Aquatic Vegetation from PWC Use

Submerged aquatic vegetation (SAV) is a diverse assembly of rooted macrophytes that grow in shallow water, under the surface, but not above it. These plants are beneficial to aquatic ecosystems because they provide a protective habitat for young and adult fish and shellfish, as well as food for

waterfowl, fish, and mammals; and they aid in oxygen production, absorb wave energy and nutrients, and improve the clarity of the water. In addition, SAV beds stabilize bottom sediments and suspended sediments present in the water. PWC use has the potential to impact submerged aquatic vegetation because the craft can access shallow water environments. Direct impacts resulting from collision or mechanical removal can occur. PWC use may also affect the growth and health of submerged aquatic vegetation as a result of increased turbidity, decreased available sunlight, and deposition of suspended sediments on plants.

VISITOR EXPERIENCE

Some research suggests that PWC use is viewed by some segments of the public as a nuisance due to their noise, speed, and overall environmental effects, while others believe that PWC use is no different from other watercraft, and recreationists have a "right" to enjoy this sport.

At Fire Island National Seashore visitor complaints have increased in recent years. A mission requirement of the park is to ensure visitors are satisfied with the availability, accessibility, diversity, and quality of park facilities, services, and appropriate recreational opportunities.

VISITOR SAFETY

In addition to PWC use, other national seashore activities include surfing, canoeing, and kayaking. These activities may be affected by the use of motorized watercraft, including personal watercraft. There have also been increasing complaints concerning PWC users jumping ferry wakes and speeding through the anchorage areas.

SOCIOECONOMIC EFFECTS

Several small communities on Fire Island rely heavily on tourism for their economic base. The population of the island increases from about 300 to 400 year-round residents to between 80,000 and 100,000 people during the summer season. Some of these visitors use personal watercraft for recreation and/or transportation. The National Park Service identified 15 PWC dealerships and rental shops in the vicinity of Fire Island National Seashore. In addition to the businesses offering PWC sales and service, businesses potentially affected by PWC restrictions would include lodging establishments, restaurants, gas stations, and retail stores in the area.

NATIONAL SEASHORE MANAGEMENT AND OPERATIONS

Impact to Park Operations from Increased Enforcement Needs

Personal watercraft, because of their increased accident rates and visitor conflicts, require additional park staff to enforce standards, limits, or closures. The National Park Service, New York State Department of Environmental Conservation, the Suffolk County Police, the Town of Brookhaven, and the Islip Harbor Police have jurisdiction within park waters.

Conflict with State and Local Ordinances and Policies Regarding PWC Use

Some states and local governments have taken action, or are considering taking action, to limit, ban, and otherwise manage PWC use. New York State has strict boating regulations applicable to PWC use.

ISSUES ELIMINATED FROM FURTHER CONSIDERATION

As explained below, the following impact topics and issues have been dismissed from further consideration:

Cultural Resources: No new cultural resource investigations were carried out as part of this study. The findings were based on the national seashore's existing cultural resource documentation (John Milner Associates 1998, Linck 1988, NPS 1979), readily available historical sources on the island, and information provided orally by park employees. The known cultural resources on the island include the 1858 lighthouse and the William Floyd Estate, both of which are listed on the National Register of Historic Places, and 13 archeological sites.

No systematic archeological survey has been made of the national seashore, so additional, undiscovered archeological sites may be present. For the most part the narrow barrier islands of the Atlantic Coast were not intensely occupied by Native American peoples. The dynamic nature of these landforms also tends to destroy evidence of human presence within centuries or even decades. Therefore, the potential of these islands for prehistoric archeological sites is generally low. The islands were regularly visited by Native Americans gathering shells (Long Island was the most important source in the region of shell for the beads known as "wampum"), hunting birds, and collecting other marine resources; shell middens left during these visits have been found on barrier islands. Generally, these middens are on the bayside, near the inlets. It is assumed that these sites were once more common, but that most have been destroyed by the constant movement of the island sands. No Native American archeological sites have been recorded on Fire Island.

The first recorded European use of the island was as a whaling station in the 1650s. In 1693 the island became the property of William Tangier Smith, who lived on the island at least part time. In 1753 half of the island was sold to the town of Brookhaven, and from that point until the mid 1800s Brookhaven residents used the island for grazing cattle and harvesting salt hay. Some local histories record that the island had a sinister reputation in the 1700s, when some of the residents were thought to make their livings by salvaging cargo from wrecks. Because of the number of wrecks along the shore, the first lighthouse was erected in 1826, and life-saving stations were constructed starting in 1847. The island's transformation into a vacation destination began after the construction of the Long Island Railroad and received a big boost in 1855, when David Sammis built the Surf Hotel in what is now Kismet. Development accelerated in the 1920s, when many vacation homes were built. A real estate boom in the 1950s created pressure to preserve part of the island as a park, leading to the establishment of the national seashore in 1964. The 13 archeological sites that have been recorded on the island are all historic and include the remains of life-saving stations, refuse middens, and early recreational facilities.

The William Floyd Estate, in the town of Mastic, was added to the national seashore in 1974. The standing house is the one in which William Floyd, a signer of the Declaration of Independence, was born in 1734, and it remained in the Floyd family for eight generations. The

landscape surrounding the house was developed by the last private owners to promote wildlife and is currently managed by the National Park Service as a cultural landscape.

Another potential cultural resource in the national seashore is shipwrecks. The shoals off the island were notorious — hence the establishment of the lighthouse — and many wrecks have been noted over the years.

No cultural resources are known to be present or are expected in locations likely to be impacted by PWC use.

Sacred Sites/Native American Concerns: This is not an issue because there are no known sacred sites or Native American concerns at Fire Island National Seashore or, more specifically, within the vicinity of existing or potential future landing zones or PWC use areas.

Environmental Justice: On 11 February 1994, President Clinton issued Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations." This order directs agencies to address environmental and human health conditions in minority and low-income communities so as to avoid the disproportionate placement of any adverse effects from federal policies and actions on these populations. Local residents may include low-income populations; however, these populations would not be particularly or disproportionately affected by PWC use. Other areas near the park, including Great South Bay, are available to all PWC users. This issue was dismissed from further analysis for the following reasons:

1. Personal watercraft are used by a cross-section of ethnic groups and income levels.
2. Other areas are available and open to personal watercraft and are used by all ethnic groups and income levels.
3. NPS actions would not disproportionately affect minority or low-income populations.
4. Any NPS actions to limit PWC use would not displace PWC use to low-income or ethnically sensitive areas.

Wetlands: Any potential impacts to wetlands in the vicinity of the shoreline are evaluated under the topic "Shoreline Vegetation." Wetlands that occur farther inland within the national seashore would not be affected by PWC use because of the limited distance that PWC users generally walk when not using their machines.

Floodplains: The level of PWC use and associated PWC activities identified in each alternative would have no adverse impacts on floodplains. No development is proposed in the alternatives; thus, no flooding would result as a result of PWC use and cause impacts to human safety, health, or welfare.

Prime and Unique Agricultural Lands: No prime and unique agricultural farmland exists in the vicinity of areas that would be affected by PWC use.

Energy Requirements and Natural or Depletable Resource Requirements: PWC operation requires the use of fossil fuels. While PWC use could be limited or banned within Fire Island National Seashore, no alternative considered in this environmental assessment would affect the number of personal watercraft used within the region or the amount of fuel that is consumed. The level of PWC use considered in this environmental assessment is minimal. Fuel is not now in short supply and PWC use would not have an adverse effect on continued fuel availability.

RELATIONSHIP TO OTHER PLANS, POLICIES, AND ACTIONS

NPS PLANS, POLICIES, AND ACTIONS

1977 General Management Plan

The 1977 *General Management Plan* was created to provide an environmentally sound management foundation for the national seashore. The plan ensures the protection and preservation of beaches, dunes, and other natural features, as well as provides reasonable access and facilities for recreational uses. Because a variety of landowners and governmental jurisdictions are affected by management at Fire Island National Seashore, planning and management activities discussed in the plan are based on cooperative efforts. PWC and/or motorized watercraft use is not discussed in the *General Management Plan*.

2000 Strategic Plan, Fiscal Years 2001–2005

The *Strategic Plan* addresses topics such as the mission of Fire Island National Seashore, the goals for accomplishing and maintaining its mission, and strategies for achieving these goals from 2001 to 2005. A general overview of the park's organizational structure, financial resources, available facilities, and evaluation techniques is provided in this document.

Fire Island's mission goals fall under one of the following 4 categories:

Preserve park resources.

Provide for visitor experience at the park.

Strengthen and preserve natural and cultural resources and enhance recreational opportunities.

Ensure organizational effectiveness.

Within these four categories each specific long-term goal is highlighted in measurable ways. While there are specific goals addressing recreational uses, educational opportunities, and resource improvement, no specific PWC and motorized watercraft use recommendations are proposed.

2001 Air Resource Management Plan

The *Air Resource Management Plan* highlights NPS goals and objectives regarding air quality, noise, artificial light, weather, and climate. This plan proposes an aggressive role for the National Park Service in preserving, protecting, and enhancing the air quality in all park units. The National Park Service aims to preserve the natural quiet and sounds associated with each park. To ensure protection from excessive noise, monitoring programs and necessary actions should be applied to prevent adverse effects to the natural resources and to the visitors at each park. While the plan addresses the need to protect the park's air quality and noise environment associated with all new and human sources, it contains no specific regulations for PWC or motorized watercraft.

OTHER FEDERAL AGENCY PLANS, POLICIES, AND ACTIONS

1972 Coastal Zone Management Act

In recognition of the increasing pressures of over-development on the nation's coastal resources, Congress enacted the Coastal Zone Management Act in 1972. The act encourages states to preserve, protect, develop, and where possible, restore or enhance valuable natural coastal resources such as wetlands, floodplains, estuaries, beaches, dunes, barrier islands, and coral reefs, as well as the fish and wildlife using those habitats. A unique feature of the coastal zone management program is that participation by states is voluntary. To encourage states to participate, the act makes federal financial assistance available to any coastal state or territory that is willing to develop and implement a comprehensive coastal management program. In addition, once a state adopts a plan consistent with the Coastal Zone Management Act, that state's coastal plan agency can make consistency determinations on federal actions subject to the plan.

State coastal zones include the coastal waters and adjacent shorelands that extend inland to the extent necessary to control activities that have a direct, significant impact on coastal waters. For federal approval, a coastal zone management plan must (1) identify the coastal zone boundaries; (2) define the permissible land and water uses within the coastal zone that have a direct and significant impact on the coastal zone and identify the state's legal authority to manage these uses; (3) inventory and designate areas of particular concern; (4) provide a planning process for energy facilities siting; (5) establish a planning process to assess the effects of, and decrease the impacts from, shoreline erosion; and (6) facilitate effective coordination and consultation between regional, state, and local agencies. The National Oceanic and Atmospheric Administration approves coastal zone management plans and oversees subsequent implementation of the programs.

1982 Coastal Barriers Resources Act

Congress passed the Coastal Barriers Resources Act in 1982 to address problems caused by coastal barrier development. The act restricts federal expenditures and financial assistance, including federal flood insurance, in the Coastal Barrier Resource System. This system is made up of a defined list of undeveloped coastal lands and associated aquatic environments that serve as barriers protecting the Atlantic, Gulf, and Great Lakes coasts.

The system currently includes 585 units, which add up to almost 1.3 million acres and about 1,200 shoreline miles. There are also 274 "otherwise protected areas," a category added by the 1990 Coastal Barrier Improvement Act for coastal barriers within lands reserved for conservation purposes. Fire Island is included in this system as an otherwise protected area.

Three important goals of this act are to

- minimize loss of human life by discouraging development in high risk areas
- reduce wasteful expenditure of federal resources
- protect the natural resources associated with coastal barriers

Federal monies can be spent within the system for certain exempted activities, after consultation with the U.S. Fish and Wildlife Service. Examples of such activities include emergency assistance, military activities for national defense, and maintenance of existing federal navigational channels.

STATE AND LOCAL GOVERNMENT PLANS, POLICIES, AND ACTIONS

2001 Long Island South Shore Estuary Reserve Comprehensive Management Plan

The *2001 Long Island South Shore Estuary Reserve Comprehensive Management Plan* was prepared as a result of the Long Island South Shore Estuary Reserve Act. The act was established to address the concern of the future health of the South Shore Estuary. The purpose of the plan is to recommend management actions to protect and restore the health of the estuary. It was developed in coordination with the South Shore Estuary Reserve Council (SSERC), New York State Department of State's (NYS DOS) Division of Coastal Resources, and county and local governments. The plan provides recommendations to improve and maintain water quality; protect and restore living resources of the reserve; expand public use and enjoyment of the estuary; sustain and expand the estuary-related economy; and increase education, outreach, and stewardship. The plan provides the implementation actions, which are strictly voluntary, necessary to achieve the recommendations. Plan recommendations are strictly voluntary; there is currently no legal mandate that they be implemented. However, the SSERC and partners are using the completed plan to request implementation funding.

2000 Nonpoint Source Management Program

The mission of New York's nonpoint source management program is to control, reduce, or treat polluted runoff through the implementation of structural, operational, or vegetative management practices; to administratively coordinate various state agencies and other interested partners having regulatory, outreach, incentive-based, or funding programs that foster installation of management practices for any of the identified sources of nonpoint pollution threatening or impairing the waters of New York; and to conduct local implementation and statewide coordination and evaluation on a watershed basis.

New York Coastal Management Program

The New York Department of State, Division of Coastal Resources, reviews projects and activities of federal agencies for consistency with the policies of the New York State coastal management program. The state's program establishes New York's vision for its coast by clearly articulating specific policies on development, fish and wildlife, flooding and erosion hazards, recreation, historic and scenic resources, agricultural lands, energy and ice management, public access, water and air resources, and general policy (NYS DOS 2002). Federal activities (e.g., development projects, permits, and funding) are reviewed by the Division of Coastal Resources to ensure adherence to the state program. Over 800 federal activities are reviewed each year. The Division of Coastal Resources advises agencies on the consistency of their activities with the state or local program.

The consistency provisions of the federal Coastal Zone Management Act of 1972 require federal activities to be consistent with the state's federally approved coastal management program. This requirement applies to all federal activities and federally authorized activities within, as well as activities outside, the state's coastal zone that affect the zone. Applicants for federal agency approvals or authorizations are required to submit copies of federal applications to the New York State Department of State, together with a Federal Consistency Assessment Form and consistency certification, so that the state can review the consistency certification and proposal for consistency with the coastal management program. Applicants for federal funding must submit an identification of the proposed funding source and a description of the project. If the Department of State determines that the proposed activity

would be inconsistent with the state's coastal management program, federal agencies may not fund or approve the proposal. Direct activities by federal agencies are subject to similar requirements.

1998 New York Clean Water Action Plan

The federal Clean Water Action Plan requires each state to prepare a unified watershed assessment to determine where additional funding will help achieve "fishable and swimmable" waters for all Americans. On October 1, 1998, New York submitted to the Environmental Protection Agency an assessment bringing together water quality and natural resource factors in each of the state's 54 watersheds. Based on the state's unified watershed assessment, the state established restoration priorities for those watersheds that did not meet clean water or natural resource goals. PWC and motorized watercraft are not specifically addressed in the plan.

New York Water Quality Standards

The New York State water quality standards (6 NYCRR Part 703) provide standards, guidance values, and/or groundwater effluent limitations, including all (total) forms of a substance, unless indicated otherwise. Where a standard or guidance value is for a specific form of the substance, water quality based effluent limitations for permits may include other forms of the substance to account for changes in the substance that occur in the receiving water. Part 703.5 lists water quality standards for toxic and other deleterious substances.

New York State Implementation Plan

A state implementation plan is a state proposal on how to reduce air pollution to levels that are below the national ambient air quality standards within the state. These plans are approved by the U.S. Environmental Protection Agency and include the following information: (1) descriptions of current emission control programs, (2) future programs, (3) an inventory of emission sources, including stationary sources (as an example, factories) and mobile sources (on-road and off-road cars and trucks), (4) modeling demonstrations used to predict future air quality, and (5) rate-of-progress determinations that show how emissions will decrease over set periods of time.

The New York State Department of Environmental Conservation, Air Resources Division, is responsible for drafting and implementing the implementation plan. The current plan consists of a series of revisions and is not contained in one volume.

New York State Boating Laws

The New York State boating laws require that PWC users follow all boating laws. However, there are some restrictions placed on PWC users that do not apply to other boaters. These restrictions establish requirements and standards for operating hours, the type of gear that must be worn on board, the potential uses for personal watercraft, use in proximity to other watercraft and swimmers, and mandatory PWC education. Speed limits, safety operating rules, and boating courtesy are also recommended.

ALTERNATIVES

Alternatives selected for full analysis in this environmental assessment must meet the objectives of the park to a large degree, while also meeting the purpose of and need for action. Four alternatives are described in this section, along with other alternatives that were considered and eliminated from further consideration. The alternatives analyzed in this document are in accordance with the National Environmental Policy Act and are the result of agency and public scoping input, as stipulated in the settlement agreement between the Bluewater Network and the National Park Service. The action alternatives address continued PWC use under a special regulation for new management strategies and mitigation measures. The no-action alternative assumes the National Park Service would not take action to promulgate a special regulation to keep national seashore waters open to PWC use; hence, PWC use would not be permitted within any areas of the national seashore.

ALTERNATIVE A — CONTINUE PWC USE AS CURRENTLY MANAGED UNDER A SPECIAL REGULATION

A special regulation would be adopted to continue the current management and regulation of PWC use, as provided for in the current Park Superintendent's Compendium. This is considered the "baseline" alternative to compare against other management strategies, including closure of the unit to PWC use. The Park Superintendent's Compendium allows for PWC use in all waters within Fire Island National Seashore (see Alternative A map).

All local, state, and federal regulations regarding PWC use would remain in effect and be enforced by the National Park Service. These include the following:

- No operation from sunset to sunrise.
- No operating within 500 feet of a bathing area unless the waterbody is less than 500 feet wide, then cannot operate in excess of 10 mph.
- No operating at excessive speed within 100 feet of the shoreline.
- Must operate below 5 mph when within 100 feet of the shore, a dock, pier, raft, float, or anchored boat.
- No reckless PWC operation or maneuvering in a manner that unnecessarily endangers life, limb, or property.
- Must have a visual distress flag and an auditory distress signal.
- Cannot operate while impaired or intoxicated from alcohol or drugs.
- Personal watercraft sold or manufactured in New York must be consistent with the California air emissions reduction and regulations for new spark-ignition PWC marine engines (New York Environment Statutes 19-0306-A, 2000).
- Personal watercraft must be registered with the state.

ALTERNATIVE B — CONTINUE PWC USE, BUT LIMIT USE TO AREAS ADJACENT TO BEACH COMMUNITIES

Alternative B would implement geographic restrictions on PWC use, limiting them to areas adjacent to beach communities (see Alternative B map). PWC users would be allowed to operate

- north of Moriches Inlet
- west of the west boundary of the Sunken Forest and east of the east boundary of the Fire Island Lighthouse, excluding the area in Clam Pond located in Saltaire and any area within 1,000 feet of East Fire Island and West Fire Island
- adjacent to the communities of Davis Park, Water Island, Fire Island Pines and Cherry Grove

PWC would be prohibited from operation in:

- all areas between the west boundary of Kismet and the west boundary of Fire Island National Seashore, comprising the Fire Island Lighthouse
- channels to and from Bellport Beach and Great Gun Beach
- all areas between the west boundary of Moriches Inlet and the west boundary of the Sunken Forest, except for those areas used as ferry channels and the beach communities of Davis Park, Water Island, Fire Island Pines, and Cherry Grove
- the oceanside of Fire Island National Seashore from the west boundary of Moriches Inlet to the east boundary of Robert Moses State Park
- the William Floyd Estate area
- within NPS marinas

All local, state, and federal laws and regulations relative to PWC use would remain in effect and be enforced by the park.

ALTERNATIVE C — CONTINUE PWC USE, BUT LIMIT USE TO AREAS ADJACENT TO BEACH COMMUNITIES AND ENFORCE A 1,000-FOOT BUFFER ALONG ALL SHORELINES WITHIN THE NPS BOUNDARY

Alternative C would continue to allow PWC use in the areas adjacent to beach communities, as in alternative B; however, PWC use would not be permitted in the same areas identified in alternative B and would not be permitted within 1,000 feet of any shoreline (including smaller islands) (see Alternative C map). In addition, PWC users operating in ferryways would be required to maintain a no wake speed. All local, state, and federal laws and regulations relative to PWC use would remain in effect and be enforced by the park.

NO-ACTION ALTERNATIVE

For the purposes of this analysis, the no-action alternative assumes a scenario of discontinuing all PWC use at this national park system unit. The National Park Service would take no further action to adopt special regulations retaining PWC use, which would result in a ban on PWC use at the seashore (see No-Action Alternative map).

ENVIRONMENTALLY PREFERRED ALTERNATIVE

The environmentally preferred alternative is the alternative that would promote the National Environmental Policy Act, as expressed in section 101 of the act. The identification of the environmentally preferred alternative is that which best meets the following requirements:

- Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations.
- Ensure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings.
- Attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences.
- Preserve important historic, cultural, and natural aspects of our national heritage and maintain, wherever possible, an environment that supports diversity and variety of individual choice.
- Achieve a balance between population and resource use that will permit high standards of living and a wide sharing of life's amenities.
- Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

The environmentally preferred alternative is the alternative that would cause the least damage to the biological and physical environment — the alternative that would best protect, preserve, and enhance historic, cultural, and natural resources. This discussion also summarizes the extent to which each alternative meets section 102(1) of the National Environmental Policy Act, which asks that agencies administer their own plans, regulations, and laws so that they are consistent with the policies outlined above to the fullest extent possible.

Alternative A would not satisfy the majority of the six requirements detailed above. Alternative A would attain the widest range of beneficial park uses to PWC users and would preserve an environment that supports diversity and variety of individual choice. However, because PWC use would continue at existing levels, natural resources within the national seashore would not be ensured protection, and the experiences of non-PWC users could be adversely affected. Therefore, this alternative would not achieve a balance between population and resource use that permits a high standard of living and a wide sharing of life's amenities. Alternative A would result in the degradation of water and air quality and would limit protection of wildlife and wildlife habitats. Alternative A would not fulfill the responsibilities of each generation as trustee of the environment for succeeding generations due to continued degradation resulting from PWC use within the national seashore.

Alternative B would have impacts on park resources and visitor use and experience at Fire Island National Seashore very similar to those described for alternative A; however, it would restrict PWC use to those areas within the national seashore adjacent to beach communities. Alternative B would provide for the protection of wildlife and wildlife habitats associated with nearshore and shoreline areas along most of Fire Island National Seashore from adverse effects of PWC use in these areas. Alternative B would allow limited access to the national park shoreline in designated areas, enabling PWC users to enjoy a wide range of beneficial uses of park amenities while maintaining an environment that supports diversity and variety of individual choice. Alternative B would attain a wide range of beneficial uses of the environment but the potential for degradation and risk to visitor health and safety would still exist, specifically as it relates to water and air quality.

Alternative C would have impacts on park resources and visitor use and experience at Fire Island National Seashore very similar to those described for alternatives A and B; however, it would restrict PWC use to those areas within the national seashore adjacent to beach communities and would restrict PWC use from a 1,000-foot buffer around all national seashore land. In addition, PWC users would be required to maintain no-wake speeds within ferryways. Alternative C would provide a high degree of protection to water and air quality, soundscapes, wildlife, and wildlife habitat in nearshore and

shoreline habitats of Fire Island National Seashore from adverse effects of PWC use in these areas. Alternative C would allow limited PWC access to the national seashore and would therefore maintain an environment that supports diversity and variety of individual choice, thus achieving a balance between population and resource use that permits a wide sharing of amenities.

The no-action alternative would ensure safe, healthful, productive, and aesthetically and culturally pleasing surroundings for visitors without the threat of PWC users entering the area and introducing noise and safety considerations. The no-action alternative would attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences of removing PWC use from the park entirely. The no-action alternative would ensure the highest degree of protection to wildlife and wildlife habitat associated with nearshore and shoreline habitats of Fire Island National Seashore by excluding PWC from use in these areas. However, the no-action alternative would completely exclude personal watercraft from land access to the national seashore and not maintain an environment that supports diversity and variety of individual choice, nor would it achieve a balance between population and resource use that permits a wide sharing of amenities.

Based on the analysis prepared for PWC use at Fire Island National Seashore, alternative C is the environmentally preferred alternative because it would best fulfill park responsibilities as trustee of this sensitive habitat; ensure safe, healthful, productive, and aesthetically and culturally pleasing surroundings; and attain a wider range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences.

ALTERNATIVES CONSIDERED BUT NOT ANALYZED FURTHER

Current management restrictions under the Park Superintendent's Compendium do not limit PWC use. Park staff considered temporal restrictions to protect nesting habitat, for example, but decided they were not feasible because restrictions normally occur during PWC use seasons in spring and summer. Areas could only be open in the winter months, when very little PWC use occurs. Other management strategies that were considered and rejected included charging user fees, allowing only four-stroke engines, or requiring insurance. These strategies could not be implemented due to lack of staff and labor time.

TABLE 1: SUMMARY OF PWC MANAGEMENT ALTERNATIVES

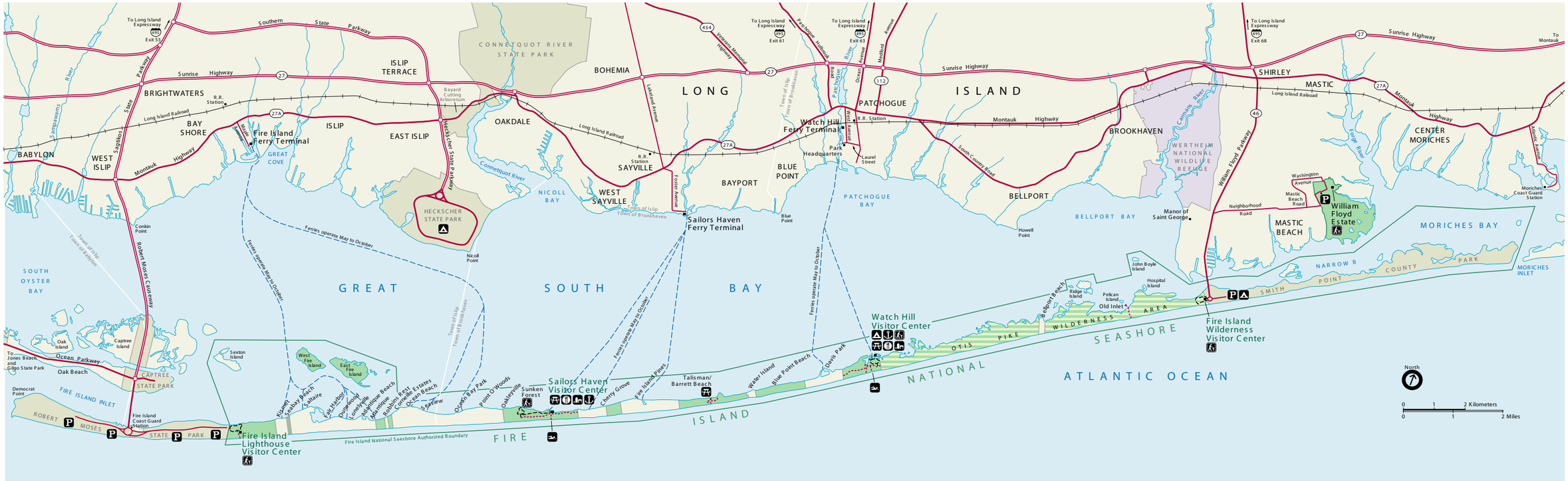
	Alternative A: Continue PWC Use as Currently Managed Under a Special Regulation	Alternative B: Continue PWC Use, but Limit to Areas Adjacent to Beach Communities	Alternative C: Continue PWC Use, but Limit to Areas Adjacent to Beach Communities and Enforce 1,000-foot Buffer around National Seashore	No-Action Alternative
Management	Allow PWC use under a special regulation.	Allow PWC use under a special regulation.	Allow PWC use under a special regulation.	Ban PWC use.
Use Area	Continue PWC use indefinitely in all waters within the national seashore.	Limit PWC use to areas adjacent to beach communities.	Limit PWC use to areas adjacent to beach communities and enforce a 1,000 foot buffer around all park lands.	All areas within Fire Island National Seashore closed to PWC use
Other Restrictions	None	None	PWC can operate in ferryways but must maintain a no-wake speed.	None
Engine Type	No restrictions.	No restrictions.	No restrictions.	No restrictions.
Use Hours	Sunrise to sunset.	Sunrise to sunset.	Sunrise to sunset.	Not applicable.
Numbers	No limits.	No limits.	No limits.	No limits.
State Regulations	Enforce all state regulations.	Enforce all state regulations.	Enforce all state regulations.	Enforce all state regulations.

Fire Island National Seashore

New York

Alternative A --

Continue PWC Use as Currently Managed under a Special Regulation



United States Department of the Interior/National Park Service WASO/May '02/615-20044

- Food service
- Store
- Picnic area
- Campground
- Lifeguarding swimming area
- Marina
- Parking
- National Park Service lands
- Wilderness area
- Trail
- Self-guiding nature trail

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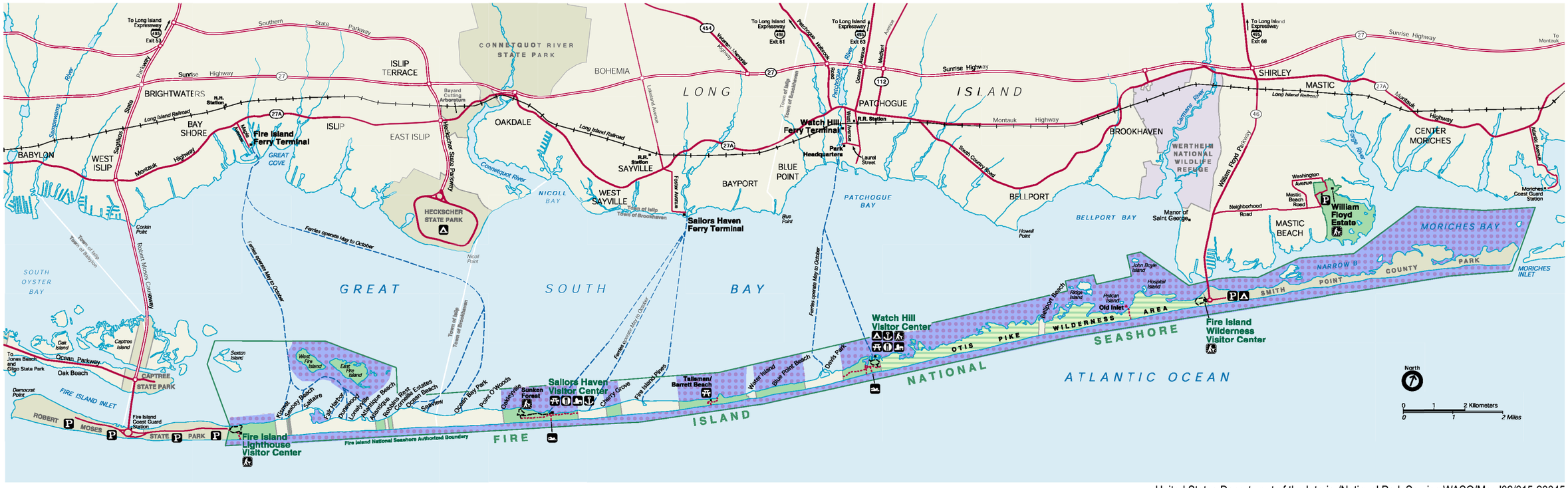
Fire Island National Seashore

New York

Alternative B --

Continue PWC Use, but Limit to Areas Adjacent to Beach Communities



United States Department of the Interior/National Park Service WASO/May '02/615-20045

Food service
Store
Picnic area
Campground
Lifeguarding swimming area
Marina
Parking
National Park Service lands
Wilderness area
Trail
Self-guiding nature trail
Restricted PWC use area

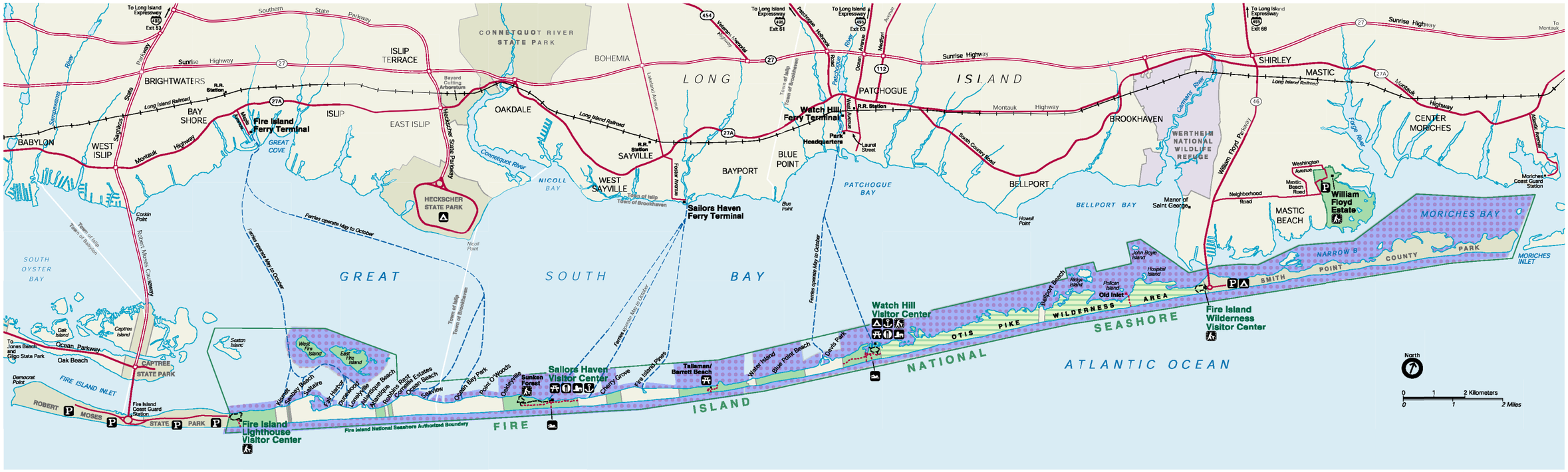
blank back of map

Fire Island National Seashore

New York

Alternative C --

Continue PWC Use, but Limit Use to Areas Adjacent to Beach Communities and Enforce a 1,000-Foot Buffer along all Shorelines within the National Seashore Boundary



United States Department of the Interior/National Park Service WASO/May '02/615-20046

- Food service
- Store
- Picnic area
- Campground
- Lifeguarding swimming area
- Marina
- Parking
- National Park Service lands
- Wilderness area
- Trail
- Self-guiding nature trail
- Restricted PWC use area

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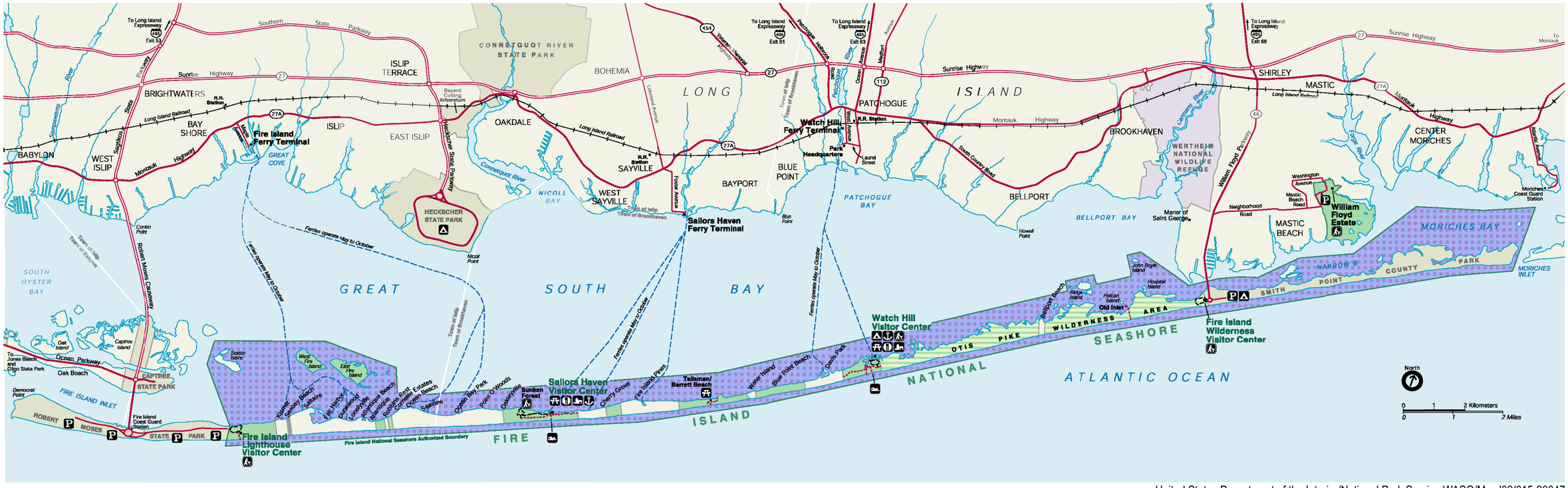
Fire Island National Seashore

New York

No Action Alternative -- Discontinue PWC Use



United States Department of the Interior/National Park Service WASO/May '02/615-20047

- Food service
- Store
- Picnic area
- Campground
- Lifeguarding swimming area
- Marina
- Parking
- National Park Service lands
- Wilderness area
- Trail
- Self-guiding nature trail
- Restricted PWC use area

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TABLE 2: SUMMARY OF ENVIRONMENTAL CONSEQUENCES

Impact Topic	Alternative A: Continue PWC Use as Currently Managed under a Special Regulation	Alternative B: Continue PWC Use, but Limit Use to Areas Adjacent to Beach Communities	Alternative C: Continue PWC Use, but Limit Use to Areas Adjacent to Beach Communities and Enforce 1,000-foot Buffer along all Shorelines within the NPS Boundary	No-Action Alternative
Water Quality	Impacts due to PWC emissions of organic pollutants in 2002 would be moderate (MTBE in area I) to negligible (all other pollutants). Impact from MTBE in areas II and III would be minor in 2002. By 2012 all water quality impacts from PWC use are expected to be negligible due to reduced emission rates and the ban on MTBE in gasoline in 2004. Water quality impacts from PWC use based on ecotoxicological benchmarks for organic pollutants would be negligible for all pollutants. Cumulative ecotoxicological impacts would be negligible. Impacts to human health from benzo(a)-pyrene would be negligible. Cumulative human health impacts from benzene would range from possibly major to moderate (area I) to negligible (area III). Potential human health impacts from MTBE would range from major (area I) to moderate (area III). By 2012 cumulative water quality impacts are expected to be lower due to reduced emission rates and the ban on MTBE in gasoline after 2004. However, human health impacts from benzene in 2012 would remain moderate in area I and minor in area II. Focused water quality monitoring in high use areas would be needed to verify the estimation of impacts. No impairment to water quality is expected.	Compared to alternative A, closing the eastern section of the national seashore to PWC use would have a beneficial impact on water quality in area III. Closing roughly half of areas I and II would not reduce PWC uses or emissions within these areas, but it would result in more localized adverse effects of PWC pollutants. Banning PWC use in the eastern part of Great South Bay and Moriches Bay would help reduce impacts in this area, while water quality impacts near the inlets would be similar to those for alternative A. Cumulative ecotoxicological impacts would be negligible. Impacts to human health from benzo(a)pyrene would be negligible for all areas in both 2002 and 2012. Cumulative human health impacts from benzene would be minor to possibly major in areas I and II and minor to negligible in area III (boats only). For MTBE, human health impacts would be moderate to possibly major in all three areas; however, no MTBE-related impacts are projected for 2012. Focused water quality monitoring in high use areas would be needed to verify the estimation of impacts. No impairment to water quality is expected.	This alternative would have a beneficial effect in shoreline areas and for humans swimming in these areas, but an adverse effect on water quality in areas farther offshore. Similar to alternative B, closing the eastern section of the national seashore to PWC use would have a beneficial impact in area III. Closing portions of areas I and II would not reduce PWC emissions within these areas and would result in more localized adverse effects. Banning PWC use in the eastern part of Great South Bay and Moriches Bay would help reduce water quality impacts in this area, while impacts in the vicinity of the inlets would be similar to those for alternative A. Cumulative ecotoxicological impacts would be negligible for all pollutants, and human health impacts from benzo(a)pyrene would be negligible. Human health impacts from benzene would be minor to possibly major in areas I and II and minor to negligible in area III (boats only). For MTBE, human health impacts would be moderate to possibly major in all three areas; however, no MTBE-related impacts are projected for 2012. Focused water quality monitoring in high use areas would be needed to verify the estimation of impacts. No impairment to water quality is expected.	Over the short and long term, banning PWC use within the national seashore would have a beneficial impact by contributing to improved water quality conditions in areas currently open to PWC use. On a cumulative basis, other motorboat use would continue to have negligible to possibly major adverse impacts on water quality in the national seashore due to discharges of organic pollutants. Focused water quality monitoring would be needed to verify the estimation of impacts. No impairment to water quality is expected.
Air Quality				
▪ Impacts on Human Health	Impacts in 2002 and 2012 from continuing PWC use within the national seashore boundary would be negligible adverse for PM_{10} and NO_x emissions, minor adverse for CO, and major adverse for VOC emissions in 2002, decreasing to	PWC annual emissions would result in negligible adverse impacts for PM_{10}, and minor adverse impacts for CO and NO_x throughout the assessment period. For VOC emission impacts would be major adverse in 2002, declining to moderate	PWC annual emissions would be very similar to those under alternative B in both 2002 and 2012, with negligible adverse impacts for PM_{10} and minor adverse impacts for CO and NO_x. For VOC emissions the impact would be major	As a result of banning PWC use within the national seashore boundary, the no-action alternative would have beneficial impacts for the ozone precursors NO_x and VOC. Cumulative emissions would decrease slightly due to the

Impact Topic	Alternative A: Continue PWC Use as Currently Managed under a Special Regulation	Alternative B: Continue PWC Use, but Limit Use to Areas Adjacent to Beach Communities	Alternative C: Continue PWC Use, but Limit Use to Areas Adjacent to Beach Communities and Enforce 1,000-foot Buffer along all Shorelines within the NPS Boundary	No-Action Alternative
	moderate by 2012 as a result of improved emission controls. Cumulative emissions from all boating activities in 2002 and 2012 are predicted to result in negligible adverse impacts for PM_{10}, moderate adverse impacts for CO and NO_x, and major adverse impacts for VOC. As a result of improved engine technology, VOC emissions would decline by 2012, but not enough to lower the impact. Any predicted major impact levels are based on the criteria selected for this analysis only. The State Implementation Plan recognizes that high pollutant levels in this area come from many sources, including motorized watercraft, and it takes this into account in establishing plan provisions and requirements. Air pollution sources in the Fire Island area do not contribute to the deterioration of air quality to the extent that the park's purpose is not being or will not be met, and no key resource damage has been identified due to air quality impacts. For these reasons, no impairment of air quality resources is predicted.	by 2012 due to improved emission controls. Cumulative emissions from all sources would result in negligible adverse impacts for PM_{10}, moderate adverse impacts for NO_x, and major adverse impacts for CO and VOC in both 2002 and 2012. For the same reasons as discussed under alternative A, no impairment of air quality resources is predicted.	adverse in 2002, decreasing to moderate adverse by 2012 due to improved emission controls. Cumulative emissions in both 2002 and 2012 would result in negligible adverse impacts for PM_{10}, moderate adverse impacts for NO_x, and major adverse impacts for CO and VOC. For the same reasons as discussed under alternative A, no impairment of air quality resources is predicted.	elimination of PWC use, and improved emissions controls. Impacts would still be negligible adverse for PM_{10}, moderate adverse for NO_x, and major adverse for CO and VOC in both 2002 and 2012. For the same reasons as discussed for alternative A, no impairment of air quality resources is predicted.
▪ Impacts on Air Quality Related Values	Annual emissions from personal watercraft would result in moderate adverse impacts for ozone exposure and negligible impacts to visibility. There are no perceptible visibility impacts or observed ozone injury on plants. Cumulative emissions would result in moderate adverse impacts for ozone and negligible visibility impacts. Air quality related values would not be impaired.	PWC annual emissions would result in moderate adverse impacts for ozone and negligible impacts to visibility. Cumulative emissions from all boating activities would result in moderate adverse impacts for ozone and negligible visibility impacts. Air quality related values would not be impaired.	PWC annual emissions would result in moderate adverse impacts for ozone and negligible impacts for visibility. Cumulative emissions would result in moderate adverse impacts for ozone and negligible impacts for visibility. Air quality related values would not be impaired.	Banning PWC use within the national seashore would have beneficial impacts on air quality. Cumulative emissions would result in moderate adverse impacts for ozone and negligible impacts for visibility. Air quality related values would not be impaired.
Soundscapes	PWC use would continue to have a negligible to minor adverse impact to visitors throughout the national seashore. Cumulative impacts of	Noise impacts would continue to range from negligible to minor due to continued PWC use. Area III would experience long-term beneficial impacts with the	Removing PWC use from many areas of the national seashore, as well as implementing a 1,000-foot buffer zone, would result in negligible adverse impacts.	Over the short and long term, banning PWC use within the national seashore would have a beneficial impact by eliminating this noise source within the seashore

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	boating noise, ambient noise levels, and PWC noise would range from negligible to moderate, depending on the location within the national seashore and the time of year. Projected increased PWC use levels would not increase the severity of noise impacts. Impacts would remain short term, occurring in daylight hours during the warmer months. The soundscape would not be impaired.	removal of PWC use from this area. Noise from personal watercraft and other boats within and near the national seashore would continue to have negligible to minor adverse impacts on other recreational users. The soundscape would not be impaired.	Noise from PWC and motorized boat use within and near the national seashore would continue to have negligible to minor adverse impacts on other recreational users. The soundscape would not be impaired.	boundary. On a cumulative basis, noise from other motorboats would continue to have negligible to minor adverse impacts. The soundscape would not be impaired.
Wildlife and Wildlife Habitat				
• Impacts of PWC Use	Impacts to wildlife using nearshore habitats in areas of high PWC use would be minor because noise-sensitive species are not expected to regularly use these areas or immediately adjacent habitats, especially during the summer. Impacts on wildlife using marshes, submerged aquatic vegetation beds, and shoreline areas near low PWC use areas are expected to be moderate because species would likely be less accustomed to high levels of human activity and noise. Occasional PWC use in nearby areas could have moderate adverse effects on wading and shorebirds, waterfowl, and other wildlife by disrupting normal nesting, foraging, or resting activities. The adverse effects of less frequent PWC use in the low use areas would be potentially greater than in the high use areas, where wildlife would be more accustomed to human uses. Cumulative impacts from all visitor uses at Fire Island National Seashore would be short term, moderate, and adverse. Wildlife or wildlife habitat would not be impaired.	Impacts to wildlife in areas remaining open to PWC use would be minor, adverse, and long term because species sensitive to noise and human activity are not expected to regularly occur in these areas during high use periods. Prohibiting PWC use over a large area of Fire Island National Seashore would result in short- and long-term beneficial impacts to wildlife and habitat. Cumulative impacts to wildlife would be minor to moderate and adverse in areas remaining open to PWC use, similar to alternative A. In areas closed to PWC use (a large percentage of the national seashore) impacts would be beneficial over the short and long term. Wildlife in areas closed to PWC use could be adversely affected by noise and possible water quality impacts in adjacent areas; however, these effects are expected to be negligible. Wildlife or wildlife habitat would not be impaired.	Impacts to wildlife from PWC use would be short term and minor because species sensitive to noise and human activity are not expected to regularly occur in these areas during high use periods. Prohibiting PWC use throughout a large portion of the national seashore, and requiring no-wake speeds in ferryways, would have short- and long-term beneficial impacts to wildlife and habitat. Restricting PWC access to most of the shallow water habitat along the national seashore would enhance the quality of essential fish habitats in these areas, a long-term beneficial impact. Cumulative impacts to wildlife would be short term, minor to moderate, and adverse, similar to alternative A except fewer areas would remain open to PWC use. Wildlife using closed areas adjacent to PWC use areas could be affected by noise and possible water quality impacts in adjacent areas; however, such effects are expected to be negligible. Wildlife or wildlife habitat would not be impaired.	Eliminating PWC use within the national seashore boundary is expected to have beneficial impacts on wildlife species associated with nearshore and shoreline habitats. Restricting PWC access to shallow water habitat along the national seashore would also enhance the quality of essential fish habitats in these areas, a long-term beneficial impact. Cumulative impacts are expected to be short term, minor to moderate, and adverse, similar to alternative A, because other motorized uses would continue. Wildlife or wildlife habitat would not be impaired.
• Impacts on Aquatic Fauna	Alternative A would have minor to possibly major adverse effects on aquatic fauna, particularly in the Great South Bay waters in the western section of the	Reducing underwater noise in the eastern section of the national seashore would have a long-term, beneficial impact to aquatic fauna in this area. A reduction in	Alternative C would have a beneficial impact to aquatic fauna from reduced underwater noise in the eastern section of the national seashore and in nearshore	The no-action alternative would result in long-term beneficial impacts to the underwater soundscape of Fire Island. No change in motorized boat

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	national seashore. On a cumulative basis long-term, moderate to possibly major, adverse impacts could be possible as a result of all motorized watercraft activity. No impairment to aquatic fauna is expected because no species would be eliminated or suffer substantial population declines, and the park would not be prevented from fulfilling its purpose.	emissions due to new technologies would contribute to reduced noise emissions. In the western and central sections of the national seashore, impacts would be similar to those described for alternative A. However, noise could increase locally. PWC use would have a minor to possibly major adverse effect on aquatic fauna. Cumulative effects would be similar to alternative A — long-term, moderate to possibly major, adverse impacts as a result of all motorized watercraft uses. However, eliminating PWC use in the eastern section of the national seashore would create long-term beneficial impacts in this area. No impairment to aquatic fauna is expected.	waters around the island. In the western and central sections, impacts would be similar to alternative B except in the 1,000-foot buffer zone. PWC use would have a minor to moderate adverse effect on aquatic fauna in nearshore waters and minor to possibly major impacts in areas open to PWC use. Cumulative effects would be similar to alternative A, with no change expected in deeper waters or in areas outside the national seashore boundary. Impacts would be moderate to possibly major. No impairment to aquatic fauna is expected.	use is expected in deeper waters and in areas outside the national seashore boundary, so impacts on aquatic fauna would be moderate to possibly major, the same as alternative A. Long-term beneficial impacts could be expected from banning PWC use in NPS jurisdictional waters. No impairment of aquatic fauna is expected.
Threatened, Endangered, or Special Concern Species	Threatened or endangered species in the area of Fire Island National Seashore are not likely to be adversely affected by PWC use under alternative A. Speed limit restrictions within 100 feet of the shoreline and mandatory buffers around sensitive shorebird nesting areas would reduce the potential for adverse effects. Sea turtles are not likely to be adversely affected by PWC use because they are expected to avoid high use areas as a result of noise and activity. Foraging by bald eagles and peregrine falcons could potentially be affected by PWC use; however, because these birds are typically present at a time of year when PWC use is low, adverse effects are not likely. Potential effects to the seabeach amaranth are expected to be minimal because foot traffic associated with PWC use would occur primarily in low beach areas where the plant does not occur. Cumulative impacts are not likely to adversely affect threatened or endangered	Threatened or endangered species are not likely to be adversely affected by PWC use. Effects would be the same as alternative A in areas remaining open to PWC use. Requiring PWC users to operate at 5 mph or less within 100 feet of the shoreline would minimize adverse effects associated with rapid approaches and noise to sensitive shorebirds in shoreline habitats. Beneficial effects are expected in areas closed to PWC use. Cumulative impacts would be similar to alternative A; however, PWC use would no longer contribute to any impacts in areas where use was banned. No impairment of threatened, endangered, or sensitive species is expected.	Alternative C is not likely to adversely affect federal or state listed threatened or endangered species. Effects would be similar to alternative A; however, restricting PWC use within 1,000 feet of any shoreline would further minimize potential impacts to sensitive shorebirds. Cumulative impacts would be similar to alternative A, with no contribution from PWC use to any impacts in areas where use was banned. No impairment of threatened, endangered, or sensitive species is expected.	Eliminating PWC use within Fire Island National Seashore would ensure that no impacts to threatened or endangered species would occur as a result of this use within NPS boundaries. Cumulative impacts are not likely to adversely affect federal or state listed threatened or endangered species in Fire Island National Seashore, similar to alternative A. PWC use would not contribute to any impacts. No impairment of threatened, endangered, or sensitive species is expected.

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	species in Fire Island National Seashore. Threatened, endangered, or sensitive species are not expected to be impaired.			
Shoreline Vegetation / Wetland Habitats (Also see Submerged Aquatic Vegetation)	Impacts to shoreline vegetation from foot traffic associated with PWC access to beach areas, and to marsh habitats from PWC use in shallow water habitats would be short term and minor to moderate because of low levels of PWC use in affected areas and limited access to shallow water habitats. Minor to moderate, direct and indirect, adverse cumulative effects to shoreline and wetland vegetation are expected in association with continued foot traffic around landing areas and impacts to tidal wetland habitat associated with limited access to shallow water habitats. No impairment to shoreline or wetland vegetation is expected.	Impacts to shoreline vegetation would be short term and minor to moderate as a result of foot traffic associated with PWC access to beach areas, the same as alternative A. Impacts to tidal wetland habitats from PWC use could also occur, but impacts are expected to be minor because PWC access to tidal wetland habitats along the national seashore would be restricted and because PWC users would likely avoid operating in shallow water habitats to prevent damage to their craft. Minor, adverse, direct, and indirect cumulative effects to shoreline and wetland vegetation are expected in association with continued foot traffic around landing areas and increased motorized use in the future. No impairment to shoreline or wetland vegetation is expected.	Short-term, minor impacts to shoreline vegetation would result primarily from foot traffic associated with PWC access to beach areas. Beneficial impacts to tidal wetland habitats are expected as a result of restricting PWC use within 1,000 feet of any shoreline. Minor, adverse, direct cumulative impacts to shoreline vegetation are expected in association with continued foot traffic around landing areas. Cumulative beneficial impacts to vegetation associated with wetland habitats are expected due to the 1,000-foot buffer zone. No impairment to shoreline or wetland vegetation is expected.	Effects to shoreline and wetland vegetation from closing Fire Island National Seashore to PWC use would be long term and beneficial. On a cumulative basis beneficial effects would be minor because of continued foot traffic associated with other park users. Cumulative beneficial impacts to vegetation associated with the wetland habitats are expected from banning PWC use. No impairment to shoreline vegetation is expected.
Submerged Aquatic Vegetation	Short- and long-term, moderate, direct impacts to submerged aquatic vegetation are expected due to mechanical removal or damage from PWC collisions. Indirect impacts could result from suspended sediments settling on plants after disturbance and modification of substrates (i.e., scouring) as a result of PWC operation in shallow water habitats. Although PWC use in shallow vegetated flats could destroy or fragment SAV meadows, these habitats are generally avoided by PWC users to prevent damage to their engines. Adverse direct and indirect cumulative effects associated with increased future use by all motorized watercraft users would be moderate as a result of	Short- and long-term, minor impacts to submerged aquatic vegetation are expected, similar to alternative A, but to a lesser degree because restricting PWC access to large areas of shallow flats along the national seashore would reduce the overall potential for impacts. Cumulative impacts associated with increased future use by all motorized watercraft users would be minor and adverse because large areas would be closed to PWC use and most other watercraft cannot access shallow water habitats. No impairment to submerged aquatic vegetation is expected.	Direct and indirect impacts to submerged aquatic vegetation would be similar to alternative A, but would be less extensive. Restricting PWC access to large areas of shallow flats, including all areas within 1,000 feet of a shoreline within the national seashore, would reduce direct and indirect impacts to SAV habitats to short-term, minor, adverse impacts. Cumulative impacts associated with increased future use by all motorized watercraft users would be minor and adverse because nearshore areas would be closed to PWC use and most other watercraft cannot access shallow water habitats. No impairment to submerged aquatic vegetation is expected.	Eliminating PWC use within the national seashore boundary would result in a long-term, beneficial impact to SAV communities. Impacts associated with the operation of other watercraft in areas closed to PWC use are expected to be minor due to the inability of most watercraft to access the shallow water habitats. No impairment to submerged aquatic vegetation is expected.

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	limited access to the shallow water habitats. No impairment to submerged aquatic vegetation is expected.			
Visitor Experience	Continued PWC use would result in negligible to moderate adverse impacts on visitor experiences, depending on the location and seasonal variations in visitor use. There would be moderate adverse impacts between PWC users, birdwatchers, and anglers during the summer. This alternative would partially meet the park's strategic goal for improved visitor satisfaction (in the case of PWC users). Cumulative impacts related to all other watercraft and other visitors would continue to result in negligible impacts, since there would be little noticeable change in visitor experiences. Most visitors would continue to be satisfied with their experiences at Fire Island National Seashore.	Restricting PWC use to certain areas would result in a beneficial impact to visitor experiences, depending on location and seasonal variations in visitor use, as described for alternative A. PWC users would experience negligible to minor adverse impacts with the closure of certain areas to personal watercraft. This alternative would partially meet the park's strategic goal for improved visitor satisfaction (in the case of other boaters and non-boating visitors) by restricting PWC use to specific areas of the island. Cumulative effects of PWC and other motorized watercraft uses would be negligible since motorized boats would still be allowed in areas closed to PWC use. Most visitors would continue to be satisfied with their experiences at the national seashore, with a slightly greater benefit for visitors in areas where adjacent PWC use was restricted.	Alternative C would have beneficial impacts to the experiences of visitors other than PWC users. There would be minor to moderate adverse impacts to PWC users as a consequence of closing areas of the national seashore to PWC use, prohibiting use within the 1,000-foot buffer zone, and requiring no-wake speeds in ferryways. However, PWC users would still be allowed to operate outside the restricted areas and no-wake zones. Similar to alternative A, cumulative impacts for all PWC users in the region would be negligible to minor because other nearby areas would remain open to this use. Impacts on other boaters and visitors would be negligible since there would be little noticeable change in overall visitor experiences. Most visitors would continue to be satisfied with their experiences at the national seashore.	Banning PWC use within the national seashore boundary would have major adverse impacts on PWC users. Impacts on other boaters and visitors would be negligible to moderate and beneficial. Banning PWC use within NPS jurisdictional waters could drive PWC users to other regional areas where the additional use could affect other recreationists (e.g., other boaters), creating a minor adverse cumulative impact in those areas. Impacts on other boaters and visitors would be negligible since there would be little noticeable change in overall visitor experiences. Most visitors would continue to be satisfied with their experiences at the national seashore.
Visitor Safety	While the number of PWC users is not expected to increase substantially over the next 10 years, conflicts between PWC users and other water recreationists (swimmers and boaters) would result in moderate adverse impacts as use increased for all activities. Cumulative impacts on visitor safety would be negligible to minor over the next 10 years, depending on the type of water-oriented activity and its location.	Alternative B would eliminate the potential for PWC-related accidents in certain areas of the national seashore. In areas open to PWC use, existing conditions would continue, with negligible to moderate adverse visitor safety impacts. Cumulative impacts would be negligible to minor, with no contribution from PWC use within areas of the national seashore closed to this activity. Impacts related to the restriction of PWC use in the designated areas would be beneficial.	Alternative C would eliminate the potential for PWC-related accidents within the restricted use areas of the national seashore. No-wake restrictions in the ferryways would reduce the potential for accidents to negligible to possibly minor. An increased potential for accidents between PWC users and other boaters could occur outside NPS waters. Some beneficial impacts would result from restrictions on PWC use and subsequent fewer conflicts and accidents.	The overall reduction in accident potential from banning personal watercraft would be negligible to minor because many other uses at the national seashore are related to motorized watercraft and water-related activities, and there is always potential for accidents. Some beneficial impacts would result from restricting PWC use and subsequent fewer conflicts and accidents within the national seashore. Impacts on a cumulative basis would be negligible to minor because of the potential of increased safety hazards to other boaters operating in adjacent non-NPS waters due to possibly increased PWC activities.

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Socio-economic Environment	No measurable impacts are expected on the regional economy or the local communities.	Similar to alternative A.	Similar to alternative A.	Although no measurable regional economic impacts are expected, PWC dealerships could see a decrease in revenue. Several alternative locations for PWC use exist outside the national seashore, so PWC users would likely shift some recreational PWC use to other regional locations, potentially mitigating reductions in PWC sales.
National Seashore Operations and Management				
Enforcement Needs	Impacts would be long term and minor to moderate due to needs for additional law enforcement capability within the national seashore to enforce federal and state boating regulations.	Impacts would be similar to alternative A and would be long term and minor to moderate due to needs for additional law enforcement capability within the national seashore.	Impacts would be similar to alternative A and would be minor to moderate and long term due to existing needs for additional law enforcement capability within the national seashore	The no-action alternative would result in long-term, minor to moderate impacts to the enforcement needs of the park resulting from banning PWC use; once the ban was understood and observed by PWC users, impacts would be minor.
Conflict with State and Local Ordinances	PWC and boating regulations within the national seashore boundaries would continue to be the same as New York State boating laws and regulations. NPS regulations would have no effect on state or local ordinances.	Same as alternative A.	Same as alternative A.	State PWC regulations would not pertain to the national seashore. NPS regulations would have no effect on state or local ordinances.

THE AFFECTED ENVIRONMENT

Fire Island National Seashore is located on a 32-mile long barrier island off the south shore of Long Island, New York. The northern boundaries of the national seashore (from west to east) include the waters of Fire Island Inlet, Great South Bay, Narrow Bay, and Moriches Bay. The Atlantic Ocean comprises the southern boundary of the island. The Fire Island Lighthouse, the Sunken Forest, the Otis Park Wilderness Area, Smith Point County Park, and William Floyd Estate are all under NPS jurisdiction.

Coastal barriers, such as Fire Island, are unique land forms that provide protection for diverse aquatic habitats and serve as the mainland's first line of defense against the impacts of severe coastal storms and erosion. Located at the interface of land and sea, the dominant physical factors responsible for shaping coastal land forms are tidal range, wave energy, and sediment supply from rivers and older, pre-existing coastal sand bodies. Relative changes in local sea level also profoundly affect coastal barrier diversity. Six characteristics defining coastal barriers include that they

- are subject to the impacts of coastal storms and sea level rise
- buffer the mainland from the impact of storms
- protect and maintain productive estuarine systems that support the nation's fishing and shellfishing industries
- consist primarily of unconsolidated sediments
- are subject to wind, wave, and tidal energies
- include associated landward aquatic habitats that the non-wetland portion of the coastal barrier protects from direct wave attack (USFWS 2000)

Coastal barriers protect the aquatic habitats between the barrier and the mainland. Together with their adjacent wetland, marsh, estuarine, inlet, and nearshore water habitats, coastal barriers support a tremendous variety of organisms. Millions of fish, shellfish, birds, mammals, and other wildlife depend on barriers and their associated wetlands for vital feeding, spawning, nesting, nursery, and resting habitat.

WATER RESOURCES

Sensitive aquatic systems around Fire Island National Seashore that may be affected by water quality include, among others submerged aquatic vegetation and associated fauna, marshes, resident and non-resident nektonic communities (fish, reptiles, and marine mammals), and shellfisheries. The following section describes existing water quality conditions that have a direct impact on these aquatic systems.

SURFACE WATER

Fire Island National Seashore, located on Great South Bay and Moriches Bay to the north, is within the South Shore Estuary Reserve (SSER). The reserve is divided by five tidal inlets, two of which border Fire Island National Seashore: Fire Island Inlet to the west and Moriches Inlet to the east (see Location map). These inlets influence the bays, providing navigable connections to the Atlantic Ocean and allowing for the tidal exchange of water. Natural barrier islands, such as Fire Island National Seashore, typically experience processes such as overwash events, the cutting of inlets across the

barrier islands during hurricanes and other violent storms, and the formation of tidal shoals. Fire Island has experienced repeated overwash events (NPS, Conley n.d.). These processes control circulation patterns throughout the coastal bays. Inlets are essential for creating circulation and flushing patterns, thus maintaining healthy water quality (South Shore Estuary Reserve Council [SSERC] and NYS DOS 1999).

The tidal current pattern on the bayside of the island is influenced by the inlets on its western and eastern ends. Flood tides enter both inlets and diverge to fill the basin. Great South Bay has three current channels and Moriches Inlet has two. Moriches Bay feeds Great South Bay on the flood tide and drains it on the ebb (NPS, Conley n.d.).

WATER QUALITY

Water quality monitoring programs in the Fire Island area are numerous and exist at all levels of government. The U.S. Geological Survey Water Resources Division manages a monitoring program targeted to characterize groundwater conditions, water flow regimes, water quality (discontinued in 1996), and early warning against coastal flooding (SSERC and NYS DOS 1999). The New York State Department of Environmental Conservation directs state programs that address public health (classification of shellfish areas), water quality and biological characteristics, *Pfisteria* assessments of marine waters, and remote sensing of submerged aquatic vegetation. Suffolk County monitors groundwater and stream water quality. Additional monitoring programs occur at the township level and through citizen programs.

The 1996 Priority Waterbody List detailed the impaired waterbodies of the area (SSERC 1999), including Great South Bay. Great South Bay is listed as a priority waterbody due to pollution resulting from stormwater and marina activities. In Moriches Bay streams and other waterbodies were listed as impaired due to nutrients, silt, priority organics, and pathogens. Water quality samples collected by Suffolk County in the Islip area (Suffolk County Water Authority 2001) identified a range of pollutants (radioactivity, inorganics, synthetic organic compounds, volatile organic compounds).

The Suffolk County water quality study showed a total of 30 waterbody segments at Great South Bay and Moriches Bay with precluded, impaired, stressed, or threatened uses (SSERC 1999). According to this study, primary impaired uses included shellfishing and fish survival. Fish consumption and/or bathing were less impaired. Areas of contaminated sediments have a direct effect on the water quality of Great South Bay. Contaminants that have the potential to accumulate in sediments and be released into the water column include chlordane, PCBs, and certain heavy metals. The 1996 "Priority Water-body List" revealed non-point sources of pollution as the primary reason for impairments of several waterbody segments (NYS DEC 2000a).

The shallow bays and streams of Great South Bay are biologically highly productive ecosystems due to high loadings of nutrients and abundant sunlight that combine to produce high levels of primary production (phytoplankton). In addition, human development in coastal areas has significantly increased nutrient loadings. These conditions resulted in waves of eutrophication around the estuary. The New York State Department of Health issued several fish consumption advisories concerning fish caught in these waters.

Suffolk County's ongoing monitoring program revealed nitrogen values were generally higher along the north shore of Great South Bay. The study also shows that the lowest nitrogen concentrations in water samples were in the area of the ocean inlets, tending to increase east and west of the inlets (SSERC 1999). The total nitrogen average in Great South Bay is 0.60 mg/l, while in Moriches and

Shinnecock Bays it is 0.45 mg/l and 0.35 mg/l, respectively. This trend in better water quality in eastern waters is due to fewer land-based sources of pollution and increased water exchange through the inlets. Findings of this report included:

Stormwater results in impacts across the South Shore Estuary Reserve.

Shellfishing closures are due to pathogens in stormwater runoff.

Nonpoint sources of pollution include channelization, leachate from landfills, nutrient-rich sediments, and wastewater treatment systems.

Low levels of dissolved oxygen (4.0 mg/l) are typically found along the northern margin of bays or near the mouths of tributaries.

Hydrological, geomorphological, and meteorological factors affecting water quality at Fire Island National Seashore include the following aspects (SSERC 2000):

annual precipitation of 118 cm; flow from 320 square kilometers of watershed to the South Shore Estuary Reserve is approximately 9.8×10^8 L/day

groundwater flow averages 2×10^8 L/day

average salinity at South Shore Estuary Reserve is 26 parts per thousand (ppt)

average depths range between 1 and 5 meters

Tides are higher in the ocean than in the Great South Bay because water rises faster than it can enter the estuary; for example, in Moriches Inlet, tidal range is about 65% of the ocean tidal range in the vicinity of the inlet (NYS DOS 2000). Mean tidal ranges at Moriches Inlet are 2.28 feet and at Fire Island Inlet 2.61 feet.

Tidal currents along the shore are small, but measurable. Vertically averaged tidal current increases from 5 cm/sec in the eastern part of Great South Bay to 15 cm/sec in the western part. Currents through the Fire Island Inlet can reach speeds of 70 cm/sec.

FEDERAL/STATE REGULATIONS AND STANDARDS

The U.S. Environmental Protection Agency has developed national recommended water quality criteria for priority pollutants in ambient water for the protection of aquatic life and human health (US EPA 1998). These criteria have been adopted as enforceable standards by most states. The Clean Water Act and Federal Pollution Control Act regulate and protect all national waters. Under these laws all states must submit a 305(b) report, which characterizes the quality of their waters on a watershed level, and a 303(d) list, which establishes which specific waterbodies do not meet the federal or state water quality standards for its designated use(s). The watersheds are rated as follows:

Category I: Watersheds are in need of restoration and do not meet clean water and natural resource goals.

Category II: Watersheds are meeting goals and may need action to maintain standards.

Category III: Watersheds have pristine or sensitive aquatic conditions (most of these are designated as wilderness, wild and scenic rivers, or outstanding natural resource waters).

Category IV: Watersheds do not have sufficient data to make an assessment.

In New York water quality standards may be more stringent than the federal criteria and regulations established by the Environmental Protection Agency. State standards are consistent with EPA's antidegradation policy (40 CFR 131.12[a][1-3]), which requires states to adopt policies that establish three tiers of protection:

Tier 1: Water quality is necessary to support existing uses and is maintained.

Tier 2: Water quality is better than the minimum level necessary to support protection and propagation of fish, shellfish and wildlife, and recreation in and on the water ("fishable/swimmable"), and water quality is also maintained and protected unless, through a public process, some lowering of water quality is deemed necessary to accommodate important economic or social development.

Tier 3: Waterbodies are of exceptional recreational or ecological significance, and water quality is maintained and protected.

New York classifies its saline waters based on five use designations (NYS DEC 1998):

Class SA: Designated best usages are shellfishing for market purposes, primary and secondary contact recreation, and fishing. These waters shall be suitable for fish propagation and survival.

Class SB: Designated best usages are primary and secondary contact recreation and fishing. These waters shall be suitable for fish propagation and survival.

Class SC: Designated best usage is fishing. These waters shall be suitable for fish propagation and survival. Water quality shall be suitable for primary and secondary contact recreation, although other factors may limit the use for these purposes.

Class I: Designated best usages are secondary contact recreation and fishing. These waters shall be suitable for fish propagation and survival.

Class SD: Designated best usage is fishing. These waters shall be suitable for fish survival. This classification may be given to those waters that, because of natural or man-made conditions, cannot meet the requirements for primary or secondary contact recreation and fish propagation.

Once a waterbody is classified, the numeric water quality standards for various chemical, biological, and physical constituents established by New York State Department of Environmental Conservation are applied. These numeric standards determine whether or not a waterbody can support the designated uses. If a waterbody does not meet the numeric standards, it is considered impaired and placed on the 303(d) list. Table 3 summarizes the state and federal water classifications for waters within Fire Island National Seashore.

TABLE 3: WATERBODY CLASSIFICATIONS AT FIRE ISLAND NATIONAL SEASHORE

Waterbody	Watershed	State Use Designation[1]	303(d) Listed Impairment[2]	Federal Designation: EPA Watershed Category[3]
Great South Bay	Southern Long Island (02030202)	Class SA	Pathogen	Category I
Moriches Bay	Southern Long Island (02030202)	Class SA	Pathogen	Category I

Source: NYS DEC 1998; NYS DEC 2000; US EPA 1998.

COUNTY STUDIES

The Suffolk County Bureau of Marine Resources (Office of Ecology) has monitored water quality in the South Shore Estuary Reserve since 1976. None of the parameters were those of primary concern for PWC or boat use (e.g., BTEX). Seven stations are located within Fire Island National Seashore boundaries (see Table 4). Physical water quality data was reviewed for samples, collected at the bottom of the water column, from 1996 through 2000. Table 4 summarizes water quality data and indicates that the stronger currents and higher volumes of water in the Fire Island Inlet area favor better water clarity (higher Secchi readings), higher salinity levels, and higher dissolved oxygen values than the monitoring stations located to the east.

TABLE 4: FIRE ISLAND NATIONAL SEASHORE PHYSICAL WATER QUALITY PARAMETERS

	Depth (ft)			Secchi (ft)			Dissolved Oxygen (mg/l)			Salinity (ppt)		
Station*	Min.	Max.	Avg.	Min.	Max.	Avg.	Min.	Max.	Avg.	Min.	Max.	Avg.
090100	7.0	15.0	10.8	2.0	>9.0	-	4.6	10.9	7.7	21.2	30.8	25.1
090140	4.0	14.0	6.7	2.0	>6.5	-	6.0	11.0	8.7	21.6	27.7	24.8
090150	7.0	15.0	12.7	1.0	>12.0	-	4.2	12.5	8.5	21.2	29.1	25.3
090180	7.0	18.0	13.8	2.0	>15.0	-	5.6	14.0	8.6	22.6	30.8	28.0
090200	15.0	34.0	25.6	2.0	>20.0	-	5.2	12.5	8.8	24.4	32.2	29.3
090280	8.0	15.0	10.2	1.0	>9.0	-	5.1	13.4	8.7	24.4	32.2	27.0
090300	5.5	22.0	14.5	3.0	>13.0	-	6.3	11.1	8.5	23.4	29.6	26.8

Source: R. Nuzzi, Suffolk County Office of Ecology, pers. comm., T. Taylor, LBG, April 16, 2002.

* **Station**	**General Location**
090100	West side of Smith Point Bridge
090140	FLG “1" buoy, 0.5 mi north of the entrance to the Davis Park Marina
090150	1.9 mi SSE of Green Point
090180	FLR "6" buoy in west channel, 0.9 mi NNW of West Fire Island
090200	Fire Island Inlet, 0.65 mi east of bridge
090280	Center span of Robert Moses Causeway Bridge
090300	Ocean Beach STP outfall, approx. 0.15 mi south of buoy C "15"

AIR QUALITY

The Environmental Protection Agency defines ambient air as “that portion of the atmosphere, external to buildings, to which the general public has access” (40 CFR Part 50). In compliance with the 1970 Clean Air Act and the 1977 and 1990 Clean Air Act amendments, the Environmental Protection Agency has promulgated national ambient air quality standards (NAAQS) and regulations. The standards were enacted for the protection of the public health and welfare, allowing for an adequate margin of safety. To date, the agency has issued standards for six criteria pollutants: carbon monoxide (CO), sulfur dioxide (SO_2), particles with a diameter less than or equal to a nominal 10 micrometers (PM_{10}), ozone (O_3), nitrogen dioxide (NO_2), and lead (Pb). Areas that do not meet national standards are called non-attainment areas.

There are primary and secondary air quality standards. Primary standards are designed to protect sensitive segments of the population from adverse health effects, with an adequate margin of safety, which may result from exposure to criteria pollutants. Secondary standards are designed to protect human health and welfare and, therefore, in some cases, are more stringent than the primary standards. Human welfare is considered to include both the natural and man-made environments. Each state and locality has the primary responsibility for air pollution prevention and control. Under the Clean Air Act as amended, state and local air pollution control agencies have the authority to adopt and enforce ambient air quality standards that are more stringent than the national standards. New York has adopted specific standards that relate to various classifications of areas. In some cases, these differ from the national ambient air quality standards.

Fire Island National Seashore is designated as a class II airshed, which means that the national seashore's air quality is protected by allowing limited increases (i.e., allowable increments) over baseline concentrations of pollution for the pollutants sulfur dioxide (SO_2), nitrogen oxides (NO_x), and particulate matter (PM).

Fire Island National Seashore is in Suffolk County, within the New York Metropolitan Area and the NY-NJ-CT Air Quality Control Region (40 CFR 81.13, Nov. 6, 1991). The Environmental Protection Agency has designated the Suffolk County area as being in attainment for all criteria pollutants (CO, NO_2, PM_{10}, SO_2, and lead) except ozone, which is classified as severe-17, requiring the national ambient air quality standards to be met by 2007. Existing ambient air quality levels within or near the study area are monitored by the states and tabulated in annual reports (Table 5). Located within the ozone non-attainment area, the proposed actions are subject to the requirements and emission threshold set by the federal conformity rules (40 CFR Part 93), in which the emission threshold set for ozone precursor pollutants — nitrogen oxides (NO_x) or volatile organic compounds (VOC) — is 25 tons/year. All ambient air quality levels except ozone meet the national ambient air quality standards.

TABLE 5: REPRESENTATIVE MONITORED AMBIENT AIR QUALITY DATA

	New York State Monitoring Data (2001)		
Pollutant	Monitoring Station	Period	1st/2nd Highest
Carbon Monoxide (CO)	57 Division Street Holtsville, NY	1-hour 8-hour	3.9 / 3.4 ppm 2.3 / 2.2 ppm
Sulfur Dioxide (SO_2)	 57 Division Street Holtsville, NY	3-hour 24-hour Annual	93.6 / 88.4 $\mu g/m^3$ 62.4 / 59.8 $\mu g/m^3$ 13.0 $\mu g/m^3$
Particulates (PM_{10})	Eisenhower Park, Merrick Ave & Old County Road, Nassau, NY	24-hour Annual	31 / 28 $\mu g/m^3$ 16.3 $\mu g/m^3$
Ozone (O_3)	57 Division Street Holtsville, NY	 1-hour	 0.147 / 0.138 ppm
Nitrogen Dioxide (NO_2)	57 Division Street Holtsville, NY	Annual Average	 34 $\mu g/m^3$
Lead (Pb) Quarterly Average	Susan Wagner HS Brielle Ave. & Manor Rd. Richmond, NY	 Quarterly Average	 0.02 $\mu g/m^3$

Source: US EPA 2002

ppm = parts per million

$\mu g/m^3$ = micrograms per cubic meter

Most personal watercraft run on small, gasoline-powered outboard engines that contribute to approximately 5% of the national mobile source VOC emissions. In the areas dominated by boats, personal watercraft can contribute 10% or more of the regional hydrocarbon emissions (US EPA 2000a). When compared to all nonroad engines, recreational marine engines contribute approximately 30% of the total nonroad engine emissions, the second highest level of hydrocarbon emissions nationally. Other small marine spark-ignition engines contribute 50% annually to hydrocarbon emissions (US EPA 1996a).

Currently, most PWC utilize two-stroke outboard technology, in which the resulting gases from the combustion of an air/fuel/oil mixture are pushed through the cylinders along with exhaust gases. This type of technology can emit between 25% to 30% unburned (not combusted) fuel from its exhaust. To reduce hydrocarbon emissions, newer technology utilizes four-stroke spark-ignition technology, which reduces the amount of exhaust emissions. Four-stroke engines comprise less than 1% of the PWC market (US EPA 1996a).

Based on the design, two-stroke engines produce more power than the current four-stroke engines by burning higher amounts of fuel, resulting in higher ozone emissions. The four-stroke inboard engines used on larger marine vehicles would usually operate on carbureted and fuel-injection systems that can better regulate combustion activities (US EPA 1996a).

As a result of the increasing use of personal watercraft and other small marine vehicles, as well as the increasing potential effects on air quality, the Environmental Protection Agency requires outboard personal watercraft, wave-runners, and other small vessels to meet more stringent emissions regulations as outlined in 40 CFR Parts 89–91. These regulations began with the 1999 model year for all recreational marine vessels (Mace et al. 1998). This program allows the Environmental Protection Agency to work closely with outboard motor and PWC manufacturers for the development of better engine construction and technological solutions to meet the targeted air emission reductions in the marine environment (US EPA 1996a). New York has adopted an even more expedited schedule for PWC air emissions reduction requirements, which is essentially the same as California's (New York Environmental Statutes, sec. 19-050 2000).

SOUNDSCAPES

One of the natural resources of Fire Island National Seashore is the natural soundscape, also referred to as "natural ambient sounds" or "natural quiet." The natural soundscape includes all of the naturally occurring sounds of the seashore, such as calling birds and the surf, as well as the quiet associated with still nights.

"Noise" is defined as unwanted sound. Sounds are described as noise if they interfere with an activity or disturb the person hearing them. When elevated against the natural soundscape, which is all the sounds of nature in the absence of any human sound, all human sound is considered "noise." This does not, however, imply that all human sounds are inappropriate or unacceptable; such evaluations must consider management guidance such as park purpose, management zoning, resource sensitivity, impacts from the activity, and similar factors.

Sound pressure levels are commonly measured in decibels (dB), a logarithmic unit. The human ear is not equally sensitive to all sound frequencies, being generally less sensitive to very low and very high frequency sounds; therefore, the A-weighted decibel scale (dBA), which is calibrated to the human ear's response, is often used when analyzing impacts. Table 6 illustrates common sounds and their associated sound levels using this scale.

TABLE 6: SOUND LEVEL COMPARISON CHART

Decibels	How it Feels	Equivalent Sounds	Sound Levels at Various Locations in Fire Island National Seashore
140-160	Near permanent damage level from short exposure	Large caliber rifles (e.g., .243, 30-06)	
130-140	Pain to ears	.22 caliber weapon	Designated hunting areas
100	Very loud	Air compressor at 20 feet; garbage trucks and city buses	Banner planes flying overhead
	Conversation stops	Power lawnmower; diesel truck at 25 feet	
90	Intolerable for phone use	Steady flow of freeway traffic; 10 HP outboard motor; garbage disposal	
80		Muffled Jet Ski at 50 feet; automatic dishwasher; near drilling rig; vacuum cleaner	Standing on the beach on a windy day Touring the visitor center on a busy day

Decibels	How it Feels	Equivalent Sounds	Sound Levels at Various Locations in Fire Island National Seashore
70		Drilling rig at 200 feet; window air conditioner outside at 2 feet	Entrance road on a busy day
60	Quiet	Window air conditioner in room; normal conversation	Sitting on the beach at night
50	Sleep interference	Quiet home in evening	Hiking a trail in Otis Pike Wilderness Area
		Bird calls	Bird watching
40		Library	
30		Soft whisper	In a tent at a camp site after sundown
20		In a quiet house at midnight; leaves rustling	

Note: Modified from *Final Environmental Impact Statement, Miccosukee 3-1 Exploratory Well, Broward County, Florida* (U.S. Department of the Interior).

For the average human a 10 dB increase in the measured sound level is subjectively perceived as being twice as loud, and a 10 dB decrease is perceived as half as loud. The decibel change at which the average human would indicate that the sound is just perceptibly louder or perceptibly quieter is 3 dB. There is generally a 6 dB reduction in sound level for each doubling of distance from a noise source due to spherical spreading loss (e.g., if the sound level at 25 feet from a PWC was 86 dB, the sound level at 50 feet would be expected to be 80 dB, at 100 feet 74 dB, etc.).

Many factors affect how an individual responds to noise. Primary acoustical factors include the sound level, the distribution of sound levels across the frequency spectrum, and the duration (and other time-related factors such as how often it occurs, and timing sensitivity) of the sound. Secondary acoustical factors include the spectral complexity, sound level fluctuations, frequency fluctuation, rise-time of the noise, and localization of the noise source (Mestre Greve Associates 1992).

Non-acoustical factors also play a role in how an individual responds to sounds. Non-acoustical factors vary from the past experience and adaptability of an individual to the predictability of when a noise will occur. The listener's activity will also affect how he/she responds to noise.

Personal watercraft and outboard motors are similar in the actual noise level they generate (in terms of decibels), which is generally around 80 dB or less at 50 feet from a motorized boat or personal water-craft (US EPA 1974) but can range from below 80 to as much as 102 dB (Sea-Doo 2000; Bluewater Network 2001). However, unlike motorboats, personal watercraft are highly maneuverable and are used for stunts and acrobatics, often resulting in quickly varying noise levels due to changes in acceleration and exposure of the jet exhaust when crossing waves. The frequent change in pitch and noise levels, especially if operated closer to land, make the noise from personal watercraft more noticeable to human ears (Asplund 2001).

Sources of noise within the national seashore and surrounding areas include automobiles, boat motors, personal watercraft, motorcycles, all-terrain vehicles, various types of equipment (e.g., tractors, lawn mowers), power lines and transformers, and firearms during hunting season. Most sources of noise within the national seashore are generally localized or seasonal in duration. Examples include the use of all-terrain vehicles and firearms. Noise related to automobile traffic is relegated to the entrance roads and those areas where beach traffic is allowed (see Location map). A permit is required for off-road vehicle use. Single automobiles produce noise levels in the range of 70 dBA near the vehicle, while moderately heavy traffic may produce noise levels in the range of 85 to 90 dBA near the roadway (Miyara 1998).

Background noise at Fire Island National Seashore is expected to be in the western sections of the park, where the beach communities occur and there are increased numbers of people, versus the more central and eastern sections of the park that maintain a more natural landscape. Noise levels are affected in those areas of the park with vehicular access, such as the Smith Point Bridge and areas with visitor centers. The bayside of the island experiences more exposure to noise emanating from water-craft. Various types and sizes of watercraft are present in a transportation corridor. Smaller boats in this area use outboard engines, similar to PWC engines, with 15 hp to 130 hp. Larger fishing and performance vessels use both inboard and outboard diesel (compression ignition), ranging from 90 to 660 hp. Altogether, noise related to boating activity and background noise may be expected to be very high during the summer months. Natural sounds can be heard occasionally, but motorized noise is the primary noise, especially during daylight hours on the bayside of the island.

Areas such as the Otis Pike Wilderness Area are more sensitive to noise due to the undeveloped nature of the area. Consequently, PWC-generated noise caused by frequent changes in pitch and loudness from rapid acceleration, deceleration, and change of direction noticeably intrudes on natural soundscape.

WILDLIFE AND WILDLIFE HABITAT

MAMMALS

Seventeen species of terrestrial mammals were identified on Fire Island during surveys conducted by McCormick in 1974. Common species identified in the survey include white-tailed deer, eastern cottontail, red fox, raccoon, masked shrew, short-tailed shrew, muskrat, weasel, mink, white-footed mouse, and Norway rat. The little brown bat is the most common bat observed in the area. Feral cats and dogs are also present (U.S. Army Corps of Engineers [USACE] 1999).

The New York Bight has one of the highest diversities of marine mammals in the United States. Two species of marine mammals occur year-round in the waters off Fire Island National Seashore. These resident species include the bottle-nosed dolphin and the harbor seal. Transient marine mammals that occur regularly or in large numbers in the vicinity of the national seashore include the northern right whale, fin whale, Minke whale, humpback whale, and Beluga whale. It should be noted that the occurrences of these mammals are largely confined to offshore waters. Harbor porpoise have been sighted on rare occasion in the Great South Bay (USACE 1999).

AMPHIBIANS AND REPTILES

Eight reptile and one amphibian species occur on Fire Island National Seashore. Fowler's toad is the only identified amphibian species. Reptiles identified include eastern mud turtle, spotted turtle, northern diamondback terrapin, snapping turtle, eastern box turtle, eastern hognose snake, eastern garter snake, and northern black racer (USACE 1999).

Northern diamondback terrapins are common on the backbay sides of the barrier islands. The turtles forage in tidal creeks of marshes and in the open bays. The northern diamondback terrapin feeds on marine snails, clams, and worms. The species typically comes ashore in June to lay eggs, which hatch in late summer (USACE 1999).

Five species of sea turtles that occur seasonally in the waters around Fire Island National Seashore are either threatened or endangered (see "Threatened or Endangered Species," page 57).

BIRDS

More than 330 species of birds have been identified on Fire Island National Seashore (see Table 7 for the most common). Fire Island is located along the Atlantic flyway for shorebirds, waterfowl, and other birds that nest in the north and migrate south for the winter. The salt marshes, beaches, and dunes on the island are nesting places for various species of plovers, gulls, terns, geese, herons, and ducks. The American oystercatcher and black skimmer are two migratory species that are known to breed in the salt marshes and barrier beaches of Fire Island. The federally threatened piping plover also nests on the island.

TABLE 7: AVIAN SPECIES COMMON TO FIRE ISLAND NATIONAL SEASHORE

Bird Species	Spring	Summer	Early Fall	Late Fall	Winter
Coastal Birds					
Double-crested cormorant	c	c	c	c	u
Northern gannet	a	o	o	a	u
Laughing gull	c	c	c	c	-
*Greater black-backed gull	a	a	a	a	a
Ring-billed gull	c	u	c	c	c
*Jerring gull	a	a	a	a	a
*Common tern	a	a	a	o	-
*Least tern	c	c	c	-	-
Gull-billed tern	r	r	r	-	-
Royal tern	o	u	u	o	-
Shorebirds					
Semipalmated plover	c	u	a	u	-
**Piping plover*	u	u	u	-	-
Black-bellied plover	c	u	a	a	u
*American oystercatcher	c	c	c	c	r
*Willet	c	c	c	u	-
*Spotted sandpiper	u	u	c	-	-
Marbled godwit	-	-	o	o	-
Sanderling	c	u	a	a	c
Semipalmated sandpiper	c	u	c	u	-
Western sandpiper	-	-	u	u	-
Least sandpiper	c	u	c	o	-
Dunlin	c	-	o	c	c
Wading and Marsh Birds					
*Great egret	c	c	c	c	r
*Snowy egret	c	c	c	c	r
*Black crowned night heron	c	c	c	c	o
*Little blue heron	u	u	u	u	-
*Green heron	u	u	u	-	-
Tricolored heron	o	o	o	o	-
*Glossy ibis	c	c	c	-	-
Waterfowl					
Tundra swan	-	-	-	r	r
*Mute swan	u	u	u	u	c
Snow goose	c	-	-	c	o
Brant	a	o	-	a	a
*Canada goose	a	a	a	a	a
Wood duck	o	-	o	o	-
Black scoter	c	-	-	c	u
Bufflehead	c	-	-	c	c
Canvasback	o	-	-	o	o
Greater scaup	c	-	-	c	c
Lesser scaup	o	-	-	o	o
Common eider	o	-	-	o	o
Oldsquaw	c	-	-	c	c
Red-breasted merganser	c	-	-	c	c
Ruddy duck	o	-	-	o	o
Commom goldeneye	c	-	-	c	c

Bird Species	Spring	Summer	Early Fall	Late Fall	Winter
Surf scoter	c	-	-	c	u
White winged scoter	c	-	-	c	u

Source: Modified from NPS 1999b.
Notes: a – abundant c – common u – uncommon o – occasional r – rare
* Birds known to nest on or near Fire Island National Seashore
Italics = threatened/endangered species

Shorebirds

Fire Island and the surrounding bays and small islands provide habitat for a variety of both resident and migratory shorebirds. Shorebirds migrate annually between the Arctic and South America, moving through the area throughout the year. Northward migration, commonly known as spring migration, begins late winter, peaks in May, and lasts through June. Southward, or fall, migration begins in late June with peaks in late July and August and lasts into fall (NYS DOS 1998a).

Between 8 and 14 shorebird species are recorded annually in four South Shore Estuary Christmas Bird Counts. Three of the bird counts include areas of Fire Island National Seashore in the Great South Bay, Narrow Bay, and Moriches Bay. Dunlin account for an average 70% of shorebirds counted. Other common species are sanderling and black-bellied plover. A few birds, such as dunlin, black-bellied plover, sanderling, purple sandpiper, and common snipe, overwinter in small numbers (NYS DOS 1998a).

Migratory shorebirds use the beaches, marshes, and especially the intertidal flats as feeding grounds. Flocks of semipalmated plovers, least sandpipers, dunlin, semipalmated sandpipers, sanderlings, western sandpipers, purple sandpipers, short-billed dowitchers, black-bellied plovers, and yellowlegs feed on invertebrates that occur in the tidal flats, salt marshes, and beaches in the area. After feeding the birds rest on beaches above the high tide line and on the small islands in the area (USACE 1999).

The complex of flats, marshes, and spoil islands in Moriches Bay near the inlet are recognized as one of the best and most consistent shorebird concentration areas in Nassau and Suffolk Counties. Approximately 490 acres of tidal mud and sand flats are found near the inlet surrounding the East and West Inlet Islands. The major concentration of shorebirds at this site occurs during the fall and is comprised primarily of semipalmated plovers, black-bellied plovers, lesser and greater yellowlegs, semipalmated sandpipers, least sandpipers, and short-billed dowitchers (NYS DOS 1998a).

Waterfowl

Great South Bay is the largest enclosed, shallow saltwater bay in New York. The bay supports large concentrations of migrating and wintering waterfowl, particularly greater scaup, American black duck, brant, red-breasted merganser, common goldeneye, and bufflehead. Based on aerial surveys conducted by the New York State Department of Environmental Conservation, Great South Bay supports the largest wintering waterfowl concentrations in the South Shore Estuary Reserve and the state (due, in part, to the large size of the survey segment) (NYS DOS 1998a).

Scaup use the Great South Bay for resting and feeding on benthic invertebrates such as clams, mussels, and snails throughout the bay. Concentrations of diving ducks occur in shallow waters on the bayside of Fire Island National Seashore at Point O'Woods, Barrett Beach, and Long Cove. Notable concentrations of dabbling duck occur in the marshes on the bayside of Fire Island, and around East and West Fire Islands. Sea ducks, especially oldsquaw and scoters, and diving ducks also concentrate in the Fire Island Inlet (NYS DOS 1998a).

The barrier island shoreline along Moriches Bay is characterized by extensive salt marshes and tidal flats. About 50% of the Moriches Bay area is characterized by marshes and shoals. The waters of Moriches Bay support significant concentrations of wintering waterfowl, especially scaup and American black duck, and lesser numbers of Canada goose, brant, mergansers, mallard, mute swan, canvasback, common goldeneye, and bufflehead. Based on aerial surveys, Moriches Bay has the highest average concentration of canvasback of the south shore bays. The most important areas for dabblers are the flats and marshes behind Fire Island in western Moriches Bay, the marshes around the William Floyd Estate, and the marshes that occur where the freshwater streams feed into the bay, particularly in eastern Moriches Bay. Scaup concentration areas in Moriches Bay include the open water areas near the William Floyd Estate, the center of the bay east of Moriches Inlet, and in eastern Moriches Bay (NYS DOS 1998a).

Raptors

Numerous species of raptors have been identified on Fire Island National Seashore, including sharp-shinned hawk, turkey vulture, goshawk, Cooper's hawk, red-tailed hawk, red-shouldered hawk, broad-winged hawk, rough-legged hawk, bald eagle, northern harrier, American kestrel, osprey, and gyrfalcon. Owl species include barn owl, screech owl, snowy owl, long-eared owl, short-eared owl, and saw-whet owl. The long-eared owl, short-eared owl, barn owl, and saw-whet owl reportedly breed on the island. Other raptors known to nest on Fire Island National Seashore include the northern harrier, American kestrel, and osprey (USACE 1999).

Fire Island National Seashore serves as a migration corridor for raptors, with average migration totals of 5,000 hawks and a maximum total of 6,654 between 1980 and 1995 (NY Audubon 2002). High numbers of merlins, American kestrels, and peregrine falcons (in addition to other passerines) use the barrier island as a stop-over location during migration.

FISHERIES

More than 150 species of fish occur in the waters of Fire Island National Seashore. Many finfish species use the estuarine waters for spawning, young-of-year and nursery habitat, seasonal feeding grounds, and general living space. Common resident fish include mummichog, Atlantic silverside, striped killifish, northern pipefish, sheepshead minnow, threespine and fourspine sticklebacks, striped anchovy, and bay anchovy. The estuary is an essential nursery habitat for commercially, recreationally, and ecologically important species, including summer flounder, blackfish, black sea bass, bluefish, striped bass, Atlantic menhaden, butterfish, and scup. Resident fishes, especially the abundant bay anchovy and silversides, are prey species for most piscivorous fish and birds, and rely on the estuary for spawning and nursery areas. Other resident fish using the estuary as spawning and nursery habitats include mummichog, striped killifish, sticklebacks, naked goby, grubby, longhorn and shorthorn sculpin, pipefish, winter flounder, white perch, tomcod, weakfish, blackfish, cunner, northern puffer, sheepshead minnow, hogchoker, and oyster toadfish (NYS DOS 1998b). The surf zone supports abundant numbers of northern puffer, northern kingfish, striped bass, bluefish, weakfish, and summer flounder from April through November. Blueback herring, hickory shad, alewife, American shad, and butterfish are also abundant in the surf (USACE 1999).

The 1996 Magnuson-Stevens Act requires cooperation among the National Marine Fisheries Service, fishing participants, and federal and state agencies to protect, conserve, and enhance essential fish habitat. Essential fish habitat is defined as those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (16 USC 1802(10)). Essential fish habitat occurs for various

life stages of several species of fish in Great South Bay and the Atlantic Ocean waters surrounding Fire Island National Seashore. Table 8 identifies essential fish habitat in the vicinity of Fire Island National Seashore.

TABLE 8: ESSENTIAL FISH HABITAT IN THE VICINITY OF FIRE ISLAND NATIONAL SEASHORE

Species	Location	Eggs	Larvae	Juvenile	Adult	Spawning Adult
Atlantic butterfish	Great South Bay – Atlantic Ocean	x	x	x	x	
Atlantic herring	Great South Bay			x	x	
Atlantic mackerel	Great South Bay – Atlantic Ocean	x	x	x	x	
Atlantic salmon	Great South Bay (salinity >25%)				x	
Black sea bass	Great South Bay – Atlantic Ocean				x	
Bluefish	Great South Bay – Atlantic Ocean				x	x
Blue shark	Great South Bay – Atlantic Ocean				x	
Cobia	Great South Bay – Atlantic Ocean	x	x	x	x	
Dusky shark	Great South Bay – Atlantic Ocean		x			
King mackerel	Great South Bay – Atlantic Ocean	x	x	x	x	
Monkfish	Atlantic Ocean	x	x			
Pollock	Great South Bay (salinity >25%)			x		
Red hake	Atlantic Ocean	x	x	x		
Sand bar shark	Great South Bay – Atlantic Ocean		x	x	x	
Sand tiger shark	Great South Bay – Atlantic Ocean		x			
Skipjack tuna	Atlantic Ocean				x	
Scup	Great South Bay – Atlantic Ocean			x	x	
Spanish mackerel	Great South Bay – Atlantic Ocean	x	x	x	x	
Summer flounder	Great South Bay – Atlantic Ocean			x	x	
Whiting	Atlantic Ocean	x	x	x		
Windowpane flounder	Great South Bay	x	x	x	x	x
Winter flounder	Great South Bay	x	x	x	x	x
Yellowtail flounder	Atlantic Ocean	x	x			

Source: National Oceanic and Atmospheric Administration (NOAA) 2002.

SHELLFISH

Approximately 24 species of shellfish occur in the waters around Fire Island National Seashore (NYS DOS 1999a). Two species with commercial importance are the surf clam and the ocean quahog, or black clam. Surf clams are found from the lower intertidal zone to the sub-tidal zone and occur at depths of up to approximately 100 feet. Black clams are considered an offshore species and are typically found at depths of approximately 25 to 585 feet (USACE 1999). Examples of other shellfish species occurring in the area include Atlantic ribbed mussel, Atlantic razor clam, Atlantic oyster drill, bay scallop, blue mussel, channel whelk, common periwinkle, eastern oyster, razor clam, marsh periwinkle, northern moon snail, salt-marsh snail, and soft shell clam (NYS DOS 1999a).

Surf clams represent a significant standing crop to commercial fishermen. A 1966 survey conducted by the New York State Department of Environmental Conservation showed high inshore surf clam densities between Fire Island Inlet and Moriches Inlet. Densities are variable and depend on location. Based on the New York State Department of State technical report on molluscan shellfish in the South Shore Estuary, no commercially viable shellfish beds occur within or immediately adjacent to Fire Island National Seashore; however, beds do exist to the west of the seashore boundary in the Great South Bay (NYS DOS 1999a).

Elevated levels of coliform are responsible for the year-round closure of 12,886 acres of shellfish beds in Great South Bay and the periodic closure of three of its bathing beaches (NYS DOS 1999a). Elevated levels of fecal coliform bacteria from stormwater runoff, waterfowl, and vessel discharges of human waste have also closed 6,170 acres of shellfish beds in Moriches and Shinnecock Bays.

Nutrients and sediment in stormwater runoff have affected fish survival in tributaries, and nutrients are suspected of playing a role in the brown tide outbreaks in the subregion (NYS DOS 1999a).

Numerous species of crustacean shellfish occur and are harvested in the waters around Fire Island National Seashore, including blue crab, Jonah crab, rock crab, lady crab, fiddler crab, green crab, spider crab, hermit crab, mud crab, and horseshoe crab. Blue crabs are commercially harvested with crab pots. Dredges are also used in Great South Bay and Moriches Bay to take wintering crabs. Recreational crabbing of blue crab occurs in Great South Bay. Crabs are caught using collapsible traps, hand lines, and dip nets. Recreational crabbing for lady crab occurs in and near Fire Island Inlet during the summer, and recreational crabbing for rock crab occur in the same area during late fall. Blue crabs are taken at night from boats, docks, and piers using a dip net (NYS DOS 1999b).

THREATENED OR ENDANGERED SPECIES

WILDLIFE

Federally listed wildlife species documented to occur on Fire Island National Seashore include the threatened piping plover and bald eagle and the endangered roseate tern. Informal consultation with the U.S. Fish and Wildlife Service was initiated but written response was not received. The National Marine Fisheries Service has documented five species of sea turtles and three whales that occur in the area. As stated previously, listed sea turtles include the federally threatened loggerhead sea turtle, and the endangered Kemp's ridley, leatherback, green sea turtle, and hawksbill. Federally protected whales that occur seasonally off the coast of New York include the endangered northern right whale, humpback whale, and fin whale (see appendix B).

The piping plover has been listed as a federally threatened species since 1986. Piping plovers arrive on Fire Island in March; egg laying and incubation occurs from April through June, with chicks typically hatching from May through August. The birds begin leaving Fire Island in August and are almost completely gone by September (NPS 2001b). Adult piping plovers returning to the national seashore in spring can be found almost anywhere along the beaches. Nesting in recent years occurs primarily on the beaches in front of the Otis Pike Wilderness Area. Plovers have been documented in other areas of the park sporadically over the past 7 to 10 years. Plovers generally forage on the beach, but also in dune swales or on the bay shore if there is access through the primary dunes for flightless chicks (NPS 2001b).

Based on piping plover sightings or nest location data (11 recorded points), all sightings have been on the Atlantic coast beaches except for one near the shore of Fire Island Inlet and one on the back bay shore near Old Inlet. Piping plover counts have been conducted on Long Island since 1985, with an average of 16 birds per year on Fire Island from 1985 to 1993 (ranging from a low of 4 to a high of 26), and an average number of 8.6 pairs from 1994 to 2000 (a low of 4 and a high of 17 pairs). Piping plover nesting productivity on Fire Island National Seashore has been low, with about 0.79 fledgling per pair since 1993 (NPS 2001b).

The federally threatened bald eagle is occasionally sighted in the national seashore (NPS 2001b). An average of two bald eagles were counted on the national seashore during fall migrations each year between 1986 and 1995 (NY Audubon Society 2002).

The northeast breeding population of roseate terns has been listed as endangered since 1987. The roseate tern is exclusively a coastal bird that breeds on small islands or occasionally on barrier beaches. It arrives in coastal areas around Fire Island in April, with egg laying, incubation, and rearing

of chicks from May through August. Most roseate terns leave the coastal areas around Fire Island by the end of September. The only nesting colony within the national seashore is on West Inlet Island. Roseate tern nesting sites are always associated with common tern colonies in New York. Based on ``DEC records, at one time 200 pairs of roseate terns were documented on Fire Island. No pairs of roseate terns were documented on West Inlet Island between 1987 and 1996, and in 1996, 36 pairs of roseate terns were documented on West Inlet Island (NPS 2001b).

Five species of sea turtles have been documented around Fire Island National Seashore, although none nest in the area. The loggerhead sea turtle is federally threatened and the Kemp's ridley, leatherback, hawksbill, and green sea turtles are federally endangered. Sea turtles occurring in nearshore waters are typically small juveniles; the most abundant is the loggerhead, followed by the Kemp's ridley. The waters off Long Island are also warm enough to support green sea turtles from June through October. The leatherback sea turtle, which is the most commonly observed turtle from May through October, utilizes offshore areas and is not found in the estuaries or backbay areas. The hawksbill sea turtle rarely occurs in the area and is probably an anomalous visitor. Sea turtles begin arriving in the waters around Fire Island in June and July and remain for several weeks, using the shallow coastal waters to forage. Kemp's ridley and loggerheads feed primarily on benthic crustaceans, and green sea turtles feed primarily on eelgrass and algae. The leatherback sea turtle remains offshore of the barrier island and commonly feeds on jellyfish and ctenophores. All sea turtles in the area feed on submerged aquatic vegetation, including green fleece, sea lettuce, and eelgrass (USACE 1999). Sea turtles leave the area by late fall as water temperatures decrease.

Based on correspondence with the New York Natural Heritage Program, two state-listed species — the threatened common tern and the endangered least tern — have the potential to be affected by PWC use in Fire Island National Seashore. (A determination of the species with potential to be affected by PWC use is based on review of a state report, which provides species habitat and location information considered to be sensitive by the New York Natural Heritage Program and is not reprinted in this document.) The state endangered peregrine falcon is also documented to occur within the national seashore, but was not included in the Natural Heritage Program list.

The common tern arrives on Fire Island in April and May and remains until September or October. It nests from late May through July, and most young are fledged by September. Common terns typically nest in sand, gravel, or seaweed along ocean and backbay beaches and on the small islands in the Great South Bay. Based on observations documented between 1985 and 1998, with the exception of a ternery at Long Cove, most breeding occurs on the small backbay islands within the national seashore. Common terns typically rest on beaches during and after foraging in the ocean and back bays (NPS 2001b). An average of 760 pairs of common terns per year have been counted in the national seashore from 1985 through 1998. The Natural Heritage Program database indicates 11 common tern records: 2 points on the oceanside, 3 points on the bay beaches, and 6 points on smaller backbay islands including East Fire Island, West Fire Island, New Made Island, Sexton Island, and West Inlet Island. The most abundant terneries occur on New Made Island and West Inlet Island. Most breeding occurs on the small backbay islands. In most years observed (1985–1998), more than 98% of the tern pairs are found on the small islands in the Great South Bay. The only consistent ternery on Fire Island is at Long Cove (NPS 2001b).

The least tern arrives on Fire Island in April and remains through September. Egg laying, incubation, and rearing typically occur from May through August. Breeding habitat consists of flat, open sand, gravel, or dredge spoil with little vegetation. Nesting sites are typically associated with piping plover nesting sites (NPS 2001b). Least terns forage in the Great South Bay or on the ocean when the water is calm, with the most active foraging time in the early morning, and they commonly rest on beaches

during and after foraging (NPS 2001b). An average of 40 pairs of least terns per year have been counted in the national seashore from 1994 through 1999, predominantly at Watch Hill and Long Cove.

The state endangered peregrine falcon occurs at Fire Island National Seashore during the fall migration. An average of 146 peregrine falcons were counted during fall migrations each year between 1986 and 1995 (NY Audubon Society 2002).

PLANT SPECIES

The federally threatened seabeach amaranth occurs on overwash flats on the accreting ends of barrier islands, on lower foredunes of beaches, and on non-eroding beaches landward of the wrackline. The plant also occurs on blowouts and on dredge spoils. Seabeach amaranth seems to be incapable of competing with other plants and is typically found in areas with little or no vegetation. There are six recorded locations of seabeach amaranth on Fire Island. The largest concentrations of the plant have been recorded at Democrat Point and Smith Point (NPS 2001b).

VEGETATION

SHORELINE VEGETATION/WETLAND HABITATS

The topographic characteristics of the barrier island result in the development of characteristic zonation in vegetative communities from the ocean shore to the backbay mudflats. The zonation in vegetative communities occurs, in part, as a result of salt spray, sand deposition, wind flow, cyclic littoral erosion, and human and meteorological disturbances. The zonation in vegetative communities is more prevalent in areas where the primary and secondary dunes are well developed. Plants growing on primary dunes must be able to withstand high intensities of salt spray and survive periodic burial by sand. Woody shrubs will typically dominate the more stable secondary dunes and swales. Maritime forest communities are found leeward of the secondary dune system, and salt marsh communities will typically be found bayward of the maritime forest community. This zonation is not contiguous across Fire Island National Seashore but is found extensively throughout the area (USACE 1999). Some areas along the seashore have lost sections of the primary and secondary dune systems to erosion.

The majority of the coastal beach lacks vegetation. Where vegetation occurs, it is characterized by common saltwort, seaside spurge, and sea rocket. Vegetation on the oceanside of the primary dunes is typically dominated by beach grass with limited amounts of dusty miller and beach pea. The leeward sides of primary dunes, which are relatively undisturbed, are characterized by beachgrass, beach plum, bayberry, Virginia creeper, and poison ivy. Bearberry and beach heather occur in the dune and swale community, along with widely spaced beach heather. The landward side of the secondary dune system is dominated by woody shrubs and tree species, including black cherry, pitch pine, eastern red cedar, winged sumac, highbush blueberry, and American holly (USACE 1999).

Trees in the maritime forest are characterized by eastern red cedar, pitch pine, winged sumac, black cherry, American holly, and sassafras. Shrubs include highbush blueberry, serviceberry, and red chokeberry with some elderberry and arrow-wood. Herbaceous vegetation includes poison ivy, wild sarsaparilla, Virginia creeper, Canada mayflower, and false Solomon's seal (USACE 1999).

Salt marsh and tidal flat habitats occur along the backbay shoreline between the Fire Island Inlet and Moriches Inlet. Tidal wetland habitats are common along the backbay of the national seashore from

the western boundary of the Otis Pike Wilderness Area east to the Moriches Inlet, around East Fire Island, and along the shoreline of the William Floyd Estate. Maps prepared by the New York State Department of State, Division of Coastal Resources, show tidal wetlands in the South Shore Estuary Reserve, which includes Fire Island National Seashore (see appendix B). The most common type of salt marshes occurring in this area formed on wash over fans along back barriers and flood tidal deltas.

The salt marsh and tidal flat habitats can be divided into three zones, including the supratidal zone, intertidal zone, and subtidal zone. The supratidal zone occurs above the normal high tide level but is dissected by tidal channels and inundated during extreme high tides. The zone is typically flooded bi-monthly by spring tides and irregularly by storm tides. Dominant vegetation occurring in the high tidal marsh habitat includes stands of salt meadow cordgrass, groundsel tree, seaside goldenrod, bayberry, sea lavender, spike grass, blackgrass, and glasswort (USACE 1999). The intertidal zone occurs between the high and low tide levels and, depending on wind and tide conditions, is flooded once or twice per day. Vegetation in the lower salt marsh habitats is dominated by salt marsh cordgrass. The subtidal flat lies below the mean low tide level and is inundated most of the time. The subtidal flat is typically characterized by macroalgae, including sea lettuce, rockweed, green fleece, hollow green weed, Irish moss, graceful red weed, Agardh's red weed, false agardhiella, and banded weeds (USACE 1999).

SUBMERGED AQUATIC VEGETATION

Submerged aquatic vegetation (SAV) is a diverse assemblage of rooted macrophytes that grow in shallow water, under the surface, but not above it. Under federal regulations SAV beds are considered special aquatic sites (40 CFR 230). These plants are beneficial to aquatic ecosystems because they provide protective habitat for young and adult fish and shellfish, as well as food for waterfowl, fish, and mammals. They also aid oxygen production, absorb wave energy and nutrients, and improve the clarity of the water. In addition, SAV beds stabilize bottom sediments and suspended sediments present in the water.

Seagrass meadows dominated by eelgrass are abundant from Fire Island Inlet to Moriches Inlet. Large meadows of eelgrass have been identified in extensive shallow flats adjacent to the Otis Pike Wilderness Area. In most areas, the eelgrass is separated from the shoreline by narrow bands of unvegetated substrate. In more quiescent areas widgeon grass occurs in the narrow bands that separate the eelgrass from the shoreline (USACE 1999).

Several animals of commercial importance are abundant in eelgrass meadows and depend on the habitat for both nursery and adult habitat. Winter flounder use the eelgrass meadows for nursery habitat, and larvae of sea scallops depend on the dense grasses for protection from predators. In 1997 NPS staff observed 13 species of fish and 4 species of decopods in throw trap samples collected from eelgrass beds in Great South Bay. Spine stickleback was the most common fish species in the samples. Bay anchovy, northern pipefish, Atlantic silversides, seaboard goby, mummichog, winter flounder, American eel, and oyster toads were also common in the samples. The most common decopods observed included sand shrimp, grass shrimp, shore shrimp, and blue crab (USACE 1999).

VISITOR USE AND EXPERIENCE

Fire Island National Seashore reports an average of 600,000 recreational visitors a year, based on the number of people using the visitor centers on the island. However, taking into consideration the summer population and the private communities, visitation is probably closer to 3 million to 4 million

people. Seventeen private communities occur within Fire Island National Seashore —some consisting of only a few homes while others have hundreds, with restaurants, grocery stores, retail stores and other businesses, and an elementary school (in Ocean Beach). Rental properties, summer homes, and year-round homes exist on the island.

Access to most Fire Island communities is by ferry from terminals at one of three mainland ports: Bay Shore, Sayville, and Patchogue. At the western end of Fire Island, the Robert Moses Causeway leads into Robert Moses State Park, while on the island's eastern end, the William Floyd Parkway leads into Smith Point County Park. A main road provides access to the parks, but driving within the seashore boundaries is limited to permit holders west of Watch Hill and is not permitted in the Otis Pike Wilderness during piping plover breeding.

The majority of the national seashore is open year-round, excluding Sailors Haven and Watch Hill; which are open between May 15 and October 15. Peak visitation occurs May through September, when approximately 87% of the annual visitation occurs. There are no entrance fees; however, permits are required for camping in the Otis Pike Wilderness Area and the Watch Hill campground. Permits are also needed for driving, hunting, and sport fishing. Year-round residents in the villages of Ocean Beach and Saltaire number between 300 and 400 people, while in summer numbers increase to about 80,000 to 100,000 (Law et al. 2002). The seasonal population is comprised of both "day-trippers" and others who stay for periods ranging from one week to the entire season. Apart from several small hotels, inns and boardinghouses, most of the seasonal housing is either rental or time-shared. The majority of the park's visitors come from Long Island or elsewhere in the New York metropolitan area.

The National Park Service classifies visitation to Fire Island as either a *recreation visit* or a *nonrecreation visit*. A *visit* is defined as the entry by any person (except NPS personnel) onto lands and waters administered by the NPS. Same day reentries, negligible transits, and entries into detached portions of the same park on the same day are considered as a single visit. A *recreation visit* is defined as the entry of persons onto lands and waters administered by the National Park Service for recreational purposes, excluding government personnel, through-traffic (commuters), trades-people and persons residing within the park boundaries. Finally, a *nonrecreation visit* is defined as through-traffic, persons going to and from in-holdings, trades-people doing business in the park, and government personnel (other than NPS) with business in the park.

In 2001 Fire Island had 661,692 recreation visitors. Although this figure is 3.3% less than the 1990 figure of 683,962, recreation visits to the park have increased steadily overall since 1995. According to NPS growth figures, recreation visits to the park are forecast to increase 1.5% to 671,670 visitors in 2002 and by an additional 4.4% to 701,216 visitors in 2003.

VISITOR ACTIVITIES

The main attractions of Fire Island National Seashore are the Fire Island Lighthouse, the Sunken Forest, the Otis Pike Wilderness Area, and the William Floyd Estate.

Fire Island Lighthouse — Fire Island's most historically significant landmark was built in 1857 to protect ships from running ashore on the island. In 1987 New York State rebuilt the lighthouse as a museum and observatory.

The Sunken Forest — Located in Sailors Haven, the Sunken Forest is one of the last remaining maritime forests on the eastern seaboard. This naturally preserved area is abundant

with hardwood groves, dunes, swamps, and marshland. Some trees are estimated to be over 200 years old (NPS 2002).

The Otis Pike Wilderness Area — This 1,300 acre federally protected wilderness area is located on the eastern 7 miles of Fire Island, between Watch Hill and Smith Point. It is the only federal wilderness area in New York State.

The William Floyd Estate — The William Floyd Estate is located amid 600 acres of woods, ponds, and salt marsh on the mainland, at the western end of Moriches Bay. It is the historic home of William Floyd, a Revolutionary War general and signer of the Declaration of Independence. He was born there in 1734, and over eight generations of the Floyd family have lived there. In colonial times it was the center of a large plantation.

Fire Island National Seashore offers a variety of outdoor recreational activities to visitors, including surfing, swimming, camping and hiking, birdwatching, boating and canoeing, and fishing and clamming.

Surfing — During hurricane season, waves along Fire Island's south-facing shores have been known to exceed 10 feet. A series of sandbars and jetties enable variations in the island's surf conditions. Sandbar breaks can be found in Atlantique, Point O'Woods, and Smith Point. Steeper, faster wave conditions can be found near and between the two jetties at Ocean Beach.

Swimming — All of the island's 32 miles of ocean beaches are open to the public. Some areas are undeveloped shorelines, and some have showers and other amenities. The water temperature in the summer ranges from 50 to 68 degrees. The main swimming areas are Robert Moses State Park, Lighthouse Beach, Sailors Haven, Barrett Beach, Watch Hill, and Smith Point County Park. The beaches on the Great South Bay are generally warmer, with calmer waves.

Camping and Hiking — Fire Island provides limited camping facilities. One seasonal campground is located at Watch Hill. It is accessible only by ferry, private boat, or on foot from elsewhere on the island, with 26 tent-only sites, running water, grills, showers and bathrooms. Cost is $20 and reservations must be obtained through a lottery in April, which allocates campsites for the season. Wilderness camping [no amenities] is also permitted in the Otis Pike Wilderness Area. Camping is free but campers must register at the ranger station at Watch Hill. Watch Hill, Sailors Haven, and the Otis Pike Wilderness Area all have marked hiking trails.

Birdwatching — Fire Island is one of the best places in the New York City area for bird-watching. Its diverse habitats support a great variety of birds throughout the year, and it is a prime stopping place for birds on migration. More than 300 species of birds have been recorded on the island, which represents approximately one-third of all the birds found in North America.

Boating and Canoeing — Boating is popular on the Great South Bay, with numerous power-boats, sailboats, fishing boats, personal watercraft, and water taxis on the water each day. Canoes and kayaks can be found generally closer to shore. Several of the communities on the island have marinas and docking facilities for recreational boaters.

Fishing — Surfcasting for bluefish and striped bass is popular on the Atlantic beaches. On the bayside, there is an abundance of fluke, flounder, blues, stripers, crabs, and more. Bay fishing is best accessible by boat; however, the community docks have been known to be quite productive at times. There are also many charter services that provide offshore fishing opportunities around the Fire Island area.

VISITOR SATISFACTION

Since 1998, NPS staff at Fire Island National Seashore have provided visitors the opportunity to rate park services, from visitor center exhibits and concessions to recreation. Visitor satisfaction scores of 91% (1998) and 80% (1999) were tabulated. The goal is to increase overall visitor satisfaction scores on the annual surveys by improving customer service and communications, including providing recreational opportunities and providing for basic needs of visitors (NPS 2000d).

PWC USE

PWC use within Fire Island National Seashore boundaries in the Great South Bay began over 20 years ago, as soon as they were available and on the market. PWC users can access Fire Island National Seashore in a variety of ways; however, there are no public boat ramps or public roads within the national seashore boundaries. PWC users access the national seashore via marinas in the private communities and by landing on and launching from undeveloped beaches or larger vessels. Two visitor centers, Sailors Haven and Watch Hill, provide anchorage for watercraft, including personal watercraft (Law et al. 2002).

Various sources throughout the region provided estimates of typical PWC use in the Great South Bay and Fire Island National Seashore area. Staff from the Suffolk County Department of Parks and the Police Marine Bureau, local municipalities, local dealerships, and local marinas provided estimates of PWC use ranging from 5% to 25% of all watercraft on the water at any given time of the day during peak season. Although no annual counts are conducted of visitors accessing the park by boat or personal watercraft, NPS staff conducted an informal survey on Saturdays and Sundays during July 1999. During this survey the number of boats, including personal watercraft, that were present at 2 P.M. were counted, amounting to 200–300 watercraft, approximately 20% of which (40–60 vessels) were personal watercraft (Law et al. 2002). The waterways on the bayside of Fire Island are often congested, with a variety of recreational and fishing boats accessing the waters of the national seashore from the Great South Bay. Within Fire Island National Seashore, boaters often anchor off the shorelines at the visitor centers. Mooring buoys are also used.

PWC use is typically localized within Fire Island National Seashore, occurring in areas near the private communities, ferryways, and in areas near boat ramps. Park staff indicate that the heaviest usage and highest general visitation area for watercraft of any type is the western end of the island from the Fire Island Lighthouse to Oakleyville, or the western boundary of the Sunken Forest, on the bayside. PWC use is also prevalent along the eastern boundary in Moriches Bay near Smith Point County Park (J. Lippert, NPS, pers. comm., Apr. 12, 2002).

The majority of the PWC users within national seashore waters are private owners. Many PWC users own or rent houses on Fire Island and use personal watercraft to transit back and forth between the residential areas and Long Island. Larger boats moored in Great South Bay also use PWC to travel from their boats to Fire Island National Seashore. Other PWC users launch their vessels from Great Cove, Long Island, and travel to Kismet to access area restaurants. The oceanside of the national seashore is not a popular PWC recreational area because of the travel distance from the inlets to the oceanside of the island (Law et al. 2002).

More than 99% of the boat users within national seashore boundaries are from New York State. Of these, approximately 5% to 7% use personal watercraft. The majority (90%) of the boating visitors travel from within 30 miles of Fire Island (M. Bilecki, NPS, pers. comm., A. Cuschnir, LBG, May 2001).

VISITOR SAFETY

Personal watercraft comprise 7.5% of all registered vessels in the United States, but are involved in 36% of all boating accidents (NTSB 1998). In part, this is believed to be a boater education issue (i.e., inexperienced riders lose control of the craft), but it also is a function of how the craft are operated (i.e., no brakes or clutch; when drivers let up on the throttle to avoid a collision, steering becomes difficult).

STATE BOATING REQUIREMENTS

PWC users must abide by the following New York State watercraft laws and regulations when operating inside the boundaries of Fire Island National Seashore:

Safety:

- Operator must have a boating certificate or must be accompanied by a person with a boating certificate.
- Operator must wear a personal floatation device.
- If equipped, the operator must have the cut-off lanyard attached to him/her.

Age:

- Operator must be 16 years old or be accompanied by a person with a boating certificate.

Timing Restrictions:

- No operation from sunset to sunrise.

Restricted Activities:

- No operating within 500 feet of a bathing area unless the waterbody is less than 500 feet wide, then cannot operate in excess of 10 mph.
- No operating at excessive speed within 100 feet of the shoreline.
- Must operate below 5 mph when within 100 feet of the shore, a dock, pier, raft, float, or anchored boat.
- No reckless operation or maneuvering in a manner that unnecessarily endangers life, limb, or property, including weaving through congested vessel traffic, jumping the wake of another vessel when close to that vessel or when visibility is obstructed, or swerving at the last possible moment to avoid collision.

Other:

- Operator must have a visual distress flag and an auditory distress signal.
- Person cannot operate while impaired or intoxicated from alcohol or drugs.
- Personal watercraft must have at least two ventilators to remove any explosive gases.
- Personal watercraft sold or manufactured in New York must be consistent with the California air emissions reduction and regulations for new spark-ignition PWC marine engines (New York State Consolidated Laws [NYSCL], Environmental Conservation, 19-0306-A, 2000).

- Personal watercraft must be registered with the state.

Enforcement of PWC regulations tends to be difficult because many watercraft are launched from the Long Island side of the Great South Bay. Another issue is concurrent jurisdiction within NPS waters. In addition to NPS rangers, the New York State Department of Environmental Conservation, the Suffolk County Park Police, the Town of Brookhaven, and the Islip Harbor Police all have jurisdiction within the waters around Fire Island National Seashore.

ACCIDENTS AND INJURIES

Increased PWC use in recent years has resulted in more concern about the health and safety of operators, swimmers, snorkelers, divers, and other boaters. A 1998 NTSB study revealed that while recreational boating fatalities have been declining, PWC related fatalities have increased (NTSB 1998). Nationwide PWC accident statistics provided by the U.S. Coast Guard support the increase in PWC-related fatalities; however, since a peak of 84 PWC-related fatalities in 1997, accidents, injuries, and fatalities involving personal watercraft have decreased (M. Schmidt, U.S. Coast Guard [USCG], pers. comm., T. Taylor, LBG, Sept. 4, 2001). The U.S. Coast Guard's Office of Boating Safety studied exposure data to assess boating risks. This method compares boat types based on comparable time in the water. PWC use ranked second in boat type for fatalities per million hours of exposure in 1998, with a 0.24 death rate per million exposure hours. PWC-related accidents, fatalities, and injuries in New York State during the 1990s are shown in Table 9. In 2000, 34 of the 85 PWC-related accidents were caused by careless or reckless operator behavior (NYS OPRHP 2000).

TABLE 9: NEW YORK STATE PWC ACCIDENT TRENDS

Year	Accidents	Fatalities	Injuries
1991	40	0	21
1992	31	1	21
1993	45	1	32
1994	53	3	33
1995	117	3	48
1996	140	2	62
1997	121	6	65
1998	137	3	66
1999	117	4	70
2000	85	1	35

Source: New York State Office of Parks, Recreation, and Historic Preservation (NYS OPRHP) 2000.

The Suffolk County Marine Bureau reported 39 accidents in Great South Bay in 2001, 5 of which were PWC related. This area is patrolled not only by Suffolk County but the U.S. Coast Guard and local constables (S. Brussel, Suffolk County Police Marine Bureau, pers. comm., T. Taylor, LBG, Apr. 8, 2002). Eleven accidents or incidents involving personal watercraft have been reported at Fire Island National Seashore in the past five years; however, complaints concerning PWC users jumping ferry wakes and speeding through anchorage areas have increased (M. Bilecki, NPS, pers. comm., May 2001).

SOCIOECONOMIC ENVIRONMENT

A detailed description of the socioeconomic environment affected by PWC use at Fire Island National Seashore is provided in the report "Economic Analysis of Personal Watercraft Regulations in Fire Island National Seashore" (Law et al. 2002).

Several private communities on Fire Island rely heavily on tourism for their economic base. The population of Fire Island increases from 300–400 residents in the winter to 80,000–100,000 people in the summer. PWC use is a popular recreational activity along beaches near Long Island. In addition, personal watercraft provide an important form of transportation for some people on the local islands because many other forms of transportation (e.g., automobiles) have only limited access to the area, and there are no paved roads on the interior part of the island. Some PWC owners also use the craft to travel between their homes and larger boats that they own since shallow water adjacent to many communities prevents people from docking these boats near their homes.

Interview data suggest that most PWC activity in Fire Island National Seashore is by local residents who own vacation homes on the island. Only one PWC rental shop has been identified in the vicinity of the national seashore, in the Hampton area. The lack of PWC rental activity in the area suggests that PWC use is not a significant factor in tourist visitation to the island. In addition, interviews with property rental agencies on Fire Island indicate that PWC use is not a popular activity among visitors to these communities. Two marinas within Fire Island National Seashore are frequented by PWC users. NPS staff have identified 14 PWC dealerships in southern Long Island. Based on NPS interviews within these dealers, 30% to 90% of their customers go to Fire Island National Seashore. Most PWC sales are to local residents.

NATIONAL SEASHORE MANAGEMENT AND OPERATIONS

Rangers at Fire Island National Seashore enforce the state boating regulations to ensure visitor safety. Currently, Fire Island National Seashore has two personnel patrol the park jurisdictional waters. The patrols of the western district include approximately 16 person-hours on Friday, 25 person-hours on Saturday, 26 person-hours on Sunday, and approximately 3 to 4 person-hours per weekday. The eastern district is not patrolled as much (Law et al. 2002).

Law enforcement and rescue operations in national seashore waters are conducted with concurrent jurisdiction by the National Park Service and other law enforcement agencies, such as the Suffolk County Police Marine Bureau and the U.S. Coast Guard (Law et al. 2002).

ENVIRONMENTAL CONSEQUENCES

SUMMARY OF LAWS AND POLICIES

Three overarching environmental protection laws and policies guide the National Park Service — the National Environmental Policy Act (NEPA) of 1969, and its implementing regulations; the National Parks Omnibus Management Act of 1998 (NPOMA); and the National Park Service Organic Act.

1. The National Environmental Policy Act is implemented through regulations of the Council on Environmental Quality (40 CFR 1500–1508). The National Park Service has in turn adopted procedures to comply with the act and the CEQ regulations, as found in *Director's Order #12: Conservation Planning, Environmental Impact Analysis, and Decision Making* (2001), and its accompanying handbook.

2. The National Parks Omnibus Management Act of 1998 (NPOMA) (16 USC 5901 et seq.) underscores the National Environmental Policy Act in that both are fundamental to NPS park management decisions. Both acts provide direction for articulating and connecting the ultimate resource management decision to the analysis of impacts, using appropriate technical and scientific information. Both also recognize that such data may not be readily available, and they provide options for resource impact analysis should this be the case.

   The Omnibus Act directs the National Park Service to obtain scientific and technical information for analysis. The National Park Service handbook for *Director's Order #12* states that if "such information cannot be obtained due to excessive cost or technical impossibility, the proposed alternative for decision will be modified to eliminate the action causing the unknown or uncertain impact or other alternatives will be selected" (sec. 4.4).

   Section 4.5 of *Director's Order #12* adds to this guidance by stating "when it is not possible to modify alternatives to eliminate an activity with unknown or uncertain potential impacts, and such information is essential to making a well-reasoned decision, the National Park Service will follow the provisions of the regulations of CEQ (40 CFR 1502.22)." In summary, the Park Service must state in an environmental assessment or impact statement (1) whether such information is incomplete or unavailable; (2) the relevance of the incomplete or unavailable information to evaluating reasonably foreseeable significant adverse impacts on the human environment; (3) a summary of existing credible scientific adverse impacts that is relevant to evaluating the reasonably foreseeable significant adverse impacts; and (4) an evaluation of such impacts based on theoretical approaches or research methods generally accepted in the scientific community.

3. The 1916 NPS Organic Act (16 USC 1) commits the Park Service to making informed decisions that perpetuate the conservation and protection of park resources unimpaired for the benefit and enjoyment of future generations.

GENERAL METHODOLOGY FOR ESTABLISHING IMPACT THRESHOLDS AND MEASURING EFFECTS

While much has been observed and documented about the overall effects of personal watercraft on the environment, as well as public safety concerns, site-specific impacts under all conditions and scenarios

are difficult to measure and affirm with absolute confidence. Even with monitoring, data collected about PWC use and the effects on park resources relative to other uses and influences, are difficult to define and quantitatively measure.

Recognizing this dilemma, the interdisciplinary planning team created a process for impact assessment, based upon the directives of the *DO #12 Handbook* (section 4.5(g)). National park system units are directed to assess the extent of impacts to park resources as defined by the context, duration, and intensity of the effect. While measurement by quantitative means is useful, it is even more crucial for the public and decision-makers to understand the implications of those impacts in the short and long term, cumulatively, and within context, based on an understanding and interpretation by resource professionals and specialists. With interpretation, one can ascertain whether a certain impact intensity to a park resource is "minor" compared to "major" and what criteria were used to draw that conclusion.

Therefore, issues and concerns, as presented in the "Purpose of and Need for Action," were further defined and focused to assess the various PWC management alternatives given the context, duration, and intensity of effects on park resources. Thresholds were established for each impact topic to help understand the severity and magnitude of changes in resource conditions, both adverse and beneficial, of the various management alternatives.

Potential impacts are described in terms of type (Are the effects beneficial or adverse?), context (Are the effects site-specific, local, or even regional?), duration (Are the effects short-term, lasting less than one year, or long-term, lasting more than one year?), and intensity (Are the effects negligible, minor, moderate, or major?). Because definitions of intensity (negligible, minor, moderate, or major) vary by impact topic, intensity definitions are provided separately for each impact topic analyzed in this document.

Each alternative is compared to a baseline to determine the context, duration, and intensity of resource impacts. The baseline, for purposes of impact analysis, is the continuation of PWC use and current management projected over the next 10 years (alternative A). In the absence of quantitative data, best professional judgment was used to determine impacts. In general, the thresholds used come from existing literature on personal watercraft, federal and state standards, and consultation with subject matter experts and appropriate agencies.

In addition to establishing impact thresholds, the park's resource management objectives and goals (as stated in the "Purpose of and Need for Action") were integrated into the impact analysis. In order to further define resource protection goals relative to PWC management, the park's *Strategic Plan* was used to ascertain the "desired future condition" of resources over the long term. The impact analysis then considered whether each PWC management alternative contributes substantially to the park's achievement of its resource goals, or would be an obstacle to achieving the resource goal as defined by the *Strategic Plan.* The planning team then considered potential ways to mitigate effects of personal watercraft on park resources, and the alternatives were modified accordingly.

For the purposes of analysis, the following assumptions are used for all impact topics:

Short-term impacts: Those occurring from PWC use in the immediate future (per trip through a single season of use, usually 1 to 6 months).

Long-term impacts: Those occurring from PWC use over several seasons of use through the next 10 years.

Direct impacts: Those occurring from the direct use or influence of personal watercraft.

Indirect impacts: Those occurring from PWC use that have indirectly altered a resource or condition.

Study area: Each resource impact is assessed in direct relationship to those resources affected both inside and outside the park, to the extent that the impacts can be substantially traced, linked, or connected to PWC use inside park boundaries. Each impact topic, therefore, has a study area relative to the resource being assessed, and it is further defined in the impact methodology.

Unless otherwise noted in the analysis, impacts are considered to be adverse.

CUMULATIVE IMPACTS

The CEQ regulations to implement the National Environmental Policy Act require the assessment of cumulative impacts in the decision-making process for federal projects. Cumulative impacts are defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions" (40 CFR 1508.7). Cumulative impacts are considered for all alternatives, including the no-action alternative.

IMPAIRMENT ANALYSIS

The NPS *Management Policies 2001* require an analysis of potential effects to determine whether or not actions would impair park resources. The fundamental purpose of the national park system, as established by the Organic Act and reaffirmed by the General Authorities Act, as amended, begins with a mandate to conserve park resources and values. NPS managers must always seek ways to avoid, or to minimize to the greatest degree practicable, adversely impacting park resources and values. However, the laws do give the National Park Service the management discretion to allow impacts to park resources and values when necessary and appropriate to fulfill the purposes of a park, as long as the impact does not constitute impairment of the affected resources and values. Although Congress has given the National Park Service the management discretion to allow certain impacts within a park system unit, that discretion is limited by the statutory requirement that the agency must leave park resources and values unimpaired, unless a particular law directly and specifically provides otherwise. The prohibited impairment is an impact that, in the professional judgment of the responsible NPS manager, would harm the integrity of park resources or values. An impact to any park resource or value may constitute an impairment, but an impact would be more likely to constitute an impairment to the extent that it has a major or severe adverse effect upon a resource or value whose conservation is:

- necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park;
- key to the natural or cultural integrity of the park; or
- identified as a goal in the park's general management plan or other relevant NPS planning documents.

Impairment may result from NPS activities in managing the park, visitor activities, or activities undertaken by concessioners, contractors, and others operating in the park.

The following process was used to determine whether the various PWC management alternatives had the potential to impair park resources and values:

1. The park's enabling legislation, the *General Management Plan,* the *Strategic Plan,* and other relevant background were reviewed to ascertain the park's purpose and significance, resource values, and resource management goals or desired future conditions.
2. PWC management objectives specific to resource protection goals at the park were identified.
3. Thresholds were established for each resource of concern to determine the context, intensity and duration of impacts, as defined above.
4. An analysis was conducted to determine if the magnitude of impact reached the level of "impairment," as defined by the NPS *Management Policies.*

The impact analysis includes any findings of impairment to park resources and values for each of the management alternatives.

PWC USE TRENDS

PWC use trends were identified to determine direct and indirect impacts of the alternatives. Other visitor use trends were identified to help assess cumulative effects. PWC and visitor use trends were based on data available from the park, as well as on discussions with staff at the national seashore, the New York State Department of Environmental Conservation and the New York State Department of State's Division of Coastal Resources, Suffolk County, local municipalities, local PWC dealerships, and local marinas. National trends in PWC ownership were also used.

The National Park Service does not count the number of visitors accessing the park by boat or personal watercraft. An informal survey in 1999 (as discussed in "The Affected Environment") counted 200–300 vessels, approximately 20% of which (40–60) were personal watercraft (Law et al. 2002). Staff from the Suffolk County Department of Parks and the Police Marine Bureau, local municipalities, local dealerships, and local marinas provided estimates of PWC use ranging from 5% to 25% of all watercraft on the water at any given time of the day during the peak season.

PWC use within Fire Island National Seashore is typically localized, occurring in areas near the private communities, ferryways, and in areas near boat ramps. Park staff indicate that the heaviest usage and highest general visitation area for watercraft of any type is the western end of the island from the Fire Island Lighthouse to Oakleyville, or the western boundary of the Sunken Forest, on the bayside. PWC is also prevalent along the eastern boundary in Moriches Bay near Smith Point County Park (J. Lippert, NPS, pers. comm., Apr. 12, 2002).

The PWC use and distribution trends used in this document are based on the number of vessels operating during the peak season (July and August) and peak hours of the day. The area of analysis was divided into four zones based on predominant usage (see Areas of Analysis map and Table 10):

> **Area I —** western boundary of Fire Island National Seashore to western boundary of Sunken Forest. This area includes the Fire Island Lighthouse Visitor Center, West Fire Island, East Fire Island, and the private communities of Kismet, Seabay Beach, Saltaire, Fair Harbor, Dunewood, Lonelyville, Atlantique Beach, Atlantique, Robbins Rest, Cornelle Estates, Ocean Beach, Seaview, Ocean Bay Park, Point O'Woods, and Oakleyville.

Area II — western boundary of Sunken Forest to eastern boundary of Davis Park. This area includes Sunken Forest, the Sailors Haven visitor center, the private communities of Cherry Grove, Fire Island Pines, Water Island, Blue Point Beach, and Davis Park.

Area III — eastern boundary of Davis Park to Moriches Inlet and the eastern boundary of Fire Island National Seashore. This area includes Otis Pike Wilderness Area, Smith Point County Park, and the William Floyd Estate.

Oceanside — This area includes the entirety of the southern boundary of the national seashore along the Atlantic Ocean.

TABLE 10: PEAK-SEASON PWC USE AT FIRE ISLAND NATIONAL SEASHORE

Area of Analysis	Location	Motorized Watercraft per Hour	Personal Watercraft per Hour	Number of Personal Watercraft per Peak Hour	Total Peak PWC-Hours
I	West of Fire Islands and Kismet	160	30–40	64	256
	Ocean Bay Park	96	20–24		
II	Cherry Grove	8	1–2	26	104
	Fire Island Pines and lateral travel	8	1–2		
	Blue Point Beach	8	1–2		
	Davis Park	80	10–20		
III	Smith Point – Moriches Bay	100	15–25	25	100
Oceanside	Atlantic Ocean	16	3–4		
Total		**476**	**81–119**	**115**	**460**

Source: Law et al. 2002; L. Migliozzi, NYS OPRHP, pers. comm., Apr. 1, 2002; J. Lippert, NPS, pers. comm., Apr 12, 2002.

Note: Due to qualitative nature of NPS surveys, analysis was based on a highest use estimate, therefore, 119 PWC/hr was the value used in all estimated projections. Other calculations, including water quality, were based on the number of personal watercraft operating on the bayside of the island (115 units) and excluded the 3–4 personal watercraft on the oceanside. It is assumed that all personal watercraft would operate for total of four hours per day.

PWC ownership growth in the region is comparable to that on the national level. National PWC ownership increased every year between 1991 and 1998; the rate peaked in 1994 at 32% and dropped slightly in 1999 and 2000 (see Table 11). Regional PWC ownership, as determined from registration data provided by the New York State Office of Parks, Recreation, and Historic Preservation shows a continual increase through 2001. New York State does not segregate PWC registrations from other boat types; all vessels less than 16 feet are categorized as class A vessels. For purposes of this analysis, PWC registration trends were assumed to be consistent with the class A vessel registration trends. Class A registration trends paralleled those of total boat registration in Suffolk County over the past six years.

TABLE 11: NATIONAL PWC REGISTRATION TREND

Year	No. of Boats Owned	No. of Personal Watercraft Owned	Boat Ownership Trend (Percentage Change)	PWC Ownership Trend (Percentage Change)
1991	16,262,000	305,915	--	--
1992	16,262,000	372,283	0%	21.7%
1993	16,212,000	454,545	0%	22.1%
1994	16,239,000	600,000	0%	32.0%
1995	15,375,000	760,000	-5%	26.7%
1996	15,830,000	900,000	3%	18.4%
1997	16,230,000	1,000,000	3%	11.1%
1998	16,657,000	1,100,000	3%	10.0%
1999	16,773,000	1,096,000	1%	-0.4%
2000	16,965,000	1,078,400	1%	-1.6%

Source: M. Schmidt, USCG, e-mail comm., Sept. 4, 2001.

* Estimates provided by the National Marine Manufacturers Association (M. Schmidt, USCG, pers. comm., Sept. 4, 2001).

To determine future PWC and other watercraft use projections, various sources of information were obtained, as cited above. No absolute number of PWC users could be established based on available information. The official registration data do not include separate counts for PWC users. Consequently, the approach considered national trends, which have started to show a decrease, and the regional trends as defined above. Total boat registration, between 1998 and 2001, averaged a 1.26% increase each year (Table 13). Class A vessel registration between 1998 and 2001 increased an average of 1.21% each year. PWC ownership trends were based on the annual increases in registration from 1998 to 2001. Data from 1997 are not representative of the period of record (1997–2001).

Looking at the national data, trends indicate that dramatic increases in ownership ended in 1996 and 1997, followed by a decline through 1998, and are now stabilizing with low percentage increases. Therefore, it is assumed that PWC use at the national seashore will continue to increase in the future, even though national trends indicate new ownership is on the decline (negative values). Regional (Suffolk County) registration trends for personal watercraft (or Class A vessels) indicate an annual increase of 1.21%. As previously mentioned, although PWC counts have not been conducted at Fire Island National Seashore, PWC use trend data in other parks around the nation indicate small annual increases (e.g., 2% a year at Pictured Rocks National Lakeshore). Suffolk County Class-A vessel ownership shows a continual increase through 2001, although the rate of growth has slowed in most recent years, similar to national trends. Regional information and surveys combined with the national trends helped provide a more accurate picture of PWC use trends in Fire Island National Seashore. Discussions with staff from the Suffolk County Department of Parks and the Police Marine Bureau, local municipalities, local dealerships, and local marinas verified the boat registration trends (1.26 % per year) provided by New York State Office of Parks, Recreation, and Historic Preservation registration data for Suffolk County. Therefore, based on a conservative approach, the analyses in this environmental assessment assumed an annual increase in PWC use within Fire Island National Seashore Park of 1.3% over the next 10 years (see Table 12).

TABLE 12: SUFFOLK COUNTY BOAT REGISTRATION TREND

Year	Total Boat Registration	Class-A Vessels (<16 feet) Registration	Total Boat Registration (Percentage Change)	Class-A Vessels Registration (Percentage Change)
1996	66,207	19,848	-	-
1997	76,107	22,750	14.95	14.62
1998	76,806	22,981	0.92	1.02
1999	78,496	23,497	2.20	2.25
2000	79,245	23,570	0.95	0.31
2001	80,006	23,871	0.96	1.28
Avg. (1998–2001)	76,145	22,753	1.26	1.21

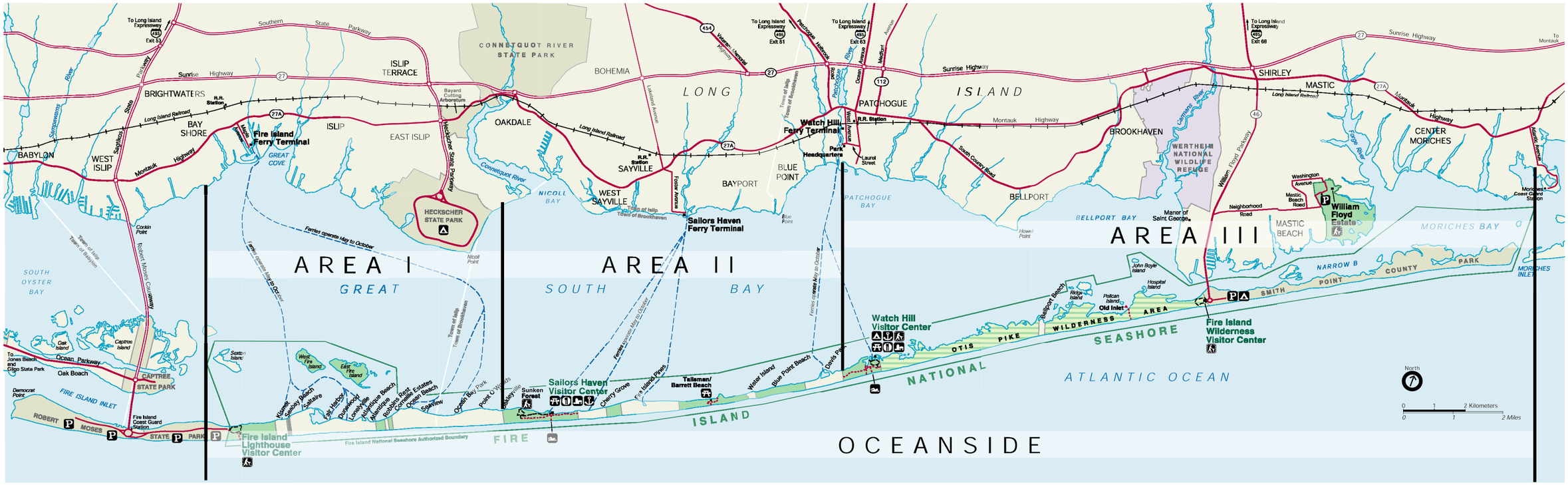
Source: L. Migliozzi, NYS OPRHP, pers. comm., T. Taylor, LBG, Apr. 1, 2002.

According to the *New York State 2000 Recreational Boating Report*, personal watercraft comprise less than 10% of the total registered vessels in New York State. However, there was a significant difference between state boat registration percentages and actual PWC use at the national seashore. Even though quantitative surveys were not conducted in Fire Island, informal surveys revealed from 5% to 25% of the watercraft present on the bayside during the summer peak season were personal watercraft. After reviewing the data collected and NPS informal survey data, PWC use was estimated at 20% of all watercraft.

Fire Island National Seashore

New York

Areas of Analysis Map



United States Department of the Interior/National Park Service WASO/May '02/615-20048

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The surveys conducted by park staff, together with the Suffolk County average total boat and Class-A vessel use trends, and the 2001 observations by NPS rangers, helped establish current user levels and develop user trends for the next 10 years. Table 13 shows the baseline conditions at Fire Island for the number of personal watercraft compared to all other boats. Although registration trends showed annual increases of 1.26%, the PWC and total boat numbers were calculated over next the 10 years using a 1.3% annual increase. These observations showed high-intensity use numbers of 476 boats and 119 personal watercraft per hour, compared to the July 1999 observations that showed up to 240 boats and 60 personal watercraft per hour operating in Fire Island National Seashore.

TABLE 13: FIRE ISLAND BOATING AND PWC USE TRENDS (PER HOUR)

	1999 Observations		2001 Observations	
Year	All Other Boats	Personal Watercraft	All Other Boats	PWC
1999	240	60		
2000	243	61		
2001	246	62	476	119
2002	249	62	482	121
2003	253	63	488	122
2004	256	64	495	124
2005	259	65	501	125
2006	263	66	508	127
2007	266	67	514	129
2008	270	67	521	130
2009	273	68	528	132
2010	277	69	535	134
2011	280	70	542	135
2012	284	71	549	137

Source: Law 2002; L. Migliozzi, NYS OPRHP, pers. comm., Apr. 1, 2002; M. Bilecki, NPS, pers. comm., D. Otto, LBG, Apr 12, 2002.

Assumptions: A conservative approach assumes a 1.3% increase/year in PWC use at Fire Island National Seashore.

The highest use estimates (476 boats and 119 PWC) provided by NPS staff observations in July 2001 were used in the water quality analysis. The high end numbers from 2002 on were used in the air quality analysis modeling.

WATER QUALITY

Most research on the effects of PWC use on water quality focuses on the impacts of two-stroke engines, and it is assumed that any impacts caused by these engines also apply to two-stroke engines in personal watercraft. There is general agreement that two-stroke engines (and personal watercraft) discharge a gas-oil mixture into the water. Fuel used in PWC engines contains many hydrocarbons, including benzene, toluene, ethylbenzene, and xylene (collectively referred to as BTEX). Polycyclic aromatic hydrocarbons (PAHs) also are released from boat engines, including those in personal watercraft. These compounds are not found appreciably in the unburned fuel mixture, but rather are products of combustion. Discharges of all these compounds — BTEX and PAHs — have potential adverse effects on aquatic life and human health if present at high enough concentrations. A common gasoline additive, methyl tertiary butyl ether (MTBE) is also released with the unburned portion of the gasoline. The PWC industry suggests that although some unburned fuel does enter the water, the fuel's gaseous state allows it to evaporate readily (Sea-Doo 2000).

A typical conventional (i.e., carbureted) two-stroke PWC engine discharges as much as 30% of the unburned fuel mixture into the exhaust (California Air Resources Board 1999). At common fuel consumption rates, an average two-hour ride on a personal watercraft may discharge three gallons (11.34 liters) of fuel into the water (NPS 1999a). The Bluewater Network states that personal watercraft can discharge between three and four gallons of fuel over the same time period. However,

the newer four-stroke technology can reduce these emissions to meet current regulatory standards for both water and air quality (US EPA 1996a). The percentage of emissions of BTEX and MTBE compounds from four-stroke inboard or outboard motors is less than those from a two-stroke outboard engine or an existing two-stroke PWC engine.

GUIDING REGULATIONS AND POLICIES

The U.S. Environmental Protection Agency has developed national recommended ambient water quality criteria for approximately 120 priority pollutants and 45 non-priority pollutants for the protection of both aquatic life and human health (through ingestion of fish/shellfish or water) (US EPA 1998).These criteria have been adopted as enforceable standards by most states. New York has adopted its own standards, some of which are more stringent than the federal criteria. There are no EPA water quality criteria for the protection of aquatic life for the PWC-related contaminants (US EPA 1999a). For the human health criteria, however, the Environmental Protection Agency has established criteria for benzene and several PAH compounds. There are no criteria for xylene. Although there is no federal drinking water standard for MTBE, it is on the "Contaminant Candidate List" for consideration in setting health standards; there is no information about the long-term effects that MTBE can have (US EPA 2001a). However, in 2001, an MTBE Water Quality Criteria Work Group (MTBE-WQCWG) was established, consisting of representatives from private companies, trade associations, and the Environmental Protection Agency. This partnership generated the toxicity data necessary for deriving ambient water qualtiy criteria for MTBE, and calculated "preliminary freshwater and marine criteria" for acute and chronic exposure effects (Mancini et al. 2002).

The National Park Service's *Management Policies 2001* state that the National Park Service will perpetuate surface water and groundwater as integral components of park aquatic and terrestrial ecosystems (sec. 4.6.1). Furthermore, the National Park Service will determine the quality of park surface and groundwater resources and avoid, whenever possible, the pollution of park waters by human activities occurring within and outside of parks, by

> working with appropriate governmental bodies to obtain the highest possible standards available under the Clean Water Act for the protection of park waters
>
> taking all necessary actions to maintain or restore the quality of surface water and ground-water within the parks consistent with the Clean Water Act and all other applicable federal, state, and local laws and regulations
>
> entering into agreements with other agencies and governing bodies, as appropriate, to secure their cooperation in maintaining or restoring the quality of park water resources (*Management Policies 2001,* sec. 4.6.3)

The mission of Fire Island National Seashore is to "preserve the natural and cultural resources within administrative boundaries." To achieve this, one long-term water quality goal was identified in the park's *Strategic Plan:* By September 30, 2005, 85% of park units will have unimpaired water quality.

Fire Island National Seashore does not have quantifiable water quality data documenting the effects of PWC emissions since they were introduced in the 1970s. To address water quality impacts potentially resulting from continued PWC use, water quality standards were used in the absence of park-specific data as a basic principle to guide the analysis.

Simply stated, a water quality standard defines the water quality goals of a waterbody by designating uses to be made of the water, by setting minimum criteria to protect the uses, and by preventing

degradation of water quality through antidegradation provisions. The antidegradation policy is only one portion of a water quality standard. Part of this policy (40 CFR 131.12(a)(2)) strives to maintain water quality at existing levels if it is already better than the minimum criteria necessary to protect the uses. Antidegradation should not be interpreted to mean that "no degradation" can or will occur, as even in the most pristine waters, degradation may be allowed for certain pollutants as long as it is temporary and short-term in nature (Rosenlieb, NPS, WRD, pers. comm., June 2001).

Other considerations in assessing the magnitude of water quality impacts is the effect on those resources that depend on a certain quality or condition of water. Sensitive aquatic organisms, submerged aquatic vegetation, riparian areas, and wetlands are affected by changes in water quality, from direct and indirect sources.

METHODOLOGY AND ASSUMPTIONS

To assess the magnitude of water quality impacts to park waters under the various PWC management alternatives, the following methods and assumptions were used:

1. The regulation at 40 CFR 131.12(a)(2) represents an overall goal or principle with regard to PWC use in that the park will strive to fully protect existing water quality so that "fishable/ swimmable" uses and other existing or designated uses are maintained. Therefore, PWC use could not be authorized to the degree that it would lower this standard and affect these uses. To do so would potentially violate 40 CFR 131.10, which basically forbids the removal of an existing use because the activity was authorized knowing this level of pollution would occur.
2. State water quality standards governing the waters of the park were examined; where standards or water quality criteria were not available for pollutants present in PWC emissions, ecological and human health toxicity benchmarks for certain pollutants were acquired from various literature sources. The classification of park waters by the state was defined; and the overall sources of water pollutants, both internal and external to the national seashore boundary, were identified in relation to the standards and classification.
3. Baseline water quality data, especially for pollutants associated with two-stroke engines (PAHs, hydrocarbons), were examined, if available.
4. Typical use patterns of motorized watercraft, including numbers and hours used, were determined from Suffolk County boating data (boating licenses issued), extrapolation from national data, a 1999 park survey conducted by the National Park Service, and informal observations by park personnel during the summer of 2001 (see "PWC Use Trends"). Use trends for motorized watercraft (PWC and motorboats) were estimated for the next 10 years for all studied areas. Information used in the 10-year projections included national and regional data. While boating activity is distributed over a full day from 4 A.M. to 6 P.M., it peaks between 10 A.M. and 2 P.M. The contaminant loading to water was calculated for one day, assuming a given number of personal watercraft (example: on average, 70 personal watercraft operating per hour in Great South Bay) each operating for four hours (280 PWC-hours during peak hours), and each discharging 11.34 liters of gasoline per PWC-hour.
5. Since no models were available to predict concentrations in water of selected pollutants emitted by personal watercraft and motorboats, an approach was developed to provide a rough estimate of whether typical PWC (and outboard motor) use over a particular time (e.g., a typical busy weekend day) would result in exceedances of the identified standards, criteria, or toxicity benchmarks. The approach is described in appendix C. Results of this approach were then taken into account, along with site-specific information about water flow, currents,

mixing, wind, turbidity, etc., as well as the specific fate and transport characteristics of the pollutant involved (e.g., volatility), to assess the potential for the occurrence of adverse water quality impacts.

6. In general, the approach provides the information needed to calculate emissions to the receiving waterbody from personal watercraft (and, by estimation, from outboard motors) of MTBE and selected hydrocarbons whose concentrations in the raw gasoline fuel were available in the literature and for which ecological and/or human health toxicity benchmarks could be acquired from the literature. The selected chemicals were benzene, MTBE, and three PAHs (benzo(a)pyrene, naphthalene, and 1-methyl naphthalene). First the emissions of these pollutants to the water per PWC operational hour (based on literature values) was estimated, and then the total loading of the pollutants into the water, based on the estimated hours of use, was estimated. The next step was to estimate the volume of water it would take to dilute the calculated emission loading to the level of the water quality standard or benchmark. The volume of water (referred to as the "threshold volume of water") was then compared to the total available volume of water, and all the mechanisms that result in loss of the pollutant from the water were also qualitatively considered. In this way, an assessment could be made as to the potential for the standards or benchmarks to be exceeded, even on a short-term basis.

   In May 2000, Governor George Pataki signed into law legislation to protect New York's water supplies against contamination from MTBE by banning the use, sale, or importation of fuels containing this additive beginning in 2004 (NY State Governor's Office 2000). It is not clear what additive will substitute MTBE. Consequently, emission calculations excluded MTBE after 2004. Governor Pataki also instructed the New York State Department of Environmental Conservation to implement new guidelines to reduce allowable levels of MTBE in surface and groundwater from the previous standard of 50 parts per billion to 10 parts per billion.

   Although there is no clear definition of how MTBE, BTEX, and PAHs resulting from marine engine exhaust affect human and aquatic health, the physical characteristics and natural tendencies of the inner bays along Fire Island National Seashore establish longer retention times for pollutants and contaminants. As a result, exposure time, concentrations, and risks associated with these pollutants may increase over time.

   Hydrocarbons also have the potential to accumulate in the sediment and solids on which marine mammals feed. As a result of bioaccumulation, long-term adverse health effects in the mammals and humans who use marine life as a food source are possible. BTEX and MTBE compounds tend to transfer from water to air more rapidly than PAHs. PAHs, however, do not dissolve easily in water and tend to bond to particulate matter and settle to the bottom sediments. Research has found that increased exposure to PAHs can adversely affect immune systems and has the potential to cause cancer in humans (Agency for Toxic Substances and Disease Registry [ATSDR] 1996a).

7. The principal mechanisms that result in loss of the pollutant from the water also were qualitatively considered. Many organic pollutants that are initially dissolved in the water volatilize to the atmosphere, especially if they have high vapor pressures, are lighter than water, and mixing occurs at the air/water interface. Other compounds that have low vapor pressure, low solubility, and high octanol/water partition coefficients tend to adhere to organic material and clays and eventually adsorb onto bottom sediments. By considering movements of the organics through the water column, an assessment can be made as to whether there could be an issue with standards or benchmarks being exceeded, even on a short-term basis. Fire Island is a marine environment, and only limited water quality criteria or standards are available for PWC-related contaminants. Some states (e.g., Washington) utilize freshwater quality criteria to assess effects on marine organisms for a variety of chemical parameters. In the absence of

established marine criteria or standards at the federal or state level, this analysis adopted freshwater ecological benchmarks for benzo(a)pyrene, naphthalene, and benzene to determine potential water quality impacts; a marine benchmark was used for 1-methyl naphthalene (USFWS 1987) and MTBE (Mancini et al. 2002). Human health benchmarks for benzene and benzo(a)pyrene are based on the consumption of aquatic organisms; the benzo(a)pyrene criterion (0.049 μg/L) is from the U.S. Environmental Protection Agency (1999a), and the benzene standard (10 μg/L) is from the New York State Department of Environmental Conservation (1999). No other state water quality standards are available for the organic chemicals being evaluated (see Table 14). Site-specific data on pollution from emissions was calculated for the park. The threshold volume was determined by considering the PWC-hours of operation for each site and the loadings during operating hours, as well as the ecotoxicological and human health benchmarks obtained from literature or guidance.

Benzene, when released to the water, is subject to rapid volatilization, with a half-life for evaporation of about 5 hours (US EPA 2001a). Consequently, this evaporation rate is discussed for benzene in the analysis of the alternatives.

TABLE 14: TOXICOLOGICAL BENCHMARKS USED IN CALCULATIONS

Chemical	Ecotoxicological Benchmark (μg/L)	Source	Human Health Benchmark (μg/L)	Source
Benzo(a)pyrene	0.014	Suter and Tsao 1996	0.049*	EPA 1999
Naphthalene	62	Suter and Tsao 1996	--	--
1-methyl naphthalene	19-34**	USFWS 1987	--	--
Benzene	130	Suter and Tsao 1996	10	NYS DEC 1999
MTBE ***	53,000 (a) and 18,000 (b)	Mancini et al. 2002	13****	

* Based on the consumption of aquatic organisms.

** Based on LC50s of 1,900 and 3,400 μg/l for dungeness crab and sheepshead minnow, respectively (19 μg/l used for estuarine/marine calculations.

*** Preliminary marine water quality criteria for acute (a) and chronic (b) effects (Mancini et al. 2002)

**** Toxicological data for MTBE is under review. There is no US EPA human health benchmark, but California has established a public health goal of 13 μg/L for freshwater. New York State will ban the use of gasoline with MTBE after 2004 and will establish a surface water standard of 10 μg/L.

8. The threshold volume of water was calculated in acre-feet (1 acre-foot =1 acre of water 1 foot deep). For example, if results showed that for benzo(a)pyrene, 55 acre-feet of water would be needed to dilute the expected emissions to the benchmark level, and the receiving body of water is a 100-acre reservoir with an average depth of 20 feet (= 2,000 acre-feet) and is well-mixed, then this would indicate little chance of a problem, especially when adding in the effects of any other processes that contribute to the loss of the benzo(a)pyrene from the water column. However, if the impact area is a 5-acre backwater area averaging 2 feet deep (10 acre-feet), then there may be at least a short-term issue, especially if outboard emissions are added and/or if there is little mixing in the area. At Fire Island the area for determining water volumes was established from NOAA nautical charts (NOAA 2002) and includes the national seashore's jurisdictional waters, as well as those areas used by personal watercraft and that may have a direct or indirect effect on park waters.
9. To assess cumulative impacts, outboard emissions were also estimated, based on estimates of relative emissions of unburned fuel and hours of use. Then, motorboat emissions were added to PWC emissions to get a more complete estimation of loading to the receiving waterbody. Inboards contribute very little to the loading and were not included in the estimation. The figures used for relative loading from various outboard engines have been obtained from reported data.

10. To predict the cumulative effects of PWC emissions in the context of all other similar types of emissions, projections of existing use were extrapolated into the future as a percentage of overall emissions in order to gage the magnitude of potential water quality changes, with and without continued PWC use at the park, and taking into account the reduction in emissions required by the Environmental Protection Agency over the next years (see Table 15 for the dates that these reductions are scheduled to occur).

    Key dates in this chronology begin with 1999, when the U.S. Environmental Protection Agency began to require production line testing for 75% hydrocarbon reduction in new outboard motors, and 2000, when testing for 75% hydrocarbon reduction in personal watercraft was required. By 2006 all new personal watercraft and outboards manufactured in the United States must have a 75% reduction in hydrocarbon emissions. According to California regulations, hydrocarbon emissions in all new outboard and PWC engines must be reduced by 90% by 2008. In 2005 and 2012 overall reductions in hydrocarbon emissions are estimated by the U.S. Environmental Protection Agency to be 25% and 50%, respectively, in personal watercraft and outboard motors. The overall reduction in current (2002) hydrocarbon emissions is estimated to be 60% by 2012. In other words, emissions in 2012 are expected to be 40% of current emissions. This estimated reduction is based on the State Implementation Plan for ozone for this area, plus the effect anticipated from the adoption of the California EPA regulations for personal watercraft (NYSCL, Environmental Conservation, 19-0306-A, 2000). Therefore, for the purpose of evaluating future emissions, overall outboard and PWC emissions to waters of the national seashore in 2012 are expected to be 40% of current emissions.

TABLE 15: ESTIMATED REDUCTIONS IN WATERCRAFT EMISSIONS

Date	Action
1999	EPA requires production line testing for 75% HC reduction in new outboards and begins to see reductions as newer models are introduced (US EPA 1997).
2000	EPA requires production line testing for 75% HC reduction in new personal watercraft and begins to see reductions as newer models are introduced (US EPA 1997).
2001	California EPA fully implements 75% HC reduction in new outboards and PWC (CARB 1999).
2005	Estimate 25% reduction in HC emissions overall as a result of newer models being gradually used (US EPA 1996b; date modified in US EPA 1997).
2006	EPA fully implements 75% HC reduction in new outboards and personal watercraft (US EPA 1996).
2008	California EPA fully implements 90% HC reduction in new outboards and PWC (CARB 1999).
2012	Estimate of 50% reduction in HC emissions overall (US EPA 1996b; date modified in US EPA 1997)
2012	Estimate of 60% reduction in HC emissions overall (CARB 1999; adopted by NYS DEC 1998, plus 1998 State Implementation Plan for ozone).

11. Existing information on PWC effects on water quality was reviewed and extrapolated to address park-specific issues. Threshold values were compared to estimated volumes of water in the three identified areas of analysis (see the Areas of Analysis map). The total number of personal watercraft used in the threshold volume calculations was 115 (see Table 10) and not 119 personal watercraft as described in the "PWC Use Trends" section. This is due to the fact that three or four PWC were observed on the oceanside, and the pollution assessment focused primarily on the backwaters of the national seashore. The 115 PWC units were assumed to be distributed among all three areas: 64 in area I, 26 in area II, and 25 in area III.

    A total of 460 motorboats (excluding personal watercraft) were used in the cumulative impact analyses for 2002. This total does not include 16 motorboats that use the oceanside waters, instead of the backwaters of the national seashore. The 460 motorboats were assumed to be distributed among the areas as follows: 256 in area I, 104 in area II, and 100 in area III. Similar to the estimation procedure for personal watercraft, motorboat usage (and organic pollutant discharge) was assumed to increase by 1.3% per year between 2002 and 2012. The

loadings of pollutants for each geographic area were estimated based on four hours a day of maximum PWC and motorboat use.

STUDY AREA

Pollutant loads were calculated for the three use areas where PWC use is now allowed (see Areas of Analysis map, page 65). For purposes of this review, the study area extends from the west boundary of Fire Island Lighthouse to Moriches Inlet on the bayside (see the Areas of Analysis map).

IMPACT TO WATER QUALITY FROM PWC USE

Given the above methodology and assumptions, the following impact thresholds were established in order to describe the predicted changes in water quality (overall, localized, short and long term, cumulative, adverse and beneficial), under the various PWC management alternatives.

Negligible: Impacts are chemical, physical, or biological effects that would not be detectable, would be well below water quality standards or criteria, and would be within historical or desired water quality conditions.

Minor: Impacts (chemical, physical, or biological effects) would be detectable but would be well below water quality standards or criteria and within historical or desired water quality conditions.

Moderate: Impacts (chemical, physical, or biological effects) would be detectable but would be at or below water quality standards or criteria; however, historical baseline or desired water quality conditions would be altered on a short-term basis.

Major: Impacts (chemical, physical, or biological effects) would be detectable and would be frequently altered from the historical baseline or desired water quality conditions; and/or chemical, physical, or biological water quality standards or criteria would be locally, slightly and singularly, exceeded on a short-term and temporary basis.

Impairment: Impacts are chemical, physical, or biological effects that would be detectable and would be substantially and frequently altered from the historical baseline or desired water quality conditions and/or water quality standards, or criteria would be exceeded several times on a short-term and temporary basis. In addition, these adverse, major impacts to park resources and values would

contribute to deterioration of the park's water quality and aquatic resources to the extent that the park's purpose could not be fulfilled as established in its enabling legislation;

affect resources key to the park's natural or cultural integrity or opportunities for enjoyment; or

affect the resource whose conservation is identified as a goal in the park's *General Management Plan* or other park planning documents.

Impacts of Alternative A — Continue PWC Use as Currently Managed under a Special Regulation

Analysis. Impacts from PWC use on the water resources of Fire Island National Seashore can be classified as chemical and physical. Chemical impacts occur due to the emissions of hydrocarbons

directly into the water. Physical impacts are associated with the resuspension of sediments and consequent increase in turbidity that occurs during PWC operation in shallow waters. Threshold volumes calculated for PWC emissions are shown in Table 16.

The impacts to water quality vary according to where PWC use occurs (e.g., flushing in inlets reduces concentrations of pollutants). Under alternative A all waters would remain open to PWC use, and the New York State boating regulations would continue to be enforced. The PWC user trend analysis indicates an increase of 1.3% a year in the overall average number of personal watercraft operating per hour in these waters; PWC use is, therefore, projected to increase from 64 to 73 in area I, 26 to 30 in area II, and 25 to 29 in area III. A change in the national socioeconomic conditions (as well as industry's marketing strategies) may cause this trend to vary one way or the other. For the purpose of estimating projected emissions for the year 2012, a 1.3% per year increase in emissions was used.

In addition, a reduction in water quality impacts associated with pollutant emissions is expected over the long term as a result of to the State Implementation Plan for ozone and the adoption of California's schedule for reducing PWC emissions. This reduction, which is estimated at 60% by 2012, is a result of newer models gradually coming into use. The threshold volumes for this alternative, which are based on PWC user trends and the forecast reductions in emissions by 2012, are presented in Table 16.

The results of the water quality analysis for PWC activity shows that for all discharged pollutants evaluated, the ecotoxicological threshold volumes estimated for 2002 and 2012 would be well below volumes of water available in the three study areas. Threshold volumes range from 1.9 to 710 acre-feet, while available volumes within the national seashore jurisdictional waters range from 2,425 to 4,580 acre-feet. Impacts to aquatic organisms are expected to be negligible for all pollutants evaluated.

TABLE 16: THRESHOLD WATER VOLUMES NEEDED TO DILUTE PWC POLLUTANTS, ALTERNATIVE A

	Area I		Area II		Area III	
	2002	2012	2002	2012	2002	2012
NPS jurisdictional waters (ac-ft)	3,970		2,425		4,580	
Volume of water for the whole bay	16,700		21,140		12,200	
Ecotoxicological Benchmark Volume*						
Benzo(a)pyrene (fuel and exhaust)	350	190	140	77	140	74
Naphthalene	140	75	57	31	55	30
1-methyl naphthalene	710	380	290	160	280	150
Benzene	340	180	140	73	130	70
MTBE (marine, acute)	4.9	banned	2.0	banned	1.9	banned
MTBE (marine, chronic)	14	banned	5.8	banned	5.6	banned
Human Health Benchmark Volume**						
Benzo(a)pyrene (fuel and exhaust)	100	54	41	22	40	21
Benzene	4,400	2,300	1,800	950	1,700	910
MTBE	20,000	banned	8,100	banned	7,800	banned

* Threshold volume (ac-ft) below which ecotoxicological effects might occur.

** Threshold volume (ac-ft) below which human health might be adversely affected.

While the waters around Fire Island are not used for drinking purposes, and while it is unlikely that a large amount of incidental ingestion of seawater would occur, national seashore visitors could be affected by an increase in pollutant loadings through the ingestion of biota (e.g., shellfish) that have accumulated pollutants or through skin absorption. Available water volumes in the three study areas appear to be adequate relative to the estimated threshold volumes for benzo(a)pyrene and benzene. The threshold volumes for MTBE in 2002 are greater than the calculated volumes for all three areas within the national seashore: the threshold volumes for MTBE range from 7,800 to 20,000 acre-feet, while the available national seashore water volumes are 2,425 to 4,580 acre-feet. Threshold volumes for MTBE are from two to five times greater than the available national seashore water volumes. However, tidal and wind-driven mixing of waters from within the national seashore to the bay waters

immediately adjacent to the national seashore and to nearshore ocean waters would act to reduce MTBE concentrations. Also, because the half-life of MTBE is estimated to be four hours (ATSDR 1996a), MTBE water concentrations from PWC emissions would decrease quickly. It is possible, however, that MTBE concentrations in areas of high PWC use and limited flushing/mixing would not decrease quickly. By 2012, MTBE emissions will be eliminated due to banning MTBE in gasoline starting in 2004.

In area I the benzene threshold volume (4,400 ac-ft) for 2002 is slightly larger than the available volume (3,970 ac-ft), but concentrations of benzene are not expected to exceed the human health standard of 10 µg/L for two primary reasons: (1) lateral mixing (and dilution) into the large volume of water (16,700 ac-ft) in Great South Bay immediately adjacent to the national seashore waters would decrease benzene concentrations; and (2) the estimated half-life of benzene in water (five hours) would act to decrease benzene concentrations. In 2012 the benzene threshold volume (2,900 ac-ft) would be less than the national seashore water volume in area I.

It is important to emphasize that while concentrations of two pollutants evaluated might exceed available water volumes, the environmental conditions at each study area (e.g., water exchange, temperature, weather conditions), as well as the behavior, fate, and transport of these chemicals, play important roles in limiting potential impacts to human health and the aquatic environment. Exposure to humans is mainly through breathing air that contains benzene, although some pollutants may enter the body through the skin. Most benzene (and its metabolites) leaves the human body through urine within 48 hours. Contrary to PAHs, benzene does not biomagnify in plants or animals (ATSDR 1997). MTBE is not considered a major harmful pollutant and is not included in routine national monitoring programs for liquids. A limited amount of MTBE gets into the blood through the skin, but the majority may enter the body through breathing or ingestion. However, it does not accumulate and its metabolites (e.g., butyl alcohol, formic acid, CO_2) are breathed out or leave the body through urine within one or two days (ATSDR 1996b).

Although the estimated volume of park jurisdictional waters in area I is 3,970 acre-feet, this area and the adjacent waters (16,700 ac-ft) are characterized by the presence of strong diurnal tidal currents. During flood tides soluble pollutants are transported into Great South Bay and South Oyster Bay, significantly increasing the supply of water and simultaneously transferring pollution problems outside the national seashore's jurisdictional waters. During outgoing ebb tides the water exchange is significantly high. As previously mentioned, tidal currents at the Fire Island Inlet can reach 2.2 feet per second. Although currents are not as intense at Moriches Inlet in area III, similar water exchange conditions are present.

Overall, water quality impacts due to PWC emissions of organic pollutants in 2002 would be moderate (MTBE in area I) to negligible (all other pollutants). Impacts from MTBE in areas II and III would be minor in 2002. By 2012 all water quality impacts from PWC emissions are expected to be negligible due to reduced emission rates and the banning of MTBE in gasoline.

Cumulative Impacts. Cumulative impacts under alternative A would result from all actions taking place around Fire Island National Seashore, including motorboats in nearby waters, point and non-point sources of pollutants (urban), and coastal development, particularly in the western area of Great South Bay. The extensive marine traffic (other than PWC use) in Great South Bay constitutes an important source of pollutants to the aquatic environment. It is assumed that in area I there would be an average of 320 motorized craft (including personal recreational boats, commercial fishing boats and cruises, official units such as the police and Coast Guard, and 64 personal watercraft), in area II there would be 130 craft (including 26 personal watercraft), and in area III there would be 125 craft

(including 25 personal watercraft). Municipal discharges from nearby areas, as well as from local marinas, are also sources of hydrocarbons to surface waters. Threshold volumes calculated for cumulative impacts are shown in Table 17.

TABLE 17: THRESHOLD WATER VOLUMES NEEDED TO DILUTE POLLUTANTS FROM ALL MOTORIZED WATERCRAFT, ALTERNATIVE A

	Area I		Area II		Area III	
	2002	2012	2002	2012	2002	2012
NPS jurisdictional waters (ac-ft)	3,970		2,425		4,580	
Volume of water for the whole bay	16,700		21,140		12,200	
Ecotoxicological Benchmark Volume*						
Benzo(a)pyrene (fuel and exhaust)	1,800	940	720	390	690	370
Naphthalene	700	380	280	150	270	150
1-methyl naphthalene	3,600	1,900	1,400	780	1,400	750
Benzene	1,700	900	680	370	660	350
MTBE (marine, acute)	24	banned	10	banned	10	banned
MTBE (marine, chronic)	72	banned	29	banned	28	banned
Human Health Benchmark Volume**						
Benzo(a)pyrene (fuel and exhaust)	500	270	210	110	200	110
Benzene	22,000	12,000	8,800	4,800	8,500	4,600
MTBE	100,000	banned	40,000	banned	39,000	banned

* Threshold volume (ac-ft) below which ecotoxicological effects might occur.

** Threshold volume (ac-ft) below which human health might be adversely affected.

Results of the water quality analysis for all motorboat activity shows that for all discharged pollutants evaluated, the ecotoxicological threshold volumes estimated for 2002 and 2012 would be below volumes of water available in jurisdictional waters in the three study areas. Threshold volumes range from 10 to 3,600 acre-feet, while available volumes within national seashore jurisdictional waters range from 2,425 to 4,580 acre-feet. Only the threshold volume for 1-methyl naphthalene in area I (3,600 ac-ft) would approach the water volume of 3,970 acre-feet. Mixing, flushing, and the resulting dilution from the 16,700 acre-ft of water directly adjacent to park waters would further reduce 1-methyl naphthalene concentrations below ecotoxicological benchmarks.

Human health threshold volumes for benzo(a)pyrene would all be lower than jurisdictional waters in each area. However, threshold volumes for benzene and MTBE would be substantially higher than available water volumes in all three study areas. Threshold volumes of benzene (area I in 2002) and MTBE (all areas in 2002) would also exceed the available water volumes in Great South Bay and Moriches Bay. Benzene threshold volumes are estimated to be up to five times the available national seashore jurisdictional water volume in a study area. MTBE threshold volumes in 2002 would be from 10 to 25 times greater than jurisdictional water volumes.

Overall, cumulative water quality impacts based on ecotoxicological benchmarks for organic pollutants would be negligible for all pollutants. None of the pollutants evaluated would have a threshold volume greater than water volumes within national seashore jurisdiction. Similarly, benzo(a)pyrene risks to human health would be negligible for all areas in 2002 and 2012. Potential human health impacts from benzene would be possibly major to moderate in area I in 2002 and 2012 and negligible in area III in 2012. These evaluations of impacts incorporate the five-hour half-life of benzene. For example, in area III the average concentration of benzene would be lower than the human health standard of 10 μg/L in less than five hours after four hours of boating activity. Potential human health impacts from MTBE would range from possibly major in area I in 2002 to moderate in area III in 2002. Monitoring of high-use areas would be needed to determine if major impact levels could actually occur. In 2012, all water quality impacts from motorized craft (including personal watercraft) are expected to be lower than in 2002 due to reduced emission rates and the ban on MTBE in gasoline

in 2004. However, impacts to human health from benzene would remain moderate in area I and minor in area II in 2012. PWC contribution to overall cumulative effects would be negligible.

Conclusion. Under alternative A water quality impacts due to PWC emissions of organic pollutants in 2002 would be moderate (MTBE in area I) to negligible (all other pollutants). Impacts from MTBE in areas II and III would be minor in 2002. By 2012 all water quality impacts from PWC use are expected to be negligible due to reduced emission rates and the ban on MTBE in gasoline in 2004. Water quality impacts from PWC use under alternative A based on ecotoxicological benchmarks would be negligible for all pollutants.

Cumulative water quality impacts from all motorboats under alternative A based on ecotoxicological benchmarks would be negligible for all pollutants. None of the pollutants evaluated would have a threshold volume greater than water volumes within national seashore jurisdiction. Similarly, benzo(a)pyrene risks to human health would be negligible for all areas in 2002 and 2012.

Cumulative human health impacts from benzene under alternative A would range from possibly major to moderate (area I) to negligible (area III). Potential human health impacts from MTBE would range from major (area I) to moderate (area III). By 2012 cumulative water quality impacts from all motorized craft are expected to be lower than in 2002 due to reduced emission rates and the ban on MTBE in gasoline after 2004. However, impacts to human health from benzene would remain moderate in area I and minor in area II in 2012. PWC contribution to cumulative effects would be negligible. Focused water quality monitoring in high use areas would be needed to verify the estimation of impacts.

No impairment to water quality is expected under this alternative.

Impacts of Alternative B — Continue PWC Use under a Special Regulation, but Limit Use to Areas Adjacent to Beach Communities

Analysis. Alternative B would limit PWC use to areas adjacent to beach communities (see Alternative B map), effectively closing area III and the oceanside shoreline of Fire Island National Seashore to PWC use. For evaluating water quality impacts under alternative B, it is assumed that the same number of personal watercraft would be operating in areas I and II, but no PWC use would occur in area III. Further, it is assumed that PWC users who would have operated in area III would move out of park waters and farther offshore into Great South Bay or Moriches Bay, but not into area I or II. Other motorboat access to park waters would not be affected under alternative B.

Banning PWC use along the majority of the eastern portion of the island would reduce impacts to water quality in this area. However, closure of portions of areas I and II would not reduce the amount of PWC use or emissions within these areas and would likely result in more localized and intensified adverse effects. Impacts to water quality in the vicinity of the inlets would be similar to those described for alternative A. Threshold volumes needed to dilute PWC pollutants in surface water under alternative B are shown in Table 18.

TABLE 18: THRESHOLD WATER VOLUMES NEEDED TO DILUTE PWC POLLUTANTS, ALTERNATIVE B

	Area I		Area II		Area III	
	2002	2012	2002	2012	2002	2012
NPS jurisdictional waters (ac-ft)	3,970		2,425		4,580	
Volume of water in PWC use areas	1,985		1,212		0	
Volume of water for the whole bay	16,700		21,140		12,200	

	Area I		Area II		Area III	
	2002	2012	2002	2012	2002	2012
Ecotoxicological Benchmark Volume*						
Benzo(a)pyrene (fuel and exhaust)	350	190	140	77	0	0
Naphthalene	140	75	57	31	0	0
1-methyl naphthalene	710	380	290	160	0	0
Benzene	340	180	140	73	0	0
MTBE (marine, acute)	4.9	banned	2.0	banned	0	banned
MTBE (marine, chronic)	14	banned	5.8	banned	0	banned
Human Health Benchmark Volume**						
Benzo(a)pyrene (fuel and exhaust)	100	54	41	22	0	0
Benzene	4,400	2,300	1,800	950	0	0
MTBE	20,000	banned	8,100	banned	0	banned

Note: This alternative would close half of area I (western area and Fire Islands area), half of area II, and all of area III to PWC use. PWC emissions in areas I and II would remain the same as in alternative A; however, pollutants would be concentrated in smaller areas.

* Threshold volume (ac-ft) below which ecotoxicological effects might occur.

** Threshold volume (ac-ft) below which human health might be adversely affected.

As in alternative A, none of the threshold volumes of contaminants based on ecotoxicological benchmarks would exceed the volumes of water in either study area where PWC use would be permitted (i.e., areas I and II). However, due to the management restrictions under alternative B, the areas of permitted use would be reduced; consequently, local effects on water quality and biota could be proportionately increased. Required threshold water volumes range from 2.0 to 710 acre-feet, compared with 1,985 and 1,212 acre-feet that would be available for areas I and II.

Although the threshold volume estimates for benzene and MTBE in alternative B would be the same as in alternative A, the volumes of water available for dilution in the two areas permitting PWC use (1,985 ac-ft in area I and 1,212 ac-ft in area II) would be substantially less than the national seashore jurisdictional water volumes. Benzene threshold volumes in both 2002 and 2012 would exceed the available water volume in area I and would slightly exceed the available water volume in area II in 2002. MTBE threshold volumes would be greater than the volumes in the permitted areas and in national seashore jurisdictional waters. Because the permitted use areas under alternative B are surrounded by other extensive areas of water, the actual mixing/dilution volumes would be substantially greater than in the PWC-permitted areas. However, the MTBE threshold volume for area I would be greater than the Great South Bay water volume in that area. In addition to the relative volume comparisons, the half-lives of benzene and MTBE (five and four hours, respectively) were considered in the evaluation of impacts to human health.

Impacts to water quality under alternative B would be similar to those for alternative A but would be somewhat greater in areas of concentrated use near beach communities. All impacts to aquatic life from pollutants would be negligible. Impacts to human health from benzo(a)pyrene would be negligible. Human health impacts from benzene would be minor in the permitted areas in area I and negligible in area II. MTBE impacts in 2002 would be moderate to possibly major in the permitted portion of area I and minor to moderate in area II. Because MTBE will be banned in 2004, there would be no PWC-related impacts in 2012 attributable to MTBE.

Cumulative Impacts. While alternative B would allow PWC use in limited portions of areas I and II and would ban PWC use in area III, other motorboats would not be affected by these restrictions and would be allowed throughout all three areas. In comparing threshold volumes with available water volumes, PWC emissions are compared to the volume in the restricted use area (see Table 19), and other motorboat emissions are compared to volumes within national seashore jurisdictional waters in each area. Water volumes in the entire bay (in each area) are also considered. As described in the evaluation of impacts for PWC use only, emissions within the limited areas would result in more localized impacts from PWC pollutants.

TABLE 19: THRESHOLD WATER VOLUMES NEEDED TO DILUTE POLLUTANTS FROM ALL MOTORIZED WATERCRAFT, ALTERNATIVE B

	Area I		Area II		Area III	
	2002	2012	2002	2012	2002	2012
NPS jurisdictional waters (ac-ft)	3,970		2,425		4,580	
Volume of water in PWC use areas	1,985		1,212		0	
Volume of water for the whole bay	16,700		21,140		12,200	
Ecotoxicological Benchmark Volume*						
Benzo(a)pyrene (fuel and exhaust)	1,800	940	720	390	550	300
Naphthalene	700	380	280	150	2,200	120
1-methyl naphthalene	3,600	1,900	1,400	780	1,100	600
Benzene	1,700	900	680	370	520	280
MTBE (marine, acute)	24	banned	10	banned	7.6	banned
MTBE (marine, chronic)	72	banned	29	banned	22	banned
Human Health Benchmark Volume**						
Benzo(a)pyrene (fuel and exhaust)	500	270	210	110	160	85
Benzene	22,000	12,000	8,800	4,800	6,800	3,600
MTBE	100,000	banned	40,000	banned	31,0000	banned

Note: This alternative would close half of area I (western area and Fire Islands area), half of area II, and all of area III to PWC use. PWC emissions in areas I and II would remain the same as in alternative A; however, pollutants would be concentrated in smaller areas.

* Threshold volume (ac-ft) below which ecotoxicological effects might occur.

** Threshold volume (ac-ft) below which human health might be adversely affected.

As shown in Table 19, estimated threshold volumes for cumulative impacts from all motorized activity would be higher than for PWC use alone. However, impacts from the five organics evaluated based on ecotoxicological benchmarks would be negligible. Estimated threshold volumes range from 8 to 3,600 acre-feet, and available water volumes in areas I and II are 1,985 and 1,212 acre-feet, respectively. The threshold volumes of 1-methyl naphthalene in area I (both years) and area II (2002) are greater than the volumes in the PWC-permitted areas, but the majority of this compound is from other motorboats that can operate throughout the park waters under alternative B.

Cumulative impacts to human health from benzo(a)pyrene would be negligible for all areas in 2002 and 2012. Human health impacts from benzene would be moderate to possibly major in area I (2002 and 2012) and minor to moderate in area II (2002 and 2012). In area III impacts from benzene from other motorboat use (since PWC use would be banned) would be negligible to minor throughout the assessment period. For MTBE, impacts related to human health would be possibly major in area I, moderate to possibly major in area II, and moderate in area III (motorboats only). No MTBE-related impacts are projected for 2012 since this gasoline additive will be banned in New York State.

These impact evaluations are based on PWC use in permitted areas only and boats operating throughout the national seashore jurisdictional waters. Also, as described previously, existing environmental conditions (e.g., flushing, mixing), and characteristics of the chemicals of concern (e.g., half-lives in water) would reduce the potential risks to the aquatic environment and human health. PWC contribution to cumulative effects would be negligible.

Conclusion. Compared to alternative A, closing the eastern section of the national seashore (area III) to PWC use would have a beneficial effect on water quality in area III. Closing roughly half of areas I and II would not reduce PWC users or emissions within these areas, but it would result in more localized adverse effects from PWC pollutants. Banning PWC use in the eastern part of Great South Bay and Moriches Bay would help reduce water quality impacts in this area, while impacts in the vicinity of the inlets would be similar to those described for alternative A.

Cumulative ecotoxicological impacts would be negligible for all pollutants, and human health impacts from benzo(a)pyrene would be negligible. Human health impacts for benzene would be minor to possibly major in areas I and II and minor to negligible in area III (boats only). For MTBE, human health

impacts would be moderate to possibly major in all three areas; however, no MTBE-related impacts are projected for 2012 since this gasoline additive will be banned in New York State. PWC contribution to cumulative effects would be negligible. Focused water quality monitoring in high use areas would be needed to verify the estimation of impacts.

No impairment to water quality is expected under alternative B.

Impacts of Alternative C — Continue PWC Use, but Limit Use to Areas Adjacent to Beach Communities and Enforce a 1,000-Foot Buffer along all Shorelines within the NPS Boundary

Analysis. Similar to alternative B, alternative C would allow PWC use only in certain areas. However, PWC operators would also be required to travel at no-wake speeds (maximum 6 mph) when accessing landing points within the seashore boundary, and a 1,000-foot buffer zone would be enforced around all national seashore lands. This management restriction would contribute to improvement in water quality by reducing resuspension of sediments in shallow waters and reducing emissions of contaminants as a consequence of reduced PWC speeds while accessing landing points. Allowable areas for PWC activity would be reduced an additional 20% in comparison to alternative B due to the buffer zone restriction. Although beneficial for water quality in shoreline areas, this condition could have an adverse effect on water quality in other areas offshore where PWC use could be concentrated. As in alternative B, it is assumed that the number of PWC users in national seashore waters in areas I and II would be the same as in alternative A. Also, it is assumed that the same number of motorized boats other than personal watercraft would be using all three areas, as in alternatives A and B. Estimated threshold volumes needed to dilute PWC emissions are shown in Table 20.

TABLE 20: THRESHOLD WATER VOLUMES NEEDED TO DILUTE PWC POLLUTANTS, ALTERNATIVE C

	Area I		Area II		Area III	
	2002	2012	2002	2012	2002	2012
NPS jurisdictional waters (ac-ft)	3,970		2,425		4,580	
Volume of water in PWC use areas	1,588		970		0	
Volume of water for the whole bay	16,700		21,140		12,200	
Ecotoxicological Benchmark Volume*						
Benzo(a)pyrene (fuel and exhaust)	350	190	140	77	0	0
Naphthalene	140	75	57	31	0	0
1-methyl naphthalene	710	380	290	160	0	0
Benzene	340	180	140	73	0	0
MTBE (marine, acute)	4.9	banned	2.0	banned	0	banned
MTBE (marine, chronic)	14	banned	5.8	banned	0	banned
Human Health Benchmark Volume**						
Benzo(a)pyrene (fuel and exhaust)	100	54	41	22	0	0
Benzene	4,400	2,300	1,800	950	0	0
MTBE	20,000	banned	8,100	banned	0	banned

Note: This alternative would close half of area I (western area and Fire Islands area), half of area II, and all of area III to PWC use. PWC emissions in areas I and II would remain the same as in alternative A; however, pollutants would be concentrated in smaller areas.

* Threshold volume (ac-ft) below which ecotoxicological effects might occur.

** Threshold volume (ac-ft) below which human health might be adversely affected.

Water quality impacts under alternative C would be similar to those for alternative B, but they would be somewhat greater in areas of concentrated use due to the 1,000-foot PWC buffer along all shorelines. However, alternative C would reduce impacts in areas along the shallower bay shoreline, where waters may not mix or circulate as much as in the open bay. All impacts to aquatic life from pollutants would be negligible because threshold volumes would range from 2 to 710 acre-feet, while water volumes in PWC use areas range from 970 to 1,588 acre-feet. Impacts to human health from benzo(a) pyrene also would be negligible. Human health impacts from benzene would be minor in area I and

negligible in area II. MTBE impacts in 2002 would be moderate to possibly major in area I and minor to moderate in area II, but by 2012 there would be no PWC-related impacts from MTBE because it would be banned beginning in 2004.

Because the permitted areas under alternative C are surrounded by other extensive areas of water (both waters within park jurisdiction and other bay waters), the actual mixing/dilution volumes would be substantially greater than in the PWC use areas. However, the MTBE threshold volume for area I would be greater than the Great South Bay water volume in that area. In addition to the relative volume comparisons, the half-lives of benzene and MTBE (five and four hours, respectively) were considered in the evaluation of impacts to human health.

Cumulative Impacts. As described above, PWC use would be allowed in only limited portions of areas I and II and would be banned in area III. Other motorboats would not be affected by these restrictions. In comparing threshold volumes with available water volumes, PWC emissions were compared to volumes in the restricted areas, and other motorboat emissions were compared to volumes within park jurisdictional waters (see Table 21). As described above for PWC use, emissions within the PWC use areas would result in more localized impacts, but those impacts would be reduced in shallower areas along the shoreline because of the 1,000-foot buffer.

Estimated threshold volumes for emissions from all motorized craft under alternative C would be higher than for PWC emissions alone, as seen in Table 21. However, impacts from the five organics evaluated based on ecotoxicological benchmarks would be negligible. Estimated threshold volumes would range from 8 to 3,600 acre-feet, while available water volumes in areas I and II are 1,588 and 970 acre-feet, respectively. However, water volumes within the national seashore boundary and in the adjacent bay are substantially larger and would serve to dilute motorboat emissions. The threshold volumes of 1-methyl naphthalene in area I (2002 and 2012) and area II (2002) would be greater than the volumes in the PWC use areas, but the majority of this compound is from other motorboats, which would be able to operate throughout national seashore waters under alternative C.

TABLE 21: THRESHOLD WATER VOLUMES NEEDED TO DILUTE POLLUTANTS FROM ALL MOTORIZED WATERCRAFT, ALTERNATIVE C

	Area I		Area II		Area III	
	2002	2012	2002	2012	2002	2012
NPS jurisdictional waters (ac-ft)	3,970		2,425		4,580	
Volume of water in PWC use areas	1,588		970		0	
Volume of water for the whole bay	16,700		21,140		12,200	
Ecotoxicological Benchmark Volume*						
Benzo(a)pyrene (fuel and exhaust)	1,800	940	720	390	550	300
Naphthalene	700	380	280	150	2,200	120
1-methyl naphthalene	3,600	1,900	1,400	780	1,100	600
Benzene	1,700	900	680	370	520	280
MTBE (marine, acute)	24	banned	10	banned	7.6	banned
MTBE (marine, chronic)	72	banned	29	banned	22	banned
Human Health Benchmark Volume**						
Benzo(a)pyrene (fuel and exhaust)	500	270	210	110	160	85
Benzene	22,000	12,000	8,800	4,800	6,800	3,600
MTBE	100,000	banned	40,000	banned	31,0000	banned

Note: This alternative would close half of areas I and II and all of area III to PWC use. PWC emissions in areas I and II would remain the same as in alternative A; however, pollutants would be concentrated in smaller areas.

* Threshold volume (ac-ft) below which ecotoxicological effects might occur.

** Threshold volume (ac-ft) below which human health might be adversely affected.

Cumulative impacts to human health from benzo(a)pyrene would be negligible for all areas in both 2002 and 2012. Impacts to water quality based on human health benchmarks for benzene would be moderate to possibly major in area I (2002 and 2012) and minor to moderate in area II (2002 and

2012). In area III impacts from benzene due to boat use only (PWC use would be banned) would be minor to negligible throughout the assessment period. MTBE impacts related to human health would be possibly major in area I, moderate to possibly major in area II, and moderate in area III (motorboats only). No MTBE-related impacts are projected for 2012. As described previously, threshold volume comparisons were made with volumes in PWC use areas, park jurisdiction water volumes, and bay areas. Also, as described previously, existing environmental conditions (e.g., flushing, mixing), and characteristics of the chemicals of concern (e.g., half-lives in water) would reduce the potential risks to the aquatic environment and human health. PWC contribution to cumulative effects would be negligible.

Conclusion. This alternative would have a beneficial effect in shoreline areas and for humans swimming in these areas, but an adverse effect on water quality in areas farther offshore. Similar to alternative B, closing the eastern section of the national seashore (area III) to PWC use would have a beneficial effect on water quality in area III. Closing portions of areas I and II would not reduce PWC emissions within these areas and would result in more localized adverse effects of PWC pollutants. Banning PWC use in the eastern part of Great South Bay and Moriches Bay would help reduce water quality impacts in this area, while impacts in the vicinity of the inlets would be similar to those described for alternative A.

Cumulative ecotoxicological impacts would be negligible, as would human health impacts from benzo(a)pyrene. Human health impacts for benzene would be minor to possibly major in areas I and II, and negligible to minor in area III (due to motorboat use only). For MTBE, human health impacts would be moderate to possibly major in all areas, including area III (motorboats only), but no MTBE-related impacts are projected for 2012. Focused water quality monitoring in high use areas would be needed to verify the estimation of impacts.

No impairment to water quality is expected under alternative C.

Impacts of the No-Action Alternative — PWC Use Prohibited throughout Fire Island National Seashore

Analysis. Banning PWC use within all Fire Island National Seashore jurisdictional waters would result in short- and long-term beneficial impacts because no PWC emissions would be released into national seashore waters. By 2012 water quality would be improved.

Cumulative Impacts. While PWC use within the national seashore would not contribute to cumulative impacts from motorized boat emissions within national seashore boundaries, impacts from other sources, including all other forms of motorized recreation, coastal development, and point and nonpoint sources of pollutants, would continue. Impacts would be somewhat reduced from those described under alternative A (see Table 17). Threshold volumes from other motorized craft are shown in Table 22.

Motorboat activity would continue to produce loadings of some contaminants (benzene and MTBE) in excess of existing water volumes for human health thresholds. MTBE will be banned by 2012, further reducing impacts.

TABLE 22: THRESHOLD WATER VOLUMES NEEDED TO DILUTE POLLUTANTS FROM MOTORIZED WATERCRAFT (EXCLUDING PERSONAL WATERCRAFT), NO-ACTION ALTERNATIVE

	Area I		Area II		Area III	
	2002	2012	2002	2012	2002	2012
NPS jurisdictional waters (ac-ft)	3,970		2,425		4,580	
Volume of water for the whole bay	16,700		21,140		12,200	
Ecotoxicological Benchmark Volume*						
Benzo(a)pyrene (fuel and exhaust)	1,400	760	580	310	550	300
Naphthalene	560	300	230	120	2,200	120
1-methyl naphthalene	2,900	1,500	1,200	620	1,100	600
Benzene	1,300	720	540	290	520	280
MTBE (marine, acute)	20	Banned	8.0	banned	7.6	banned
MTBE (marine, chronic)	57	Banned	24	banned	22	banned
Human Health Benchmark Volume**						
Benzo(a)pyrene (fuel and exhaust)	400	220	160	88	160	85
Benzene	17,000	9,400	7,100	3,800	6,800	3,600
MTBE	80,000	banned	32,000	banned	31,0000	banned

* Threshold volume (ac-ft) below which ecotoxicological effects might occur.

** Threshold volume (ac-ft) below which human health might be adversely affected.

As seen by comparing Table 17 and Table 22, motorboats alone account for approximately 80% of the organic pollutants discharged by motorized watercraft. Impacts from motorboats alone would be negligible for all ecotoxicological impacts and for human health impacts due to benzo(a)pyrene. Human health impacts from benzene would range from moderate in area I to negligible to minimal in area III. Impacts from MTBE would be possibly major in area I and moderate in areas II and III. Because MTBE would be banned in 2004, there would be no motorboat related impacts in 2012 attributable to MTBE.

Conclusion. Over the short and long term, banning PWC use within the national seashore would have a beneficial impact by contributing to improved water quality conditions in areas currently open to PWC use.

On a cumulative basis, other motorboat use would continue to have negligible to possibly major adverse impacts on water quality conditions in national seashore waters due to discharges of organic pollutants. Focused water quality monitoring would be needed to verify the estimation of impacts.

There would be no impairment to water quality under this alternative.

AIR QUALITY

Personal watercraft emit various compounds that pollute the air. Up to one third of the fuel delivered to current two-stroke engines goes unburned and is discharged as gaseous hydrocarbons; the lubricating oil is used once and is expelled as part of the exhaust; and the combustion process results in emissions of air pollutants such as volatile organic compounds (VOC), nitrogen oxides (NO_x), particulate matter (PM), and carbon monoxide (CO) (US EPA 1996a). Personal watercraft also emit fuel components such as benzene and fuel additives that are known to have adverse health effects. Even though PWC engine exhaust is usually routed below the waterline, portions of the exhaust gases end up in the air. These air pollutants may adversely impact park visitor and employee health, as well as sensitive park resources. For example, VOC and NO_x emissions in the presence of sunlight form ozone, which can cause or contribute to respiratory illness (US EPA 1996c). Ozone is harmful to sensitive species of vegetation. It causes visible foliar injury, decreases plant growth, and increases plant susceptibility to insects and disease (US EPA 1996c). Carbon monoxide can affect humans as well. It interferes with the oxygen carrying capacity of blood, resulting in lack of oxygen to tissues.

NO_x and PM emissions can reduce visibility (CARB 1997; US EPA 2000b). NO_x contributes to acid deposition effects on plants, water, and soil. However, NO_x is produced in relatively small quantities from PWC engines, and effects attributable to PWC use are estimated to be minimal.

GUIDING REGULATIONS AND POLICIES

Clean Air Act. The Clean Air Act establishes national ambient air quality standards to protect the public health and welfare from air pollution. The act also establishes the prevention of significant deterioration (PSD) of air quality program to protect the air in relatively clean areas. One purpose of this program is to preserve, protect, and enhance air quality in national parks, national wilderness areas, national monuments, national seashores, and other areas of special national or regional natural, recreational, scenic or historic value (42 USC 7401 et seq.). The program also includes a classification approach for controlling air pollution.

> Class I areas are afforded the greatest degree of air quality protection. Very little deterioration of air quality is allowed in these areas, and the unit manager has an affirmative responsibility to protect visibility and all other class I area air quality related values from the adverse effects of air pollution.
>
> Class II areas includes all national park system areas not designated as class I, and the Clean Air Act allows only moderate air quality deterioration in these areas. In no case, however, may pollution concentrations violate any of the national ambient air quality standards.

Fire Island National Seashore is designated a class II area.

Conformity Requirements. National park system areas that do not meet the national ambient air quality standards or whose resources are already being adversely affected by current ambient levels require a greater degree of consideration and scrutiny by NPS managers. Areas that do not meet national air quality standards for any pollutant are designated as nonattainment areas. Section 176 of the Clean Air Act states:

> No department, agency, or instrumentality of the Federal Government shall engage in, support in any way or provide financial assistance for, license or permit, or approve, any activity which does not conform to an [State] implementation plan. . . . [T]he assurance of conformity to such a plan shall be an affirmative responsibility of the head of such department, agency or instrumentality.

Federal agencies must ensure that any action taken does not interfere with a state's plan to attain and maintain the national ambient air quality standards in designated nonattainment and maintenance areas. In making decisions regarding PWC use within a designated nonattainment or maintenance area, park managers must conduct a conformity review to ensure that any pollutants added will not interfere with plans to attain national standards as documented in the State Implementation Plan (SIP). If there is a possibility that the addition of pollutants could interfere with SIP compliance, then the park managers should discuss plans with the appropriate state air pollution control agency and conduct a more formal conformity determination.

The Fire Island National Seashore area, located in Suffolk County, New York, is designated by the U.S. Environmental Protection Agency as in severe nonattainment for ozone, and as in attainment for all other criteria pollutants (CO, NO_x, SO_2, PM_{10}, and lead). The Division of Air Resources within the New York State Department of Environmental Conservation has included control measures and has accounted for limited growth related to ozone precursor sources, such as nonroad marine engines, in

the State Implementation Plan. The Division of Air Resources predicts that Suffolk County will attain the national air quality standard for ozone by 2007. (Allowances for emissions of these pollutants are documented in appendix N of the State Implementation Plan.) The proposed action and alternatives are subject to federal conformity review but are not predicted to add pollutants not already included in the state plan; therefore, the proposed action and alternatives are presumed to conform with the state plan, and a conformity determination is not required (40 CFR 93.158).

Applicable PWC Emission Standards. The Environmental Protection Agency issued the gasoline marine engine final rule in August 1996. The rule, which took effect in 1998, affects manufacturers of new outboard engines and the type of inboard engines used in personal watercraft. The agency adopted a phased approach to reduce emissions. The current emission standards were set at levels that are achievable by existing personal watercraft. By 2006 PWC manufacturers will be required to meet a corporate average emission standard that is equivalent to a 75% reduction in VOC emissions. The corporate average standard allows manufacturers to build some engines to emission levels lower than the standard and some engines to emission levels higher than the standard, and to employ a mix of technology types, as long as the overall corporate average is at or below the standard. Because the actual reduction in emissions depends on the sale of lower-emitting personal watercraft, the Environmental Protection Agency estimates that a 50% emission reduction will be achieved by 2020, and a 75% emission reduction by 2025.

Under New York State law (NYSCL, Environmental Conservation, 19-0306-A) standards and regulations equivalent to California are being adopted for accelerating the reduction of exhaust emissions of ozone precursor chemicals HC (which relates to VOC) and NO_x from new spark-ignition marine engines. The Division of Air Resources is scheduled to promulgate regulations by the end of 2002, which by 2012 are predicted to result in approximately a 60% reduction of VOC compared to the baseline emissions in the 1998 State Implementation Plan (CARB 1998).

NPS Organic Act and Management Policies. The National Park Service Organic Act of 1916 (16 USC 1 et seq.) and the National Park Service *Management Policies* guide the protection of park and wilderness areas. The general mandates of the Organic Act state that the National Park Service will

> promote and regulate the use of . . . national parks . . . by such means and measures as conform to the fundamental purpose of the said parks, . . . which purpose is to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations (16 USC 1).

Under its *Management Policies 2001* the National Park Service will

> seek to perpetuate the best possible air quality in parks to (1) preserve natural resources and systems; (2) preserve cultural resources; and (3) sustain visitor enjoyment, human health, and scenic vistas (sec. 4.7.1).

The *Management Policies* further state that the National Park Service will assume an aggressive role in promoting and pursuing measures to protect air quality related values from the adverse impacts of air pollution. In cases of doubt as to the impacts of existing or potential air pollution on park resources, the National Park Service "will err on the side of protecting air quality and related values for future generations."

The Organic Act and the *Management Policies* apply equally to all areas of the national park system, regardless of its designation under the Clean Air Act. Therefore, the National Park Service will protect resources at both class I and class II designated units. Furthermore, the Organic Act and *Management*

Policies provide additional protection from that afforded by the Clean Air Act's national ambient air quality standards alone because the National Park Service has documented that specific park air quality related values can be adversely affected at levels below the national standards or by pollutants for which no standard exists.

Wilderness Act. The Wilderness Act of 1964 (16 USC 1131 et seq.) defines wilderness as

> an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain . . . an area of undeveloped Federal Land retaining its primeval character and influence . . . which is protected and managed so as to preserve its natural conditions (16 USC 1131(c)).

The Wilderness Act also states that wilderness areas will be devoted to the public purposes of recreational, scenic, scientific, educational, conservation, and historical use. The NPS *Management Policies 2001* state that potential wilderness areas are "to be managed as wilderness to the extent the existing non-conforming conditions allow" (sec. 6.3.1).

METHODOLOGY AND ASSUMPTIONS

To assess the level of PWC air quality impacts resulting from a given management alternative, the following methods and assumptions were used:

1. The national ambient air quality standards and state/local air quality standards (if applicable) were examined for each pollutant.
2. Air quality designations for the surrounding area were determined. If a park, or a portion of a park, was within the boundaries of a nonattainment or maintenance area for a given pollutant, ambient air quality concentrations were assumed to violate the national ambient air quality standards for that pollutant. Fire Island National Seashore is in attainment for all criteria pollutants except ozone.
3. Local ambient air quality data from monitoring sites within the park, if available, and from monitoring sites nearby (within 100 miles) were reviewed. The occurrence of any exceedances (where applicable) and the level and frequency of pollutant concentrations were ascertained. If local ambient air quality data were not available, short-term sampling was conducted to assess current air quality conditions, or current conditions were assessed from regional interpolations. For each pollutant evaluated, the first highest maximum concentration obtained was compared with the national ambient air quality standards.
4. The use of motorized watercraft (both number of visits and hours of operation) at the national seashore was determined from visitation records, a survey by NPS staff, and information from the state. The annual number of hours of use by each watercraft type was calculated by multiplying the number of visits by the hours of operation. Peak hours of use were estimated assuming that on a high-use day all personal watercraft would operate at the same time. Average weekend day boating hours from the survey were adjusted by an allocation factor of 0.35 to calculate boating hours for the entire week (US EPA 1999b). A total of 12 weeks was figured for the summer season, plus 5% of the summer season weekly use to account for PWC use hours during the rest of the year (A. Worstell, NPS, pers. comm., D. Otto, LBG, Apr. 2002).
5. The rated horsepower, average engine load, deterioration factors, and other relevant parameters for each watercraft type were taken from the EPA nonroad model. (This model is used to calculate emissions of criteria pollutants from operation of nonroad spark-ignition type engines, including personal watercraft. The model allows assumptions to be made regarding

the mix of engine types that will be phased in as new engine standards come into effect and increasing numbers of personal watercraft will be of the cleaner burning four-stroke type. Total hydrocarbon emissions comprise approximately 100% of the VOC for two-stroke engines and 93% of the VOC for four-stroke engines [US EPA 1997; US EPA 2000a].)

6. Any reductions in emissions resulting from implementing control strategies were taken into account, as were changes in emissions resulting from increased or decreased usage.
7. Studies regarding ozone injury on sensitive plants found in the park were reviewed.
8. A calculation referred to as SUM06* (ppm-hr) was used to assess area ozone conditions. The highest three-month, five-year average commonly used for the area was determined by reviewing ambient air quality data (available from the NPS Air Resources Division).
9. Visibility impairment was determined from local monitoring data, or from qualitative evidence such as personal observations and photographs.
10. The air quality impacts of the various alternatives were assessed by considering the existing air quality levels and the air quality related values present, and by using the estimated emissions and any applicable, EPA-approved air quality models. Estimated reductions in hydrocarbon emissions include an assumption of approximately 60% reduction in VOC emission from personal watercraft by 2012 relative to the baseline year of 1998 due to engine technology improvements mandated by the Environmental Protection Agency and the state.
11. Cumulative impacts were analyzed quantitatively for all recreational watercraft. Fire Island National Seashore maintains vehicular access to the park for cars, trucks, and recreational vehicles; emissions from these vehicles and other local and regional sources of air pollutants were not assessed quantitatively but were considered in the cumulative impact assessment.

PWC impact thresholds for air quality are dependent on the type of pollutants produced, the back-ground air quality, and the pollution-sensitive resources (air quality related values) present. Impact thresholds may be qualitative (e.g., photos of degraded visibility) or quantitative (e.g., based on impacts to air quality related values or federal air quality standards, or emission based), depending on what type of information is appropriate or available.

Two categories of potential airborne pollution impacts from personal watercraft and other motorized watercraft are analyzed: (1) impacts on human health, and (2) impacts on air quality related values in the park area. Thresholds (negligible, minor, moderate, and major) are discussed below for each impact category.

STUDY AREA

The study area includes the immediate locations of PWC use and the surrounding nearshore environment where air pollutants may accumulate. For purposes of this review, the study area is Fire Island National Seashore from the west boundary of Fire Island Lighthouse to Moriches Inlet on the bayside as follows (see the Areas of Analysis map, page 65):

* The SUM06 exposure index cumulates over a given time period and diurnal window all hourly O_3 concentrations greater than or equal to 0.06 ppm.

IMPACT TO HUMAN HEALTH FROM AIRBORNE POLLUTANTS RELATED TO PWC USE

Fire Island National Seashore is in attainment with national ambient air quality standards for all criteria pollutants except ozone; the national seashore is in a serious nonattainment area for ozone.

Attainment Pollutants: The following impact thresholds have been defined for attainment pollutants:

	Activity Analyzed		Current Air Quality
Negligible:	Emission levels would be less than 50 tons/year for each pollutant.	**and**	The first highest 3-year maximum for each pollutant would be less than NAAQS.
Minor:	Emission levels would be less than 100 tons/year for each pollutant.	**and**	The first highest 3-year maximum for each pollutant would be less than NAAQS.
Moderate:	Emission levels would be greater than or equal to 100 tons/year for any pollutant.	**or**	The first highest 3-year maximum for each pollutant would be greater than NAAQS.
Major:	Emission levels would be greater than or equal to 250 tons/year for any pollutant.	**and**	The first highest 3-year maximum for each pollutant would be greater than NAAQS.

Nonattainment Pollutants: The following impact thresholds have been defined for the nonattainment pollutants and their precursors (for ozone these are VOC and NOx):

Negligible:	There would be a net decrease in emissions from current levels.
Minor:	Emissions would be 0–5 tons/year.
Moderate:	Emissions would be greater than 5 tons/year and less than conformity de minimus levels (25 tons/year).
Major:	Emissions would be equal to or greater than conformity de minimus levels (25 tons/year).

Impairment (for both attainment and nonattainment areas): Impacts would

have a major adverse effect on park resources and values;

contribute to deterioration of the park's air quality to the extent the park's purpose could not be fulfilled as established in its enabling legislation;

affect resources key to the park's natural or cultural integrity or opportunities for enjoyment; or

affect the resource whose conservation is identified as a goal in the park's *General Management Plan* or other park planning documents.

Impacts of Alternative A — Continue PWC Use as Currently Managed under a Special Regulation

Analysis. Under alternative A the assumptions for annual PWC use include 16,200 boating hours in 2002 increasing to 19,000 boating hours in 2012. The ambient air quality conditions in the national seashore meet the national and state ambient air quality standards for all pollutants except ozone. The predicted air quality impact levels would be minor adverse for CO, with PWC emission levels between 50 and 100 tons/year, negligible for PM, and minor adverse for NO_x. The air quality impact level would be major to moderate adverse for VOC since PWC emission levels in 2002 would be more than the emission threshold (25 tons/year) for an ozone nonattainment area. Table 23 shows PWC emissions and human health impacts for alternative A.

TABLE 23: PWC EMISSIONS AND HUMAN HEALTH IMPACT LEVELS, ALTERNATIVE A

	CO		PM		NO_x		VOC	
	2002	2012	2002	2012	2002	2012	2002	2012
Annual Emissions (tons/year)	71.52	66.75	1.42	0.26	0.33	1.22	32.72	19.19
Impact Level (adverse)	Minor	Minor	Negligible	Negligible	Minor	Minor	Major	Moderate

Cumulative Impacts. Many commercial and recreational marine vessels use the waters in and around the national seashore. According to an informal NPS survey, the size of boats present on the waters can vary from small 16-foot watercraft to 50-foot or longer fishing and performance boats to ferry-boats. Most of the smaller boats typically operate two-stroke gasoline outboard engines of 15 to 130 hp, or between 11 and 96 kW (OC Bayside Rentals staff, pers. comm., Sept. 13, 2001). Larger performance boats often operate on inboard diesel or gasoline engines of 340 to 660 hp. The analysis performed for this environmental assessment modeled emissions for an estimate of all watercraft using the area, but it did not include numbers for other air pollution sources, such as regional industry or motor vehicles.

Considering the average national trend of marine vehicle use and the current and future emission levels generated within the national seashore, under alternative A cumulative CO emission levels from all motorized watercraft (including personal watercraft) would result in a major adverse impact in 2002 and 2012, while levels for PM_{10} would result in negligible adverse impacts (see Table 24). The cumulative NO_x and VOC emissions would result in moderate to major adverse cumulative impacts compared to the emission threshold (25 tons/year) for ozone nonattainment.

Conclusion. Impacts in 2002 and 2012 from continuing PWC use within the national seashore boundary would be negligible adverse for PM_{10} and NO_x emissions, minor adverse for CO, and major adverse for VOC emissions in 2002, decreasing to moderate by 2012 as a result of improved emission controls.

Overall, cumulative emissions from all boating activities in 2002 and 2012 are predicted to result in negligible adverse impacts for PM_{10}, moderate adverse impacts for CO and NO_x, and major adverse impacts for VOC. As a result of improved engine technology, VOC emissions would decline by 2012 compared to present conditions, but not enough to lower the impact.

TABLE 24: PWC AND MOTORIZED BOAT EMISSIONS AND HUMAN HEALTH IMPACT LEVELS, ALTERNATIVE A

	CO		PM_{10}		NO_x		VOC	
	2002	2012	2002	2012	2002	2012	2002	2012
Annual Emissions (tons/year)	323.48	344.23	5.62	4.90	10.20	13.83	99.34	52.91
Impact Level (adverse)	Major	Major	Negligible	Negligible	Moderate	Moderate	Major	Major

Any predicted major impact levels are based on the criteria selected for this analysis only. The State Implementation Plan recognizes that high pollutant levels in this area come from many sources, including motorized watercraft, and it takes this into account in establishing plan provisions and requirements. Also, air pollution sources in the Fire Island area do not contribute to the deterioration of the park's air quality to the extent that the park's purpose is not being met or will not be met, and no key resource damage has been identified due to air quality concerns. For these reasons, alternative A is not predicted to result in impairment of air quality resources.

Impacts of Alternative B — Continue PWC Use, but Limit Use to Areas Adjacent to Beach Communities

Analysis. Alternative B, like alternative A, would allow for PWC use within the national seashore, but use would be restricted to areas adjacent to private communities. Annual assumptions for PWC use is estimated to increase from 12,700 boating hours in 2002 to 13,600 boating hours in 2012. Table 25 presents the annual PWC emissions and their impact levels for 2002 and 2012. The air quality impact levels in 2002 and 2012 would be negligible adverse for PM_{10} (emissions less than 50 tons/year), minor adverse for CO (emissions less than 100 tons/year), and minor adverse for NO_x (emissions less that the 5 tons/year). The impact for VOC would be major adverse in 2002 because they would exceed the 25 tons/year major impairment threshold by a small margin (less than 1 ton); the impact would decrease to moderate by 2012 (more than 5 tons/year and less than the emission threshold of 25 tons/year for an ozone nonattainment area).

TABLE 25: PWC EMISSIONS AND HUMAN HEALTH IMPACT LEVELS, ALTERNATIVE B

	CO		PM_{10}		NO_x		VOC	
	2002	2012	2002	2012	2002	2012	2002	2012
Annual Emissions (tons/year)	56.07	53.57	1.12	0.21	0.26	0.98	25.65	15.40
Impact Level (adverse)	Minor	Minor	Negligible	Negligible	Minor	Minor	Major	Moderate

Cumulative Impacts. Cumulative impacts would be similar to those described under alternative A, except that PWC use would be confined to those areas adjacent to the beach communities, accounting for a slight decrease in annual emissions (see Table 26). It is assumed that the same number of PWC users would continue to recreate in the general area, although not necessarily within the national seashore. In addition, other types of motorized watercraft and other regional air pollution sources would still be present. Under alternative B the cumulative PM_{10} emission levels, based on all PWC and motorized watercraft use, would be negligible throughout the assessment period, NO_x emissions would be moderate adverse, and CO and VOC emission levels would be major adverse in both 2002 and 2012. Cumulative VOC emissions would be more than the emission threshold (25 tons/year) for an ozone nonattainment area, resulting in the major adverse impact.

TABLE 26: PWC AND MOTORIZED BOAT EMISSIONS AND HUMAN HEALTH IMPACT LEVELS, ALTERNATIVE B

	CO		PM_{10}		NO_x		VOC	
	2002	2012	2002	2012	2002	2012	2002	2012
Annual Emissions (tons/year)	308.03	331.05	5.32	4.85	10.13	13.59	92.27	49.12
Impact Level (adverse)	Major	Major	Negligible	Negligible	Moderate	Moderate	Major	Major

Conclusion. PWC annual emissions under alternative B would result in negligible adverse impacts for PM_{10}, and minor adverse impacts for CO and NO_x throughout the assessment period. For VOC emissions, impacts would be major adverse in 2002, declining to moderate by 2012 due to improved emission controls.

Cumulative emissions from all boating activities (local as well as regional) would result in negligible adverse impacts for PM_{10}, moderate adverse impacts for NO_x, and major adverse impacts for CO and VOC in both 2002 and 2012.

For the same reasons as discussed under alternative A, no impairment of air quality resources is predicted.

Impacts of Alternative C — Continue PWC Use, but Limit Use to Areas Adjacent to Beach Communities and Enforce a 1,000-Foot Buffer along all Shorelines within the NPS Boundary

Analysis. PWC use under alternative C would be allowed in areas adjacent to beach communities but a 1,000-foot buffer would be enforced around the national seashore lands, and PWC users would have to operate in ferryways at no-wake speeds. Annual assumptions for PWC use are the same as for alternative B — 12,700 boating hours in 2002, increasing to 13,600 boating hours in 2012. The proposed management restrictions under this alternative would limit allowable PWC speeds relative to alternative B; some reduction of emissions is anticipated but has not been quantified. Therefore, air emissions under alternative C in 2002 and 2012 are assumed to be the same as alternative B: negligible emissions for PM_{10} and minor emissions for CO and NO_x. For VOC emissions, impacts would be major adverse in 2002 (by less than 1 ton/year), decreasing to moderate by 2012 (see Table 25).

Cumulative Impacts. Under alternative C the cumulative emission levels for CO would be the same as under alternative B (see Table 26) and would have the same degree of impact. The cumulative PM_{10} emission levels would be negligible, NO_x levels would be moderate adverse, and CO and VOC levels would be major adverse. (VOC emissions would be more than the emission threshold of 25 tons/year for an ozone nonattainment area.)

Conclusion. The PWC annual emissions under alternative C are expected to be very similar to those under alternative B in both 2002 and 2012 and would result in negligible adverse impacts for PM_{10} and minor adverse impacts for CO and NO_x. For VOC emissions the impact would be major adverse in 2002, decreasing to moderate adverse by 2012 due to improved emission controls.

Cumulative emissions from all boating activities in both 2002 and 2012 would result in negligible adverse impacts for PM_{10}, moderate adverse impacts for NO_x, and major adverse impacts for CO and VOC.

For the same reasons as discussed for alternative A, alternative C is not predicted to result in impairment of air quality resources.

Impacts of the No-Action Alternative

Analysis. Under the no-action alternative, PWC use would be banned within the national seashore boundary, with no contribution to pollution from PWC use, resulting in beneficial impacts for each of the criteria pollutants, specifically the ozone precursors NO_x and VOC.

Cumulative Impacts. The cumulative air quality impacts of all marine recreational vehicles within the vicinity of the national seashore under the no-action alternative are shown in Table 27. Cumulative emissions within the national seashore would result only from non-PWC related activities. Cumulative PM_{10} emissions would result in negligible adverse impacts, NO_x emissions in moderate adverse impacts, and CO and VOC emissions in major adverse impacts. (VOC emissions would exceed the emission threshold of 25 tons/year for an ozone nonattainment area.)

TABLE 27: ALL MOTORIZED BOAT EMISSIONS AND HUMAN HEALTH IMPACT LEVELS, NO-ACTION ALTERNATIVE

	CO		PM_{10}		NO_x		VOC	
	2002	2012	2002	2012	2002	2012	2002	2012
Annual Emissions (tons/year)	251.96	277.48	4.20	4.64	9.87	12.61	66.62	33.72
Impact Level (adverse)	Major	Major	Negligible	Negligible	Moderate	Moderate	Major	Major

Conclusion. As a result of banning PWC use within the national seashore boundary, the no-action alternative would have beneficial impacts for the ozone precursors NO_x and VOC.

Cumulative impacts from all other motorized boating activities would decrease slightly due to eliminating PWC operations and improved emissions controls. Impacts would still be negligible adverse for PM_{10}, moderate adverse for NO_x, and major adverse for CO and VOC in both 2002 and 2012.

The no-action alternative is not predicted to result in impairment of air quality resources.

IMPACT TO AIR QUALITY RELATED VALUES FROM PWC POLLUTANTS

Impacts to air quality related values include effects on visibility and biological resources (specifically ozone effects on plants) from airborne pollutants related to PWC use. To assess the impacts of ozone on plants, the existing area average ozone index values were used and are represented as SUMO6. National SUMO6 values have been compiled by the NPS Air Resources Division, based on rural and urban monitoring sites. Based on the five-year average data provided by the National Park Service, the SUMO6 for the study area is within a range of 19–25 ppm-hrs based on urban site data. $PM_{2.5}$ as a fraction of particulate matter is evaluated for visibility impairment.

The following PWC impact levels for air quality related values are assumed:

	Activity Analyzed		**Current Air Quality**
Negligible:	Emissions would be less than 50 tons/year for each pollutant.	**and**	There would be no perceptible visibility impacts (photos or anecdotal evidence). **and** There would be no observed ozone injury on plants.

			and SUM06 ozone would be less than 12 ppm-hrs.
Minor:	Emissions would be less than 100 tons/year for each pollutant.	**and**	SUM06 ozone would be less than 15 ppm-hrs.
Moderate:	Emissions would be 100–249 tons/ year for any pollutant. **or** Visibility impacts from cumulative PWC emissions would be likely (based on past visual observations).	**or**	Ozone injury symptoms would be identifiable on plants. **and** SUM06 ozone would be less than 25 ppm-hrs.
Major:	Emissions would be equal to or greater than 250 tons/year for any pollutant. **or** Visibility impacts from cumulative PWC emissions would be likely (based on modeling or monitoring).	**and**	Ozone injury symptoms would be identifiable on plants. **or** SUM06 ozone would be greater than 25 ppm-hrs.

Impairment: Air quality related values in the park would be adversely affected. In addition, impacts would

have a major adverse effect on park resources and values;

contribute to deterioration of the park's air quality to the extent that the park's purpose could not be fulfilled as established in its enabling legislation;

affect resources key to the park's natural or cultural integrity or opportunities for enjoyment; or

affect the resource whose conservation is identified as a goal in the park's *General Management Plan* or other park planning documents.

Impacts of Alternative A — Continue PWC Use as Currently Managed under a Special Regulation

Analysis. Annual PWC emission loads and their impact levels for 2002 and 2012 under this alternative are shown in Table 28. SUM06 ozone levels would be 15–25 ppm-hrs, resulting in a moderate adverse impact level related to ozone injury. Currently, there are no perceptible qualitative visibility impacts of record or observed ozone injury to plants. PWC emission levels would be less than 50 tons/year for $PM_{2.5,}$ a negligible adverse impact on visibility.

TABLE 28: AIR QUALITY VALUES RELATED IMPACTS FROM PWC EMISSIONS, ALTERNATIVE A

	SUM06 Ozone (ppm-hrs)		$PM_{2.5}$	
	2002	2012	2002	2012
Ozone Level / Annual Emissions	15–25	15–25	1.31	0.24
Impact Level (adverse)	Moderate	Moderate	Negligible	Negligible

Cumulative Impacts. The cumulative impact analysis includes a quantitative assessment of fine particulate matter ($PM_{2.5}$) for other marine recreational vehicle use, taking into consideration national use trends, as well as current and future emission levels. Cumulative emissions and impacts of all PWC and other boating use under alternative A are shown in Table 29.

The cumulative impact from all emissions related to PWC and motorized boat use would be moderate adverse for ozone (between 15 and 25 SUM06 ozone values) and negligible for visibility as a function of $PM_{2.5}$ emissions (less than 50 tons/year) Future emission levels would decrease as a result of EPA and state marine engine emission requirements taking effect.

TABLE 29: AIR QUALITY RELATED IMPACTS FROM PWC EMISSIONS AND MOTORIZED BOATS, ALTERNATIVE A

	SUM06 Ozone (ppm-hrs)		$PM_{2.5}$	
	2002	2012	2002	2012
Ozone Level / Annual Emissions	15–25	15–25	5.17	4.51
Impact Level (adverse)	Moderate	Moderate	Negligible	Negligible

Conclusion. Annual emissions from personal watercraft under alternative A would result in moderate adverse impacts for ozone exposure and negligible impacts to visibility. There are no perceptible visibility impacts on record or observed ozone injury on plants.

Cumulative emissions from all boating activities would result in moderate adverse impacts for ozone and negligible visibility impacts from $PM_{2.5}$.

This alternative would not impair air quality related values.

Impacts of Alternative B — Continue PWC Use, but Limit Use to Areas Adjacent to Beach Communities

Analysis. Under this alternative the ambient air quality levels in the national seashore would meet the national ambient air quality standards, and there would be no perceptible qualitative visibility impacts or observed ozone injury on plants. Table 30 presents the annual PWC emission loads and their impact levels for 2002 and 2012. Ozone-related injury to plants would be moderate, again based on a SUM06 ozone level of 15-25 ppm-hrs. PWC emission levels are projected to be slightly lower than under alternative A due to PWC use restrictions. Emission levels for $PM_{2.5}$ would result in a negligible impact on visibility because levels would be substantially below 50 tons/year.

TABLE 30: AIR QUALITY RELATED IMPACTS FROM PWC EMISSIONS, ALTERNATIVE B

	SUM06 Ozone (ppm-hrs)		$PM_{2.5}$	
	2002	2012	2002	2012
Ozone Level / Annual Emissions	15–25	15–25	1.03	0.19
Impact Level (adverse)	Moderate	Moderate	Negligible	Negligible

Cumulative Impacts. Cumulative emissions and impacts of all motorized watercraft and from other local and regional sources under alternative B are summarized in Table 31. The impact levels from air

emissions of all activities would be moderate adverse for ozone (vegetation damage) and negligible for $PM_{2.5}$ (visibility).

TABLE 31: AIR QUALITY RELATED IMPACTS FROM PWC EMISSIONS AND MOTORIZED BOATS, ALTERNATIVE B

	SUM06 Ozone (ppm-hrs)		$PM_{2.5}$	
	2002	2012	2002	2012
Ozone Level / Annual Emissions	15–25	15–25	4.89	4.46
Impact Level (adverse)	Moderate	Moderate	Negligible	Negligible

Conclusion. PWC annual emissions under alternative B would result in moderate adverse impacts for ozone exposure and negligible impacts to visibility. There are no perceptible qualitative visibility impacts of record or observed ozone injury on plants.

The cumulative impacts from all PWC and other motorized boating use would result in moderate adverse impacts related to ozone effects on vegetation and negligible impacts on visibility (from $PM_{2.5}$).

This alternative would not impair air quality related values.

Impacts of Alternative C — Continue PWC Use, but Limit Use to Areas Adjacent to Beach Communities and Enforce a 1,000-Foot Buffer along all Shorelines within the NPS Boundary

Analysis. PWC use under alternative C would only be allowed within limited areas and at restricted speeds, resulting in slightly reduced emissions relative to alternative A and levels similar to alternative B. Table 32 presents the annual PWC emission loads and their estimated impact levels for 2002 and 2012. Impacts related to ozone injury would be moderate adverse, based on the SUM06 ozone level for the park. The PWC emission levels of $PM_{2.5}$ would all be far below 50 tons/year in 2002 and 2012, a negligible adverse impact.

TABLE 32: AIR QUALITY RELATED IMPACTS FROM PWC EMISSIONS, ALTERNATIVE C

	SUM06 Ozone (ppm-hrs)		$PM_{2.5}$	
	2002	2012	2002	2012
Annual Emissions (tons/year) or SUM06 ozone level	15–25	15–25	4.89	4.46
Impact Level (adverse)	Moderate	Moderate	Negligible	Negligible

Cumulative Impacts. The cumulative emissions and impacts of all marine recreational boating activities sources are shown in Table 33. Cumulative impacts would be moderate adverse for ozone effects on vegetation and negligible for visibility ($PM_{2.5}$ levels).

TABLE 33: AIR QUALITY RELATED IMPACTS FROM PWC EMISSIONS AND MOTORIZED BOATS, ALTERNATIVE C

	SUM06 Ozone (ppm-hrs)		$PM_{2.5}$	
	2002	2012	2002	2012
Annual Emissions (tons/year) or SUM06 ozone level	15–25	15–25	4.89	4.46
Impact Level (adverse)	Moderate	Moderate	Negligible	Negligible

Conclusion. PWC annual emissions under alternative C would result in moderate adverse impacts for ozone exposure and negligible impacts for visibility. There are no perceptible visibility impacts on record or observed ozone injury on plants.

Cumulative emissions from all motorized boating activities would result in moderate adverse impacts for ozone exposure to vegetation and negligible impacts for visibility.

This alternative would not impair air quality related values.

Impacts of the No-Action Alternative

Analysis. Under the no-action alternative PWC use within national seashore boundaries would be banned, and there would be no contribution from this pollution source within the national seashore boundary. Impacts would be beneficial due to reduced PWC-related ozone precursors and $PM_{2.5}$ pollutants.

Cumulative Impacts. While PWC use would no longer be allowed within the national seashore, other motorized boat use would continue at the same levels within the seashore and in adjacent areas. The total cumulative emission loads and impact levels are shown in Table 34. The cumulative impact levels from air emissions of all other motorized boating activities under the no-action alternative would be moderate for ozone effects on vegetation and negligible for effects on visibility. Future emission levels would decrease due to controlled engine emission regulations.

TABLE 34: AIR QUALITY RELATED IMPACTS FROM MOTORIZED BOATS, NO-ACTION ALTERNATIVE

	SUM06 Ozone (ppm-hrs)		$PM_{2.5}$	
	2002	2012	2002	2012
Ozone Level / Annual Emissions	15–25	15–25	5.17	4.89
Impact Level (adverse)	Moderate	Moderate	Negligible	Negligible

Conclusion. The no-action alternative would have beneficial impacts on the air quality of Fire Island National Seashore as a result of banning PWC use.

Cumulative emissions would result in moderate impacts for ozone and negligible impacts for visibility.

This alternative would not impair air quality related values.

SOUNDSCAPES

All motorized watercraft, including PWC, produce noise that may impact park soundscapes and visitor experiences. Any watercraft that does not meet the NPS watercraft noise regulation of 82 dB at 82 feet at full acceleration is subject to fine and removal from the park. Therefore, it is assumed for this analysis that 82 dB at 82 feet is the maximum that would be emitted for any legal watercraft at full acceleration (normally the “loudest” portion of its operation).

In addition, the noise from personal watercraft may be more noticeable and therefore more impacting to people than from other motorcraft due to frequent changes in acceleration and direction, and

jumping into the air, causing rapid increases in the noise level and changes in sound frequency distribution.

GUIDING REGULATIONS AND POLICIES

The national park system includes some of the quietest places on earth, as well as a rich variety of sounds intrinsic to park environments. These intrinsic sounds are recognized and valued as a park resource in keeping with the NPS mission (*NPS Management Policies 2001,* sec. 1.4.6), and are referred to as the park's natural soundscape. The natural soundscape, sometimes called natural quiet, is the aggregate of all the natural sounds that occur in parks, absent human-caused sound, together with the physical capacity for transmitting the natural sounds (sec. 4.9). It includes all of the sounds of nature, including such "non-quiet" sounds as birds calling, thunder, and waves breaking against the shore. Some natural sounds are also part of the biological or other physical resource components of parks (e.g., animal communication, sounds produced by physical processes such as wind in trees, thunder, waves).

NPS policy requires restoration of degraded soundscapes to the natural condition whenever possible, and protection of natural soundscapes from degradation due to noise (undesirable human-caused sound) (*Management Policies 2001,* sec. 4.9). The National Park Service is specifically directed to "take action to prevent or minimize all noise that, through frequency, magnitude, or duration, adversely affects the natural soundscape or other park resources or values, or that exceeds levels that have been identified as being acceptable to, or appropriate for, visitor uses at the sites being monitored" (*Management Policies 2001,* sec. 4.9). Overriding all of this is the fundamental purpose of the national park system, established in law (e.g., 16 USC 1 et seq.), which is to conserve park resources and values (*Management Policies 2001,* sec. 1.4.3). NPS managers must always seek ways to avoid, or to minimize to the greatest degree practicable, adverse impacts on park resources and values (*Management Policies 2001,* sec 1.4.3).

Noise can adversely affect park resources, including but not limited to natural soundscapes. It can directly impact them, for example by modifying or intruding upon the natural soundscape. It can also indirectly impact resources, for example by interfering with sounds important for animal communication, navigation, mating, nurturing, predation, and foraging functions.

Noise can also adversely impact park visitor experiences. The term "visitor experience" can be defined as the opportunity for visitors to experience a park's resources and values in a manner appropriate to the park's purpose and significance, and appropriate to the resource protection goals for a specific area or management zone within that park. In other words, visitor experience is primarily a resource-based opportunity appropriate to a given park or area within a park, rather than a visitor-based desire. Noise impacts to visitor experience can be especially adverse when management objectives for visitor experience include solitude, serenity, tranquility, contemplation, or a completely natural or historical environment. Management objectives (also called desired conditions) for resource protection and visitor experience are derived through well-established public planning processes from law, policy, regulations, and management direction applicable to the entire national park system and to each specific park unit.

Visitor uses of parks will only be allowed if they are appropriate to the purpose for which a park was established, and if they can be sustained without causing unacceptable impacts to park resources or values (*Management Policies 2001,* sec. 8.1 and 8.2). While the fundamental purpose of all parks also includes providing for the "enjoyment" of park resources and values by the people of the United States, enjoyment can only be provided in ways that leave the resources and values unimpaired for the

enjoyment of future generations (*Management Policies 2001,* sec. 1.4.3). Unless mandated by statute, the National Park Service will not allow visitors to conduct activities that, among other things, unreasonably interfere with "the atmosphere of peace and tranquility, or the natural soundscape maintained in wilderness and natural, historic, or commemorative locations within the park" (*Management Policies 2001,* sec. 8.2). While many visitor activities are allowed or even encouraged in parks consistent with the above policies, virtually all visitor activities are limited or restricted in some way (e.g., through carrying capacity determinations, implementation plans, or visitor use management plans), and on a park- or area-specific basis, some visitor activities are not allowed at all.

The degree to which a given activity (e.g., PWC use) is consistent with, or moves the condition of a resource or a visitor experience toward or away from a desired condition, is one measure of the impact of the activity.

The federal regulation pertaining to noise abatement for boating and water use activities (36 CFR 3.7) prohibits operating a vessel on inland waters "so as to exceed a noise level of 82 decibels measured at a distance of 82 feet (25 meters) from the vessel" and specifies that testing procedures to determine such noise levels should be in accordance with or exceed those established by the Society of Automotive Engineers (SAE) in "Exterior Sound Level Measurement Procedure for Pleasure Motorboats" (J34). This SAE procedure specifies that sound level measurements be taken 25 meters perpendicular to the line of travel of the vessel at full throttle (SAE 2001). It is important to note that this NPS regulation and the SAE procedure were developed for enforcement purposes, not impact assessment purposes. The level in the regulation does not imply that there are no impacts to park resources or visitor experiences at levels below 82 dB; it just indicates that noise levels from vessels legally operating on NPS waters will be no "louder" than 82 dB. As explained elsewhere in this document, a single decibel value does not provide much information for impact assessment purposes.

Human-generated noise sources at Fire Island National Seashore include personal watercraft and other types of watercraft, vehicular traffic, aircraft, and noise generating from the private communities.

METHODOLOGY AND ASSUMPTIONS

The methodology used to assess noise impacts from personal watercraft in this document is consistent with the NPS *Management Policies 2001*, and *Director's Order #47: Soundscape Preservation and Noise Management,* and the reference manual for DO #47 (NPS 2000b). Park-specific factors related to context, time, and intensity are discussed below, and then integrated into a discussion of the impact thresholds used in this analysis.

Potential impacts to the soundscape at Fire Island National Seashore were evaluated based on the existing sound levels in comparison to potential sound levels associated with each of the alternatives. This evaluation is a qualitative assessment. The qualitative assessment is based on the general trends of existing and future PWC use in the park and best professional judgment. While specific background noise studies are not available at Fire Island National Seashore, certain conditions have been taken into account given the number of PWC users in the identified study areas and land use patterns surrounding those areas. For example, it is assumed that the soundscape throughout the majority of area I is that of an active suburban area, while area II is an area of day use, and area III is more characteristic of a quiet rural town with associated tourism. Impacts to wildlife from noise are addressed separately under "Wildlife and Wildlife Habitat."

> **Context:** Fire Island National Seashore includes areas characterized by intense motorized boat activity (area I) and areas characterized by bird watching, canoeing, hiking, and camping (area

III). Resources at the seashore that are most likely to be affected by PWC noise include the park's natural and noise-sensitive wildlife, such as breeding waterfowl.

Time Factor: PWC use occurs during all seasons except winter. PWC use occurs during daylight hours, as mandated under New York State boating regulations. Use generally discontinues during periods of inclement weather (e.g., cold, thunderstorms).

In areas of concentrated PWC use, such as the Ocean Bay Park, noise from personal watercraft and other boats can be virtually constant from sunrise to sunset. In areas of low use, noise from PWC and other boat types can be intermittent, usually lasting at least a few minutes when present.

Intensity: The levels of sound generated by watercraft using the national seashore area is expected to affect users differently. For example, visitors participating in less sound-intrusive activities such as bird-watching and/or hiking would likely be more adversely affected by PWC noise than another PWC or motorboat user. Therefore, impacts to soundscape must take into account the effect of noise levels on different types of recreation users within the study area. The following is a list of other considerations for evaluating sound impacts:

The maximum number of PWC operating per hour would increase from 64 in 2002 to 72.8 by 2012 in area I, from 26 to 29.6 in area II, and from 25 to 28.4 in area III. These are considered to be the maximum number of personal watercraft operating in each area midday during peak season, when use is highest.

Ambient noise levels in areas II and III include natural sounds, other visitors, and other boats.

Ambient noise levels in area I include noise associated with areas of heavy visitation and high boat and PWC usage.

In order to estimate the relative impacts of PWC use at the national seashore, the following methodology was followed:

1. PWC use was estimated as explained in "PWC Use Trends." National literature was used to estimate the average decibel levels of PWC. Literature sources included federal and state agencies, PWC industry specifications, and measurements conducted by various nongovernmental organizations.
2. Areas of shoreline use by other visitors were identified in relation to where PWC launch and operate offshore. Personal observations from park staff were used to identify these areas, as well as PWC user trend information (see "PWC Use Trends").
3. Other considerations, such as topography and prevailing winds, were then used to identify areas where PWC noise levels may be exacerbated, or reduced.
4. In this assessment the noise of two or more personal watercraft operating at the same time (when one unit produces 82 dB) and at a distance of 82 feet from the source, was shown to be 85 dB.* Consequently, the noise levels calculated for the study area, based on PWC average numbers per hour estimated in the user trend section of this report, would be

   Area I — 64 PWC / hour = 100 dB

   Area II — 26 PWC / hour = 96 dB

* The equation used was $10 \times \log ((10^{82/10}) + (10^{82/10})) = 85$ dB

Area III — 25 PWC / hour = 96 dB

At 500 feet from PWC users (the distance from bathing beaches that PWC users must maintain under New York State boating regulations) the following noise levels were calculated:**

Area I — 64 PWC / hour = 84.4 dB

Area II — 26 PWC / hour = 80.4 dB

Area III — 25 PWC / hour = 80.3 dB

At 1,000 feet from PWC users (the proposed buffer under alternative C), the estimated noise levels for the three study areas would be:

Area I — 64 PWC / hour = 78.4 dB

Area II — 26 PWC / hour = 74.4 dB

Area III — 25 PWC / hour = 74.3 dB

STUDY AREA

The study area for soundscapes is related to the location that personal watercraft operate and the distance that PWC noise travels. PWC use is allowed throughout Fire Island National Seashore; however, the majority of use is on the bayside of the island (see "PWC Use Trends," page 70). PWC noise can travel inland and is expected to dissipate within 0.75 mile of the source. Thus, the study area for soundscapes is all of Fire Island National Seashore and is analyzed by defined areas of use (see Areas of Analysis map, page 65).

IMPACT TO VISITORS FROM PWC NOISE

Given this methodology and the accompanying assumptions, the following criteria have been developed to assess the noise impacts for each of the alternatives:

Negligible: Natural sounds would prevail; motorized noise would be very infrequent or absent, mostly immeasurable.

Minor: Natural sounds would be predominant in areas where management objectives call for natural processes to predominate, with motorized noise infrequent at low levels. In areas where motorized noise is consistent with the park purpose and objectives, motorized noise could be heard frequently throughout the day at moderate levels, or infrequently at higher levels, and natural sounds could be heard occasionally.

Moderate: In areas where management objectives call for natural processes to predominate, natural sounds would predominate, but motorized noise could occasionally be present at low to moderate levels. In areas where motorized noise is consistent with park purpose and objectives, motorized noise would predominate during daylight hours and would not be overly disruptive to noise-sensitive visitor activities in the area; in such areas, natural sounds could still be heard occasionally.

** The equation used was $20 \times \log (D1/D2)$
where D1 = the location to be calculated
D2 = the distance of the known noise source

Major: In areas where management objectives call for natural processes to predominate, natural sounds would be impacted by human noise sources frequently or for extended periods of time at moderate intensity levels (but no more than occasionally at high levels), and in a minority of the area. In areas where motorized noise is consistent with park purpose and zoning, the natural soundscape would be impacted most of the day by motorized noise at low to moderate intensity levels, or more than occasionally at high levels; motorized noise would disrupt conversation for long periods of time and/or make enjoyment of other activities in the area difficult; natural sounds would rarely be heard during the day.

Impairment: The level of noise associated with PWC use would be heard consistently and would be readily perceived by other visitors throughout the day, especially in areas where such noise would potentially conflict with the intended use of that area. In addition, these adverse, major impacts (described above) to park resources and values would:

contribute to deterioration of the park's soundscape to the extent that the park's purpose could not be fulfilled as established in its enabling legislation;

affect resources key to the park's natural or cultural integrity or opportunities for enjoyment; or

affect the resource whose conservation is identified as a goal in the park's *General Management Plan* or other park planning documents.

Impacts of Alternative A — Continue PWC Use as Currently Managed under a Special Regulation

Analysis. As stated above, on a typical summer day during peak operating hours, approximately 64, 26, and 25 PWC users are present in areas I, II, and III, respectively. Other watercraft are also present. PWC users and boaters are required to maintain a distance of 500 feet from any marked bathing beaches, but no other restrictions inhibit their access to the island.

Noise limits established by the National Park Service are 82 dB at 82 feet. On average more than 20 PWC are present at any point within the park boundary. Two personal watercraft that emit 82 dB of sound would result in a noise level of 85 dB at 82 feet. Noise levels generated by 5 PWC at 85 dB would reach the island shoreline at 77dB when traveling greater than 200 feet from shore. Visitors canoeing, kayaking, or fishing within the park boundary would be directly exposed to noise generated by personal watercraft.

Within the national seashore boundary, the noise levels recede as the noise travels over the shoreline, dunes, and vegetation. As sound travels inland, the attenuating properties of the terrain and natural vegetation further reduce noise levels. However, in many parts of the island the dunes are not wider than 500 feet; consequently, PWC noise would affect oceanside, as well as bayside, visitors.

The ambient noise levels vary between each PWC use area. Ambient levels in area I are higher than those in areas II and III. Due to the level of human activity and various other uses in area I, PWC use would result in negligible adverse impacts to other visitors and the natural soundscapes. In area I PWC noise would be heard throughout the day.

Ambient noise levels may be assumed to be lower in areas II and III (e.g., Otis Pike Wilderness Area). PWC noise would have minor adverse impacts to visitors on shore within area II. PWC and watercraft noise would be consistent throughout the day due to the presence of marinas. Area III, near Moriches Inlet, may also be assumed to have lower ambient noise levels due to its location away from urban

surroundings. Noise disturbances in this area would be more intrusive due to the abundant bird population in the Otis Pike Wilderness Area. PWC noise levels would have minor adverse impacts in the area of the wilderness, potentially disturbing wildlife and thus impacting visitor experience.

Overall, PWC noise levels are expected to have negligible to minor adverse impacts at certain locations within the Fire Island National Seashore boundary. Due to consistent boat and PWC traffic in Great South Bay and Moriches Bay, PWC noise generated within the national seashore would be consistent with the ambient noise level. Overall, implementation of this alternative would result in negligible to minor adverse impacts on the soundscape of Fire Island National Seashore. Impacts would be short term, since PWC noise would be confined to daylight hours during warmer weather. Potential reduction in noise emissions (as forecasted by the industry) could contribute to a reduction of adverse impacts to park visitors.

Cumulative Impacts. Other noise sources present at Fire Island National Seashore include waves, ocean breezes, private communities, and other watercraft. Other boating activities within the national seashore generate noise levels similar to that from personal watercraft. Near East and West Fire Islands boats outnumber personal watercraft by four to one. Near the marinas, boats are more prevalent in area II as well. Boaters access the national seashore from various locations on Long Island. Fishing boats and tour boats are also prevalent within the national seashore boundary. The cumulative impacts of boating noise, ambient noise levels, and PWC noise would range from negligible to moderate, depending on the location within the national seashore and the time of year. The western section experiences elevated noise levels due to the presence of private communities and the level of boat traffic within this area. Impacts to noise levels would be minor to other visitors and minor to moderate for the natural soundscape.

Other park users contribute to the soundscape of Fire Island National Seashore, including beach users, hikers, surfers, four-wheel drive enthusiasts, and canoeists. However, visitors consider these sounds compatible with national seashore uses. Visitor noise has a negligible adverse impact on the soundscape at Fire Island National Seashore. All impacts would be short term.

Conclusion. PWC use would continue to have a negligible to minor adverse impact to visitors throughout the national seashore.

Cumulative impacts of boating noise, ambient noise levels, and PWC noise would range from negligible to moderate, depending on the location within the national seashore and the time of year. Projected increased PWC use levels would not increase the severity of noise impacts. Impacts would remain short term, occurring in daylight hours during the warmer months.

This alternative would not impair the soundscape.

Impacts of Alternative B — Continue PWC Use, but Limit Use to Areas Adjacent to Beach Communities

Analysis. This alternative would prohibit PWC use in all areas of Fire Island National Seashore excluding the private communities. As a result, PWC activity within the national seashore waters would be reduced substantially in areas II and III and in several segments of area I. Impacts within areas I and II would be similar to those described under alternative A, although more localized. Noise impacts would continue to range from negligible to minor due to continued PWC use. Area III would experience long-term beneficial impacts since no PWC use would be allowed in this area.

Cumulative Impacts. All areas would continue to experience negligible to minor adverse impacts due to noise generated by PWC and other motorboat uses. Boats would continue to have access to all areas of the national seashore, and noise generated by them would still impact visitors. Noise from personal watercraft and other boats traveling outside the national seashore boundary would continue to have negligible to minor adverse impacts on other recreational users within national seashore boundaries.

Conclusion. Noise impacts would continue to range from negligible to minor due to continued PWC use. Area III would experience long-term beneficial impacts with the removal of PWC use from this area.

Noise from personal watercraft and other motorized within and near the national seashore would continue to have negligible to minor adverse impacts on other recreational users.

This alternative would not impair the soundscape.

Impacts of Alternative C — Continue PWC Use, but Limit Use to Areas Adjacent to Beach Communities and Enforce a 1,000-Foot Buffer along all Shorelines within the NPS Boundary

Analysis. Like alternative B, alternative C would allow PWC use but would limit it to areas adjacent to the beach communities, and a 1,000-foot buffer would be enforced around the national seashore. In addition, PWC users would be required to operate at no-wake speeds (maximum 6 mph) within ferryways, which would reduce PWC-generated noise levels. Impacts would be negligible adverse under alternative C. PWC operations at idle would also reduce noise levels farther from the shoreline. Noise reductions at 1,000 feet from shore would be substantial, therefore beneficial.

Cumulative Impacts. Cumulative impacts would be the same as for alternative B in areas open to PWC use. The cumulative adverse impact of boating noise, ambient noise levels, and PWC use (where permitted) would continue to range from negligible to minor, depending on the location of the hearer. Like alternative B, noise from personal watercraft and other boats would have negligible to minor adverse impacts on other recreational users at other locations within the national seashore.

Conclusion. Removing PWC use from many areas of the national seashore, as well as implementing a 1,000-foot buffer zone, would result in negligible adverse impacts.

Noise from PWC and motorized boat use within and near the national seashore would have negligible to minor adverse impacts on other recreational users at other locations within the national seashore.

This alternative would not impair the soundscape.

Impacts of the No-Action Alternative

Analysis. Over the short and long term, banning PWC use within the national seashore would have a beneficial impact by reducing noise generated by personal watercraft.

Cumulative Impacts. Other boating activities within the national seashore would continue to generate noise levels equal to those described under alternative A. Although PWC-generated noise would be eliminated within the park, other boating activity would continue to result in negligible to minor, short-term, adverse impacts within national seashore boundaries during daylight hours.

Conclusion. Over the short and long term, banning PWC use within the national seashore would have a beneficial impact by eliminating this noise source within the seashore boundary.

On a cumulative basis, noise from other motorboats would continue to have negligible to minor adverse impacts.

This alternative would not impair the soundscape.

WILDLIFE AND WILDLIFE HABITAT

Some research suggests that PWC use impacts wildlife by interrupting normal activities, causing alarm or flight, causing animals to avoid habitat, displacing habitat, and affecting reproductive success. This is thought to be caused by a combination of PWC speed, noise, and ability to access sensitive areas, especially in shallow water.

PWC use may have a greater impact on waterfowl and nesting birds. Disturbance may force nesting birds to abandon eggs during crucial embryo development stages and flush other waterfowl from habitat, causing stress and associated behavior changes. Collisions with waterfowl may also be of concern.

GUIDING REGULATIONS AND POLICIES

The National Park Service *Management Policies 2001* state that the National Park Service will maintain as parts of the natural ecosystems of parks all native plants and animals (sec. 4.4.1). The National Park Service will achieve this by

> preserving and restoring the natural abundance, diversities, dynamics, distributions, habitats, and behaviors of native plant and animal populations and communities and ecosystems in which they occur
>
> restoring native plant and animal populations in parks when they have been extirpated by past human-caused actions
>
> minimizing human impacts on native plants, animal populations, communities, and ecosystems, and the processes that sustain them

The mission of Fire Island National Seashore is to "preserve . . . barrier island dynamics and ecology, biodiversity . . . and wilderness." To achieve this, long-term goals stated in Fire Island's *Strategic Plan* include the protection, restoration, or maintenance of ecosystems, including rare or endangered plant and animal populations. Additional federal, state, and local regulations and/or policies for wildlife and wildlife habitat at Fire Island are shown in Table 35.

TABLE 35: NPS LAWS AND POLICIES

Laws or Policy	Management Direction
GENERAL — NATIONAL PARK SERVICE	
National Park Service Organic Act	The National Park Service will "conserve the scenery and the natural and historic objects and the wild life therein and . . . provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations." (16 USC 1)
National Park Service *Management Policies 2001*	"Congress, recognizing that the enjoyment by future generations of the national parks can be assured only if the superb quality of park resources

Laws or Policy	Management Direction
	and values is left unimpaired, has provided that when there is a conflict between conserving resources and values and providing for enjoyment of them, conservation is to be predominant." (sec. 1.4.3.) The NPS *Management Policies* acknowledge that providing opportunities for public enjoyment is a fundamental part of the NPS mission. But they emphasize that recreational and other activities, including management activities, may be allowed only when they will not cause impairment or derogation of a park's resources, values, or purposes. The sole exception is when an activity that would cause impairment or derogation is specifically mandated by Congress (sec. 1.4.4.).
Public Law 88-587	On September 11, 1964, Congress established Fire Island National Seashore to protect its cultural and natural resources, its values of maritime and American history, barrier island dynamics and ecology, biodiversity, museum collection objects, and wilderness.
Public Law 95-625; NPS Management Policies; 16 USC 1a-7(b)(4)	NPS management plans must include measures for protecting the parks' resources.
	NATURAL RESOURCES
National Environmental Policy Act *DO #12: Conservation Planning, Environmental Impact Analysis, and Decision-making*	The purpose of the National Environmental Policy Act is to establish a national policy "which will encourage productive and enjoyable harmony between man and his environment; to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man; to enrich the understanding of the ecological systems and natural resources important to the Nation." The act is implemented by regulations of the Council on Environmental Quality. Within the National Park Service , the provisions of the act and the CEQ regulations are implemented through Director's Order #12.
NPS *Management Policies 2001* NPS *Natural Resources Management Guideline* (DO #77) Endangered Species Act of 1973 Migratory Bird Conservation Act of 1958 Marine Mammal Protection Act of 1972	Policies and guidelines for natural resources direct that the park must (1) identify and complete inventories of natural resources for baseline information; (2) minimize impacts of human activities, developments, and uses on marine and terrestrial resources; (3) continue to close areas of the seashore to protect nests; and (4) manage endangered, threatened, and candidate species.
Title 36 *Code of Federal Regulations* 1.5, 1.6, 1.10, 2.1, 2.2, 2.3, 2.4, 2.5	Title 36 CFR provides authorization for closing areas and limiting public use to protect resources; providing public notice of closures or use limits; prohibiting the destruction, defacing, or disturbing of resources; and protecting fish and wildlife and permit research.
Executive Order 13158, "Marine Protected Areas"	Signed May 2000, this order helps fulfill the purposes of the NPS Organic Act and other pertinent statutes. The purpose of the order, consistent with domestic and international law, is to: (a) strengthen the management, protection, and conservation of existing marine protected areas and establish new or expanded MPAs; (b) develop a scientifically based, comprehensive national system of MPAs representing diverse U.S. marine ecosystems, and the Nation's natural and cultural resources; and (c) avoid causing harm to MPAs through federally conducted, approved, or funded activities."
Executive Order 11990, "Protection of Wetlands"	This order requires federal agencies to avoid, to the extent possible, the long- and short-term adverse impacts associated with the destruction of modification of wetlands.
Executive Order 11988, "Floodplain Management"	This order requires federal agencies to avoid, to the extent possible, the long- and short-term adverse impacts associated with the occupancy and modifications of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative.
Public Law 94-265	The Magnuson-Stevens Fishery Conservation and Management Act calls for direct action to stop or reverse the continued loss of fish habitats. Congress mandated the identification of habitats essential to managed species and measures to conserve and enhance this habitat. The act requires cooperation among National Marine Fisheries Service, the councils, fishing participants, and federal and state agencies to protect, conserve, and enhance essential fish habitat. Those areas along Fire Island National Seashore designated as essential fish habitats are outlined in "The Affected Environment."

Source: Adapted from NPS *Management Policies 2001*.

METHODOLOGY AND ASSUMPTIONS

Information on avian species likely to occur in areas accessible by personal watercraft was considered in the analysis. The analysis of potential impacts to non-avian species was based on the potential for wildlife species that are likely to occur in habitats to be affected by the alternatives being considered.

A similar methodology was used to determine the relative magnitude of impacts from PWC-generated noise to avian species under the various management alternatives. No specific monitoring data are available at the park to quantify impacts; therefore, personal observations by NPS staff were used to determine areas of concern (nesting areas, critical habitat, etc.). These areas were identified and impacts were assessed relative to the number and proximity of PWC users potentially traveling during critical seasons and by the type of species present in those sensitive areas (state, federally listed, species of concern, etc.). Although no specific data exist at the park, studies have been done to examine the impact of PWC on nesting bird colonies (e.g., common terns). Specific buffers (~100m) have been suggested for common tern species, with greater distances for more sensitive subspecies, such as roseate terns (>200m). There is much information on the flight distances of nesting birds in the literature.

IMPACT OF PWC USE ON WILDLIFE AND WILDLIFE HABITAT

The following thresholds were used to determine the magnitude of effects on wildlife and wildlife habitat (special status species are discussed in "Threatened, Endangered, or Special Concern Species," beginning on page 124):

> *Negligible:* There would be no observable or measurable impacts to native species, their habitats, or the natural processes sustaining them. Impacts would be of short duration and well within natural fluctuations.
>
> *Minor:* Impacts would be detectable, but they are not expected to be outside the natural range of variability or to have any long-term effects on native species, their habitats, or the natural processes sustaining them. Population numbers, population structure, genetic variability, and other demographic factors for species might have small, short-term changes, but long-term characteristics would remain stable and viable. Occasional responses to disturbance by some individuals could be expected, but without interference to feeding, reproduction, or other factors affecting population levels. Key ecosystem processes might have short-term disruptions that would be within natural variation. Sufficient habitat would remain functional to maintain viability of all species. Impacts would be outside critical reproduction periods for sensitive native species.
>
> *Moderate:* Breeding animals of concern are present; animals are present during particularly vulnerable life-stages, such as migration or juvenile stages; mortality or interference with activities necessary for survival can be expected on an occasional basis, but is not expected to threaten the continued existence of the species in the park unit. Impacts on native species, their habitats, or the natural processes sustaining them would be detectable, and they could be outside the natural range of variability for short periods of time. Population numbers, population structure, genetic variability, and other demographic factors for species might have short-term changes, but would be expected to rebound to pre-impact numbers and to remain stable and viable in the long term. Frequent responses to disturbance by some individuals could be expected, with some negative impacts to feeding, reproduction, or other factors affecting short-term population levels. Key ecosystem processes might have short-term disruptions that would be outside natural variation (but would soon return to natural conditions). Sufficient

habitat would remain functional to maintain viability of all native species. Some impacts might occur during critical periods of reproduction or in key habitat for sensitive native species.

Major: Impacts on native species, their habitats, or the natural processes sustaining them would be detectable, and they would be expected to be outside the natural range of variability for long periods of time or be permanent. Population numbers, population structure, genetic variability, and other demographic factors for species might have large, short-term declines, with long-term population numbers significantly depressed. Frequent responses to disturbance by some individuals would be expected, with negative impacts to feeding, reproduction, or other factors resulting in a long-term decrease in population levels. Breeding colonies of native species might relocate to other portions of the park. Key ecosystem processes might be disrupted in the long term or permanently. Loss of habitat might affect the viability of at least some native species.

Impairment: Some of the major impacts described above might be an impairment of park resources if their severity, duration, and timing resulted in the elimination of a native species or substantial population declines in a native species, or they precluded the park's ability to meet recovery objectives for listed species. In addition, these adverse, major impacts to park resources and values would

contribute to deterioration of the park's wildlife resources and values to the extent that the park's purpose could not be fulfilled as established in its enabling legislation;

affect resources key to the park's natural or cultural integrity or opportunities for enjoyment; or

affect the resource whose conservation is identified as a goal in the park's *General Management Plan* or other park planning documents.

Study Area: Wildlife and Wildlife Habitat

The study area includes the immediate locations of PWC use and the surrounding nearshore environment where wildlife and wildlife habitat may occur. For purposes of this review, the study area is Fire Island National Seashore from the west boundary of Fire Island Lighthouse to Moriches Inlet on the bayside.

Impacts of Alternative A — Continue PWC Use as Currently Managed under a Special Regulation

Analysis. PWC use would continue in all waters within the national seashore and would be managed in accordance with all state regulatory requirements.

The western end of Fire Island National Seashore (area I) experiences high levels of PWC use, particularly in the areas of Kismet, Atlantique Beach, and Ocean Beach. High levels of PWC use also occur in bay areas around Davis Park (area II) and at the eastern end of the national seashore in the areas between Smith Point and Moriches Inlet (area III). As a result, human activity and noise levels associated with PWC use near these areas are typically high, especially between May and September. Noise levels and the ability of PWC users to rapidly approach landing areas could adversely affect terrestrial wildlife, such as shorebirds and waterfowl, in these areas by causing alarm or flight. Effects are expected to be minor because species sensitive to a high level of noise and human activity are not expected to regularly use these areas during high use periods. Requirements for PWC users to operate

at under 5 mph within 100 feet of the shoreline would minimize adverse effects associated with rapid approach and noise to wildlife utilizing shoreline habitats.

Areas along Fire Island National Seashore where PWC and other watercraft use is minimal are likely to support more wildlife species sensitive to high levels of human activity, especially in areas where there is suitable habitat, such as beaches, marshes, tidal flats, and submerged aquatic vegetation beds. Occasional nearshore PWC use in these areas could adversely affect waterfowl or shorebirds by disrupting normal nesting, foraging, or resting activities, causing alarm and flight and over time potentially resulting in habitat avoidance and displacement.

Nesting sites for ground-nesting birds are typically associated with beach or near beach habitats on the Atlantic shore, backbay shores, and small islands associated with Fire Island National Seashore. Reactions of various nesting bird species to nearby PWC use indicates alarm or flight responses and in some cases the abandonment of nests.

Bird species must maximize their foraging when certain invertebrate prey species are available. For birds raising offspring or building up fat reserves for migration, being chased from feeding areas can affect their potential for survival, especially when these disturbances continue for several days. For terns, which rest on beaches when not feeding, repeated disturbance could lead to exhaustion, potentially affecting the bird's survival.

Migratory songbirds can also be adversely affected by noise levels and encroachment associated with PWC use. Various species of migratory songbirds such as hummingbirds, swallows, orioles, tanagers, thrushes, and sparrows are abundant along the Atlantic coastal barrier islands. Migratory birds can be easily stressed and are vulnerable during the intensive migration periods (Mabey et al. 1993). However, adverse effects associated with PWC use are expected to be short-term, minor, adverse impacts because most migrations of these species occur when PWC use is low.

Northern diamondback terrapins are common on the backbay sides of the barrier islands. The turtles forage in tidal creeks of marshes and in the open bays. Potential adverse effects to the terrapin from PWC use could occur as a result of collision or disruption of foraging activities, especially during high use periods. Requirements for PWC users to operate under 5 mph within 100 feet of the shoreline would minimize the potential for adverse effects.

Porpoises and seals can be directly affected by collisions; however, very shallow waters throughout most of the national seashore limit the potential for collisions within NPS boundaries. (Indirect impacts caused by noise generated underwater are discussed separately beginning on page 119.)

Most of the turtles that occur in the area are juveniles and never come ashore. Sea turtles begin arriving in the waters around Fire Island National Seashore in June and July and remain for several weeks. The shallow coastal waters are used as foraging habitat (special status species are discussed in "Threatened, Endangered, or Special Concern Species," beginning on page 124).

Short-term, moderate, direct, adverse effects to fish species that occur in nearshore habitats are expected. Essential fish habitat established under the Magnuson-Stevens Fishery Conservation and Management Act occurs for several fish species in Great South Bay, Moriches Bay, and along the Atlantic coast. Species commonly in shallow waters around Fire Island National Seashore, such as Atlantic herring, bluefish, and several species of flounder, could be disrupted from normal feeding behavior as a result of PWC use in nearshore areas. Continuous PWC use in areas providing essential fish habitat functions, particularly in shallow water areas, could adversely affect suitability of these areas to meet life-cycle requirements.

Adverse effects to local shellfish populations could occur as a result of suspension of sediment in shallow waters, pollution from PWC emissions, and destruction of submerged aquatic vegetation. The effects could be a direct (e.g., bay scallops are highly susceptible to pollutants and high levels of suspended sediments) or indirect (e.g., elimination of habitats such as sea grasses).

Overall, short-term, minor to moderate, adverse indirect impacts to wildlife and habitat are expected under alternative A.

Cumulative Impacts. The areas around Kismet, Atlantique Beach, Ocean Beach, Davis Park and the eastern end of the national seashore between Smith Point and Moriches Inlet currently experience high levels of PWC and other watercraft use. With the exception of the Davis Park area, little PWC use occurs between the Sailors Haven visitor center and the eastern end of the Otis Pike Wilderness Area. PWC use on the oceanside of the national seashore is minimal. Based on observations of NPS staff, between 80 and 120 PWC users per hour may use national seashore waters between May and September. Noise levels and activity associated with all motorized watercraft in the high use areas would likely adversely affect terrestrial wildlife, such as shorebirds and waterfowl using the areas by causing alarm or flight responses. Adverse cumulative effects associated with increased future use are expected to be minor to moderate because species sensitive to a high level of noise and human activity are not expected to regularly occur in the high use areas or immediately adjacent habitats during high use periods.

Moderate adverse cumulative effects to birds and other wildlife using the low use areas between the Sailors Haven visitor center and the Otis Pike Wilderness Area and the oceanside of the national seashore are expected. The frequency of PWC and other powered marine vessel use in these areas is much less than elsewhere. Birds and other wildlife species using nearby marsh and shoreline areas would likely be less accustomed to high levels of human activity and noise. Occasional nearshore PWC use in these areas could adversely affect wildlife by disrupting normal nesting, foraging, or resting activities, causing alarm and flight responses, and over time potentially resulting in habitat avoidance and displacement.

Overall, cumulative impacts on wildlife and wildlife habitat at Fire Island National Seashore would be minor to moderate because interactions between wildlife and visitors would be brief.

Conclusion. Impacts to wildlife using nearshore habitats in areas of high PWC use would be minor because noise-sensitive species are not expected to regularly use these areas or immediately adjacent habitats, especially during the peak summer season. Impacts to wildlife using marshes, submerged aquatic vegetation beds, and shoreline areas near low PWC use areas are expected to be moderate because species would likely be less accustomed to high levels of human activity and noise. Occasional PWC use in nearby areas could have moderate adverse effects on wading and shorebirds, waterfowl, and other wildlife by disrupting normal nesting, foraging, or resting activities. The adverse effects of less frequent PWC use in the low use areas would be potentially greater than in the high use areas, where wildlife would be more accustomed to human uses.

Cumulative impacts from all visitor uses at Fire Island National Seashore would be minor to moderate and adverse on wildlife and wildlife habitats because the interactions between wildlife and visitors would be brief.

This alternative would not impair wildlife or wildlife habitat.

Impacts of Alternative B — Continue PWC Use, but Limit Use to Areas Adjacent to Beach Communities

Analysis. In areas remaining open to PWC use, impacts on wildlife and wildlife habitat would short term and minor, similar to those discussed under alternative A. Effects are expected to be minor because species sensitive to a high level of noise and human activity are not expected to regularly use these areas during high use periods. Requirements for PWC users to operate less than 5 mph within 100 feet of the shoreline would minimize adverse effects associated with rapid approach and noise to wildlife utilizing shoreline habitats.

In areas where PWC use would be banned, impacts to shorebirds, waterfowl, and other fish and wildlife species using shallow water habitats and the shoreline would be long term and beneficial. Restricting PWC access to large areas of shallow water habitat along the national seashore would also enhance the quality of essential fish habitats that occur in these areas, a long-term, beneficial impact.

Cumulative Impacts. Cumulative impacts to wildlife and wildlife habitat would be minor to moderate adverse, similar to those discussed under alternative A, except that PWC-related impacts would be limited to areas remaining open to PWC use. PWC use is not expected to increase greatly in nearby areas as a result of closing areas of the national seashore because use is already low in these areas. Short-term, minor, indirect, adverse impacts to wildlife and habitat are expected under alternative B because species sensitive to a high level of noise and human activity are not expected to regularly occur in the high use areas or immediately adjacent habitats during high use periods. Impacts in areas no longer open to PWC use would be beneficial over the short and long term.

Conclusion. Impacts to wildlife in areas remaining open to PWC use would be minor, adverse, and long term because species sensitive to noise and human activity are not expected to regularly occur in these areas during high use periods. Prohibiting PWC use over a large area of Fire Island National Seashore would result in short- and long-term beneficial impacts to wildlife and habitat.

On a cumulative basis impacts to wildlife species would be minor to moderate and adverse in areas remaining open to PWC use, similar to those discussed under alternative A. In areas closed to PWC use (a large percentage of the national seashore) impacts would be beneficial over the short and long term. Wildlife in areas closed to PWC use could be adversely affected by uses in adjacent areas as a result of noise and possible water quality impacts; however, these effects are expected to be negligible.

This alternative would not impair wildlife or wildlife habitat.

Impacts of Alternative C — Continue PWC Use, but Limit Use to Areas Adjacent to Beach Communities and Enforce a 1,000-Foot Buffer along all Shorelines within the NPS Boundary

Analysis. Impacts similar to those discussed under alternative A are expected in areas remaining open to PWC use, with short-term, minor, adverse, indirect impacts because species sensitive to a high level of noise and human activity are not expected to regularly occur in these areas during high use periods. Impacts in areas closed to PWC use would be similar to those discussed for alternative B, with short- and long-term, beneficial impacts to shorebirds, waterfowl, and other fish and wildlife species using shallow water habitats and the shoreline, or within 1,000 feet of any shorelines within the national seashore. Implementing no-wake zones in ferryways would minimize potential for impacts associated with potential collisions with wildlife and would minimize adverse effects associated with noise fluctuations. Restricting PWC access in most of the shallow water habitat along the national seashore would also enhance the quality of essential fish habitats in these areas, a long-term beneficial impact.

Cumulative Impacts. Cumulative impacts to wildlife and habitat would be short term, minor to moderate, adverse, and indirect, similar to those discussed for alternative A, except impacts related to PWC use would only occur in areas remaining open to such use. PWC use is not expected to increase greatly in nearby areas as a result of PWC area closures because use in these areas is relatively low. Discontinuing PWC use throughout a large portion of Fire Island National Seashore would result in short- and long-term beneficial impacts to wildlife and wildlife habitat.

Conclusion. Impacts to wildlife from PWC use would be short term and minor because species sensitive to noise and human activity are not expected to regularly occur in these areas during high use periods. Prohibiting PWC use throughout a large portion of the national seashore would have short- and long-term beneficial impacts to wildlife and habitat in the closed areas. Implementing no-wake zones in ferryways would minimize the potential for collisions with wildlife. Restricting PWC access to most of the shallow water habitat along the national seashore would also enhance the quality of essential fish habitats in these areas, a long-term beneficial impact.

Cumulative impacts to wildlife would be short term, minor to moderate, and adverse, similar to those discussed under alternative A except fewer areas would remain open to PWC use. Discontinuing PWC use over a large percentage of the national seashore and implementing no-wake zones in ferryways would have beneficial impacts to wildlife and wildlife habitat over the short and long term. Wildlife using closed areas adjacent to PWC use areas could be affected by noise and possible water quality impacts from PWC use in adjacent areas; however, such effects are expected to be negligible.

This alternative would not impair wildlife or wildlife habitat.

Impacts of the No-Action Alternative

Analysis. Banning PWC use within the national seashore under the no-action alternative would result in short- and long-term beneficial impacts on wildlife and wildlife habitat. Eliminating PWC use in the national seashore would buffer terrestrial and nearshore wildlife and habitats from the adverse effects of PWC use occurring beyond NPS boundaries. Restricting PWC access to shallow water habitat along the national seashore would also enhance the quality of essential fish habitats in these areas, a long-term beneficial impact.

Cumulative Impacts. Cumulative impacts would be short term and minor to moderate, similar to alternative A except there would be no contribution from PWC use within the national seashore. Noise levels and activity associated with all motorized watercraft in high use areas would likely adversely affect shorebirds and waterfowl using the areas by causing alarm or flight responses. Adverse cumulative effects associated with increased future motorized uses are expected to be short-term, minor, adverse, and indirect because species sensitive to noise and human activity are not expected to regularly occur in the high use areas or immediately adjacent habitats during high use periods.

Conclusion. Eliminating PWC use within the national seashore boundary is expected to have beneficial impacts on wildlife species associated with nearshore and shoreline habitats. Eliminating PWC access to shallow water habitat along the national seashore would also enhance the quality of essential fish habitats in these areas, a long-term beneficial impact.

Cumulative impacts are expected to be short term, minor to moderate, and adverse, similar to alternative A, because other motorized uses would continue.

This alternative would not impair wildlife or wildlife habitat.

IMPACT OF PWC NOISE ON AQUATIC FAUNA

Methodology and Assumptions

While the full impact noise has on marine mammals is not completely understood, the increase in human-made underwater noises could be a serious problem to their survival to the extent that it interferes with their methods of communication and hunting strategy (Coastal Carolina University [CCU] 1998). The average vocalizations in whales range between 145 to 186 dB. Noise generated by motorized recreation and watersports can be greater than 100 dB over a range of frequencies (12 Hz – 30 kHz) (CCU 1998), and the hearing range of marine mammals can vary between 20 Hz to 150 kHz (humans have a hearing range between 20 Hz and 20 kHz).

Aquatic wildlife react to high levels of underwater noise in various ways, depending on the species, exposure period, intensities, and frequencies. PWC motors produce noise levels in the range of 70–102 dB per unit. Because of the way the craft are used, noise is usually produced at various intensities, and this continual change in loudness during normal use makes PWC-caused noise much more disturbing than the constant sounds of conventional motorboats (Bluewater Network 2001).

Increases in human-made noise have the potential to cause adverse effects on the survival, communication, and hunting methods of marine mammals. The reactionary response of marine mammals to low-frequency, high-decibel noises varies from species to species. As a general rule, whales will avoid sounds between 110 to 120 dB. At higher frequencies, all species become frantic, their heart rate increases, and in some cases, vocalization ceases (CCU 1998).

Recent studies have found that some mammals have stopped feeding and resting and became overly alert around increased presence of human noise sources. Temporary noise disturbances may alter the swimming path, heart rate, or breathing of a marine mammal, while long-term noise disturbances may inhibit mammals from accessing critical feeding, nesting, and mating habitat (Acoustical Society of America 2000).

It is widely known that intense sounds can damage the sensory cells of the ears of mammalian species; for example, 160 dB in air can cause tissue damage to the ears of mammals. The concern is that similar sounds can impair hearing in other wildlife species. One of the few direct studies on the impact of sound on fishes conducted under laboratory conditions (Hastings et al. 1996) found that when fish were subjected to high decibel levels for four hours, some sensory cells of the ears were damaged. This damage does not show up until a few days after exposure, and it is a long-term effect (regeneration did occur after a few days).

Although marine mammals show a diverse behavioral range that can obscure any correlation between a specific behavior and the impact from noise, it is well documented that these species rely on sound for communication, navigation, or detection of predators and prey. Disruption of any of these important functions could interfere with normal activities and behavior (Cornell University n.d.). The impact of intense sound on marine mammals can range from minimal changes in behavior to physiological damage (permanent hearing loss) that may impair their ability to survive.

Data on PWC-related noise effects on various species of marine mammals, reptiles, and fish are limited, and no specific monitoring has been done at the national seashore to quantify impacts. Therefore, personal observations of park staff were used to determine areas of concern. These areas were identified and assessed relative to the number of personal watercraft being used, their proximity to aquatic fauna during critical seasons, and the type of species present in those sensitive areas.

Marine mammals that can be affected by increased noise levels at Fire Island National Seashore include dolphins and whales. Kemp's ridley, loggerhead, and green sea turtles, and northern diamondback terrapins have been identified in the waters at Fire Island National Seashore. Most turtle species in the area are juveniles that come to feed. In addition, more than 150 species of fish can be found in the waters surrounding Fire Island National Seashore. Essential fish habitat occurs in the vicinity of the national seashore for more than 20 species of fish.

Sound produced in air behaves differently than when produced underwater. The measurement scales for sound in water and in air have a difference of 63 dB between them. Sound measured at 100 dB underwater is equivalent to 160 dB in air (Cornell University n.d.). That is, a PWC engine producing 100 dB in air would produce 163 dB underwater.

Sound travels 4.5 times faster in water than it does in air, and low frequency sounds travel farther underwater than high frequency sounds. Noise from recreational watersports range from about 12 Hz to about 30 kHz, and noise from commercial fishing fleets can generate levels from 5 to 500 Hz when sonar equipment is used.

In this assessment the noise of two or more personal watercraft operating at the same time (when one unit produces 82 dB), and at a distance of 82 feet from the source, was calculated to be 85 dB (see page 107). Underwater noise from the same source at a distance of 82 feet would be approximately 148 dB. The air and underwater noise calculated for the three study areas, based on PWC average numbers per hour estimated in the "PWC Use and Distribution" section of this report, would be:

Area I — 64 PWC / hour = 100 dB (air) and 163 dB (underwater)

Area II — 26 PWC / hour = 96 dB (air) and 159 dB (underwater)

Area III — 25 PWC / hour = 96 dB (air) and 159 dB (underwater)

Using the same calculation as for soundscapes, at a distance of 1,000 feet from the source (the proposed buffer under alternative C, see page 107), the estimated noise levels for the three study areas would be

Area I — 64 PWC / hour = 78.4 dB (air) and 141.4 dB (underwater)

Area II — 26 PWC / hour = 74.4 dB (air) and 137.4 dB (underwater)

Area III — 25 PWC / hour = 74.3 dB (air) and 137.3 dB (underwater)

This means that 25 to 64 personal watercraft operating 1,000 feet from shore would still produce noise levels that could have harmful effects on aquatic fauna.

Study Area: Aquatic Fauna

The study area includes the immediate locations of PWC use and the surrounding nearshore environment where aquatic fauna would occur. For purposes of this review, the study area is Fire Island National Seashore from the west boundary of Fire Island Lighthouse to Moriches Inlet on the bayside (see the Areas of Analysis map, page 65).

Impacts of Alternative A — Continue PWC Use as Currently Managed under a Special Regulation

Analysis. Under this alternative PWC and other boat use would be permitted in all waters within Fire Island National Seashore and surrounding areas. PWC-generated noise could affect the activities of marine reptiles, mammals, and fish in Great South Bay, including the suitability of essential fish habitat. While these conditions might not cause mortality, they could adversely affect how these marine organisms are distributed. There would be a minor to possibly major impact from PWC activity in the shallow waters of Great South Bay. Although no turtle landings have been observed in Great South Bay, fish populations may be affected to the extent that the survival of local populations could be in danger. Potential reduction in noise emissions (Sea-Doo 2001b) could reduce adverse impacts. Long-term effects under this alternative include a potential reduction in species diversity in shallow waters and a limitation for access of fauna through Fire Island and Moriches Inlets. Impacts to aquatic fauna would be greatest in the western section of Fire Island National Seashore, where high levels of PWC use have been observed. PWC use also occurs in bay areas around Davis Park (central section) and at the eastern end of the national seashore near Smith Point. Very little PWC use is observed on the oceanside of Fire Island National Seashore.

Cumulative Impacts. There is a high level of use by both personal and conventional watercraft in Great South Bay, particularly in the western section of the national seashore. As a result, human activity and noise levels near the national seashore are typically high, especially from May through September. Underwater noise sources include powerboats, personal watercraft, commercial and official (U.S. Coast Guard, local police) vessels. New technologies would contribute to reduced noise emissions (Sea-Doo 2001b; Yamaha Motor 2001). Long-term, moderate to possibly major, adverse cumulative impacts could be possible with an increase in watercraft use.

Conclusion. Alternative A would have minor to possibly major adverse effects on aquatic fauna, particularly in the Great South Bay waters in the western section of Fire Island National Seashore, as well as in the central and eastern sections of the national seashore.

On a cumulative basis long-term, moderate to possibly major, adverse impacts could be possible as a result of all motorized watercraft activity.

No impairment to aquatic fauna from noise generated by PWC use is expected because no species would be eliminated or suffer substantial population declines, and the park would not be prevented from fulfilling its purpose.

Impacts of Alternative B — Continue PWC Use, but Limit Use to Areas Adjacent to Beach Communities

Analysis. Under Alternative B the eastern section of Fire Island National Seashore would be closed to all PWC use, and the western section would be open to PWC use only adjacent to beach communities. As previously mentioned, a high level of PWC use occurs in Great South Bay. The highest intensity of PWC use has been observed in the western section of Fire Island National Seashore. Under this alternative some PWC users normally operating near the eastern section of Fire Island National Seashore might relocate to the western and central sections, increasing noise levels in these areas. Closing portions of the western section of the seashore (in areas I and II) could cause a more localized and increased noise impact to aquatic habitats as a consequence of more PWC units operating in a smaller area. As discussed under alternative A, PWC-generated noise could disturb marine reptiles,

mammals, and fish. Bayside waters in the western and central sections of the national seashore would suffer a minor to possibly major impact from PWC activity.

Banning PWC use in the eastern section of the national seashore in Great South Bay would eliminate PWC noise effects to aquatic fauna in this area, a beneficial impact.

Cumulative Impacts. The long-term cumulative effects of selecting this alternative would be similar to alternative A, with long-term, moderate to possibly major, adverse impacts as a result of all motorized watercraft activity. Increased noise levels in more localized areas adjacent to beach communities are expected. Eliminating PWC use in the Great South Bay in the eastern section of the national seashore would create long-term beneficial impacts on the aquatic fauna in this area.

Conclusion. Reducing underwater noise in the eastern section of the national seashore would have a long-term, beneficial impact to aquatic fauna in this area. A reduction in emissions due to new technologies would contribute to reduced noise emissions. In the western and central sections of the national seashore, impacts would be similar to those described for alternative A. However, noise could increase locally. PWC use would have a minor to possibly major adverse effect on aquatic fauna.

The cumulative effects of this alternative would be similar to those described for alternative A, with long-term, moderate to possibly major, adverse impacts as a result of all motorized watercraft activity. However, eliminating PWC use in eastern section of Fire Island National Seashore would create long-term beneficial impacts in this area of the Great South Bay.

For the reasons stated in alternative A, no impairment to aquatic fauna from noise generated by PWC use is expected.

Impacts of Alternative C — Continue PWC Use, but Limit Use to Areas Adjacent to Beach Communities and Enforce a 1,000-Foot Buffer along all Shorelines within the NPS Boundary

Analysis. Alternative C is similar to alternative B except that PWC use would be prohibited within 1,000 feet of the national seashore shoreline. PWC use would still be allowed in areas adjacent to beach communities, as long as they were 1,000 feet from the shore.

Enforcing a 1,000-foot buffer would reduce noise emission intensities in nearshore areas. However, as described in the scientific literature, sound travels faster and with higher intensities in water than in air. Consequently, PWC units operating 1,000 feet from shore would still have a minor to moderate impact on aquatic fauna. In the long term, minor reductions in noise emissions as a consequence of the 1,000-foot buffer, and a potential reduction in noise emissions (as forecasted by the industry) from newer machines, could contribute to a reduction of adverse impacts to aquatic fauna in nearshore areas. Impacts outside the 1,000-foot buffer zone would be similar to those described for alternative B.

As in alternative B, eliminating PWC use in the Great South Bay waters in the eastern section of the national seashore would eliminate impacts to aquatic fauna from PWC noise in the area, a long-term, beneficial impact.

Cumulative Impacts. The long-term cumulative effects of alternative C would be similar to those of alternative A; that is, motorized watercraft activity in deeper water and in areas outside the national seashore would continue to have moderate to possibly major adverse impacts on aquatic fauna. However, enforcing a 1,000-foot buffer would have a beneficial effect on noise in nearshore waters.

Conclusion. Alternative C would have a beneficial impact to aquatic fauna from a reduction in underwater noise in the eastern section of the national seashore and in nearshore waters around the island. In the western and central sections of the national seashore, impacts would be similar to those described for alternative B, except in the 1,000-foot buffer zone. PWC use would have a minor to moderate adverse effect on aquatic fauna in nearshore waters and minor to possibly major impacts in areas open to PWC use.

Cumulative effects would be similar to those described for alternative A, with no change expected in deeper waters or in areas outside the national seashore boundary. Impacts on aquatic fauna would be moderate to possibly major.

For the reasons stated in alternative A, no impairment to aquatic fauna from noise generated by PWC use is expected.

Impacts of the No-Action Alternative

Analysis. Short- and long-term beneficial effects are expected under the no-action alternative. Eliminating PWC use in the national seashore would provide aquatic fauna protected habitat and feeding areas away from adverse effects due to PWC use, as discussed under alternative A. PWC use would still have moderate adverse effects on aquatic fauna species utilizing habitats adjacent to national seashore boundaries. In the long term, this alternative would create beneficial impacts by eliminating disturbances that could adversely affect the presence of aquatic fauna in these areas.

Cumulative Impacts. Long-term beneficial impacts could be expected from a reduction of PWC use in NPS jurisdictional waters. However, no change is expected in motorized boat use in deeper waters and in areas outside the national seashore boundary, so impacts would be long term and moderate to possibly major, similar to alternative A.

Conclusion. The no-action alternative would result in long-term beneficial impacts to the underwater soundscape of Fire Island.

No change in motorized boat use is expected in deeper waters and in areas outside the national seashore boundary, so impacts on aquatic fauna would be moderate to possibly major, the same as alternative A. Long-term beneficial impacts could be expected from banning PWC use in NPS jurisdictional waters.

No impairment of aquatic fauna is expected.

THREATENED, ENDANGERED, OR SPECIAL CONCERN SPECIES

GUIDING REGULATIONS AND POLICIES

The Endangered Species Act (16 USC 1531 et seq.) mandates that all federal agencies consider the potential effects of their actions on species listed as threatened or endangered. If the National Park Service determines that an action may adversely affect a federally listed species, consultation with the U.S. Fish and Wildlife Service is required to ensure that the action will not jeopardize the species' continued existence or result in the destruction of adverse modification of critical habitat.

Informal consultation was initiated with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service during the internal scoping period for this project. A list of species that are known to occur or may occur within or adjacent to PWC use areas within the boundaries of Fire Island National Seashore was requested. Responses from National Marine Fisheries Service are included in appendix B. A response from U.S. Fish and Wildlife Service was not received at the time of this writing.

An analysis of the potential impacts to each species listed in the letter is included in this section. It has been determined that none of the alternatives would adversely affect any of the listed species at Fire Island National Seashore. The completed environmental assessment will be submitted to the U.S. Fish and Wildlife Service and National Marine Fisheries Service for review. If the agencies concur with the findings of the National Park Service, no further consultation will be required.

Formal consultation would be initiated if the National Park Service determined that actions associated with the preferred alternative are likely to adversely affect one or more of the federally listed threatened or endangered species identified in the national seashore. At that point a biological assessment would be prepared to document the potential effects. From the date that formal consultation was initiated, the U.S. Fish and Wildlife Service or National Marine Fisheries Service would be allowed 90 days to consult with the agency and 45 days to prepare a biological opinion based on the biological assessment and other scientific sources. The U.S. Fish and Wildlife Service or National Marine Fisheries Service would state its opinion as to whether the proposed PWC activities would be likely to jeopardize the continued existence of the listed species or result in the destruction or adverse modification of critical habitat. Such an opinion would be the same as a determination of impairment. To ensure that a species would not be jeopardized by PWC activities, the National Park Service would confer with the U.S. Fish and Wildlife Service or National Marine Fisheries Service to identify recommendations for reducing adverse effects and would integrate those into the preferred alternative.

The NPS *Management Policies 2001* state that potential effects of agency actions will also be considered on state or locally listed species. The National Park Service is required to control access to critical habitat for such species, and to perpetuate the natural distribution and abundance of these species and the ecosystems on which they depend.

Species in Fire Island National Seashore that have the potential to be affected by proposed PWC management alternatives include species that are known to inhabit or are likely to inhabit the area, plus those that could possibly be found in the area, but would most likely be transients or migrants.

METHODOLOGIES AND ASSUMPTIONS

Identification of state and federally listed species was accomplished through discussions with park staff and informal consultation with U.S. Fish and Wildlife Service, the National Marine Fisheries Service, and the New York Natural Heritage Program. Response letters from the above referenced agencies are included in appendix B.

Primary steps in assessing impacts to listed species were to determine (1) which species are found in areas likely to be affected by management actions described in the PWC alternatives, (2) current and future use and distribution of personal watercraft by alternative, (3) habitat loss or alteration caused by the alternatives, and (4) displacement and disturbance potential of the actions and the species' potential to be affected by PWC activities. The information contained in this analysis was obtained through best professional judgment of park staff and experts in the field (as cited in the text), and by conducting a literature review.

Documentation of the occurrence and locations of federal and state rare, threatened, or endangered species in Fire Island National Seashore was provided by the National Park Service through several studies and surveys that have been conducted at the park. Determination of the potential for adverse effects to rare, threatened, or endangered species was based on the locations of sensitive species with respect to PWC use and the potential for the use to affect the species. All known federally listed species that occur in Fire Island National Seashore are discussed in the analysis. Only state listed species that occur in the vicinity of the PWC use areas, or that have potential to be affected by PWC use, are discussed in the analysis.

At Fire Island species of concern include piping plover and roseate tern, both of which are listed by the federal and state governments. There are concerns about disturbance of suitable nesting habitats. While foraging for food, bald eagles and peregrine falcons might also be affected by the physical presence and noise of personal watercraft.

STUDY AREA

The study area includes the immediate locations of PWC use and the adjacent nearshore environment where threatened, endangered, or sensitive species or habitat may occur. For purposes of this review, the study area is Fire Island National Seashore from the west boundary of Fire Island Lighthouse to Moriches Inlet on the bayside.

IMPACT OF PWC USE ON SUCH SPECIES

The Endangered Species Act defines the terminology used to assess impacts to listed species as follows:

> *No effect:* A proposed action would not affect a listed species or designated critical habitat.
>
> *May affect / not likely to adversely affect:* Effects on special status species would be discountable (i.e., extremely unlikely to occur and not able to be meaningfully measured, detected, or evaluated) or completely beneficial.
>
> *May affect / likely to adversely affect:* When an adverse effect to a listed species might occur as a direct or indirect result of proposed actions and the effect would either not be discountable or completely beneficial.
>
> *Is likely to jeopardize proposed species/adversely modify proposed critical habitat (impairment):* The appropriate conclusion when the National Park Service, U.S. Fish and Wildlife Service, or the National Marine Fisheries Service identifies situations in which PWC use could jeopardize the continued existence of a proposed species or adversely modify critical habitat to a species within or outside park boundaries.

Impacts of Alternative A — Continue PWC Use as Currently Managed under a Special Regulation

Analysis. Under alternative A the current management and regulation of PWC use in all waters within the national seashore would continue, with the following impacts on species of concern.

Piping plover nesting areas in the national seashore have been documented on the Atlantic coast beaches of the barrier island, and in the Old Inlet area on the backbay side of the island. Old Inlet is

the most consistently used piping plover nesting area in the national seashore and has been used regularly since 1993 (NPS 2001b). PWC use in the vicinity of Old Inlet is minimal and transient; shallow waters in the vicinity of Old Inlet would also limit access. In addition, access to locations providing nesting areas for the piping plover is prohibited during the nesting season, and a fenced 150-foot buffer from pedestrian disturbance is enforced around breeding birds, in accordance with U.S. Fish and Wildlife Service guidelines. If nesting piping plovers were found at other locations in the national seashore, the same access restrictions would be implemented, thus minimizing potential adverse effects associated with PWC use or associated pedestrian access.

The only roseate tern nesting colony in Fire Island National Seashore is on West Inlet Island. Personal watercraft use in the area around Moriches Inlet and West Inlet Island is high, especially between May and September. Noise levels and the ability of PWC users to rapidly approach landing areas would likely adversely affect roseate terns and other shorebirds utilizing the areas by causing alarm or flight responses. Roseate tern numbers have been declining in recent years, and nesting success has dropped. This is partially due to successional changes that are creating less suitable habitat on islands in Moriches Bay, as well as an increase in predators (e.g., foxes, gulls). With numbers at such critically low levels, the addition of disturbance from PWC use in the area could further decrease the suitability of the habitats for the roseate tern. Implementing protective measures, as discussed above, during nesting periods would minimize adverse effects to roseate terns and other shorebirds nesting in near-shore habitats. Requirements for personal watercraft to operate under 5 mph within 100 feet of the shoreline would also minimize adverse effects associated with rapid approach and noise to roseate terns and other shorebirds using shoreline habitats for nesting, foraging, or resting.

The reaction of various nesting bird species to nearby PWC use indicates that they can cause alarm or flight responses and in some cases the abandonment of nests. However, existing background noise and separation of PWC use areas from known nesting sites minimizes the potential for PWC use to disturb piping plover or roseate terns.

Piping plovers, roseate terns, and other bird species must maximize their foraging when certain invertebrate prey species are available. For birds raising offspring or building up fat reserves for migration, being chased from feeding areas can affect their potential for survival, especially when these disturbances continue over several days. For terns, which rest on beaches when not feeding, repeated disturbance could lead to exhaustion, potentially affecting the bird's ability to survive.

Common terns and least terns both nest in nearshore habitats associated with the national seashore during the summer months when PWC use is highest. Both species forage in the ocean and backbay areas and use beach areas for resting. Impacts similar to those discussed for the piping plovers and roseate terns are expected to affect common and least terns. In areas where these species nest in association with piping plovers and roseate terns, they would receive protection similar to that provided the federally listed species. The New York State Department of Environmental Conservation recommends a 50-foot posted buffer around least tern and common tern nesting areas. The buffer areas are enforced on all state lands and within the national seashore. Requirements for PWC users to operate under 5 mph within 100 feet of the shoreline would also minimize adverse effects associated with rapid approach and noise to least terns and common terns using shoreline habitats for nesting, foraging, or resting areas.

The flushing distances for different species and subspecies can differ dramatically, and each sub-species should be examined separately. A study published by R. M. Erwin in 1989 looked at distances at which nesting common terns, least terns, and black skimmers from coastal sites in Virginia and North Carolina flushed from human intruders. It was determined that at least 100 meters (328 feet)

should be maintained around least tern colonies and 200 meters (656 feet) around common tern and black skimmer colonies.

The federally threatened and state endangered bald eagle and the state endangered peregrine falcon are occasionally documented in Fire Island National Seashore (NPS 2001b), typically during fall migrations. Although PWC use is not likely to directly affect the bald eagle or the peregrine falcon, their foraging activities could be affected as a result of the physical presence and noise of personal watercraft. Effects are expected to be minimal because the birds typically occur in the national seashore during fall raptor migrations when PWC use is low.

Implementation of alternative A is not likely to adversely affect federally listed sea turtles documented to occur in the area. Direct impacts would be unlikely because turtles are expected to avoid areas where PWC use occurs due to related underwater noise and disturbance. Based on the review of the proposed action and the action location, the National Marine Fisheries Service stated that it does not appear that there is an action on which to consult (see appendix B).

Federally protected whales documented to occur off the coast of New York, including the endangered northern right whale, humpback whale, and fin whale, are not expected to be affected by PWC use at Fire Island National Seashore, according to the National Marine Fisheries Service (see appendix B).

Because of the relatively minor degree of disturbance caused by foot traffic and the minor extent of ground covered, it is unlikely, except in infrequent cases, that overland traffic associated with PWC landing areas would impact the seabeach amaranth. It is not expected that foot traffic on lower sections of the beach, where most PWC-associated overland traffic would occur, would affect the plant. However, where users accessed higher beach and dune areas, the plant could be stepped on and destroyed. Foot traffic associated with PWC use is not expected to be detrimental to the persistence of the seabeach amaranth at Fire Island National Seashore.

In summary, alternative A is not likely to adversely affect threatened, endangered, or special concern species at Fire Island National Seashore.

Cumulative Impacts. Cumulative impacts are not likely to adversely affect federal or state listed threatened or endangered species at Fire Island National Seashore. The areas around Kismet, Atlantique Beach, Ocean Beach, Davis Park and the eastern end of the national seashore between Smith Point and Moriches Inlet currently experience high levels of PWC and other watercraft use. With the exception of the Davis Park area, PWC use between the Sailors Haven visitor center and the Otis Pike Wilderness Area is low. PWC use on the oceanside is minimal. Based on NPS staff observations, between 80 and 120 PWC users per hour may utilize national seashore waters during peak summer periods.

The most intense PWC use and associated human activity and noise levels occur between May and September. Noise levels and activity associated with all motorized watercraft in the high use areas could adversely affect sensitive species, such as listed shorebirds using the areas by causing alarm or flight responses or avoidance responses. If levels of conventional watercraft use increased over time, in combination with PWC use, the level of noise and human activity with the potential to adversely affect sensitive bird species within the national seashore would also be expected to increase. However, requiring PWC operators to travel at 5 mph or less within 100 feet of a shoreline would minimize potential for short-term adverse cumulative effects to sensitive species utilizing shoreline habitats. Mandatory buffers around nesting piping plovers, roseate terns, least terns, and common terns would also minimize the potential for adverse cumulative affects to these species during nesting periods. Increased PWC use could adversely affect sea turtles as a result of collisions; however, increased

underwater noise and disturbance associated with increased PWC and other watercraft use would likely cause turtles to avoid high-use areas.

Occasional nearshore PWC use in low-use areas could result in short-term adverse effects to sensitive species by disrupting normal nesting, foraging, or resting activities, causing alarm and flight responses. Cumulative increases in conventional watercraft and personal watercraft in low-use areas could increase the potential for the disturbance of, or impacts to, sensitive species that occur in these areas. However, impacts are expected to be minimal as a result of mandatory buffers around nesting piping plovers, roseate terns, least terns, and common terns. Enforcement of less than 5 mph speed limits within 100 feet of the shoreline would also minimize the potential for adverse cumulative impacts to these species.

Cumulative effects associated with increased foot traffic are not expected to adversely affect the seabeach amaranth because foot traffic would most likely occur on lower sections of the beach, where this species is not established.

Conclusion. Threatened or endangered species in the area of Fire Island National Seashore are not likely to be adversely affected by PWC use under alternative A. Speed limit restrictions within 100 feet of the shoreline and mandatory buffers around sensitive shorebird nesting areas would reduce the potential for adverse effects. Sea turtles are not likely to be adversely affected by PWC use because they are expected to avoid high use areas as a result of noise and activity. Foraging activities of bald eagles and peregrine falcons could potentially be affected by PWC use; however, because these birds are typically present at a time of year when PWC use is low, adverse effects are not likely. Potential effects to the seabeach amaranth are expected to be minimal because foot traffic associated with PWC use would occur primarily in low beach areas where the plant does not occur.

Cumulative impacts are not likely to adversely affect threatened or endangered species at Fire Island National Seashore.

No impairment of threatened, endangered, or sensitive species is expected.

Impacts of Alternative B — Continue PWC Use, but Limit Use to Areas Adjacent to Beach Communities

Analysis. Under this alternative PWC use would only be allowed in areas adjacent to beach communities within national seashore waters.

Effects to federal and state listed threatened or endangered species as a result of PWC use under alternative B would be the same as those discussed for alternative A in areas remaining open to personal watercraft. Requirements for PWC users to operate under 5 mph within 100 feet of the shoreline would minimize adverse effects associated with rapid approach and noise to sensitive shorebirds in shoreline habitats. Beneficial effects are expected in areas closed to PWC use. In particular, piping plover nesting areas in the area of Old Inlet and roseate tern nesting areas on West Inlet Island would benefit as a result of eliminating PWC-related disturbances in these areas. Short- and long-term beneficial impacts to threatened or endangered species are expected as a result of discontinuing PWC use throughout a large portion of the national seashore.

Implementation of alternative B is not likely to adversely affect federal or state listed threatened or endangered species at Fire Island National Seashore.

Cumulative Impacts. Cumulative impacts on federal or state listed threatened or endangered species would be similar to those discussed under alternative A; however, PWC use would contribute to those impacts only in areas remaining open to personal watercraft. Closing portions of the national seashore to PWC use is not expected to increase use greatly in nearby areas, which typically have low levels of use. Cumulative impacts are not likely to adversely affect federal or state listed threatened or endangered species within Fire Island National Seashore.

Conclusion. Threatened or endangered species are not likely to be adversely affected by PWC use under alternative B. Effects would be the same as those discussed for alternative A in areas remaining open to PWC use. Requiring PWC users to operate at 5 mph or less within 100 feet of the shoreline would minimize adverse effects associated with rapid approaches and noise to sensitive shorebirds in shoreline habitats. Beneficial effects are expected in areas closed to PWC use. Short- and long-term beneficial impacts to federal and state threatened or endangered species are expected as a result of discontinuing PWC use throughout a large portion of Fire Island National Seashore.

Cumulative impacts are not likely to adversely affect threatened or endangered species at Fire Island National Seashore, similar to alternative A; however, PWC use would no longer contribute to impacts in areas where use was banned.

No impairment of threatened, endangered, or sensitive species is expected.

Impacts of Alternative C — Continue PWC Use, but Limit Use to Areas Adjacent to Beach Communities and Enforce a 1,000-Foot Buffer along all Shorelines within the NPS Boundary

Analysis. Under this alternative PWC use would be limited to areas adjacent to beach communities and users would have to stay 1,000 feet away from any shoreline (including smaller island shorelines). PWC users operating in ferryways must maintain a no-wake speed.

Effects to federally listed threatened or endangered species as a result of PWC use would be similar to those discussed under alternative A; however, restricting PWC use within 1,000 feet of any shoreline would minimize potential impacts to sensitive shorebirds using shoreline habitats for nesting, foraging or resting. Alternative C is not likely to adversely affect federal or state listed threatened or endangered species within Fire Island National Seashore.

Cumulative Impacts. Cumulative impacts to listed species due to PWC use under alternative C would be the same as those discussed under alternative A in areas remaining open to PWC use. However, banning PWC use within 1,000 feet of any shoreline would further minimize the potential for adverse effects associated with cumulative impacts. Cumulative impacts are not likely to adversely affect federal or state listed threatened or endangered species at Fire Island National Seashore.

Conclusion. Alternative C is not likely to adversely affect federal or state listed threatened or endangered species at Fire Island National Seashore. Effects would be similar to those discussed under alternative A; however, restricting PWC use within 1,000 feet of any shoreline would further minimize potential impacts to sensitive shorebirds.

Cumulative impacts are not likely to adversely affect federal or state listed threatened or endangered species on Fire Island National Seashore, similar to alternative A. PWC use would no longer contribute to any impacts in areas where use was banned.

No impairment of threatened, endangered, or sensitive species is expected.

Impacts of the No-Action Alternative

Analysis. Under the no-action alternative all PWC use would be banned within the boundary of Fire Island National Seashore, and no effects to threatened or endangered species are expected as a result of PWC use within the NPS boundary.

Cumulative Impacts. While other motorized uses would continue within Fire Island National Seashore, cumulative impacts are not likely to adversely affect federal or state listed threatened or endangered species, similar to alternative A. PWC use would not contribute to any impacts.

Conclusion. Eliminating PWC use within Fire Island National Seashore would ensure that no impacts to threatened and endangered species would occur as a result of this use within NPS boundaries.

Cumulative impacts are not likely to adversely affect federal or state listed threatened or endangered species, similar to alternative A. PWC use would not contribute to any impacts.

No impairment of threatened, endangered, or sensitive species is expected.

SHORELINE AND SUBMERGED AQUATIC VEGETATION

METHODOLOGY AND ASSUMPTIONS

Personal watercraft have the potential to impact shoreline vegetation and submerged aquatic vegetation as a result of operating in shallow waters or adjacent to wetland habitats. Direct impacts resulting from collision or mechanical removal can occur. Potential indirect impacts include the deposition of suspended sediments on aquatic or submerged aquatic vegetation or the modification of substrates. Impacts to shoreline vegetation associated with foot traffic adjacent to landing areas can also occur.

Primary steps in assessing impacts to shoreline and submerged aquatic vegetation were to determine (1) occurrence and location of vegetation in areas likely to be affected by management actions described in the personal watercraft alternatives, (2) current and future use and distribution of personal watercraft by alternative, (3) habitat impact or alteration caused by the alternatives, and (4) disturbance potential of the actions and the potential to affect shoreline or aquatic vegetation as a result of PWC activities. The information contained in this analysis was obtained through best professional judgment of park staff and experts in the field, and by conducting a literature review.

STUDY AREA

The study area includes the immediate locations of PWC use and the adjacent nearshore environment. For purposes of this review, the study area extends from the west boundary of Fire Island Lighthouse to Moriches Inlet on the bayside.

IMPACTS ON SHORELINE VEGETATION / WETLAND HABITATS FROM PWC USE

The following thresholds were used to determine the magnitude of effects on shoreline vegetation and wetland habitats:

Negligible: No shoreline vegetation or wetland communities are present in areas likely to be accessed by personal watercraft; no impacts or impacts with only temporary effects are expected.

Minor: Shoreline vegetation or wetland habitats are present, but only in low numbers. Occasional impacts to species or communities are expected, but with no impacts or limited impacts on the continued existence of the species or viable functioning communities within the national seashore.

Moderate: Shoreline vegetation or wetland habitats are present in areas accessible by personal watercraft. Direct loss of vegetation or other effects are expected on an occasional basis, but are not expected to threaten the continued existence of the species or viable functioning communities in the national seashore.

Major: Shoreline vegetation or wetland habitats are present in relatively high numbers in areas accessible by personal watercraft. Direct loss of vegetation or other effects are expected on a regular basis and could threaten continued survival of species or communities of species in the park.

Impairment: PWC use would contribute substantially to the deterioration of the shoreline or wetland habitats to the extent that the park's shoreline would no longer function as a natural system. In addition, these adverse major impacts to park resources and values would

contribute to deterioration of these resources to the extent that the park's purpose could not be fulfilled as established in its enabling legislation;

affect resources key to the park's natural or cultural integrity or opportunities for enjoyment; or

affect the resource whose conservation is identified as a goal in the park's *General Management Plan* or other park planning documents.

Impacts of Alternative A — Continue PWC Use as Currently Managed under a Special Regulation

Analysis. PWC use would continue in all waters within the national seashore in the short and long term, and all state regulatory requirements would apply. Direct impacts from PWC use to shoreline vegetation would occur around landing areas because of vegetation being trampled by foot traffic. Also, direct impacts to wetland vegetation and habitat could be expected in areas where PWC users access shallow water habitats fringed by marsh habitats. These habitats are common along the backbay of Fire Island National Seashore, from the western boundary of Otis Pike Wilderness Area east to Moriches Inlet, around East Fire Island, and along the shoreline of the William Floyd Estate. Impacts to shoreline vegetation associated with the low salt marsh habitats could be expected where PWC users accessed shallow inter-tidal zones, resulting in plants being removed or damaged by collisions. Indirect impacts due to the modification of substrates (i.e., scouring) associated with PWC operation in shallow water habitats could also occur. However, PWC users tend to avoid shallow water areas to prevent damage to their craft. Adverse effects are expected to be short term, minor to moderate, and adverse due to limited PWC use in the area of the Otis Pike Wilderness Area and limited access to shallow water habitats.

Cumulative Impacts. Adverse direct and indirect cumulative effects associated with future increased use by motorized watercraft, including personal watercraft, would be minor to moderate around landing areas and in tidal wetland habitat.

Conclusion. Impacts to shoreline vegetation from foot traffic associated with PWC access to beach areas, and to marsh habitats from PWC use in shallow water habitats, would be short term and minor to moderate because of low levels of PWC use in affected areas and limited access to shallow water habitats.

Minor to moderate, direct and indirect, adverse cumulative effects to shoreline and wetland vegetation are expected in association with continued foot traffic around landing areas and impacts to tidal wetland habitat associated with limited access to shallow water habitats.

No impairment to shoreline and wetland vegetation is expected. (Also see "Submerged Aquatic Vegetation" below.)

Impacts of Alternative B — Continue PWC Use, but Limit Use to Areas Adjacent to Beach Communities

Analysis. Under this alternative PWC use would only be allowed adjacent to beach communities within the waters of Fire Island National Seashore. Direct impacts from PWC use to shoreline vegetation would occur around landing areas because of vegetation trampled by foot traffic, similar to alternative A. Direct impacts to wetland vegetation and habitat could occur in areas where PWC users access shallow water habitats fringed by marsh habitats. Impacts to wetland habitats (mechanical removal of plants and damage from collisions) would be minor under alternative B because PWC use would not be allowed in areas along the national seashore where these habitats occur; however, impacts could occur in tidal wetlands outside the restricted PWC use areas. Indirect impacts due to modification of substrates (i.e., scouring) associated with PWC operation in shallow water habitats could also occur. Adverse effects on shoreline vegetation are expected to be short term and minor due to restricted PWC access to tidal wetlands and limited access to shallow water habitats; these impacts are expected to be less than those discussed under alternative A.

Cumulative Impacts. Adverse direct and indirect cumulative effects associated with increased future use by both PWC and other watercraft users are expected to be minor, similar to alternative A.

Conclusion. Impacts to shoreline vegetation would be short term and minor to moderate as a result of foot traffic associated with PWC access to beach areas, similar to alternative A. Impacts to tidal wetland habitats from PWC use could also occur, but are expected to be minor because PWC access to tidal wetland habitats along the national seashore would be restricted under this alternative and because PWC users would likely avoid operating in shallow water habitats to prevent damage to their craft.

Minor, adverse, direct and indirect cumulative effects to shoreline and wetland vegetation are expected in association with continued foot traffic around landing areas and increased motorized use in the future.

No impairment to shoreline and wetland vegetation is expected. (Also see "Submerged Aquatic Vegetation" below.)

Impacts of Alternative C — Continue PWC Use, but Limit Use to Areas Adjacent to Beach Communities and Enforce a 1,000-Foot Buffer along all Shorelines within the NPS Boundary

Analysis. Under this alternative PWC use would be allowed adjacent to beach communities; but no PWC use would be allowed closer than 1,000 feet to any shoreline. PWC users operating in ferryways must maintain a no-wake speed.

Direct impacts to shoreline vegetation from PWC use are expected around landing areas, as described for alternative A. Impacts to wetland vegetation and habitat are expected to be beneficial because no PWC use would be allowed within 1,000 feet of any shoreline in the national seashore. Effects to shoreline vegetation associated with PWC use under alternative C are expected to be short term and minor.

Cumulative Impacts. Adverse, direct, cumulative effects associated with increased future PWC and other motorized watercraft use are expected to be minor. Impacts to shoreline vegetation around landing areas associated with foot traffic would continue. Cumulative beneficial impacts to shoreline vegetation associated with the wetland habitats are expected due to the 1,000-foot buffer zone.

Conclusion. Short-term, minor impacts to shoreline vegetation would result primarily from foot traffic associated with PWC access to beach areas. Impacts to tidal wetland habitats are expected to be beneficial as a result of restricting PWC use within 1,000 feet of any shoreline.

Minor, adverse, direct cumulative impacts to shoreline vegetation are expected in association with continued foot traffic around landing areas. Cumulative beneficial impacts to shoreline vegetation associated with wetland habitats are expected due to the 1,000-foot buffer zone.

No impairment to shoreline and wetland vegetation is expected. (Also see “Submerged Aquatic Vegetation” section.)

Impacts of the No-Action Alternative

Analysis. Discontinuing all PWC use at Fire Island National Seashore under the no-action alternative would have long-term beneficial impacts on shoreline vegetation. Closing Fire Island National Seashore to PWC use would reduce the amount of foot traffic in vegetated areas around landing areas, and it would also eliminate the potential for PWC to access shallow water wetland habitats that occur along the barrier island shorelines and islands in the backbay areas of the national seashore.

Cumulative Impacts. Closing the national seashore to PWC use would reduce traffic associated with PWC users; however, foot traffic associated with non-PWC users would continue, somewhat limiting the beneficial effects of removing PWC traffic. Cumulative beneficial impacts to vegetation associated with the wetland habitats are expected from banning PWC use.

Conclusion. Effects to shoreline and wetland vegetation from closing Fire Island National Seashore to PWC use would be long term and beneficial.

On a cumulative basis beneficial effects would be minor because of continued foot traffic associated with other park users. Cumulative beneficial impacts to vegetation associated with the wetland habitats are expected from banning PWC use.

No impairment to shoreline and wetland vegetation is expected. (Also see "Submerged Aquatic Vegetation" below.)

IMPACT ON SENSITIVE SUBMERGED AQUATIC VEGETATION FROM PWC ACCESS

The study area and impact thresholds for submerged aquatic vegetation would be the same as defined for shoreline vegetation.

Impacts of Alternative A — Continue PWC Use as Currently Managed under a Special Regulation

Analysis. Continuing PWC use in all existing areas would have direct impacts to submerged aquatic vegetation in areas where PWC users access shallow water habitats along the shorelines of the back-bays of the national seashore. Seagrass meadows dominated by eelgrass are abundant in the backbay areas from Fire Island Inlet to Moriches Inlet. Large meadows of eelgrass have been identified in extensive shallow flats adjacent to the Otis Pike Wilderness Area.

Direct impacts to submerged aquatic vegetation would include mechanical removal or damage from collision. Indirect impacts would include settling of suspended sediments on vegetation as a result of PWC use in shallow areas. Additional indirect impacts could also occur due to the modification of substrates (i.e., scouring) associated with PWC operation in shallow water habitats. Although PWC use in shallow vegetated flats could destroy or fragment SAV meadows, these habitats are not frequented by PWC users because the plants, particularly thickly growing eelgrass colonies, clog the intakes of the engines, potentially causing damage.

Short- and long-term, moderate, direct and indirect adverse impacts to submerged aquatic vegetation are expected under alternative A.

Cumulative Impacts. Impacts to submerged aquatic vegetation associated with motorized use in shallow water habitats would continue. Adverse direct and indirect cumulative effects associated with increased future use by all motorized watercraft, including personal watercraft, would be moderate as a result of limited access to shallow water habitats. PWC users would avoid SAV beds because of potential for damage to their crafts.

Conclusion. Short- and long-term, moderate, direct impacts to submerged aquatic vegetation are expected due to mechanical removal or damage from PWC collisions. Indirect impacts could result from suspended sediments settling on plants after disturbance and modification of substrates (i.e., scouring) as a result of PWC operation in shallow water habitats. Although PWC use in shallow vegetated flats could destroy or fragment SAV meadows, the habitats are generally avoided by PWC users to prevent damage to their engines.

Adverse direct and indirect cumulative effects associated with increased future use by all motorized watercraft users would be moderate as a result of limited access to the shallow water habitats.

No impairment of submerged aquatic vegetation due to PWC use is expected under alternative A.

Impacts of Alternative B — Continue PWC Use, but Limit Use to Areas Adjacent to Beach Communities

Analysis. Direct and indirect impacts to submerged aquatic vegetation would be similar to those discussed under alternative A. However, prohibiting PWC use in large areas of shallow flats along the shoreline would reduce the overall potential for impacts. Impacts in shallow water habitats remaining open to PWC use would be similar to those described for alternative A. Short- and long-term, minor, direct and indirect, adverse impacts to submerged aquatic vegetation are expected.

Cumulative Impacts. Impacts to submerged aquatic vegetation associated with PWC operation in shallow water habitats would continue. Impacts are expected to be minor as a result of closing large areas of shallow flats along the national seashore to PWC use, and because PWC users would continue to avoid SAV beds to prevent damage to their craft. Impacts associated with the operation of other watercraft in areas closed to PWC use are expected to be minor due to the inability of most watercraft to access the shallow water habitats. Overall, cumulative, direct and indirect, adverse, impacts associated with increased future use by both personal and other motorized watercraft would be minor.

Conclusion. Short and long-term, minor impacts to submerged aquatic vegetation are expected, similar to those discussed under alternative A, but to a lesser degree because restricting PWC access to large areas of shallow flats along the shoreline would reduce the overall potential for impacts.

Cumulative impacts associated with increased future use by all motorized watercraft users would be minor and adverse because large areas would be closed to PWC use and most other watercraft cannot access shallow water habitats.

No impairment to submerged aquatic vegetation is expected under alternative B.

Impacts of Alternative C — Continue PWC Use, but Limit Use to Areas Adjacent to Beach Communities and Enforce a 1,000-Foot Buffer along all Shorelines within the NPS Boundary

Analysis. Direct and indirect impacts to submerged aquatic vegetation would be similar to those discussed under alternative A. However, restricting PWC access to most areas with shallow flats along the national seashore and limiting access within 1,000 feet of shorelines would result in short-term, direct and indirect, minor, adverse impacts to submerged aquatic vegetation.

Cumulative Impacts. Closing most of the shallow flats within the national seashore and all areas within 1,000 feet of shorelines to PWC use would prevent related use impacts in these areas. Impacts associated with other watercraft in areas closed to PWC use would be minor due to the inability of most craft to operate in shallow water habitats. Cumulative, direct and indirect, adverse impacts associated with increased future use by both personal and other watercraft would be minor.

Conclusion. Direct and indirect impacts to submerged aquatic vegetation would be similar to those discussed under alternative A, but would be less extensive. Restricting PWC access to large areas of shallow flats, including all areas within 1,000 feet of a shoreline within the national seashore, would reduce direct and indirect impacts to SAV habitats to short-term, minor, adverse impacts.

Cumulative impacts associated with increased future use by all motorized watercraft users would be minor and adverse because nearshore areas would be closed to PWC use and most other watercraft cannot access shallow water habitats.

No impairment to submerged aquatic vegetation is expected under alternative C.

Impacts of the No-Action Alternative

Analysis. Discontinuing all PWC use within the national seashore boundary would result in beneficial impacts to submerged aquatic vegetation.

Cumulative Impacts. Other motorized watercraft would still be able to access some areas, with the potential to adversely affect submerged aquatic vegetation. Impacts associated with operation of other watercraft in areas closed to PWC use are expected to be minor due to the inability of most watercraft to access shallow water habitats. PWC use would no longer contribute to impacts on submerged aquatic vegetation.

Conclusion. Eliminating PWC use within the national seashore boundary would result in a long-term, beneficial impact to SAV communities.

Impacts associated with the operation of other watercraft in areas closed to PWC use are expected to be minor due to the inability of most watercraft to access shallow water habitats.

No impairment to submerged aquatic vegetation under the no-action alternative is expected.

VISITOR USE AND EXPERIENCE

GUIDING REGULATIONS AND POLICIES

The NPS *Management Policies 2001* state that enjoyment of park resources and values by the people of the United States is part of the fundamental purpose of all parks and that the National Park Service is committed to providing appropriate, high-quality opportunities for visitors to enjoy the parks. Because many forms of recreation do not require a national park setting, the National Park Service will therefore:

- Provide opportunities for forms of enjoyment that are uniquely suited and appropriate to the superlative natural and cultural resources found in parks.
- Defer to local, state, and other federal agencies; private industry; and non-governmental organizations to meet the broader spectrum of recreational needs and demands.

Unless mandated by statute, the National Park Service will not allow visitors to conduct activities that would

- impair park resources or values
- create an unsafe or unhealthful environment for other visitors or employees
- be contrary to the purposes for which the park was established
- unreasonably interfere with the atmosphere of peace and tranquillity, or the natural soundscape maintained in wilderness and natural, historic, or commemorative locations within the park; NPS interpretive, visitor service, administrative, or other activities; NPS concessioner or contractor operations or services; or other existing, appropriate park uses

Part of the purpose of Fire Island National Seashore is to offer opportunities for public access, use, and enjoyment. Its significance lies in that the national seashore is comprised of relatively unspoiled and undeveloped beaches, dunes, other natural features, and a diverse barrier island ecosystem. One of the park's mission goals is to ensure "visitors safely enjoy and are satisfied with the availability, accessibility, diversity, and quality of park facilities, services, and appropriate recreational opportunities." To achieve this, two five-years visitor goals were identified in the *Strategic Plan*:

> *Visitor Satisfaction* — By September 30, 2005, 95% of visitors to Fire Island National Seashore are satisfied with appropriate park facilities, services, and recreational opportunities.
>
> *Visitor Safety* — By September 30, 2005, the Fire Island National Seashore visitor accident/incident rate will be reduced from the FY1992–FY1996 baseline of 9.48 per 100,000 visitor days to 7.96 per 100,000 visitor days (a 16% reduction).

Both goals focus on maintaining high visitor satisfaction by means of appropriate and safe recreational opportunities and experiences.

METHODOLOGIES AND ASSUMPTIONS

The purpose of this impact analysis is to determine if PWC use at Fire Island National Seashore is compatible or in conflict with the purpose of the park, its visitor experience goals, and the direction provided by the NPS *Management Policies*. Thus, these policies and goals were integrated into the impact thresholds.

To determine impacts, the current level of PWC use was calculated at locations throughout the national seashore where PWC use is known to occur. Other recreational activities and the type of visitor experiences that are proposed in these locations were also identified. Visitor surveys (if available) and staff observations were also evaluated to determine visitor attitudes and satisfaction in areas where personal watercraft are encountered.

Data suggest that the vast majority of visitors are satisfied with their current experiences. The potential for change in visitor experiences was evaluated by identifying projected increases or decreases in both PWC and other visitor uses, and by determining whether these projected changes would affect the desired visitor experience and result in greater safety concerns or additional user conflicts.

STUDY AREA

The appropriate study area for analyzing visitor experience impacts includes the locations related to PWC operation and the distance that PWC-related noise travels. Personal watercraft are currently allowed to operate in all waters of Fire Island National Seashore.

IMPACT OF PWC USE ON VISITOR EXPERIENCE GOALS

The following thresholds were defined:

> *Negligible:* Visitors would not likely be aware of the effects associated with changes proposed for visitor use and enjoyment of park resources.
>
> *Minor:* Visitors would likely be aware of the effects associated with changes proposed for visitor use and enjoyment of park resources; however, the changes in visitor uses and

experience would be slight and likely short term. Other areas in the park would remain available for similar visitor experiences and uses without derogation of park resources and values.

Moderate: Visitors would be aware of the effects associated with changes proposed for visitor use and enjoyment of park resources. Changes in visitor uses and experiences would be readily apparent and likely long term. Other areas in the park would remain available for similar visitor experiences and uses without derogation of park resources and values, but visitor satisfaction could be measurably affected (either beneficially or adversely). Some visitors who desire to continue their use and enjoyment of the activity/visitor experience would be required to pursue their choices in other available local or regional areas.

Major: Visitors would be highly aware of the effects associated with changes proposed for visitor use and enjoyment of park resources. Changes in visitor uses and experiences would be readily apparent and long term. The proposed change in visitor use and experience would preclude future generations of some visitors from enjoying park resources and values. Some visitors who desire to continue their use and enjoyment of the activity/visitor experience would be required to pursue their choice in other available local or regional areas.

Impacts of Alternative A — Continue PWC Use as Currently Managed under a Special Regulation

Analysis. *Impact to PWC Users —* The continuation of PWC use under alternative A would have little or no noticeable change in the experiences of these visitors or their level of satisfaction since access to the national seashore and PWC activity inside the park boundary would remain unchanged.

Impact to Other Boaters — Other boaters at Fire Island National Seashore would continue to interact with PWC operators the same as they do now. Alternative A would have little adverse effect on the experiences of other boaters.

Impact to Other Visitors — The visitor population at Fire Island National Seashore is dispersed throughout the park. The number of personal watercraft used in the park is expected to increase between 2002 and 2012 by only one to two watercraft per area. The increased amount of contact would not be noticeable when compared to existing conditions. Effects to park visitors would be negligible during off-season or nonpeak hours (weekdays) because of reduced PWC use; however, impacts to visitor experiences, specifically birdwatching, would be moderately adverse toward the end of the season when the first waves of migratory birds begin to arrive and PWC users are still present.

Based on this analysis, PWC activity as defined under alternative A would have a negligible to moderate adverse impact on the experience of swimmers, hikers, and other visitors to Fire Island National Seashore, depending on seasonal variations in visitor activity.

Cumulative Impacts. The location and number of other boats and their proximity to other visitors affect visitor experiences. Motorized boats would continue to be present within the national seashore boundary. No change to other park visitors and activities would result under this alternative, and no other actions are currently planned that would affect PWC use or visitor experiences within the seashore. Some conflicts between PWC users and anglers and sailboaters would still occur. Cumulative impacts on visitor experiences related to the use of personal watercraft and other motorized boats would be negligible, since there would be little noticeable change from existing conditions. Most visitors would continue to be satisfied with their experiences at Fire Island National Seashore.

Conclusion. Continued PWC use at Fire Island National Seashore would result in negligible to moderate adverse impacts on visitor experiences, depending on the location and seasonal variations in visitor use. There would be moderate adverse impacts between PWC users, birdwatchers, and anglers during the peak summer months. Alternative A would partially meet the park's strategic goal for improved visitor satisfaction (in the case of PWC users).

Cumulative impacts related to all other watercraft and other visitors would continue to result in negligible impacts, since there would be little noticeable change in visitor experiences. Most visitors would continue to be satisfied with their experiences at Fire Island National Seashore.

Impacts of Alternative B — Continue PWC Use, but Limit Use to Areas Adjacent to Beach Communities

Analysis. This alternative would implement geographic restrictions on PWC use in the national seashore, permitting use only in areas adjacent to beach communities. In addition, all local, state, and federal laws and regulations relative to PWC use would remain in effect and enforced by the National Park Service.

Impact to PWC Users — While PWC users would not be allowed to operate within certain areas of the national seashore, they would continue to have access to other areas within the boundary. PWC users would notice little or no change in their experiences or level of satisfaction, since restrictions would allow for continued access to certain areas, and PWC activity outside the NPS boundary would remain unchanged. PWC users would experience negligible to minor adverse impacts with the closure of certain areas to personal watercraft.

Impact to Other Boaters — Other boaters at Fire Island National Seashore would continue to interact with PWC users, which would be limited to the areas adjacent to beach communities. Alternative B would eliminate the potential for PWC-related conflicts in the area of the Fire Island Lighthouse; in channels to and from Bellport Beach and Great Gun Beach; in all areas between the west boundary of Moriches Inlet and the west boundary of the Sunken Forest, except for those areas used as ferry channels; in all Atlantic Ocean areas from the west boundary of Moriches Inlet to the east boundary of Robert Moses State Park (the boundary of Fire Island National Seashore extends 1,000 feet into the ocean from the beach); at the William Floyd Estate; and within NPS marinas. Based on this analysis, alternative B would have a beneficial effect on the experiences of other boaters now and in the future.

Impact to Other Visitors — Other visitors to Fire Island National Seashore would continue to interact with PWC operators, but on a limited basis. These interactions would be focused at areas near beach communities. The effects on park visitors would continue to be negligible during the off-season or nonpeak hours (weekdays). Beneficial impacts on visitor experiences such as birdwatching and swimming would be expected.

Cumulative Impacts. Cumulative impacts would be similar to those described for alternative A except that the potential for PWC use to affect visitors would be reduced in large areas, even though motorized boats would continue to operate within the national seashore boundary. Cumulative impacts on visitor experiences would be negligible because motorized boats would still be allowed in areas closed to PWC use. Most visitors would continue to be satisfied with their experiences at Fire Island National Seashore.

Conclusion. Restricting PWC use to certain areas would result in a beneficial impact to visitor experiences, depending on location and seasonal variations in visitor use, as described for alternative A.

PWC users would experience negligible to minor adverse impacts with the closure of certain areas to personal watercraft. Alternative B would partially meet the park's strategic goal for improved visitor satisfaction (in the case of other boaters and non-boating visitors) by restricting PWC use to specific areas of the island.

Cumulative effects of PWC and other motorized watercraft uses would be negligible since motorized boats would still be allowed in areas closed to PWC use. Most visitors would continue to be satisfied with their experiences at the national seashore, with a slightly greater benefit for visitors in areas where adjacent PWC use was restricted.

Impacts of Alternative C — Continue PWC Use, but Limit Use to Areas Adjacent to Beach Communities and Enforce a 1,000-Foot Buffer along all Shorelines within the NPS Boundary

Analysis. This alternative is the same as alternative B except that in national seashore areas remaining open to PWC use, a 1,000-foot buffer zone would be enforced, and a no-wake zone would be implemented within ferryways.

Impact on PWC Users — Impacts to PWC users would be similar to alternative B except PWC users would be banned within 1,000 feet of any shoreline and no-wake zones would be implemented in ferryways; however, within nearshore shallow waters, PWC users do not usually operate at high speed. Changes for PWC users would be readily apparent and likely long term; as a result, some users could reduce their use of Fire Island National Seashore waters and go to other areas. The impact for PWC users would be long term and minor to moderate.

Impact on Other Boaters — Interactions between other boaters and PWC operators would continue on a limited basis within park waters open to PWC use, but potential impacts to visitor experiences would be reduced because of the 1,000-foot buffer around all national seashore lands. Based on this analysis, alternative C would have negligible adverse and beneficial effects on the visitor experiences of other boaters now and in the future.

Impact on Other Visitors —This alternative would have the same effect as alternative B; however, with the enforcement of a 1,000-foot buffer, there would be a reduction in potential impacts to visitors in areas open to PWC use. The effect on park visitors would continue to be negligible during the off-season or nonpeak hours (weekdays) and would be reduced during peak PWC use times. Therefore, alternative C would have beneficial effects on the visitor experiences of other visitors.

Cumulative Impacts. Cumulative impacts would be similar to those described for alternative A. The location and number of other motorized boats and their proximity to other visitors would affect visitor experiences within the national seashore; however, the potential for PWC use to affect visitor experiences would be reduced within this area. Cumulative impacts on all PWC users would be negligible to minor because they might not be aware of the proposed changes, and other areas outside the national seashore would remain open to PWC use. Impacts on other boaters, as well as all visitors, would be negligible adverse, since there would be little noticeable change in overall visitor experiences. Most visitors would continue to be satisfied with their experiences at Fire Island National Seashore.

Conclusion. Alternative C would have beneficial impacts to the experiences of visitors other than PWC users. There would be minor to moderate adverse impacts to PWC users as a consequence of closing areas of the national seashore to PWC use, prohibiting use within the 1,000-foot buffer zone, and requiring no-wake speeds in ferryways. However, PWC users would still be allowed to operate outside the restricted areas and no-wake zones.

Similar to alternative A, cumulative impacts for all PWC users in the region would be negligible to minor because other nearby areas would remain open to PWC use. Impacts on other boaters and visitors would be negligible since there would be little noticeable change in overall visitor experiences. Most visitors would continue to be satisfied with their experiences at the national seashore.

Impacts of the No-Action Alternative

Analysis. PWC use would be discontinued within the national seashore boundary.

Impact on PWC Users — Banning PWC use within the national seashore would have major adverse effects on those visitors who depend on this means of access to their homes or boats anchored offshore. Because there are numerous other opportunities to enjoy the national seashore and other areas would still available to PWC use outside of its boundaries, impacts would most likely be negligible to minor. Changes to visitor experiences would be long term, and visitors would have to pursue this activity in other areas outside the national seashore.

Impact on Other Boaters — Interactions between other boaters and PWC operators would be eliminated within the national seashore, resulting in a beneficial impact.

Impact on Other Visitors — The effect of banning PWC use on other park visitors would be negligible because most visitors would probably not be aware of the effect of the change. However, some frequent visitors to the Otis Pike Wilderness Area would find the future absence of PWC on the near bay-side to be a beneficial impact to their visitor experiences.

Cumulative Impacts. Some conflicts with anglers and sailboaters would remain because PWC users would still be able to ride in waters outside the national seashore boundary. Banning PWC use within NPS jurisdictional waters could force PWC riders to other regional areas where the additional use could affect others recreationists (e.g., other boaters), creating a minor adverse cumulative impact in those areas.

Impacts on all other boaters and visitors would be negligible since there would be little noticeable change in overall visitor experiences. Most visitors would continue to be satisfied with their experiences at the national seashore.

Conclusion. Banning PWC use within the national seashore boundary would have major adverse impacts on PWC users, specifically for PWC users accessing the communities on the western end of the island. However, PWC users would still have ample alternative places to ride outside the national seashore and would not be adversely affected. Impacts on other boaters and visitors would be negligible to moderate and beneficial.

Banning PWC use within NPS jurisdictional waters could drive PWC users to other regional areas where the additional use could affect other recreationists (e.g., other boaters), creating a minor adverse cumulative impact in those areas. Impacts on all other boaters and visitors would be negligible since there would be little noticeable change in overall visitor experiences. Most visitors would continue to be satisfied with their experiences at the national seashore.

VISITOR SAFETY

GUIDING REGULATIONS AND POLICIES

In addition to the guiding regulations and policies discussed in the "Visitor Experience" section, the NPS *Management Policies 2001* state that the National Park Service is committed to providing appropriate, high-quality opportunities for visitors to enjoy the parks. The policies also state, "While recognizing that there are limitations on its capability to totally eliminate all hazards, the Service and its concessioners, contractors, and cooperators will seek to provide a safe and healthful environment for visitors and employees" (sec. 8.2.5.1). Further, the National Park Service will strive to protect human life and provide for injury-free visits (sec. 8.2.5).

Director's Order #9: Law Enforcement Program (NPS 2000a), in conjunction with *Reference Manual 9: Law Enforcement,* establishes and defines standards and procedures for NPS law enforcement. Along with education and resource management, law enforcement is an important tool in achieving this mission. Commissioned rangers perform resource stewardship, education, and visitor use management activities, including law enforcement. They provide for tranquil, sustainable use and enjoyment of park resources while simultaneously protecting these resources from all forms of degradation. The objectives of the law enforcement program are to (1) prevent criminal activities through resource education, public safety efforts, and deterrence, (2) detect and investigate criminal activity, and (3) apprehend and successfully prosecute criminal violators.

In New York, PWC users are required to comply with all federal boating laws and regulations. In addition to these requirements, the owner/operator is required to comply with additional regulations and/or laws specific to the state (see "Affected Environment," page 64).

The National Park Service, within the boundaries of Fire Island National Seashore, has jurisdiction over state waters. Based on concurrent jurisdiction agreements, NPS park rangers enforce boating regulations within the national seashore boundary.

METHODOLOGY AND ASSUMPTIONS

The methodology for assessing impacts on visitor safety is similar to that described under "Visitor Experience." The potential visitor-related impacts attributable to personal watercraft — a higher rate of accidents than other watercraft and conflicts with other park users — could potentially affect the mandate to provide for injury-free visits.

As described in the "Affected Environment," New York State PWC regulations are enforced within the national seashore. These regulations govern PWC activities near the shore, the timing of PWC use, and the age and educational requirements of operators.

STUDY AREA

In terms of PWC use, the appropriate boundary for analyzing visitor experience impacts includes the locations related to PWC operation and the distance that PWC noise travels. Personal watercraft are allowed in all waters of Fire Island National Seashore.

IMPACT TO VISITOR SAFETY FROM PWC USE

The impact intensities for visitor safety follow. At the point where impacts to visitor safety became moderate, it is assumed that current visitor satisfaction and safety levels would begin to decline and some of the national seashore's long-term visitor goals would not be achieved.

Negligible: The impact to visitor safety would not be measurable or perceptible.

Minor: The impact to visitor safety would be measurable or perceptible, but it would be limited to a relatively small number of visitors at localized areas. Impacts to visitor safety might be realized through a minor increase in the potential for visitor conflicts in current accident areas.

Moderate: The impact to visitor safety would be sufficient to cause a change in accident rates at existing low accident locations or to create the potential for additional visitor conflicts in areas that currently do not exhibit noticeable accident trends.

Major: The impact to visitor safety would be substantial. Accident rates in areas usually limited to low accident potential are expected to substantially increase in the short and long term.

Impacts of Alternative A — Continue PWC Use as Currently Managed under a Special Regulation

Analysis. Under this alternative all national seashore waters would continue to be open to PWC use. Personal watercraft, due to their ability to reach speeds up to 70 mph and their ability to access shallow-draft areas, can create wakes that pose a conflict and safety hazard to other users, such as canoeists. The capability of NPS staff to enforce boating laws is directly dependent on the presence of patrols in use areas.

Conflicts between PWC Users and Swimmers — Potential accidents involving PWC users and swimmers could occur in nearshore waters (most swimmers do not venture farther than 200 feet from shore). With projected future increases in both visitors and PWC use, the potential adverse impacts to swimmers could be moderate.

Conflicts between Personal Watercraft and Other Boats — There is potential for PWC users to have accidents with other boaters (canoeists, kayakers, sailboaters, and motorboaters) due to the high level of activity. The high-speed capabilities of personal watercraft pose threats to the safety of the PWC operator and vessels that are slower to turn, such as sailboats and canoes. Because of the degree of use in waters around Fire Island, the potential for accidents with boaters is considered moderate, and this potential would increase with more use. The impact to visitor safety would be considered moderate.

Cumulative Impacts. Depending on the type of water-oriented activity and its location, impacts to visitor safety could range from negligible to minor. As the number of motorized watercraft increased, the potential for accidents would escalate as well over the next 10 years as congestion increased.

Conclusion. While the number of PWC users is not expected to increase substantially over the next 10 years, conflicts between PWC users and other water recreationists (swimmers and boaters) would result in moderate adverse impacts as use increased for all activities.

On a cumulative basis impacts on visitor safety would be negligible to minor over the next 10 years, depending on the type of water-oriented activity and its location.

Impacts of Alternative B — Continue PWC Use, but Limit Use to Areas Adjacent to Beach Communities

Analysis. Alternative B would result in impacts similar to those described under alternative A, but the potential for impacts to visitor safety resulting from PWC use would be eliminated in the areas where personal watercraft use would be restricted.

Cumulative Impacts. Cumulative impacts would be similar to those described in alternative A, but with beneficial impacts related to the restriction of PWC use in the designated areas. Depending on the type of activity and its location, potential impacts to visitor safety could range from negligible to minor.

Minor adverse impacts in areas outside national seashore waters are likely to increase to the extent that PWC users concentrated their activities in these areas as a consequence of closures in Fire Island waters.

Conclusion. Alternative B would eliminate the potential for PWC-related accidents within certain areas of the national seashore. Within the areas open to PWC use, existing conditions would continue, with negligible to moderate adverse impacts to visitor safety.

Cumulative impacts would be negligible to minor, with no contribution from PWC use within areas of the national seashore closed to this activity. Impacts related to the restriction of PWC use in the designated areas would be beneficial.

Impacts of Alternative C — Continue PWC Use, but Limit Use to Areas Adjacent to Beach Communities and Enforce a 1,000-Foot Buffer along all Shorelines within the NPS Boundary

Analysis. Similar to alternative B, alternative C would allow PWC use only within designated areas adjacent to beach communities, but a 1,000-foot buffer zone where PWC use was prohibited would also be established. An additional management restriction would be the requirement to operate at no-wake speeds within ferryways within the seashore boundary.

The potential for impacts to visitor safety resulting from PWC use would be eliminated in areas where PWC use would no longer be allowed and would be further reduced in the ferryways as a result of the no-wake regulation. Swimmers would benefit from restrictions on PWC use.

Cumulative Impacts. Depending on the type of activity and its location, potential cumulative impacts to visitor safety would be negligible. Boaters utilizing waters outside the park could be adversely affected to the extent that increased PWC use in these waters would conflict with their activities. Some beneficial impacts would result from restrictions on PWC use and subsequent fewer conflicts and accidents.

Conclusion. Alternative C would eliminate the potential for PWC-related accidents within the restricted use areas of the national seashore. No-wake restrictions in the ferryways would reduce the potential for accidents, with negligible to possibly minor adverse impacts.

An increased potential for accidents between PWC users and other boaters could occur outside NPS waters. Some beneficial impacts would result from restrictions on PWC use and subsequent fewer conflicts and accidents.

Impacts of the No-Action Alternative

Analysis. Impacts on visitor safety associated with PWC use within the national seashore would be eliminated. For those visitors who come to Fire Island for swimming, fishing, and traditional boating, eliminating personal watercraft would have a beneficial impact.

Cumulative Impacts. Some beneficial impacts would result from restrictions on PWC use and subsequent fewer conflicts and accidents within the national seashore. However, other recreational activities in the park have the potential to affect visitor safety. Depending on the type of activity and its location, potential impacts to visitor safety could range from negligible to minor. Closing Fire Island National Seashore to PWC use could force PWC riders to go to other areas in the region for recreation. This would increase cumulative impacts to safety (accidents with other boaters) in those waters.

Conclusion. Eliminating PWC use within the national seashore would have a beneficial impact for those visitors who come to Fire Island for swimming, fishing, and traditional boating. The overall reduction in accident potential, however, would be negligible to minor because many other uses at the national seashore are related to motorized watercraft and water-related activities, and there is always potential for accidents.

Some beneficial impacts would result from restrictions on PWC use and subsequent fewer conflicts and accidents within the national seashore. Impacts on a cumulative basis would be negligible to minor because of the potential of increased safety hazards to other boaters operating in adjacent non-NPS waters due to possibly increased PWC activities.

SOCIOECONOMIC EFFECTS

ECONOMIC IMPACT ANALYSIS

PWC use is a popular recreational activity along beaches near Long Island. In addition, personal watercraft serve as an important form of transportation for some people on the local islands because many other forms of transportation (e.g., automobiles) have only limited access to the area. Personal watercraft are used not only for transportation within and between the local islands, but also to travel between homes and larger boats anchored offshore. Boat owners often cannot dock large boats in the immediate vicinity of their homes because the water is too shallow. Because there are no roads on the interior of the island, some boat owners may use PWC to reach their boats. Interview data suggest that most PWC activity in Fire Island National Seashore is by local residents who own vacation homes on the island. NPS staff identified only one PWC rental shop in the vicinity of Fire Island National Seashore, in the Hampton area; this business is believed to be far enough away from the national seashore that it would not be negatively affected by PWC management alternatives at Fire Island National Seashore. There are 14 shops in the region that sell personal watercraft.

Information is insufficient to accurately estimate the number of regional PWC-using visitors who would stop visiting the area if PWC use was restricted in Fire Island National Seashore. The lack of PWC rental activity in the vicinity of Fire Island National Seashore suggests that PWC use is not a significant factor in tourist visitation. Thus, it is unlikely that a substantial number of people would stop visiting the area as a result of PWC use restrictions. In addition, interviews with property rental agencies serving the communities on Fire Island indicate that PWC use is not a popular activity among visitors to these communities. All three property rental agencies contacted by NPS staff indicated that banning PWC use in Fire Island National Seashore would have no impact on their business.

Given the small expected change in the number of PWC users traveling to the region, especially relative to total visitation to the Long Island area, regulations that are being considered would have no noticeable impact on the total number of visitors to the region. Thus, overall revenues of lodging establishments, restaurants, and other businesses in the Long Island region would not be significantly affected. To the extent that reduced access to Fire Island would reduce visitation, tourism-related businesses on the island could experience localized impacts. However, it is likely that most home-owners and vacationers would continue to visit Fire Island. Overall, no measurable impact on the regional economy is expected, but it is possible that communities on Fire Island would experience localized impacts.

Although no measurable regional economic impact due to the PWC regulations is anticipated, it would be very likely that PWC dealerships would see a decrease in revenue, especially under the no-action alternative. According to local PWC dealerships, several substitution possibilities for PWC use are available outside the national seashore. Thus, PWC users who are no longer willing or able to ride in Fire Island National Seashore as a result of a change in regulations would likely shift recreational PWC use to other locations within the region. This substitution could somewhat mitigate reductions in PWC sales for recreational use.

However, personal watercraft are also used extensively by vacation homeowners and renters for transportation around Fire Island and between Long Island and Fire Island. If personal watercraft could no longer be used for these purposes, there could be a substantial decline in PWC sales in southern Long Island. PWC sales and rental shops in the area were interviewed to gain additional information about potential impacts on those businesses. Of the seven PWC dealerships that were contacted, a general concern was that any restriction in PWC use could cause a reduction in sales as a result of negative publicity. Under alternatives B and C, the dealerships interviewed reported expected reductions in revenue of between 0% and 50%. All of the sales shops predicted significant declines in sales as a result of the no-action alternative, ranging from a 50% to 100% reduction in revenue.

BENEFIT-COST ANALYSIS

The purpose of benefit-cost analysis is to determine whether a proposed action (in this case, the regulation of PWC use in Fire Island National Seashore) would promote an efficient allocation of resources; that is, whether the proposed action would generate more benefits than costs. These costs and benefits accrue directly to households that use personal watercraft, and indirectly to those who are affected by PWC use (e.g., those who benefit from reduced noise). The resulting changes in PWC use could also impose costs on those who own or work for PWC-related businesses.

Even individuals who do not visit the national seashore could benefit from the knowledge that seashore resources were being protected. In other words, they may hold positive values for protecting, or not using, the national seashore environment. These nonuse values can stem from a desire to ensure the enjoyment of these resources by others (both current and future generations) or from a sense that these resources have intrinsic value. Evidence of nonuse value for resources like Fire Island has been established in the economic literature (Pearce and Moran 1994). Restrictions on PWC use in Fire Island can therefore provide benefits to both users and nonusers in numerous ways by protecting the national seashore's ecological resources.

For purposes of this analysis, six major affected groups have been identified along with the anticipated impacts of the proposed regulatory alternatives (see Table 36). The following definitions apply:

Consumer surplus — the economic measure of net benefits that accrue to individuals from PWC use and the appreciation of Fire Island National Seashore resources.

Producer surplus — the economic measure of net benefits that accrue to businesses that sell or rent personal watercraft and other related businesses. Producer surplus is generally equivalent to business profit.

Increases in consumer surplus and producer surplus represent benefits, while decreases in those measures represent costs.

TABLE 36: SOCIOECONOMIC IMPACT OF ALTERNATIVES ON USER GROUPS

User Group	Alternative A: Continue PWC Use as Currently Managed Under a Special Restriction	Alternative B: Continue PWC Use as Currently Managed but Limit to Areas Adjacent to Communities	Alternative C: Continue PWC Use, but Limit Use to Areas Adjacent to Communities and Enforce a 1,000-foot along All Shorelines within the NPS Boundary	No-Action Alternative
PWC Users	No change in consumer surplus.	Consumer surplus is expected to decrease as a result of spatial restrictions on PWC uses.	Similar to alternative B but possibly a greater decrease due to additional spatial restrictions and no-wake zones.	Consumer surplus is expected to decrease more than under alternative C as a result of banning PWC use.
Other Visitors or Potential Visitors (canoeists, anglers, other boaters, swimmers, hikers, other visitors)	No change in consumer surplus.	Consumer surplus is expected to increase slightly for current users as a result of increased solitude, improved water quality, and a decreased risk of accidents involving PWC users.	Similar to alternative B, although the magnitude of the increase could be somewhat greater due to additional spatial restrictions and no-wake zones.	Similar to alternative C, although the magnitude of the increase could be greater because PWC use would no longer be allowed in the national seashore.
		Consumer surplus is expected to increase for new visitors who would not have visited the national seashore without these restrictions on PWC use.	Similar to alternative B but a slightly greater increase for new visitors who would not have visited the national seashore without these PWC use restrictions.	Similar to alternative C except a somewhat greater increase.
Producers of PWC services (PWC rental and sales shops, other parts of the local economy providing services to PWC users)	No change in producer surplus.	PWC rental shops are not expected to experience a measurable decline in producer surplus.	Same as alternative B.	Same as alternative B.
		PWC sales shops are expected to experience a decline in producer surplus due to less demand for personal watercraft.	Similar to alternative B except a greater decline.	Producer surplus for PWC dealerships could decrease substantially more than under alternative C as a result of decline in PWC sales and servicing.
		Other parts of the local economy such as hotels, restaurants, and gas stations are not expected to have a decrease in producer surplus.	There could be a small decrease in producer surplus, but no measurable impact on the regional economy is expected.	There could be a decrease in producer surplus, but no measurable impact on the regional economy is expected.

User Group	Alternative A: Continue PWC Use as Currently Managed Under a Special Restriction	Alternative B: Continue PWC Use as Currently Managed but Limit to Areas Adjacent to Communities	Alternative C: Continue PWC Use, but Limit Use to Areas Adjacent to Communities and Enforce a 1,000-foot along All Shorelines within the NPS Boundary	No-Action Alternative
Local Residents	No change in welfare.	Local residents who use personal watercraft could experience a decline in welfare if they live in areas adjacent to restricted zones. Local residents who do not use personal watercraft could experience an increase in welfare as a result of a decline in noise, increased water quality, and a decreased risk of accidents involving PWC users.	Similar to alternative B except the decline in welfare could be somewhat greater because PWC access would be limited to ferryways. Similar to alternative B except the increase would be greater.	Similar to alternative C except the decline in welfare would be greater due to banning PWC use. Similar to alternative C except the increase would be greater as a result of banning PWC use.
Producers of Services for Non-PWC Users	No change in producer surplus.	Producer surplus is expected to increase because restrictions on PWC use could result in increased demand for angling, canoeing, and other activities and an increased demand for services related to these activities.	Similar to alternative B; the increase is not expected to be substantially larger than under alternative B.	Similar to alternative B, but the increase could be somewhat larger than under alternatives B and C.
General Public	No change in welfare.	The general public could experience an increase in welfare as a result of enhanced nonuse values resulting from greater environmental quality.	Similar to alternative B; the increase is not expected to be substantially larger than under alternative B.	Similar to alternative B, but the increase is expected to be larger than under alternatives B and C because of banning PWC use within the national seashore.

This analysis of benefits is qualitative since quantification was not feasible with currently available data. The primary beneficiaries of alternatives B, C, and the no-action alternative would be national seashore visitors who do not use personal watercraft and whose national seashore experience is negatively affected by the presence of these watercraft. In Fire Island National Seashore other popular activities include canoeing, fishing, boating, and hiking.

Nonusers of Fire Island National Seashore are also likely to benefit from the proposed measures. For example, the general public could benefit simply from the perception that the area's natural resources are being protected. Part of this benefit stems from an increased assurance that the quality of the national seashore's resources is being protected for the enjoyment of future generations.

COSTS TO PWC USERS

Two groups of PWC users might be affected by the proposed regulations: users who currently ride in Fire Island National Seashore and those who ride in other areas outside the national seashore. Users displaced from the national seashore could decide to ride in these other areas if PWC use was restricted within NPS boundaries. For PWC users who currently ride in national seashore waters or

who may want to ride there in the future, use restrictions could result in consumer surplus losses. However, to the extent that individuals consider other PWC areas close substitutes to riding in the national seashore, the loss in consumer surplus associated with restricting PWC use in the national seashore would be lower. PWC users in nearby areas could lose some consumer surplus if these areas became more crowded due to PWC restrictions within the national seashore.

Under alternative A no change in PWC use is anticipated. Consumer surplus to PWC users would remain unchanged from current conditions. Under alternative B prohibiting PWC use, except in areas adjacent to beach communities, could decrease the consumer surplus of PWC users. However, because community waters would still be open to PWC users and substitute areas for recreational PWC use are nearby, minimal consumer losses are expected. Alternative C would impose the same restrictions as alternative B, with the addition of a 1,000-foot buffer around the national seashore for all waters except for the ferry channels, where a no-wake restriction would be implemented. This would reduce the accessibility of the national seashore, particularly for PWC owners who live in areas closed to PWC use. Because substitute areas exist nearby, there would likely be some shifting of recreational use away from Fire Island National Seashore towards these areas. However, those people relying on personal watercraft as a form of transportation around Fire Island, between islands, and to reach their larger boats, might have to find alternative forms of transportation, especially if they owned or rented a home near an area closed to PWC use. Alternative C is expected to result in minor to moderate losses in consumer surplus. Under the no-action alternative banning PWC use would mean that the PWC users in the national seashore would lose the full value of their consumer surplus for rides within seashore boundaries.

COSTS TO LOCAL AREA BUSINESSES

If PWC use decreased as a result of the alternatives being considered, then the suppliers of PWC and rental services could be affected. In addition, lodging establishments, restaurants, gas stations, and other businesses that serve PWC users could experience a reduction in business from the proposed regulation. One firm in the Fire Island National Seashore region rents personal watercraft and 14 shops sell them. It is unlikely that any alternative would affect the rental shop because it operates north of Fire Island National Seashore in the Hampton Bay area. Based on interview responses with NPS staff, the following potential ranges of annual losses in producer surplus (annual sales estimates and estimated profit margins) are projected:

	Loss for PWC Sales Shops	**Loss for PWC Rental Shops**
Alternative A:	$0	$0
Alternative B:	$0 – $2,871,480	$0 – $132,090
Alternative C:	$0 – $3,589,350	$0 – $165,110
No-action alternative:	$7,178,710 – $10,005,190	$43,070 – $462,310

PWC services and sales comprise a minute fraction of the total economic activity in the area surrounding Fire Island National Seashore, which includes New York City. Therefore, the total regional sales of lodging establishments, restaurants, gas stations, and other businesses that serve PWC users are not likely to experience a measurable reduction in business under any of the alternatives. However, it is possible there could be localized impacts on tourist-related businesses on Fire Island if PWC restrictions reduced visitation to the island.

NATIONAL SEASHORE MANAGEMENT AND OPERATIONS

IMPACT TO PARK OPERATIONS FROM INCREASED ENFORCEMENT NEEDS

NPS rangers at Fire Island National Seashore are responsible for ensuring the safety of national seashore visitors and the protection of resources. These duties include enforcing PWC use regulations within the national seashore; however, the size of the national seashore makes it difficult to effectively patrol. Due to the increased accident rates and visitor safety conflicts with PWC users, additional staff could be needed to enforce standards, limits, and closures. The National Park Service, the New York State Department of Environmental Conservation, the Suffolk County Police, the Town of Brookhaven, and the Islip Harbor Police all have jurisdiction within national seashore waters. New York State has strict boating regulations applicable to PWC use that include boater education courses.

Impacts to park operations from increased enforcement needs have been analyzed qualitatively using best professional judgment.

Impacts of Alternative A — Continue PWC Use as Currently Managed under a Special Regulation

Analysis. Under this alternative national seashore waters would remain open to PWC use, with a continuing need for enforcement related to increased accident rates and visitor safety conflicts with PWC users. NPS rangers would continue to enforce New York State boating regulations. NPS staff would have difficulty maintaining an adequate number of enforcement personnel on the water to ensure compliance with regulations.

Cumulative Impacts. The National Park Service, the New York State Department of Environmental Conservation, the Suffolk County Police, the Town of Brookhaven, and the Islip Harbor Police would continue to have jurisdiction within national seashore waters. NPS rangers would continue to provide assistance to the various user groups within the national seashore, both to resolve conflicts and to ensure safety. Seasonal staff would be required to meet existing and future (2012) needs.

Conclusion. Impacts under alternative A would be long term and minor to moderate due to needs for additional law enforcement capability within the national seashore to enforce federal and state boating regulations.

Impacts of Alternative B — Continue PWC Use, but Limit Use to Areas Adjacent to Beach Communities

Analysis. Under this alternative PWC use would be restricted to areas adjacent to the beach communities. This restriction would require education and enforcement by NPS staff to prevent PWC users from entering restricted areas. This could be completed using existing boat patrols, with the anticipation that PWC users would sometimes operate illegally within restricted areas. To provide more control on PWC operations, daily boat patrols would be required. This could be accomplished by adding seasonal staff positions, which would require more park operating funds.

Cumulative Impacts. As described for alternative A, the National Park Service, the New York State Department of Environmental Conservation, the Suffolk County Police, the Town of Brookhaven, and the Islip Harbor Police would continue to have jurisdiction within national seashore waters. However, existing park operations would not be sufficient to adequately monitor and assist current seashore

users. NPS rangers would continue to provide assistance to the various user groups within the national seashore, both to resolve conflicts and to ensure safety. Park operations and enforcement needs for these user groups would be the same as under alternative A, since the number of people and boats would not change under this alternative. Seasonal staff would be required to meet existing and future (2012) needs.

Conclusion. Impacts would be similar to alternative A and would be long term and minor to moderate due to needs for additional law enforcement capability within the national seashore.

Impacts of Alternative C — Continue PWC Use, but Limit Use to Areas Adjacent to Beach Communities and Enforce a 1,000-Foot Buffer along all Shorelines within the NPS Boundary

Analysis. Additional PWC use restrictions under alternative C (maintaining a 1,000-foot buffer around the national seashore and requiring no-wake zones within the ferryways) would limit PWC use as a recreational activity in this area and favor its use as a transport vehicle. The proposed restrictions on PWC operations would require education and enforcement by NPS staff. Enforcement actions would be required to prevent PWC users from entering restricted areas. This could be completed using the existing irregular boat patrols, with the anticipation that personal watercraft would sometimes operate illegally within the seashore. To provide more control of PWC operations, daily boat patrols would be required. This could be accomplished by adding seasonal staff positions, requiring additional park operations funds.

Cumulative Impacts. As described for alternative B, existing park operations are inadequate to monitor and assist with the enforcement of PWC use restrictions in the national seashore. NPS rangers would continue to provide assistance to various user groups. Park operations and enforcement needs for these user groups would be the same as now, since the number of people and boats would not change under this alternative. Additional seasonal staff positions would be required to meet existing and future (2012) needs related to park operations.

Conclusion. Impacts would be similar to alternative A and would be long term and minor to moderate due to existing needs for additional law enforcement capability within the national seashore.

Impacts of the No-Action Alternative

Analysis. The no-action alternative would require additional enforcement to ensure that PWC use restrictions within the national seashore boundary were observed. NPS staff would be required to enforce these restrictions. Removing personal watercraft, however, would reduce the number of complaints related to user conflicts. Park staff would continue to make reasonable efforts to provide for the protection, safety, and security of all park visitors, employees, concessioners, and public and private property, and to protect the natural and cultural resources entrusted to its care. Eliminating PWC use would decrease the potential for accidents in and near the landing areas, but more rangers and boats would be required to enforce the regulations.

Cumulative Impacts. Other visitor activities in the national seashore besides PWC use require the presence of enforcement personnel. If visitation numbers increased over time, the need for additional commissioned park rangers would also increase. Depending on park visitation and the ability of the park to hire additional personnel, potential impacts to enforcement needs in the national seashore would be long-term and could range from negligible to moderate.

Conclusion. The no-action alternative would result in long-term, minor to moderate impacts to the enforcement needs of the park resulting from banning PWC use; once the ban was understood and observed by PWC users, impacts would be minor.

CONFLICT WITH STATE AND LOCAL ORDINANCES AND POLICIES REGARDING PWC USE

Impacts of Alternative A — Continue PWC Use as Currently Managed under a Special Regulation

Analysis. PWC use would continue to be managed under New York State boating laws and regulations. PWC regulations within the national seashore boundary would not conflict with state or local ordinances and policies.

Cumulative Impacts. Management of PWC use would be consistent with existing New York State boating laws and regulations.

Conclusion. PWC and boating regulations within the national seashore boundaries would continue to be the same as New York State boating laws and regulations. National seashore regulations would have no effect on local ordinances.

Impacts of Alternative B — Continue PWC Use, but Limit Use to Areas Adjacent to Beach Communities

Analysis. Like alternative A, PWC use would continue to be managed under New York State boating laws and regulations within the national seashore boundary. PWC users would be limited to areas adjacent to the beach communities. PWC regulations within the national seashore would not conflict with state and local ordinances and policies; therefore, there would be no impact on national seashore management.

Cumulative Impacts. As described for alternative A, management of PWC use would be consistent with New York State boating laws and regulations, except in those areas where PWC use was prohibited.

Conclusion. As described for alternative A, PWC and boating regulations would be the same as New York State boating laws and regulations. There would be no effect from NPS regulations on local ordinances.

Impacts of Alternative C — Continue PWC Use, but Limit Use to Areas Adjacent to Beach Communities and Enforce a 1,000-Foot Buffer along all Shorelines within the NPS Boundary

Analysis. Like alternative B, management of PWC use would continue to be consistent with New York State boating laws and regulations where PWC use was allowed within the national seashore. PWC use would be limited to areas adjacent to beach communities; however, a 1,000 foot buffer would be enforced around the national seashore, and PWC users would be required to maintain no-wake speeds within the ferryways. PWC regulations would not conflict with state and local ordinances and policies; therefore, there would be no impact on national seashore management.

Cumulative Impacts. Management of PWC use would continue to be consistent with New York State boating laws and regulations, except in those areas where PWC use was prohibited or restricted to no-wake speeds.

Conclusion. As described for alternative A, PWC and boating regulations would be the same as New York State boating laws and regulations. There would be no effect from NPS regulations on local ordinances.

Impacts of the No-Action Alternative

Analysis. Banning PWC use within the national would not affect the enforcement of other New York State boating laws and regulations within the national seashore.

Cumulative Impacts. Management of other motorized watercraft would continue to be consistent with New York State boating laws and regulations.

Conclusion. Similar to alternative A, boating regulations would be the same as those for New York State. NPS regulations would have no effect on local ordinances.

UNAVOIDABLE ADVERSE IMPACTS

Unavoidable adverse impacts are impacts that cannot be avoided and cannot be mitigated, and therefore would remain throughout the duration of the action. Under any alternative there would be adverse cumulative impacts if emissions reduced water quality such that standards or criteria would be exceeded.

The following describes potential adverse impacts related to specific alternatives.

- PWC use throughout the national seashore under alternative A would adversely impact soundscapes, adversely affecting wildlife and visitor experiences.
- Under alternative B the potential for adverse impacts would be similar to alternative A; however, impacts would be localized to those areas near communities that already experience some noise pollution.
- Alternative C and the no-action alternative would adversely impact the experiences of PWC users as a result of use restrictions within the national seashore or banning personal watercraft altogether.

LOSS IN LONG-TERM AVAILABILITY OR PRODUCTIVITY TO ACHIEVE SHORT-TERM GAIN

As noted above, some resources could be degraded through implementation of alternatives A, B, and C. None of these resources would be impacted to the degree of "impairment" or long-term permanent loss. Enforcement of existing federal and state laws, and park regulations by national seashore staff, would likely result in the long-term protection of these resources. These conditions could only be achieved by an increase in rangers and resources (boats) made available to the park.

IRREVERSIBLE OR IRRETRIEVABLE COMMITMENTS OF RESOURCES

Irretrievable commitments of resources are those that can be reversed; that is, the commitment of a renewable resource or the short-term commitment of any resource. These include the commitment of water quality and air quality by allowing all mobile sources desiring to do so, including personal watercraft, to continue using the national seashore under alternatives A, B, and C. The use of fossil fuels to power personal watercraft would be an irretrievable commitment of this resource; however, this use is minor.

COORDINATION AND CONSULTATION

Coordination and consultation efforts for this planning process focused on the means or processes to be used to include the public; the major interest groups; and local public entities. Based on past experience, park staff place a high priority on meeting the intent of public involvement in the NEPA process and giving the public an opportunity to comment on proposed actions.

The following agencies, groups, and organizations have been identified as having an interest in this issue as the NEPA process moves forward:

Congressional Delegation
Senator Hillary Clinton
Senator Charles Schumer
Representative Felix Grucci, Jr.
Representative Steve Israel

Federal Agencies
Army Corps of Engineers
Department of Commerce
- National Oceanic and Atmospheric Administration
  - National Marine Fisheries Service

Department of the Interior
- United States Fish and Wildlife Service
- U.S. Geological Survey

Department of Transportation
- U.S. Coast Guard
- U.S. Coast Guard Auxiliary

State Agencies
Heckscher State Park
Robert Moses State Park
New York State Department of Environmental Conservation
New York State Department of State, Division of Coastal Resources
New York State Office of Parks, Recreation and Historic Preservation
- Long Island Region
- Bureau of Marine and Recreational Vehicles

New York State Sea Grant Institute

Local Agencies
Hampstead Department of Conservation and Waterways
Long Island Regional Planning Board
Nassau County Police Marine Bureau
Smith Point County Park
Suffolk County
- Department of Parks, Recreation and Conservation
- Park Police
- Planning Department
- Police Department, Marine Bureau

Town of Babylon

Town of Brookhaven
Department of Public Services
Town of Islip
Division of Harbor Police
Town of Southhampton
Village of Bellport
Village of Ocean Beach
Village of Patchogue
Village of Saltaire

Businesses and Organizations
American Watercraft Association
Animal Protection Institute
Atlantis Aquarium/Riverhead Foundation
Biodiversity Legal Foundation
Bluewater Network
Captain Bills Marina
Coalition of Parents and Families for Personal Watercraft Safety
Dockside 500 Marina, Inc.
Earth Justice
East End Jet Ski
Environmental Defense
Extreme Motorsports, Inc.
Fire Island Association, Inc.
Fire Island Ecology Coalition
Friends of Fire Island/Wilderness
Greenpeace
Littoral Society
Izaak Walton League
Maple Avenue Marina
Mastic Beach Property Owners' Association, Inc.
Moriches Bay Audubon Society
National Parks and Conservation Association
Natural Resources Defense Council
Natural Trails and Waters Coalition
New York Marine Trade Association
New York Sportfishing Federation
Noise Pollution Clearinghouse
Ocean Conservancy (formerly Center for Marine Conservation)
Personal Watercraft Industry Association
Sierra Club
South Shore Estuary Reserve Council
West Sayville Boat Basin
Wilderness Society

APPENDIX A: CONSULTATION REGARDING THREATENED AND ENDANGERED SPECIES

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
NORTHEAST REGION
One Blackburn Drive
Gloucester, MA 01930-2298

MAR 27 2002

Ms. Shannon R. Cauley
The Louis Berger Group, Inc.
1819 H Street, NW, Suite 900
Washington, DC 20006

Dear Ms. Cauley:

This responds to your inquiry on March 19, 2002, requesting information on the presence of any federally listed threatened or endangered species and/or designated critical habitat for listed species in the vicinity of the Fire Island National Seashore.

The National Park Service (NPS) in compliance with the National Environmental Policy Act (NEPA) has contracted the Louis Berger Group, Inc. to prepare an Environmental Assessment (EA) to determine the potential effects associated with the use of personal watercraft (PWC) at the Fire Island National Seashore. The EA will evaluate four alternatives concerning the use of PWC at Fire Island. The alternatives include: no action (eliminating PWC use entirely); continuing PWC use under current park management policies; continuing PWC use but limiting areas of use to those areas adjacent to beach communities; and continuing PWC use but enforcing a 1,000 foot buffer zone around the entire park.

Four species of federally threatened or endangered sea turtles and three species of endangered whales are found in the Northeast. The sea turtles in northeastern nearshore waters are typically small juveniles with the most abundant being the federally threatened loggerhead (*Caretta caretta*) followed by the federally endangered Kemp's ridley (*Lepidochelys kempi*). Loggerhead turtles were found to be relatively abundant off the Northeast (from near Nova Scotia, Canada to Cape Hatteras, North Carolina). From November to March in 1985 through 1988, 130 cold-stunned turtles were collected along the Long Island shoreline, including 97 Kemp's ridleys. The waters off Long Island have also been found to be warm enough to support federally endangered green sea turtles (*Chelonia mydas*) from June through October. The three species of chelonid turtles found in the Northeast remain very briefly in open ocean waters, spending most of their time during the summer months in harbors and estuarine waters. Federally endangered leatherback sea turtles (*Dermochelys coriacea*) are located in New York and New England waters during the warmer months as well.

Concentrations of leatherbacks were observed during the summer off the south shore of Long Island and off New Jersey. Leatherbacks in these waters are thought to be pursuing their preferred jellyfish prey.

Federally endangered Northern right whales (*Eubalaena glacialis*), humpback whales (*Megaptera novaeangliae*), and fin whales (*Balaenoptera physalus*) may all be found seasonally in New York waters. Northern right whales have been documented in the nearshore waters of Long Island from January through September. Humpback whales feed during the spring, summer, and fall over a range, which encompasses the eastern coast of the United States. Fin whales are common in waters of the United States Exclusive Economic Zone, principally offshore from Cape Hatteras northward.

Section 7(a)(2) of the Endangered Species Act (ESA) states that each Federal agency shall, in consultation with the Secretary, insure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat. Because federally listed loggerhead, Kemp's ridley, green and leatherback sea turtles and Northern right, humpback, and fin whales may be present in this area, any discretionary federal action that may affect these species must undergo section 7 consultation.

At this time, it does not appear that there is an action on which to consult. Should this change, the federal action agency would be responsible for initiating section 7 consultation, at which time the project details would be submitted to the NMFS Northeast Regional Office along with an assessment of the project's impacts to federally listed whales and sea turtles. After reviewing this information, the National Marine Fisheries Service would then be able to conduct a consultation under section 7 of the ESA.

The information on this project has been forwarded to Diane Rusanowsky, NMFS Habitat Conservation Division, for comments on Essential Fish Habitat (EFH) in the Fire Island area. Should you have any questions about the Protected Resources comments, please contact Kim Damon-Randall at (978) 281-9112 and for questions regarding EFH, please contact Diane at (203) 579-7071.

Sincerely,

Mary A. Colligan
Assistant Regional Administrator
for Protected Resources

cc: Rusanowsky, F/NER4-CT

File Code: 1514-05 (A) General

New York State Department of Environmental Conservation
Division of Fish, Wildlife & Marine Resources
New York Natural Heritage Program
625 Broadway, Albany, New York 12233-4757
Phone: (518) 402-8935 • **FAX:** (518) 402-8925
Website: www.dec.state.ny.us

Erin M. Crotty
Commissioner

April 22, 2002

Shannon R. Cauley
The Louis Berger Group Inc
1819 H Street, NW
Washington, DC 20006

Dear Ms. Cauley:

In response to your recent request, we have reviewed the New York Natural Heritage Program databases with respect to the proposed Environmental Assessment for the Fire Island National Seashore and vicinity, area as indicated on the map you provided.

Enclosed is a report of rare or state-listed animals and plants, significant natural communities, and other significant habitats, which our databases indicate occur, or may occur, on your site or in the immediate vicinity of your site. The information contained in this report is considered sensitive and may not be released to the public without permission from the New York Natural Heritage Program.

Your project location is within, or adjacent to, a designated Significant Coastal Fish and Wildlife Habitat. This habitat is part of New York State's Coastal Management Program (CMP), which is administered by the NYS Department of State (DOS). Projects which may impact the habitat are reviewed by DOS for consistency with the CMP. For more information regarding this designated habitat and applicable consistency review requirements, please contact:

Greg Capobianco or Steven C. Resler - (518) 474-6000
NYS Department of State
Division of Coastal Resources and Waterfront Revitalization
41 State Street, Albany, NY 12231

The presence of rare species may result in your project requiring additional permits, permit conditions, or review. For further guidance, and for information regarding other permits that may be required under state law for regulated areas or activities (e.g., regulated wetlands), please contact the appropriate NYS DEC Regional Office, Division of Environmental Permits, at the enclosed address.

For most sites, comprehensive field surveys have not been conducted; the enclosed report only includes records from our databases. We cannot provide a definitive statement on the presence or absence of all rare or state-listed species or significant natural communities. This information should NOT be substituted for on-site surveys that may be required for environmental impact assessment.

Our databases are continually growing as records are added and updated. If this proposed project is still under development one year from now, we recommend that you contact us again so that we may update this response with the most current information.

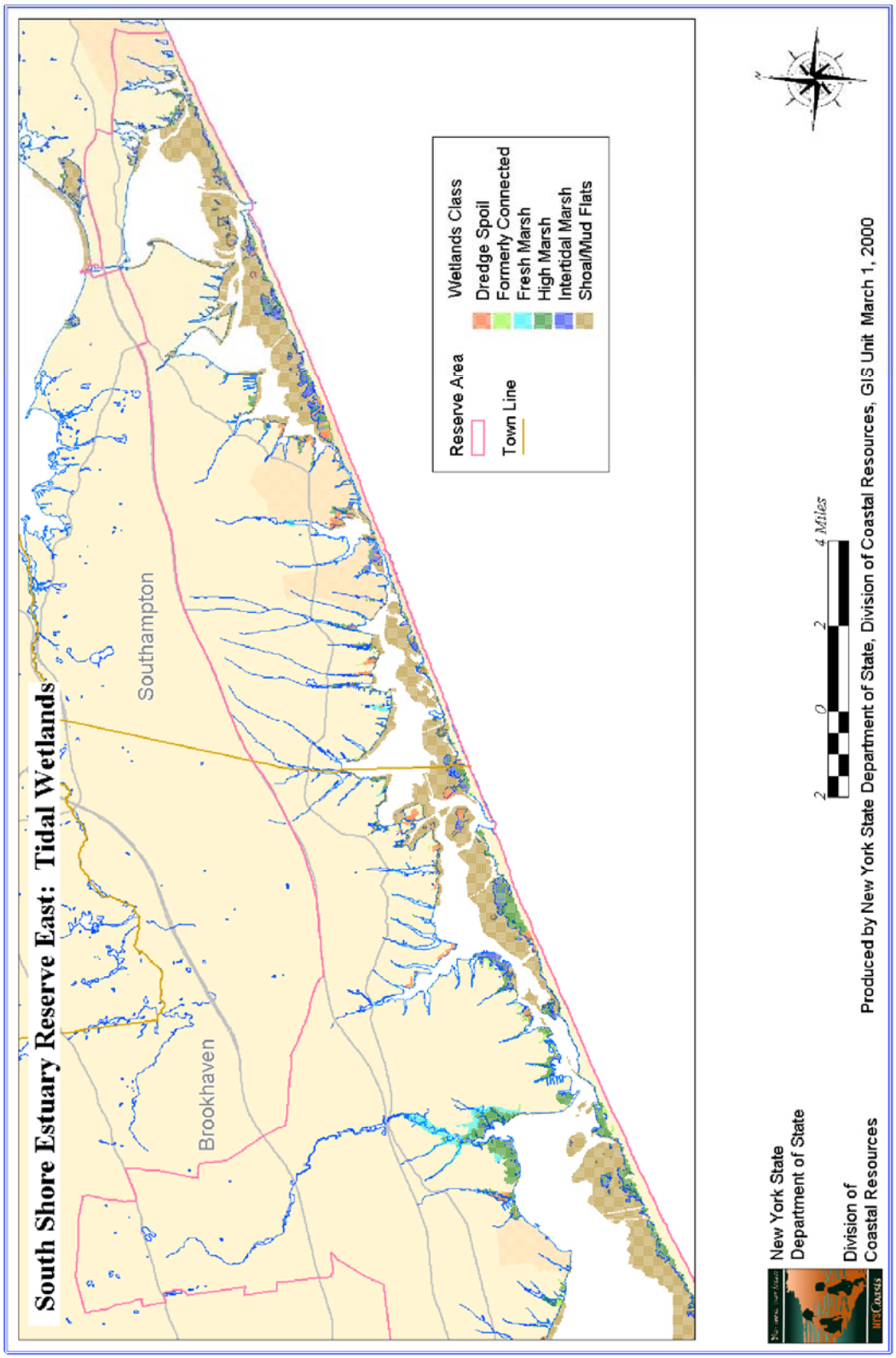
Sincerely,

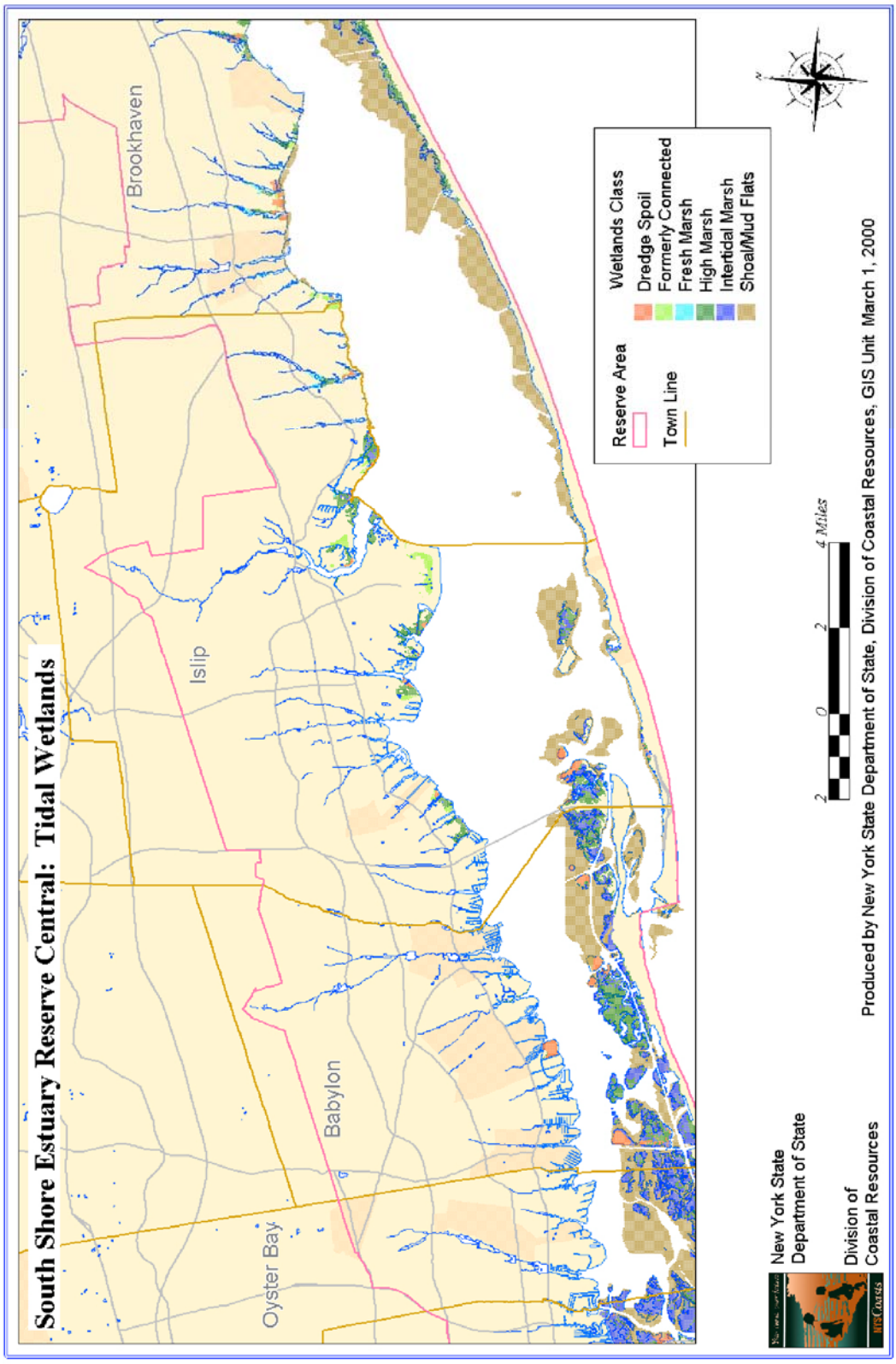
Teresa Mackey

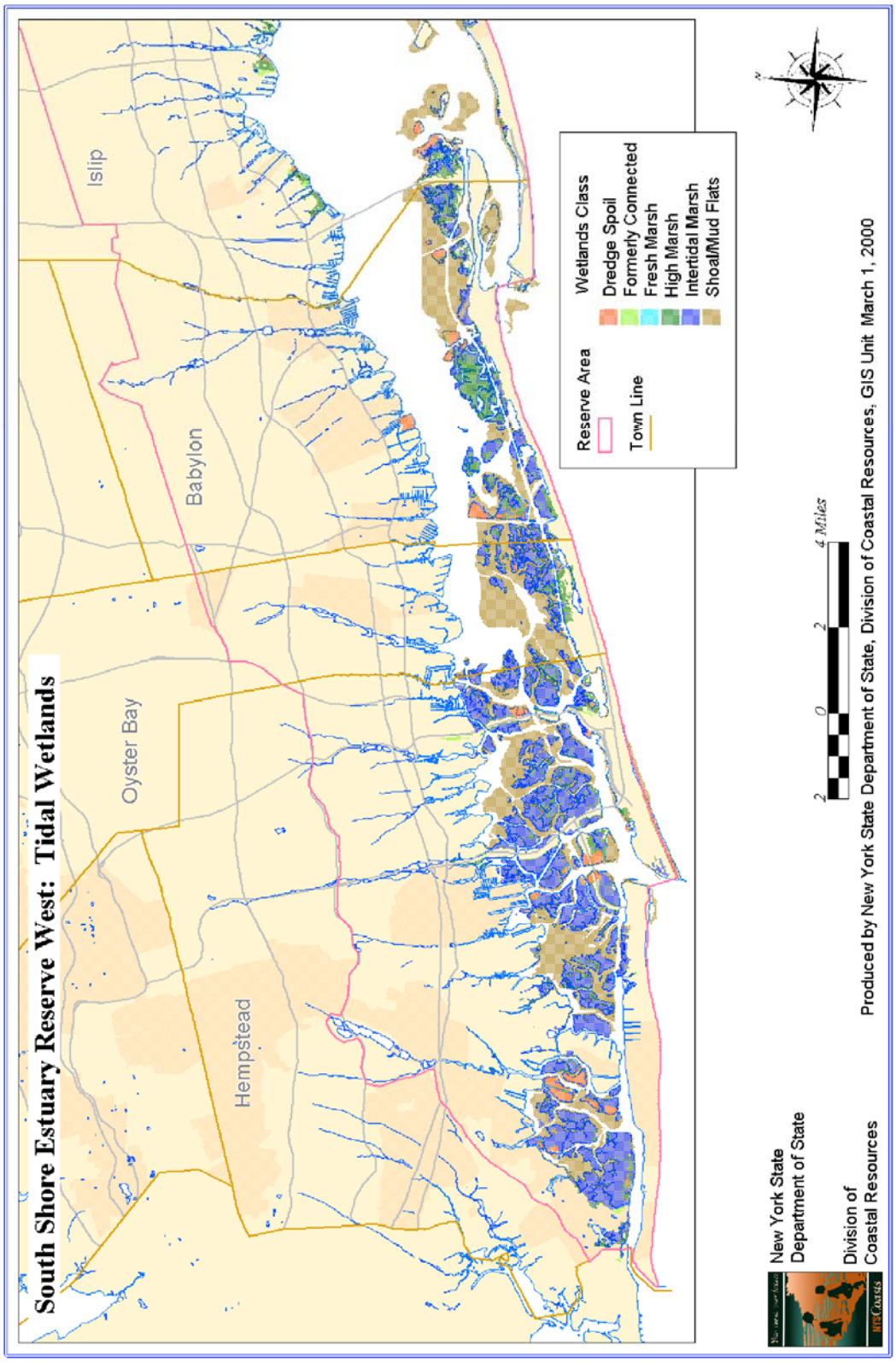
Teresa Mackey
Information Services
NY Natural Heritage Program

Encs.
cc:

APPENDIX B: NEW YORK STATE WETLAND MAPS




South Shore Estuary Reserve Central: Tidal Wetlands
Brookhaven
Islip
Babylon
Oyster Bay
Wetlands Class
Dredge Spoil
Formerly Connected
Fresh Marsh
High Marsh
Intertidal Marsh
Shoal/Mud Flats
Reserve Area
Town Line
2 0 2 4 Miles
New York State
Department of State
Division of
Coastal Resources
Produced by New York State Department of State, Division of Coastal Resources, GIS Unit March 1, 2000


South Shore Estuary Reserve West: Tidal Wetlands
Islip
Babylon
Oyster Bay
Hempstead
Wetlands Class
Dredge Spoil
Formerly Connected
Fresh Marsh
High Marsh
Intertidal Marsh
Shoal/Mud Flats
Reserve Area
Town Line
2
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New York State
Department of State
Division of
Coastal Resources
Produced by New York State Department of State, Division of Coastal Resources, GIS Unit March 1, 2000

APPENDIX C: APPROACH TO EVALUATING SURFACE WATER QUALITY IMPACTS

Objective

Using simplifying assumptions, estimate the minimum (threshold) volume of water in a reservoir or lake below which concentrations of gasoline constituents from personal watercraft or outboards would be potentially toxic to aquatic organisms or humans. Using the estimated threshold volumes, and applying knowledge about the characteristics of the receiving waterbody and the chemical in question, estimate if any areas within the waterbody of interest may present unacceptable risks to human health or the environment.

Overall Approach

Following are the basic steps in evaluating the degree of impact a waterbody (or portion of a waterbody) would experience based on an exceedance of water quality standards / toxicity benchmarks for PWC- and outboard-related contaminants.

1. Determine concentrations of polycyclic aromatic hydrocarbons (PAHs), benzene, and methyl tertiary-butyl ether (MTBE) in gasoline (convert from weight percent to mg/L, as needed) and PAHs in exhaust. The half-life of benzene in water is 5 hours at 25°C (Verschuren 1983; US EPA 2001).
2. Estimate loading of PAHs, benzene, and MTBE for various appropriate PWC-hour levels of use for one day (mg/day)
3. Find/estimate ecological and human health toxicity benchmarks (risk-based concentrations [RBCs]) (µg/L) for PAHs, benzene, and MTBE.
4. Divide the estimated loading for each constituent (µg) by a toxicity benchmark (µg/L) to determine the waterbody threshold volume (L) below which toxic effects may occur (convert liters to ac-ft).

Estimated reductions in hydrocarbon (HC) emissions from personal watercraft and outboards will be significantly reduced in the near future, based on regulations issued by the EPA and California Air Resources Board (see the estimated reductions on page 80). Other states may also have emission reduction programs that must be applied.

Assumptions and Constants

Several assumptions must be made in order to estimate waterbody threshold volumes for each HC evaluated. Each park should have park-specific information that can be used to modify these assumptions or to qualitatively assess impacts in light of park-specific conditions of mixing, stratification, etc. and the characteristics of the chemicals themselves. The assumptions are as follows:

- BTEX (benzene, toluene, ethyl benzene, and xylene) are volatile and do not stay in the water column for long periods of time. Because benzene is a recognized human carcinogen, it is retained for the example calculations below and should be considered in each environmental assessment or environmental impact statement (Verschuren 1983; US EPA 2001b).

- MTBE volatilizes slightly and is soluble in water. MTBE may accumulate in water from day to day, but this is not factored into the calculation and should be considered qualitatively in the assessment.
- PAHs volatilize slightly (depending on structure and molecule size) and may adhere to sediment and settle out of the water column or float to the surface and be photo-oxidized. They may accumulate in water from day to day, but this is not factored into the calculation and should be considered qualitatively in the assessment.
- The toxicity of several PAHs increases (by several orders of magnitude) when the PAHs are exposed to sunlight. This was not incorporated because site-specific water transparency is not known, and should be discussed qualitatively.
- The threshold volume of water will mix vertically and aerially with contiguous waters to some extent, but the amount of this mixing will vary from park to park and location to location in the lake, reservoir, river, etc. Therefore, although the threshold volume calculation assumes no mixing with waters outside the "boundary" of the threshold volume of water, this should be discussed in the assessment after the threshold volume is calculated. The presence or absence of a thermocline should also be addressed.
- Volume of the waterbody, or portion thereof, is estimated by the area multiplied times the average depth.

In addition to these assumptions, several constants required to make the calculations were compiled from literature and agency announcements. Gasoline concentrations are provided for benzene, MTBE and those PAHs for which concentrations were available in the literature. Constants used are:

- Gasoline emission rate for two-stroke personal watercraft: 3 gal/hour at full throttle (California Air Resources Board 1998)
- Gasoline emission rate for two-stroke outboards: estimated at approximately the same as for personal watercraft for same or higher horsepower outboards (80–150 hp); approximately twice that of personal watercraft for small (e.g. 15 hp) outboards. (Note: Assume total hours of use for the various size boats/motors, and that smaller 15 hp motors that exhaust relatively more unburned fuel would probably be in use for a much smaller amount of time than the recreational speedboats and PWC.) This estimate is based on data from Allen et al. 1998 (Fig. 5). It is noted that other studies may show different results, e.g., about the same emissions regardless of horsepower, or larger horsepower engines having more emissions than smaller engines (e.g., California Air Resources Board 2001); the approach selected represents only one reasonable estimate.
- 1 gallon = 3.78 liters
- Specific gravity of gasoline: 739 g/L
- 1 acre-foot = 1.234×10^6 L
- Concentration of benzo(a)pyrene (B[a]P) in gasoline: 2.8 mg/kg (or 2.07 mg/L) (Gustafson et al. 1997)
- Concentration of naphthalene in gasoline: 0.5% or 0.5 g/100 g (or 3,695 mg/L) (Gustafson et al. 1997)
- Concentration of 1-methyl naphthalene in gasoline: 0.78% or 0.78 g/100 g (or approx. 5,760 mg/L) (estimated from Gustafson et al. 1997)

- Concentration of benzene in gasoline: 2.5% or 2.5 g/100 g (or 1.85×10^4 mg/L) (Hamilton 1996)
- Concentration of MTBE in gasoline: 15% or 15 g/100 g (or approx. 1.10×10^5 mg/L) (Hamilton 1996). (Note: MTBE concentrations in gasoline vary from state to state. Many states do not add MTBE.)
- Estimated emission of B(a)P in exhaust: 1080 µg/hr (from White and Carroll, 1998, using weighted average B(a)P emissions from 2-cylinder, carbureted two-stroke liquid cooled snowmobile engine using gasoline and oil injected Arctic Extreme injection oil, 24-38:1 fuel:oil ratio. Weighted average based on percentage of time engine was in five modes of operation, from full throttle to idle).
- Estimated amount of B(a)P exhaust emissions retained in water phase = approximately 40% (based on value for B(a)P from Hare and Springier 1973).

Toxicity Benchmarks

A key part of the estimations is the water quality criterion, standard, or toxicological benchmark for each contaminant evaluated. There are no EPA water quality criteria for the protection of aquatic life for the PWC-related contaminants (US EPA 1999a). There are, however, a limited number of EPA criteria for the protection of human health (via ingestion of water and aquatic organisms). Chronic ecotoxicological and human health benchmarks for contaminants were acquired from various sources.

Ecological benchmarks for benzo(a)pyrene, naphthalene, and benzene are from *Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Aquatic Biota: 1996 Revision* (Suter and Tsao 1996). The ecological benchmarks for benzo(a)pyrene (0.014 µg/L) and benzene (130 µg/L) are Tier II Secondary Chronic Values in Table 1 of Suter and Tsao (1996), which were calculated using methods in the Great Lakes Water Quality Initiative (US EPA 1993). The ecological benchmark for naphthalene (62 µg/L) is the EPA Region 4 chronic screening value (Table 3 of Suter and Tsao 1996). This screening value was chosen for use as a conservative mid-range value considering the wide range of chronic values for naphthalene (12-620 µg/L) shown in Suter and Tsao (1996). The ecological benchmarks for 1-methyl naphthalene (19 and 34 µg/L) are based on LC_{50} values of 1900 and 3400 µg/L for the marine invertebrate, dungeness crab (*Cancer magister*), and the fresh water/estuarine fish, sheepshead minnow (*Cyprinodon variegatus*) (USFWS 1987). The MTBE benchmarks of 18,000 µg/L (chronic) and 53,000 µg/L (acute) are for marine waters and are based on the preliminary chronic water quality criteria presented in Mancini et al. (2002).

State water quality standards were reviewed and applied as appropriate. Following are the toxicity benchmarks for the PAHs, benzene, and MTBE having gasoline concentration information:

Chemical	Ecological Benchmark (µg/L)	Source	Human Health Benchmark** (µg/L)	Source
Benzo(a)pyrene	0.014	Suter and Tsao 1996	0.0044** 0.049**	US EPA 1999a
Naphthalene	62	Suter and Tsao 1996	--	--
1-methyl naphthalene	19–34*	USFWS 1987	--	--
Benzene	130	Suter and Tsao 1996	1.2** 71***	US EPA 1999a**
MTBE	18,000 (chronic) 53,000 (acute)	Mancini et al. 2002	13****	--

Notes to table:

* Based on LC_{50}s of 1900 and 3400 µg/L for dungeness crab and sheepshead minnow, respectively (34 µg/L used for freshwater calculations; 19 µg/L used for marine and estuarine calculations).

** Based on the consumption of water and aquatic organisms.

*** Based on the consumption of aquatic organisms only.

**** Ecological benchmarks considered preliminary water quality criteria. Human health toxicological information for MTBE is currently under review. There is no EPA human health benchmark, but California has established a public health goal of 13 µg/L, which is used in the calculations below.

Example Calculations

Calculations of an example set of waterbody volume thresholds are provided below for the chemicals listed above together with their concentrations in gasoline and available toxicity benchmarks.

Loading to Water

Loadings of the five contaminants listed above are calculated for one day assuming 10 personal watercraft operate for four hours (40 PWC-hours), each discharging 11.34 L gasoline per hour and having concentrations in fuel or exhaust as listed.

Benzo(a)pyrene (from the fuel): 40 PWC-hrs × 11.34 L gas/hr × 2.07 mg/L = 939 mg

Benzo(a)pyrene (from the gas exhaust): 40 PWC-hrs × 1080 µg/hr × 1/1000mg/µg × 0.40 = 17 mg

Total B(a)P = 956 mg

Naphthalene: 40 PWC-hrs × 11.34 L gas/hr × 3695 mg/L = 1.68×10^6 mg

1-methyl naphthalene: 40 PWC-hrs × 11.34 L gas/hr × 5764 mg/L = 2.62×10^6 mg

Benzene: 40 PWC-hrs × 11.34 L gas/hr × 1.85×10^4 mg/L = 8.39×10^6 mg

MTBE: 40 PWC-hrs × 11.34 L gas/hr × 1.10×10^5 mg/L = 4.99×10^7 mg

Loadings of contaminants from two-stroke outboards should be estimated based on the estimated loading based on the horsepower of the outboards involved (see "Assumptions and Constants" above) and the estimated hours of use, based on the types of boats and the pattern of use observed.

Threshold Volumes

Threshold volumes of water (volume at which a PWC- or outboard-related contaminant would equal the thresholds listed above) are calculated by dividing the estimated loadings (mg of contaminant) for the number of operational hours (e.g., 40 PWC-hours) by the listed toxicity benchmark concentrations (µg/L), correcting for units (1 mg = 10^3 µg), and converting from liters to acre-feet (1 ac-ft = 1.234×10^6 L).

Protection of Aquatic Organisms

Benzo(a)pyrene: 956 mg B(a)P × 10^3 µg/mg / 0.014 µg/L = 6.8×10^7 L or 55 ac-ft

Naphthalene: 1.68×10^6 mg naphthalene × 10^3 µg/mg / 62 µg/L = 2.71×10^7 L or 22 ac-ft

1-methyl naphthalene: 2.62×10^6 mg 1-methyl naphth. × 10^3 µg/mg / 34 µg/L = 7.69×10^7 L or 62 ac-ft

Benzene: 8.39×10^6 mg benzene $\times 10^3$ µg/mg / 130 µg/L = 6.45×10^7 L or 52 ac-ft

MTBE (chronic): 4.99×10^7 mg MTBE $\times 10^3$ µg/mg / 18,000 µg/L = 2.77×10^6 L or 2.2 ac-ft

MTBE (acute): 4.99×10^7 mg MTBE $\times 10^3$ µg/mg / 53,000 µg/L = 9.42×10^5 L or 0.76 ac-ft

Based on these estimates and assumptions, 1-methyl naphthalene appears to be the contaminant (of those analyzed) that would be the first to accumulate to concentrations potentially toxic to aquatic organisms (i.e., it requires more water [62 ac-ft] to dilute the contaminant loading to a concentration below the toxicity benchmark); however, the threshold volumes are very similar among 1-methyl naphthalene, benzo(a)pyrene, and benzene.

Protection of Human Health

Benzo(a)pyrene: 956 mg B(a)P $\times 10^3$ µg/mg / 0.0044 µg/L = 2.17×10^8 L or 176 ac-ft

Benzene: 8.39×10^6 mg benzene $\times 10^3$ µg/mg / 1.2 µg/L = 6.99×10^9 L or 5,670 ac-ft

Note: If CA public health goal of 13 µg/L used: *MTBE:* 4.99×10^7 mg MTBE $\times 10^3$ µg/mg / 13 µg/L = 3.83×10^9 L or 3,110 ac-ft

The California public health goal for MTBE is a drinking water–based goal and is not directly comparable to the other criteria used in this analysis. However, it may be of interest, since MTBE is very soluble and MTBE concentration could be an issue if the receiving body of water is used for drinking water purposes and MTBE is not treated. Using the numbers provided above, benzene would be the first PWC-related contaminant in these example calculations that would reach unacceptable levels in surface water; however, volatilization of benzene from water to air was not included in the calculation. MTBE would be the next contaminant to reach unacceptable concentrations. If human health water quality criteria for ingestion of aquatic organisms only were used for benzo(a)pyrene and benzene (0.049 µg/L and 71 µg/L, respectively), the corresponding threshold volumes would be 15.8 acre-feet and 95.8 acre-feet.

As a result of the estimated reductions in HC emissions (from the unburned fuel) in response to EPA regulations (listed above), additional personal watercraft and/or outboards may be used in the parks without additional impacts to water quality. For example, based on the expected overall reductions from EPA (1996a, 1997), up to 75% additional personal watercraft/ outboards may be used in a given area in 2025 without additional impacts to water quality over current levels. Effects on noise levels, physical disturbance, or hydrocarbon emissions that are products of combustion (e.g., B(a)P) may not be similarly ameliorated by the reduced emission regulations.

Application of Approach

Use of the approach described above for evaluating possible exceedance of standards or other benchmarks must be adapted to the unique scenarios presented by each park, PWC use, and waterbody being evaluated. State water quality standards (including the numeric standards and descriptive text) must be reviewed and applied, as appropriate.

Factors that would affect the concentration of the contaminants in water must be discussed in light of the park-specific conditions. These factors include varying formulations of gasoline (especially for MTBE); dilution due to mixing (e.g., influence of the thermocline); wind, currents, and flushing; plus loss of the chemical due to volatilization to the atmosphere (Henry's Law constants can help to predict

volatilization to air; see Yaws et al. 1993); adsorption to sediments and organic particles in the water column (e.g., PAHs); oxidation; and biodegradation (breakdown by bacteria). Toxicity of phototoxic PAHs may be of concern in more clear waters, but not in very turbid waters.

The chemical composition of gasoline will vary by source of crude oil, refinery, and distillation batch. No two gasolines will have the exact same chemical composition. For example, B(a)P concentrations may range from 0.19 to 2.8 mg/kg, and benzene concentrations may range from 0 to 7% (2%–3% is typical). MTBE concentrations will vary from state to state and season to season, with concentrations ranging from 0% to 15%. The composition of gasoline exhaust is dependent on the chemical composition of the gasoline and engine operating conditions (i.e., temperature, rpms, and oxygen intake). If site-specific information is available on gasoline and exhaust constituents, it should be considered in the site-specific evaluation. If additional information on the toxicity of gasoline constituents (e.g., MTBE) becomes available, it should be considered in the site-specific evaluation.

Lastly, results of the studies included in the collection of papers entitled "Personal Watercraft Research Notebook" provided by the NPS staff can be used to provide some framework for analysis. The following table summarizes some of the results presented in various documents on the collection for benzene, benzo(a)pyrene, and MTBE.

Table C-1: Pollutant Concentrations Reported in Water

Pollutant	Source(s)	Levels Found:	
		"Lower Use" (e.g. open water, offshore locations; reduced motorized watercraft use)	"Higher Use" (e.g., nearshore, motorized watercraft activity high)
Benzene	*Lake Tahoe Motorized Watercraft Report;* several studies reported USGS Miller and Fiore U of CA	1. <0.032 µg/l 2. <=0.3 µg/l 3. <0.1 µg/l	1. 0.13 – 0.33 µg/l 2. just over 1 µg/l 3. 0.1 – 0.9 µg/l
PAHs	A. Mastran et al. B. Ortis et al.	A. All below detection limits (<0.1 µg/l for pyrene and naphthalene; <2.5 µg/l for B(a)P, B(a)A, chrysene) B. Experiment #1 – 2.8 ng/l phototoxic PAHs	A. Total PAHs – up to 4.12 µg/l in water column; total PAHs - up to 18.86 µg/l in surface sample at marina, with naphthalene at 1µg/l; B(a)P – >=2.3 µg/l B. Experiment #1 – approx. 45 ng/l phototoxic PAHs; 5-70 ng/L total PAHs
MTBE	A. *Lake Tahoe Motorized Watercraft Report;* several studies reported 1. USGS 2. Miller and Fiore 3. U of CA 4. U of Nevada – Fallen Leaf Lake 5. Donner Lake (Reuter et al. 1998) B. NPS, VanMouwerik and Hagemann 1999a 6. Lake Perris 7. Shasta Lake 8. 3-day Jet ski event 9. Lake Tahoe	 1. 0.11 – 0.51 µg/l 2. <=3 µg/l 3. less than nearshore area 4. -- 5. <0.1 µg/l 6. 8 µg/l (winter)	 1. 0.3 – 4.2 µg/l 2. 20 µg/l (up to approx. 31) 3. up to 3.77 µg/l 4. 0.7 – 1.5 µg/l 5. up to 12 µg/l Dramatic increase from 2 – to 12 µg/l over period from July 4 to 7) 6. up to 25 µg/l 7. 9-88 µg/l over Labor Day weekend 8. 50-60 µg/l 9. often within range of 20–25 µg/l, with max of 47 µg/l

GLOSSARY

De minimis — In the context of the Clean Air Act's general conformity requirements, de minimis levels are annual quantities of air pollutant emissions below which a federal action in a non-attainment or maintenance area is presumed to conform to a state's implementation plan without undergoing more rigorous air quality analysis or modeling.

Conformity de minimis levels are levels of emissions below which a federal action in a non-attainment or maintenance area is presumed to conform to a state's implementation plan and would not require further review. Actions in attainment areas are presumed to conform and do not require analysis with respect to de minimis levels. Emission values representing the Clean Air Act conformity de minimis levels are shown below:

Non-Attainment Area (NNA)	Tons/year
Ozone (VOCs or NO_x):	
Serious NAA's	50
Severe NAA's	25
Extreme NAA's	10
Other ozone NAA's outside an ozone transport region	100
Marginal and moderate NAA's inside an ozone transport region:	
VOC	50
NO_x	100
Carbon monoxide: All NAA's	100
SO_2 or NO_2: All NAA's	100
PM_{10}:	
Moderate NAA's	100
Serious NAA's	70
Pb: All NAA's	25

Maintenance Areas	Tons/year
Ozone (NO_x), SO_2 or NO_2: All maintenance areas	100
Ozone (VOCs):	
Maintenance areas inside an ozone transport region	50
Maintenance areas outside an ozone transport region	100
Carbon monoxide: All maintenance areas	100
PM_{10}: All maintenance areas	100
Pb: All maintenance areas	25

Source: 40 CFR CHAPTER 1, sec. 51.853 Applicability.

maintenance area — A geographic region that at some time in the past was designated as a non-attainment area but has been redesignated through a formal rule-making process as being in attainment with the national ambient air quality standards. Maintenance areas continue to be monitored more rigorously than attainment areas and to be subject to controls to keep it in attainment with the national standards.

national ambient air quality standards (NAAQS) — Concentrations of criteria pollutants in ambient air (outdoor air to which the public may be exposed) below which it is safe for humans or other receptors to be permanently exposed. The Clean Air Act establishes two types of national air quality standards. **Primary standards** set limits to protect public health, including the health of "sensitive" populations such as asthmatics, children, and the elderly. **Secondary standards** set limits to protect public welfare, including protection against decreased visibility, damage to animals, crops, vegetation, and buildings.

The EPA Office of Air Quality Planning and Standards has set national ambient air quality standards for six principal pollutants, which are called "criteria" pollutants. They are listed below. Units of measure for the standards are parts per million (ppm) by volume, milligrams per cubic meter of air (mg/m^3), and micrograms per cubic meter of air ($\mu g/m^3$).

National Ambient Air Quality Standards

Pollutant	Standard Value*		Standard Type
Carbon Monoxide (CO)			
8-hour Average	9 ppm	(10 mg/m^3)	Primary
1-hour Average	35 ppm	(40 mg/m^3)	Primary

Pollutant	Standard Value*		Standard Type
Nitrogen Dioxide (NO_2)			
Annual Arithmetic Mean	0.053 ppm	(100 µg/m^3)	Primary and Secondary
Ozone (O_3)			
1-hour Average	0.12 ppm	(235 µg/m^3)	Primary and Secondary
8-hour Average **	0.08 ppm	(157 µg/m^3)	Primary and Secondary
Lead (Pb)			
Quarterly Average	1.5 µg/m^3		Primary and Secondary
Particulate (PM 10) *Particles with diameters of 10 micrometers or less*			
Annual Arithmetic Mean	50 µg/m^3		Primary and Secondary
24-hour Average	150 µg/m^3		Primary and Secondary
Particulate (PM 2.5) *Particles with diameters of 2.5 micrometers or less*			
Annual Arithmetic Mean **	15 µg/m^3		Primary and Secondary
24-hour Average **	65 µg/m^3		Primary and Secondary
Sulfur Dioxide (SO_2)			
Annual Arithmetic Mean	0.03 ppm	(80 µg/m^3)	Primary
24-hour Average	0.14 ppm	(365 µg/m^3)	Primary
3-hour Average	0.50 ppm	(1,300 µg/m^3)	Secondary

* Parenthetical value is an approximately equivalent concentration.

** The ozone 8-hour standard and the PM 2.5 standards are included for information only. A 1999 federal court ruling blocked implementation of these standards, which EPA proposed in 1997. EPA has asked the U.S. Supreme Court to reconsider that decision..

non-attainment area — A geographic region usually designated by an air quality planning authority through a formal rulemaking process within which one or more national ambient air quality standards are subject to violation. Sources of air pollutants in a non-attainment area are subject to more stringent requirements and controls than those in attainment areas (i.e., in areas where national standards are met).

Nonroad Model — An air quality emissions estimation model developed by the U.S. Environmental Protection Agency to estimate emissions from various spark-ignition type "nonroad" engines. The June 2000 draft of the NONROAD model was used to estimate air pollutant emissions from personal watercraft. It is available at <http://www.epa.gov/otaq/ nonrdmdl.htm>.

personal watercraft (PWC) — As defined in 36 CFR §1.4(a) (2000), refers to a vessel, usually less than 16 feet in length, which uses an inboard, internal combustion engine powering a water jet pump as its primary source of propulsion. The vessel is intended to be operated by a person or persons sitting, standing, or kneeling on the vessel, rather than within the confines of the hull. The length is measured from end to end over the deck excluding sheer, meaning a straight line measurement of the overall length from the foremost part of the vessel to the aftermost part of the vessel, measured parallel to the centerline. Bow sprits, bumpkins, rudders, outboard motor brackets, and similar fittings or attachments, are not included in the measurement. Length is stated in feet and inches.

SUM06 — The cumulation of instances when measured hourly average ozone concentrations equal or exceed 0.06 part per million (ppm) in a stated time period, expressed in ppm-hours.

REFERENCES CITED

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CARB	California Air Resources Board
CCU	Coastal Carolina University
CFR	Code of Federal Regulations
IWL	Izaak Walton League of America
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
NTSB	National Transportation Safety Board
NYS DEC	New York State Department of Conservation
NYS DOS	New York State Department of State
ODEQ	Oregon Department of Environmental Quality
OPRHP	Office of Parks, Recreation, and Historic Preservation
PWIA	Personal Watercraft Industry Association
SAE	Society of Automotive Engineers
SSERC	South Shore Estuary Reserve Council
TRPA	Tahoe Regional Planning Agency
USACE	U.S. Army Corps of Engineers
USCG	U.S. Coast Guard
US EPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service

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As the nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering wise use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historic places, and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people. The department also promotes the goals of the Take Pride in America campaign by encouraging stewardship and citizen responsibility for the public lands and promoting citizen participation in their care. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

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