

National Park Service
U.S. Department of the Interior

Cape Lookout National Seashore
North Carolina



Cape Lookout National Seashore

Draft Off-road Vehicle Management Plan /
Environmental Impact Statement



Spring - Summer 2014

**UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
DRAFT CAPE LOOKOUT NATIONAL SEASHORE OFF-ROAD VEHICLE MANAGEMENT PLAN /
ENVIRONMENTAL IMPACT STATEMENT**

Cape Lookout National Seashore, North Carolina

Lead Agency: National Park Service (NPS), U.S. Department of the Interior

This draft *Cape Lookout National Seashore Off-Road Vehicle Management Plan / Environmental Impact Statement* (ORV management plan/EIS) evaluates the impacts of a range of alternatives for regulations and procedures that would carefully manage off-road vehicle (ORV) use and access in Cape Lookout National Seashore (the Seashore) to protect and preserve natural and cultural resources and natural processes, to provide a variety of visitor use experiences while minimizing conflicts between and among various users, and to promote the safety of all visitors. Executive Order 11644 of 1972, amended by Executive Order 11989 of 1977, requires certain federal agencies permitting ORV use on agency lands to publish regulations designating specific trails and areas for this use. Title 36, section 4.10 of the Code of Federal Regulations implements the executive orders by providing that routes and areas designated for ORV use shall be promulgated as special regulations. Upon conclusion of this plan and decision-making process, the alternative selected for implementation will become the ORV management plan and will form the basis for a special regulation, guiding the management of ORV use at the Seashore for the next 15 to 20 years.

This ORV management plan/EIS evaluates the impacts of the no-action alternative (alternative A) and four action alternatives (alternatives B, C, D, and E). Alternative A represents a continuation of existing conditions and management policies under the *Cape Lookout National Seashore Interim Protected Species Management Plan / Environmental Assessment*, Biological Opinion and Amended Biological Opinion, and Finding of No Significant Impact. Under alternative B, existing opportunities for ORV experiences on the North and South Core Banks would continue; however, there would be a permit system, and there would be no limit on the number of ORV permits issued or a limit on ORV numbers, so ORV use and density could increase. Existing species management practices would continue, as well as new management measures, such as seasonal restrictions on night driving and the prohibition of all high-performance sport-model and two-stroke all-terrain vehicle (ATV) and utility-type vehicles (UTVs) (after a five-year grace period). Alternative C would create new seasonal pedestrian-only areas, expand an existing pedestrian-only area, and implement a permit system for ORVs with limits on the number of permits issued. The number of ORV permits would be limited to keep ORV density at historic levels. Alternative C would continue existing species management practices and implement seasonal restrictions on night driving, as well as a prohibition of all high-performance sport-model and two-stroke ATVs and UTVs (after a five-year grace period) and seasonal restrictions on all other ATVs and UTVs. Under alternative D, seasonal pedestrian areas would be created, year-round pedestrian-only areas would be increased, and ORV permits would be required. The number of permits would be limited to keep ORV density at historic levels. Existing species management practices at the Seashore would continue and additional species management practices, such as seasonal restrictions on UTV use and night driving, and the year-round prohibition of ATVs and high-performance sport-model and two-stroke UTVs (after a five-year grace period), would be implemented. Alternative E would not provide or designate any ORV routes for recreational use, and therefore, would not allow public ORV use at the Seashore. Administrative use for law enforcement and species protection would continue. No special regulation would be promulgated. Alternative C is the NPS preferred alternative. The ORV management plan/EIS analyzes impacts of these alternatives in detail for federally listed endangered, threatened, or candidate species; state-listed and special-status species; other wildlife and wildlife habitat; soundscapes/acoustic environment; visitor use and experience; socioeconomic resources; and Seashore management and operations.

The review period for this document will end 60 days after publication of the U.S. Environmental Protection Agency's Notice of Availability in the *Federal Register*. Comments will be accepted during the 60-day comment period electronically via the NPS Planning, Environment and Public Comment (PEPC) website, or hard copy delivery by a postal carrier, or hand delivery to the address below. Oral statements and written comments will be accepted during public meetings on the ORV management plan/EIS. Comments will not be accepted by fax, email, or in any other way than those specified above. Bulk comments in any format (hard copy or electronic) submitted on behalf of others will not be accepted.

For further information, visit <http://parkplanning.nps.gov/caloc> or contact:

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CAPE LOOKOUT NATIONAL SEASHORE

**DRAFT OFF-ROAD VEHICLE MANAGEMENT PLAN /
ENVIRONMENTAL IMPACT STATEMENT**

Spring/Summer 2014

EXECUTIVE SUMMARY

This draft *Cape Lookout National Seashore Off-Road Vehicle Management Plan / Environmental Impact Statement* (ORV management plan/EIS) presents five alternatives for managing off-road vehicle (ORV) use: the no-action alternative, three action alternatives allowing ORV use, and one action alternative prohibiting ORV use. It assesses the impacts that could result from continuing current management (the no-action alternative) or implementation of any of the action alternatives at Cape Lookout National Seashore (the Seashore).

At the conclusion of this plan and decision-making process, the alternative selected for implementation will become the ORV management plan, which will guide the management and control of ORVs at the Seashore for the next 15 to 20 years. It will form the basis for a special regulation to manage ORV use at the Seashore, if permitted.

BACKGROUND

In 1966, Congress authorized the establishment of Cape Lookout National Seashore as a unit of the National Park Service (NPS) “to preserve for public use and enjoyment an area in the State of North Carolina possessing outstanding natural and recreational values.” In 1976, the federal government gained ownership of the land and the Seashore was established.

Located approximately 3 miles off the mainland coast in the central coastal area of North Carolina, the Seashore occupies more than 29,000 acres of land and water from Ocracoke Inlet to Beaufort Inlet. The 56 miles of barrier islands consist mostly of wide, bare beaches with low dunes covered by scattered grasses, flat grasslands bordered by dense vegetation, maritime forest on Shackleford Banks, and large expanses of salt marsh alongside the sound. All of the islands of Cape Lookout National Seashore are subject to constant and dramatic change by the actions of wind and waves, and therefore the study area of this plan addresses the creation of new islands or the re-combination of existing islands.

Sensitive habitat and species at the Seashore are managed within the context of a variety of visitor-use patterns, which include the use of ORVs. The number of recreational visitors to the Seashore fell from approximately 625,400 in 2001 to approximately 480,290 in 2012 with visitation fluctuating between this period. During this time, visitation was highest in 2007 with approximately 860,600 visitors. Visitors to the Seashore participate in a variety of recreational activities, including beach recreation (swimming, windsurfing, sunbathing, etc.), fishing (surf and boat), motorized boating, camping, shell collecting, historical tourism, nature/eco-studies (birding, horse watching), harvesting of shellfish, nonmotorized boating (sailing, kayaking, canoeing), hunting, hiking, and photography (NPS 2004a). For many visitors, ORV use and beach driving provide access to these activities.

ORV use at Cape Lookout National Seashore predates authorization of the Seashore in 1966. ORV use is not addressed in the Seashore’s enabling legislation (16 USC 459 g-3). Beginning in the 1930s, vehicles were transported to the banks by shallow draft ferries and were used to provide access to productive commercial and recreation fishing spots, as well as for other recreational pursuits such as sightseeing and camping. Today, ORVs provide vehicular access to the Seashore beaches for recreational purposes, including activities such as surf-fishing, surfing, sunbathing, swimming, bird-watching, camping, visiting historic structures and site seeing, among other activities.

ORV routes are designated and ORV use is currently managed through the Superintendent’s Compendium, which allows for ORV use from March 16 to December 31 (with a closure of the Seashore to ORVs from January 1 through March 15). The *Cape Lookout National Seashore General Management*

Plan (NPS 1980) identified 47 of the 56 miles of the Seashore as appropriate for controlled ORV use; the remaining 9 miles on Shackleford Banks is a proposed wilderness area under the Wilderness Act (Public Law 88–577) and is managed as wilderness and closed to vehicle use. Currently, of the 47 miles identified as appropriate for ORV use, 2.2 miles are closed to ORV use year-round. Additional areas may be periodically closed to ORV use for resource protection during the nesting and fledgling season (summer and fall). Resource protection closures are temporary, lasting only during the nesting and fledgling or hatching (turtles) stages of the species. With the exception of turtle relocation areas, resource protection closure areas vary from year to year depending on the location of breeding activity.

Use of ORVs to access the Seashore is one component of the experience of many Seashore visitors, and current visitation trends are an integral component for any ORV management planning. Currently, the NPS manages ORVs at the Seashore through the *Interim Off-road Vehicle Management Report and Evaluation of Existing ORV Use at Cape Lookout National Seashore* (NPS 2007a) which implements the *Cape Lookout National Seashore Interim Protected Species Management Plan / Environmental Assessment* (NPS 2006a) and the associated Biological Opinion (USFWS 2006a) and Finding of No Significant Impact (FONSI) (NPS 2007r) as well as the *Superintendent's Compendium* (NPS 2013d). These documents guide ORV use at the Seashore until this long-term ORV management plan/EIS is implemented.

PURPOSE OF THE PLAN

The purpose of this ORV management plan/EIS is to evaluate whether to allow ORV use at the Seashore. If ORV use is permitted, this ORV management plan/EIS will address how to manage that use in compliance with the Seashore's enabling legislation, executive orders, NPS management policies, and other laws and regulations to ensure protection of the natural, cultural, and recreational values of the Seashore's dynamic coastal barrier island environment for present and future generations.

NEED FOR ACTION

Cape Lookout National Seashore provides a variety of visitor experiences, including the use of ORVs. In addition to recreational opportunities, the Seashore is home to important habitats created by the Seashore's dynamic environmental processes. This includes marshes, tidal flats, and riparian areas (ecosystems that occur along watercourses or water bodies), all of which support a variety of wildlife species (NPS 2004a). Several habitats support federally listed species, those protected under the Migratory Bird Treaty Act (MBTA), and others listed as species of special concern by the state of North Carolina.

This long-term ORV management planning effort is based on recognition by the NPS that if allowed, ORVs must be regulated in a manner that is consistent with applicable law, and in a manner that appropriately addresses resource protection (including protected, threatened, and endangered species), potential conflicts among the various Seashore users, and visitor safety.

Executive Order 11644, issued in 1972, and amended by Executive Order 11989 in 1977, states that federal agencies allowing ORV use must designate specific areas and trails on public lands where the use of ORVs may be permitted and those where it is not. Agency regulations that authorize ORV use provide that designation of such areas and trails will be based on the protection of the resources of public lands, promotion of the safety of all users of those lands, and minimization of conflicts among the various uses on those lands.

At this time, given current regulatory requirements and issues surrounding species protection as well as visitor use and safety, an ORV management plan for Cape Lookout National Seashore is needed to

- Comply with Executive Orders 11644 and 11989 regarding ORV use, and with NPS laws and regulations (36 CFR 4.10) and policies to minimize impacts on Seashore resources and values;
- Establish an approved plan incorporating public input that evaluates whether to allow ORV use, and reduces the potential for inconsistent management of ORV use, user conflicts, and safety concerns where ORVs may be allowed;
- Provide for sustainable recreational use;
- Protect natural and cultural resources from potential effects of ORV use; and
- Provide for protected species management in relation to ORV and other uses and replace the *Cape Lookout National Seashore Interim Protected Species Management Plan / Environmental Assessment* (NPS 2006a) and associated Biological Opinion (USFWS 2006a) in compliance with all associated laws and regulations such as the Endangered Species Act (ESA) and MBTA.

OBJECTIVES IN TAKING ACTION

The following are objectives identified during public scoping and by Seashore staff for developing this ORV management plan/EIS. Some objectives are only applicable to those alternatives allowing ORV use.

MANAGEMENT METHODOLOGY

- Establish ORV management practices and procedures that have the ability to adapt in response to changes in the Seashore's dynamic physical and biological environment.
- Continue an ongoing and meaningful dialogue with the multiple public groups interested in and/or affected by ORV management.
- Establish procedures for prompt and efficient public notification of management actions (for example, beach access status) including any temporary ORV use restrictions for reasons such as resource and public safety closures or storm events.
- Build stewardship through public awareness and understanding of NPS resource management and visitor use policies and responsibilities as they pertain to the Seashore and ORV management.

NATURAL PHYSICAL RESOURCES

- Minimize impacts from ORV use to soils and topographic features; for example, dunes, ocean beach, wetlands, tidal flats, and other features.

THREATENED, ENDANGERED, AND OTHER PROTECTED SPECIES

- Provide protection for threatened, endangered, and other protected species (e.g., state-listed species) and their habitats, and minimize impacts related to ORV and other uses as required by laws and policies, such as the ESA, the MBTA, and NPS laws and management policies.

VEGETATION

- Minimize impacts on native plant species related to ORV use.

OTHER WILDLIFE AND WILDLIFE HABITAT

- Minimize impacts on other wildlife species and their habitats related to ORV use.

CULTURAL RESOURCES

- Protect cultural resources, such as shipwrecks, archeological sites, and cultural landscapes, from impacts related to ORV use.

VISITOR USE AND EXPERIENCE

- Manage ORV use to allow for a variety of appropriate visitor use experiences.
- Minimize conflicts between ORV use and other users. Retain an experience where typically a family or individual traveling by ORV can experience the Seashore by finding a remote and otherwise unused stretch of beach.
- Retain a non-ORV experience that allows access to a beach that is undisturbed by motorized uses.

VISITOR SAFETY

- Ensure that ORV management promotes the safety of all visitors.

SEASHORE OPERATIONS

- Ensure that core operational needs and associated costs required to fully implement an ORV management plan and to monitor species and ORV use are identified.

PURPOSE AND SIGNIFICANCE OF CAPE LOOKOUT NATIONAL SEASHORE

All units of the national park system were formed for a specific purpose (the reason they are significant) and to preserve significant resources or values for the enjoyment of future generations through their enabling legislation. The purpose and significance of the park provides the basis for identifying uses and values that individual NPS plans will support. The following provides background on the purpose and significance of the Seashore.

As stated in the Seashore's enabling legislation (16 USC 459g), Congress established the Seashore in 1966 as a Seashore "to preserve for public use and enjoyment an area in the State of North Carolina possessing outstanding natural and recreational values." The enabling legislation includes provisions for hunting, fishing, and outdoor recreation and enjoyment opportunities. Subsequently, the purpose of Cape Lookout National Seashore is to preserve the outstanding natural, cultural, and recreational resources and values of a dynamic, intact, natural barrier island system, where ecological processes dominate (NPS 2012s).

Park significance statements capture the essence of the park's importance to the nation's natural and cultural heritage. Understanding park significance helps managers make decisions that preserve the resources and values necessary to the park's purpose. The following significance statements have been identified for Cape Lookout National Seashore as stated in the Seashore's *Foundation Document* (NPS 2012s) (please note that the statements are in no particular order).

- Cape Lookout National Seashore, 56 miles of barrier islands off the North Carolina coast, is an outstanding example of a dynamic, intact, natural barrier island system, where ecological processes dominate.
- Cape Lookout National Seashore is one of the few remaining locations on the Atlantic coast where visitors can experience and recreate in a primarily undeveloped, remote barrier island environment, which can be reached only by boat.
- Cape Lookout National Seashore preserves a diversity of coastal habitats, which support aquatic and terrestrial plant and animal life, including several protected species, such as piping plovers, American oystercatchers, sea turtles, black skimmers, terns, and seabeach amaranth.
- The free-roaming Shackleford Banks wild horse herd is legislatively protected within Cape Lookout National Seashore.
- Cape Lookout National Seashore has a rich concentration of cultural resources that tell the history of people living at the edge of the sea, dating from approximately 3000 BC to the present.
- The Cape Lookout Lighthouse protected the nation's maritime commerce from one of the most significant hazards of the North Carolina coast—the Cape Lookout shoals.
- Cape Lookout National Seashore preserves Portsmouth Village, a National Register Historic District and unique, intact coastal Carolina community that played a critical role in the conduct of maritime commerce in North Carolina from the colonial period until the outbreak of the American Civil War.
- Cape Lookout National Seashore preserves the Cape Lookout Village, a National Register Historic District that was an important community for local families beginning with establishment of a life-saving station at the Cape in 1886.
- Cape Lookout National Seashore provides an outstanding natural laboratory for studying ecological and geological processes, as well as the effects of climate change and sea level rise on the Atlantic coast.
- Cape Lookout National Seashore provides a remote setting for visitors to experience unobstructed ocean views and one of the darkest publicly accessible areas along the East Coast for nighttime vantages.

ISSUES AND IMPACT TOPICS

Issues associated with implementing an ORV management plan at Cape Lookout National Seashore were initially identified by Seashore staff during internal scoping and were further refined through the public scoping process. Table ES-1 details the issues that are discussed and analyzed in the ORV management plan/EIS.

TABLE ES-1: ISSUES AND IMPACT TOPICS

Issue	Reason for Analysis
Federally Listed Endangered, Threatened, or Candidate Species	Conflicts between ORVs, other recreational users, and listed species could create direct or indirect losses to the species. Both the northern and southern ends of the Seashore include habitat range for a variety of federally threatened and endangered species year-round, including piping plover, seabeach amaranth, red knot (candidate), and nesting sea turtles, which includes the loggerhead, green, and leatherback turtles, with Kemp's ridley turtles being occasional visitors. Current and possible future management alternatives for ORV and other recreational uses would take into consideration the needs of federally listed threatened and endangered species in determining management measures.
State-Listed and Special-status Species	Habitat for locally sensitive species, such as the American oystercatcher, Wilson's plover, and other colonial beach nesters, may be vulnerable to disturbances caused by recreational uses, including ORV use. These species require large undisturbed areas for successful breeding. Frequent human disturbance can cause the abandonment of nest sites as well as direct loss of eggs and chicks.
Other Wildlife and Wildlife Habitat	Natural processes including hurricanes and other storm events may alter, create, or remove areas of the Seashore used by both ORVs and sensitive species, requiring adaptive management of both recreational uses and natural resources to avoid conflicts. The significance of the Seashore as both a Globally Important Bird Area and coastal barrier ecosystem requires that management policies related to recreational use are considerate of and sensitive to changing landscape. During low tide, ORV use in the intertidal zone by users seeking firm sand may result in mortality of individual invertebrate species or loss of food and habitat resulting from compaction under vehicle tires.
Soundscapes/Acoustic Environment	The use of ORVs at the Seashore could create noise emissions that could impact visitors, wildlife, and wildlife habitats by altering the natural quiet and soundscapes of the Seashore. Vehicular noise and recreational uses associated with vehicles are a component of the soundscape at the Seashore. These uses could impact Seashore soundscapes by introducing an element to the soundscape that is incompatible with other recreational uses, such as bird-watching or enjoying the solitude and natural soundscape of the Seashore. Engine and recreational noise may also disturb wildlife.
Visitor Use and Experience	ORV use at the Seashore is an integral component of the experience for some visitors and may be impacted by management activities focused on protecting species and visitor safety. However, some Seashore visitors do not use ORVs and may be impacted by the presence of ORVs. Currently, there is a mix of recreational uses at the Seashore that can be accessed by vehicle and passenger ferry, or personal boat. Although many visitors use an ORV to access specific areas of the Seashore, other visitors wish to engage in recreational activities on foot and away from the presence of motorized vehicles. If management requires restricting areas of the Seashore to ORVs, it could enhance the recreational experience for some and diminish the experience for others. Further, visitor experience could be impacted by conflicts between motorized and nonmotorized recreational users. Other issues related to visitor use and experience includes viewsheds, aesthetics, and night skies.
Socioeconomic Resources	Businesses within the vicinity of the Seashore, including the communities of Davis and Atlantic, receive some level of economic benefit from the purchasing of goods and services by ORV users. Potential restrictions on ORV use have the potential to reduce visitation to the Seashore and, subsequently result in a loss of spending in the local market by these visitors.

Issue	Reason for Analysis
Seashore Management and Operations	Accommodating recreational uses while protecting sensitive species requires sufficient park personnel and adequate funding. Seashore operations (staffing and funding) may both affect and be affected by ORV management strategies. Lack of funding may reduce management flexibility. Effective management of ORV use requires funding for activities such as resource monitoring, law enforcement, education and interpretation, and maintenance/administrative support. The current level of staffing to protect natural resources was funded, in part, by a temporary funding source that became unavailable after fiscal year 2010. Staffing levels would be evaluated under the alternatives evaluated in this ORV management plan/EIS.

ALTERNATIVES

The *National Environmental Policy Act* of 1969 (NEPA) requires federal agencies to explore a range of reasonable alternatives that address the purpose of and need for the action. The alternatives under consideration must include the “no-action” alternative as prescribed by 40 CFR 1502.14. Action alternatives may originate from the proponent agency, local government officials, or members of the public at public meetings or during the early stages of project development. Alternatives may also be developed in response to comments from coordinating or cooperating agencies.

The alternatives analyzed in this document, in accordance with NEPA, are the result of internal and public scoping. These alternatives meet the management objectives of the Seashore, while also meeting the overall purpose of and need for the proposed action. Alternative elements that were considered but were not technically or economically feasible, did not meet the purpose of and need for the project, created unnecessary or excessive adverse impacts on resources, and/or conflicted with the overall management of the Seashore or its resources were dismissed from further analysis.

The NPS explored and objectively evaluated five alternatives in this ORV management plan/EIS. The elements of the five alternatives are detailed in chapter 2, table 3. How each of these alternatives meets the objectives of the ORV management plan/EIS is detailed in table ES-2.

ELEMENTS COMMON TO ALL ALTERNATIVES

The following describes elements of the alternatives common to all alternatives. Alternative E would not allow for ORV use at the Seashore, therefore, elements related to vehicle use would not be applicable to alternative E, as noted where appropriate.

- Closures for Public Safety (not applicable under alternative E)**—ORV safety closures would be implemented in the event of a threat of significant bodily injury or death, and/or damage to personal property, including vehicles and their contents. ORV safety closures would preclude ORV access; pedestrian access would be maintained through most safety closures where feasible. NPS staff would monitor ORV safety closures on a regular basis and a sufficient reduction or elimination of the conditions prompting the closure so there is no longer an imminent hazard would constitute the condition for reopening a closure. This plan does not limit or supersede existing authorities under NPS regulations contained at 36 CFR Part 1 et seq.
- Vehicle and Pedestrian Safety (not applicable to alternative E)**—Provisions related to vehicle and pedestrian safety currently exist under 36 CFR 4.20 (Right of way) and 36 CFR 4.22 (Unsafe operation). Provisions identified in the Superintendent’s Compendium (NPS 2013) for the Seashore apply to vehicle and pedestrian safety. This includes creating needless ruts, failing to fill to the original level any hole caused by excavating a vehicle from the sand, and reducing speeds

when within 100 feet of any person, vehicle, campsite, other structure or while traveling in a towed conveyance.

- **Shade Shelters**—Shade shelters provide emergency protection from sudden storms and are currently located at various locations including Shackleford Banks, Cape Lookout Light Station, Great Island Cabin Area, and Long Point Cabin Area.
- **Speed Limits**—The 2013 Superintendent’s Compendium, which annually designates speed limits in accordance with 36 CFR 4.21, states that the maximum speed limit on the beach and other designated routes is 25 miles per hour or as otherwise posted. This decreases to 15 miles per hour when within 100 feet of any person, vehicle, campsite, other structure or while traveling in a towed conveyance. The maximum speed limit while carrying passengers in a trailer or other mode of conveyance towed behind the motor vehicle specifically designed for carrying passengers while being towed is 15 miles per hour.
- **Exemptions for Essential Vehicles**—Essential vehicles are allowed in pedestrian-only areas and within resource closures as required for general park management, law enforcement, and safety.
- **Alternative Transportation**—The NPS would consider authorization of commercial beach shuttle services departing from developed nodes (NPS 2007m). Currently, a beach shuttle service operates from the lighthouse area on South Core Banks. All-terrain vehicle (ATV) and utility-type vehicle (UTV) tours operate on North Core Banks from mile marker 0.0. The Seashore’s *Commercial Services Plan / Environmental Assessment / Assessment of Effect* provides for additional commercial activities within the Seashore; the implementation of additional alternative transportation options would be evaluated as funding become available.
- **General Species Management**—Species measures are generally consistent across the alternatives (see chapter 2, table 4). Additionally, species management measures under alternative E are generally the same as alternative A but without ORV specific closures. Although ORVs would not be permitted under alternative E, areas may still be closed to pedestrians for resource protection. For bird species, the alternatives and alternative elements were developed to reflect the biological needs and, subsequently, the management needs of each species change as a function of life stage (see chapter 2, table 4). The timing of each life stage varies according to the species in question; however, there is much overlap among species. Preferred habitat is also similar between and among similar species. Therefore, some closures would likely occur at the same time and in the same place for multiple species.
- **Closures for Species Management**—ORV closures are created when they are necessary for species protection (see chapter 2, table 4 and table 5). Under all alternatives, pedestrians would be permitted in these ORV closures. Pets would be required to be leashed or otherwise physically confined at all times in all areas of the Seashore (36 CFR 2.15). All pedestrians and pets would be prohibited, even if on leash, from all full recreational closures.

Closures for bird species would vary by alternative. For sea turtles, ORVs would be prohibited from entering sea turtle closures from 50 days after the nest is laid until after the nest has hatched. ORV access would be maintained through a variety of measures, including rerouting and ramps. Camping and beach fires would be prohibited in turtle nest closures and visitors staying in cabins would be encouraged to minimize use of outside lights to prevent disturbance of hatchlings from artificial light.

- **Species Surveying and Management**—The *Cape Lookout National Seashore Interim Protected Species Management Plan / Environmental Assessment*, Biological Opinion, Amended Biological Opinion, and FONSI are the most recent Seashore planning guidance documents for species management. During ESA Section 7 consultation with U.S. Fish and Wildlife Service (USFWS)

for that planning process, conservation and performance measures for protected species were identified. Consultation with the USFWS regarding ESA compliance measures would continue under all alternatives. Additional species surveying measures from the *Cape Lookout National Seashore Interim Protected Species Management Plan / Environmental Assessment* are presented in chapter 2, table 4, and additional elements that would be implemented under each alternative are included in chapter 2, table 5.

NO-ACTION ALTERNATIVE

The no-action alternative is developed for two purposes: a no-action alternative may represent the agency's past and current actions or inaction on an issue continued into the future and may also describe existing impacts continued into the future. The no-action alternative presented here meets both of these purposes and represents "no change" from the current level of management direction and level of management intensity.

In compliance with the settlement agreement reached in *Friends of the Earth v. Department of Interior* (478 F. Supp 2d 11, D.C. Dist. Ct. (2007)), the Seashore implemented interim ORV management planning pursuant to the *Cape Lookout National Seashore Interim Protected Species Management Plan / Environmental Assessment*, Biological Opinion, Amended Biological Opinion, and FONSI, which serve in part as the no-action alternative for this ORV management plan/EIS and will be in effect until its completion. The no-action alternative reflects long-standing ORV use at the Seashore and is consistent with park planning documents over previous decades, including the Seashore's general management plan (NPS 1982) and general management plan amendment (NPS 2001e), which permit ORV use.

As stated in "Chapter 1: Purpose of and Need for Action," in order to allow ORV use, NPS must promulgate a special regulation authorizing use at the Seashore. Without a special regulation, continued off-road use would conflict with NPS regulations (36 CFR 4. 10). Therefore, in order to implement the no-action alternative, NPS would need to promulgate a special regulation.

NPS believes that the best representation of the no-action alternative is the current condition, as described in previous planning documents, the *Cape Lookout National Seashore Interim Protected Species Management Plan / Environmental Assessment*, and on-the-ground current management. It demonstrates current actions as they may be carried into the future and serves to set a baseline of existing impacts continued into the future. The NPS does not believe that a "no off-road vehicle use" alternative would fully serve the function of a no-action alternative. Given the history of continuous ORV use since the 1930s, almost a half-century before the Seashore was established, as well as its allowance in park planning documents and a settlement agreement, a complete off-road use prohibition cannot be considered as the "current management direction or level of management intensity" and would not serve as a proper environmental baseline of existing impacts continued into the future against which to compare the impacts of action alternatives. NPS notes that if a "no off-road vehicle use" alternative had been chosen as the no-action alternative, a regulation terminating ORV use, pursuant to 36 CFR 1.5(b), may have also been required in order to implement that alternative. Therefore, without action, ORV use would likely continue.

For this ORV management plan/EIS, alternative A is a continuation of existing conditions and management policies under the *Cape Lookout National Seashore Interim Protected Species Management Plan / Environmental Assessment*, Biological Opinion, Amended Biological Opinion, and FONSI. Specifically under the no-action alternative, ORV use, including ATV and UTV use, would be allowed under the special regulation. Approximately 81 percent (45 of 56 miles) of the entire length of the Seashore would be designated as available for ORV use from March 16 through December 31 (as is currently identified in the 2013 Superintendent's Compendium). Approximately 19 percent of the entire

length of the Seashore (11 of 56 miles) would be available to pedestrian-only use year-round; all 56 miles of shoreline would be available to pedestrian-only use from January 1 through March 15. The back route would be retained in its condition as of 2010, and would receive no regular maintenance.

For ORV use, no vehicle permit or operator education certificate would be required nor would vehicle limits be established. Visitors would be allowed to deliver ATV or UTVs in their personal vessels to the Seashore for personal use at designated and marked soundside access points and long-term vehicle storage and parking would be available at four lots at the Seashore. A parking permit would be required for long-term vehicle storage. The fee for the parking permit would be established to ensure the recovery of the cost of managing the parking permit program and would be subject to change. A variety of methods would be used to communicate to visitors about species, resource information, and ORV program information; the appropriate mechanism to communicate with visitors would be determined on an individual basis.

Species management measures would be the same as those outlined above under “Elements Common to All Alternatives.” In addition, for protected bird species, ORVs would be allowed in a corridor along the shoreline where 150-foot buffers can be maintained for colonial nesting species and 600-foot buffers can be maintained for foraging piping plover chicks. If a piping plover chick is found using the ocean beach, the 600-foot buffer would be put in place immediately and ORVs would be routed to the back route, if necessary. If no back route is available the beach would be closed to vehicles. If staff are available, a vehicle escort program could be used on a very limited case-by-case basis around bird closures to maintain access to Portsmouth Village, the interior of Cape Point, or areas with no back route access. Escorts would be led by trained resource management staff and would be limited to 25 vehicles or less. A minimum 300-foot buffer and full beach ramp to ramp ORV closure would be provided for mobile American oystercatcher chicks and would be adjusted to follow chick movement. Access would be allowed through American oystercatcher closures if no back route access is available. ORVs would be routed around colonial shorebird closures where a 150-foot buffer cannot be maintained. Management measures for all protected species are detailed in chapter 2, table 4 and table 5.

ACTION ALTERNATIVES

The action alternatives (except alternative E) would establish designated ORV routes and areas, with some alternatives integrating additional designated areas that would provide visitors with a pedestrian-only visitor experience. Elements common to all action alternatives are discussed below, followed by a discussion of each alternative.

ELEMENTS COMMON TO ACTION ALTERNATIVES B, C, AND D

The following describes elements of the alternatives common to all alternatives. Alternative E would not allow for ORV use at the Seashore, therefore, elements related to vehicle use would not be applicable to alternative E. This is noted where applicable.

- **Back Route**—Pull-outs along the back route to allow vehicles to pass other oncoming vehicles would be established. The back route on South Core Banks from approximately mile marker 44 to approximately mile marker 45 would only be open when full beach closures at the Cape would otherwise prevent vehicles from driving past the Cape. The back route would be re-established when impacted by a storm event, for resource protection and safety.
- **Operator Education Certificates**—A free operator education certificate would be required in order for a licensed driver to operate a vehicle at the Seashore. The purpose of the operator education certificate would be to educate licensed drivers on the rules and regulations at the

Seashore, and the species protection measures. This should help ensure safe operation of ORVs, and help protect sensitive species at the Seashore. The education certificate, which would be free and valid for the calendar year, would be issued in a manner and at locations to be determined. Drivers would be required to carry this certificate with them at all times when operating a vehicle on the Seashore.

- **Vehicle Permits and Vehicle Permit Fees**—A vehicle permit would be required, issued under Special Use Permit authority. This permit would be nontransferable, attached to an individual vehicle, and valid on a long-term (annual) or short-term (10-day) basis. The long- and short-term vehicle fee would be established and would be based on guidance in NPS Director’s Order and Reference Manual # 53, which focuses on cost recovery (including route maintenance, law enforcement, species protection, permit issuance, and other associated program costs). It is the Seashore’s goal to make the vehicle permit convenient to obtain. However, the NPS reserves the right to change the permit system over time, such as to implement a lottery or partial lottery system. The goal is to ensure the permit system is simple, straightforward, fair, accessible, and cost efficient to manage.
- **Miscellaneous Vehicle and Operator Requirements**—The following vehicles would be prohibited anywhere within the Seashore: high performance, sport model, and two-stroke ATVs and UTVs (after a five-year grace period); vehicles with three wheels or less; tracked or farm vehicles; vehicles with two-stroke engines; and combination vehicles (i.e., amphibious ATVs, amphibious aircraft, aircraft).
- **Shade Shelters**—NPS would construct up to six additional shelters located along the islands, generally near the back route (two new shelters would be constructed on North Core Banks, and four new shelters would be constructed on South Core Banks). Shade shelters are intended to provide visitors and staff emergency shelter for sudden storms.
- **Adaptive Management Strategy**—An adaptive management strategy would be implemented that evaluates species disturbance. Disturbance to the American oystercatcher (an indicator species) would be monitored, primarily related to impacts from ORVs. American oystercatchers are used as an indicator species because they are solitary nesters and are among the most sensitive of the bird species at the Seashore to disturbance. If species indicators are triggered (described below), the following actions would take place:

Step 1: Where two of the four species indicators have reached moderate impacts, more intensive management actions could be implemented. The following are management actions the Seashore may conduct at any time; however, under the adaptive management strategy additional resources would be focused on these actions:

- Additional, focused trash management and fish scrap disposal
- Additional predator control
- Additional education with testing
- Additional, focused enforcement
- ORV route restrictions
- Increased species buffers
- Reduction in the number of long-term (annual) and/or short-term (10-day) vehicle permits issued, and manage the size of parking (vehicle storage lots).

Step 2: If species indicators are triggered for two consecutive years after implementing Step 1, then the following management actions shall be taken. These management actions would not

occur where the Seashore is able to show that species indicators were triggered due to hurricanes or other strong storms, predators, or other natural conditions not tied to impacts from visitor use.

- Reduction in the number of long-term (annual) and/or short-term (10-day) vehicle permits issued
- Increased species protection buffers.

Species indicators will be reevaluated after a five-year grace period, and possibly changed, based on new information. The following indicators are as follows:

- **Breeding population size.** Target 60 breeding pairs. Minor impact: <55 breeding pairs. Moderate impact: <50 breeding pairs.
 - **Nest survival.** Target >30% of nests initiated hatch one or more chicks. Minor impact: 25%–30%. Moderate impact: <25%.
 - **Chicks fledged per breeding pair per year.** Target > 0.40. Minor impact: 0.40–0.30. Moderate impact: < 0.30.
 - **Mammal predation.** Target <20% of nests lost to mammals per year. Minor impact: 20%–25%. Moderate impact: >25%.
- **Education and Outreach**—A variety of methods would be used to communicate to visitors about species, resource information, wise use, and ORV program information. In addition, educational materials would be actively provided to Seashore users through the educational certificate requirement. This information would be updated annually based on issues identified in the previous season, and other adaptive management needs.

ACTION ALTERNATIVES

ALTERNATIVE B

Alternative B would maintain existing opportunities for ORV experiences on Core Banks; vehicle permits would be required to operate a vehicle at the Seashore, but there would be no limit on the number of permits the Seashore would release; ORV use and density could increase; existing management practices at the Seashore would continue; an annual operator education certificate would be required, plus additional education and outreach and species management measures would be implemented. In addition, there would be a phase-out of high-performance sport model and two-stroke ATV and UTVs after a five-year grace period.

Species management measures would be the same as those outlined above under “Elements Common to All Alternatives” and the no-action alternative. Additional measures would include seasonal night driving restrictions from May 1 through August 31 to reduce potential impacts to turtles and bird chicks and the limited removal of mammalian predators, when predation is observed that impacts federally listed species or species of special concern. Additional management measures for all protected species are identified in chapter 2, table 4 and table 5.

ALTERNATIVE C

Alternative C would create three new seasonal pedestrian-only areas and expand one existing pedestrian-only area; ORV permits would be required that would keep use at historic levels, but could allow an increase in ORV density (the use levels would be monitored and management actions could be triggered if density increases); existing management practices at the Seashore would continue; an annual operator

education certificate would be required, plus additional education and outreach and species management measures, such as seasonal restrictions on night driving, would be implemented. Alternative C would implement a seasonal prohibition of ATVs and UTVs; would prohibit high-performance sport-model and two-stroke ATVs and UTVs (after a five-year grace period), and would implement restrictions on trailers (after a five-year grace period).

Species management measures would be the same as those under alternative B except night driving restrictions would be in place from May 1 through September 14 to reduce potential impacts to turtles and bird chicks, and the winter Seashore closure would be extended to a total of 90 days from December 16 through March 15. Additional management measures for all protected species are identified in tables chapter 2, table 4 and table 5.

ALTERNATIVE D

Alternative D would provide increased opportunities for year-round pedestrian experiences; ORV permits would be required and would be limited to keep the number of permits issued at 8 percent below current ORV use levels; existing management practices at the Seashore would continue, plus a requirement for an annual operator education certificate, increased education and outreach and additional species management measures, such as night driving, and a year-round prohibition of ATVs, high-performance sport-model and two-stroke UTVs and of trailers, would be implemented after a five-year grace period (with non-sport UTVs allowed only seasonally).

Species management measures would be the same as those under alternative B except additional measures would be implemented for bird species including increasing buffers to ensure species protection, monitoring unfledged piping plovers, and establishing pedestrian-only areas in the vicinity of unfledged broods based on the mobility of observed broods, among others. In order to reduce potential impacts to turtles and bird chicks, night driving restrictions would be in place from May 1 through September 14. The winter Seashore closure would last from December 16 through March 15. Additional management measures for all protected species are identified in chapter 2, table 4 and table 5.

ALTERNATIVE E

Under alternative E, the entire area of Core Banks would be closed to public ORV use and no back route access would be provided. Entry by public vehicles into these areas would be prohibited, and only use by NPS essential vehicles, and other vehicle use authorized by the NPS, would be allowed (concession vehicles included). Year-round pedestrian-only areas would extend to the entire area of Core Banks and Shackleford Banks. Species management measures under alternative E would be the same as alternative A except there would be no ORV specific closures. Management measures for all protected species are fully detailed in chapter 2, tables 3, 4, and 5. All education efforts would be directed toward pedestrian use as ORVs would not be permitted at the Seashore.

ENVIRONMENTAL CONSEQUENCES

Impacts of the alternatives were assessed in accordance with Director's Order 12 and Handbook: Conservation Planning, Environmental Impact Analysis and Decision-Making. This handbook requires that impacts on park resources be analyzed in terms of their context, duration, and intensity. The analysis provides the public and decision-makers with an understanding of the implications of ORV management actions in the short and long term, cumulatively, and within context, based on an understanding and interpretation by resource professionals and specialists.

Each management alternative was evaluated for overall impacts and compared to the baseline to determine the context, duration, and intensity of resource impacts. The baseline is the condition that has resulted from management of ORVs under the management frameworks in place during the planning process for this ORV management plan/EIS.

TABLE ES-2: ENVIRONMENTAL IMPACT SUMMARY

Impact Topic	Summary
Federally Listed Endangered, Threatened, or Candidate Species	
Piping Plover	<p>Under alternative B, impacts on piping plovers from resource management activities would be slightly less than impacts under alternatives A (the no-action alternative) and E (the no-ORV alternative). This is because there would be more consistent training and supervision of resource staff conducting the surveys, the limited predator removal under alternative B, establishing pre-nesting closures by March 16 (15 days earlier than under alternative A, not applicable to alternative E), and the increased education and research programs. Impacts on piping plovers from ORV use and other recreational uses under alternative B would be less than the impacts incurred under alternative A. This is due to the closing of ORV routes where no ferry access is available, the prohibition on all high-performance sport-model and two-stroke ATVs and UTVs at the Seashore, the night driving restriction from May 1 through August 31, the likely increased compliance with resource closures due to increased law enforcement and interpretative staffing positions, the ORV permitting system, and the more intensive management actions that could be implemented under the adaptive management strategy. However, the impacts on piping plovers from recreational uses under alternative B would be greater than those incurred under alternative E because no public ORV access at the Seashore is allowed under alternative E.</p> <p>Impacts on piping plovers from resource management activities under alternative C would be slightly less than from alternatives A (the no action alternative) and E (the no ORV alternative). This is due to more consistent training and supervision of resource staff conducting the surveys, the limited predator removal under alternative C, increased educational and research efforts, and the winter vehicle closure from December 16 through March 15 (not applicable to alternative E). Impacts of ORV use and other recreational uses under alternative C would be less than those incurred under alternative A. This is due to a seasonal restriction on night driving from May 1 through September 14, the increase in the amount of pedestrian-only use areas by 4 miles, the closing of ORV routes where no ferry access is available, the prohibition on all high-performance sport-model and two-stroke ATVs and UTVs at the Seashore, shortening the timeframe that utility-model ATVs and UTVs would be permitted within the Seashore each year (reducing the March 16 through December 31 time under alternative A to September 15 through December 15), the reduction in the amount of Seashore open for ORV use, the fee-based ORV permitting system that would also limit the number of vehicles on the Seashore, the likely increased compliance with resource closures due to increased law enforcement and interpretative staffing positions, and the more intensive management actions that could be implemented under the adaptive management strategy. Compared to alternative E, the amount of impacts on piping plovers under alternative C would be greater due to public ORV use being allowed under alternative C whereas it would be prohibited under alternative E.</p> <p>Under alternative D, impacts on piping plovers from resource management activities would be less than those under alternatives A (the no-action alternative) and E (the no ORV alternative). This is due to more consistent training and supervision of resource staff conducting the surveys, the limited predator removal, slightly expanded buffers around chicks on the beach (650 feet under alternative D compared to 600 feet under alternatives A and E), the expansion of brood buffers based on the mobility of the brood, and the increased education and monitoring efforts. Impacts from ORV use and other recreational uses would be reduced when compared to alternative A. This is due to the expansion of pedestrian-use only areas by 10 miles, night time driving restrictions from May 1 through September 14, the closing of ORV routes where no ferry access is available, the prohibition on all ATVs as well as all high-performance sport-model and two-stroke UTVs at the Seashore, shortening the timeframe that utility-model UTVs would be permitted within the Seashore each year (reducing the March 16 through December 31 time under alternative A to September 15 through December 15), the reduction in the amount of Seashore open for ORV use, the fee-based ORV permitting system with a limit on the number of vehicles allowed (which would be 8 percent less than current use),</p>

Impact Topic	Summary
	<p>the likely increased compliance with resource closures due to increased law enforcement and interpretative staffing positions, and the more intensive management actions that could be implemented under the adaptive management strategy. Compared to alternative E, the amount of impacts on piping plovers under alternative D would be greater due to public ORV use being allowed under alternative C whereas it would be prohibited under alternative E.</p> <p>The resource management activities proposed for alternative E (the no ORV alternative) are essentially the same activities proposed for alternative A (the no action alternative) except that with no public ORV use allowed on the Seashore under alternative E, there would be no recreational ORV-specific closures established and surveying and monitoring protocols would be reviewed and may change due to the elimination of impacts from recreational ORV use and a reduction in the amount of impacts from pedestrians. Under alternative A, the North and South Core Banks of the Seashore would remain open to ORV use in designated routes and areas (as documented in the Superintendent's Compendium), except where resource or safety closures are present. There would be no night driving restrictions under alternative A and no restrictions on the number of vehicles allowed on the Seashore either. Therefore, when compared to alternative A, alternative E would provide more protection to piping plovers because there would be no impacts related to public ORV use, and impacts related to other recreational uses would be reduced due to limited access to the ocean front beaches due to no public ORV use.</p>
Red Knot	<p>Impacts of ORV and other recreational use would result in long-term adverse impacts on red knots under alternative B. Allowing continued ORV access along 81 percent (45 miles) of the Seashore would contribute to these long-term impacts, including noise disturbance, temporary displacement, and possibly injury/mortality of individuals. However, impacts would be reduced when compared to alternative A (the no-action alternative) due to increased education and outreach; the use of additional species management measures, such as focused predator management, and the prohibition of all high-performance sport-model and two stroke ATVs and UTVs, and the more intensive management actions that could be implemented under the adaptive management strategy. Red knots are active at night, so additional benefits would also result from a seasonal restriction on night driving from May 1 through August 3; however, benefits from this restriction would be limited since it does not cover the red knot's spring migration period when it is most numerous at the Seashore. Compared to alternative E, impacts on red knots would be greater under alternative B would provide less protection for red knots, because while alternative B allows public ORV use which can adversely impact red knots, under alternative E public ORV use on the Seashore would be prohibited, eliminating this source of adverse impact and reducing the impact from pedestrians, who without transportation opportunities to more remote areas of the Seashore would likely be limited to areas in general proximity to the ferry landing areas.</p> <p>Under alternative C, the impacts of ORV and other recreational use would result in long-term adverse impacts on red knots from noise disturbance, temporary displacement, and possibly injury/mortality of individuals. However, impacts would be reduced when compared to alternative A (the no-action alternative), due to increased education and outreach; the use of additional species management measures, such as expanded species closures (for other protected birds); the increase in the amount of pedestrian-only use areas by 4 miles; the expansion of the winter vehicle closure timeframe (changing it to December 16 through March 15 compared to January 1 through March 15 under alternative A); the closing of ORV routes where no ferry access is available; the prohibition on all high-performance sport-model and two-stroke ATVs and UTVs at the Seashore; shortening the timeframe that non-sport ATVs and UTVs would be permitted within the Seashore each year (reducing the March 16 through December time under alternative A to September 15 through December 15); the reduction in the amount of Seashore open to public ORV use; and the fee-based ORV permitting system that would also limit the number of vehicles on the Seashore, and the more intensive management actions that could be implemented under the adaptive management strategy. Red knots are active at night, so additional benefits would also result from a seasonal restriction on night driving from May 1 through September 14; however, benefits from this restriction would be limited since it does not cover the red knot's spring migration period when it is most numerous at the Seashore, and most birds have already left the Seashore prior to the latter portion of the period. Compared to alternative E, the amount of impacts on red knots under alternative C would be greater due to public ORV use being allowed under alternative C, whereas it would be prohibited under alternative E. The prohibition of public ORV use under</p>

Impact Topic	Summary
	<p>alternative E would also reduce the amount of impacts from pedestrians, because without ORVs to access the more remote areas of the Seashore pedestrians would likely be limited to areas in general proximity to the ferry landing areas.</p> <p>Alternative D would also result in long-term adverse impacts on red knots from disturbance, temporary displacement, and possibly injury/mortality of individuals. However, impacts would be reduced when compared to alternative A (the no-action alternative), due to increased education and outreach; the use of additional species management measures, such as expanded buffers/closures (for other protected birds); the closing of ORV routes where no ferry access is available; the reduction in the amount of Seashore open to public ORV use; the implementation of a vehicle permit program and the reduction in the number of public ORVs allowed on the Seashore by 8 percent; the prohibition of all ATVs, as well as all high-performance sport-model and two-stroke UTVs at the Seashore; and the shortening of the timeframe that non-sport UTVs would be permitted within the Seashore each year (reducing the March 16 through December 31 timeframe under alternative A to September 15 through December 15), and the more intensive management actions that could be implemented under the adaptive management strategy. Red knots are active at night, so additional benefits would also result from a seasonal restriction on night driving from May 1 through September 14; however, benefits from this restriction would be limited since it does not cover the red knot's spring migration period when it is most numerous at the Seashore, and most birds have already left the Seashore prior to the latter portion of the period. Compared to alternative E (the no ORV alternative), impacts on red knots under alternative D would be greater due to public ORV use being allowed under alternative D, whereas it would be prohibited under alternative E, eliminating because ORV access would continue to be permitted under alternative D. The prohibition of public ORV use under alternative E would also reduce the amount of impacts from pedestrians, because without ORVs to access the more remote areas of the Seashore pedestrians would likely be limited to areas in general proximity to the ferry landing areas.</p> <p>Under alternative E, prohibiting public ORV use at the Seashore would provide long-term beneficial impacts compared to alternative A where public ORV use would be allowed along 81 percent of the Seashore. While continued pedestrian access under alternative E would result in some short- and long-term disturbance (e.g., noise, temporary displacement, etc.) of red knots, these impacts would be reduced compared to alternative A because without the use of ORVs to access more remote areas of the Seashore, pedestrian use under alternative E would likely be limited to areas in the general proximity to the ferry landing areas. As a result, overall, alternative E would provide more protection and result in fewer adverse impacts to red knots compared to alternative A.</p>
Sea Turtles	<p>Resource management activities proposed under alternative B would provide slightly more beneficial impacts to sea turtles than those proposed under alternative A (the no-action alternative) because there would be more consistent training and supervision of resource staff conducting the surveys, the limited removal of native and nonnative mammalian predators, and the increased education and public outreach measures that would be implemented under alternative B. In comparison to alternative E (the no ORV alternative), the limited removal of native and nonnative mammalian predators under alternative B would provide slightly more beneficial impacts to sea turtles than alternative E. Adverse impacts from ORV use and other recreational uses under alternative B would be less than those incurred under alternative A. This is due to the night driving restrictions that would be put into place under alternative B from 9 p.m. to 6 a.m. from May 1 through August 31, the additional management measures that could be implemented under the adaptive management strategy if species indicators are triggered, the vehicle permit system, the ORV operator education certificate requirement, and the likely increased compliance with resource closures due to increased law enforcement and interpretative staffing positions. However, adverse impacts from ORV use and other recreational uses under alternative B would be greater than those under alternative E. This is because no ORV use would be allowed on the Seashore under alternative E, eliminating all impacts on sea turtles from ORV use and reducing impacts from other recreational uses due to the reduced access to the beaches without ORVs.</p> <p>Resource management activities under alternative C would provide slightly more beneficial impacts on sea turtles than they would under alternative A (the no-action alternative). This is because there would be more consistent training and supervision of resource staff conducting the surveys, the limited removal of native and nonnative mammalian predators, and the increased education and public outreach measures that would be implemented under</p>

Impact Topic	Summary
	<p>alternative C. In comparison to alternative E (the no ORV alternative), the limited removal of native and nonnative mammalian predators under alternative C would provide slightly more beneficial impacts to sea turtles than alternative E. Adverse impacts from ORV use and other recreational uses under alternative C would be less than those incurred under alternative A. This is due to the expansion of pedestrian-only use areas by 4 miles, night time driving restrictions from 9 p.m. to 6 a.m. from May 1 through September 14, the additional management measures that could be implemented under the adaptive management strategy if species indicators are triggered, the likely increased compliance with resource closures due to increased law enforcement and interpretative staffing positions, the vehicle permit system, the ORV operator education certificate requirement, and the limit on the number of vehicle permits that would be issued. However, adverse impacts from ORV use and other recreational uses under alternative C would be greater than those under alternative E. This is because no ORV use would be allowed on the Seashore under alternative E eliminating all impacts on sea turtles from ORV use and reducing impacts from other recreational uses due to the reduced access to the beaches without ORVs.</p> <p>Resource management activities under alternative D would provide slightly more beneficial impacts on sea turtles than they would under alternative A (the no-action alternative). This is because there would be more consistent training and supervision of resource staff conducting the surveys, the limited removal of native and nonnative mammalian predators, and the increased education and public outreach measures that would be implemented under alternative D. In comparison to alternative E (the no ORV alternative), the limited removal of native and nonnative mammalian predators under alternative C would provide slightly more beneficial impacts to sea turtles than alternative E. Adverse impacts from ORV use and other recreational uses under alternative D would be less than those incurred under alternative A. This is due to the expansion of pedestrian-only use areas by 10 miles, night time driving restrictions from 9 p.m. to 6 a.m. from May 1 through September 14, the additional management measures that could be implemented under the adaptive management strategy if species indicators are triggered, the likely increased compliance with resource closures due to increased law enforcement and interpretative staffing positions, the vehicle permit system, the ORV operator education certificate requirement, and the limit on the number of vehicle permits that would be issued. Compared to alternative E, adverse impacts from ORV use and other recreational uses under alternative D would be greater. This is because no ORV use would be allowed on the Seashore under alternative E eliminating all impacts on sea turtles from ORV use and reducing impacts from other recreational uses due to the reduced access to the beaches without ORVs.</p> <p>The resource management activities proposed for alternative E (the no ORV alternative) are the same activities proposed for alternative A (the no-action alternative) and their impacts would be the same. However, unlike alternative A, under alternative E there would be no public ORV use on the Seashore and surveying and monitoring protocols would be reviewed and may change due to the elimination of impacts from recreational ORV use and a reduction in the amount of impacts from pedestrians. Under alternative A, the North and South Core Banks of the Seashore would remain open to ORV use in designated routes and areas (as documented in the Superintendent's Compendium), except where resource or safety closures are present. There would be no night driving restrictions under alternative A and no permitting system for ORV use at the Seashore. Therefore, when compared to alternative A, alternative E would provide more protection to sea turtles because there would be no impacts related to ORV use and impacts related to other recreational uses would be reduced due to limited access to the ocean front beaches with no ORV use.</p>
Seabeach Amaranth	<p>Resource management activities proposed under alternative B would provide slightly more beneficial impacts to seabeach amaranth than those proposed under alternative A (the no-action alternative) and alternative E (the no ORV alternative) because there would be more consistent training and supervision of resource staff conducting the surveys, closures for historical bird nesting areas would be erected by March 16 (rather than April 1), providing earlier protection of potential seabeach amaranth habitat and possibly seeds that could germinate if the habitat overlaps that of seabeach amaranth. Additional benefits would also result from increased education and public outreach measures that would be implemented under alternative B. Adverse impacts from ORV use and other recreational uses under alternative B would be less than those incurred under alternative A. This is due to regular maintenance of the back route which would encourage its use rather than the ocean beach, the</p>

Impact Topic	Summary
	<p>additional management measures that could be implemented under the adaptive management strategy if species indicators are triggered, the vehicle permit system, the ORV operator education certificate requirement, and the likely increased compliance with resource closures due to increased law enforcement and interpretative staffing positions. Some adverse impacts that would occur under alternative B that would not occur under alternative A would result from the loss of habitat if construction of new ramps or the re-establishment of existing ramps after storms occur in areas of suitable habitat for the plant. Adverse impacts from ORV use and other recreational uses under alternative B would be greater than those under alternative E because no public ORV use would be allowed on the Seashore under alternative E, eliminating all impacts on seabeach amaranth from public ORV use and reducing impacts from other recreational uses, especially camping near the toe of the primary dunes, due to the reduced access to the beaches without ORVs.</p> <p>Resource management activities proposed under alternative C would provide slightly more beneficial impacts to seabeach amaranth than those proposed under alternative A (the no-action alternative) and alternative E (the no ORV alternative) because there would be more consistent training and supervision of resource staff conducting the surveys, closures for historical bird nesting areas would be erected by March 16 (rather than April 1), providing earlier protection of potential seabeach amaranth habitat and possibly seeds that could germinate if the habitat overlaps that of seabeach amaranth. Additional benefits would also result from increased education and public outreach measures that would be implemented under alternative C. Adverse impacts from ORV use and other recreational uses under alternative C would be less than those incurred under alternative A. This is due to the expansion of pedestrian-only use areas by 4 miles, the additional management measures that could be implemented under the adaptive management strategy if species indicators are triggered, the vehicle permit system, the ORV operator education certificate requirement, the limit on the number of vehicle permits that would be issued, and the likely increased compliance with resource closures due to increased law enforcement and interpretative staffing positions. Some adverse impacts that would occur under alternative C that would not occur under alternative A would result from the loss of habitat if construction of new ramps or the re-establishment of existing ramps after storms occurs in areas of suitable habitat for the plant. Compared to alternative E, alternative C would provide less protection for seabeach amaranth because ORV access would be permitted under alternative C whereas no impacts from recreational ORVs would occur under alternative E and potential impacts from other recreational uses, especially camping near the toe of the primary dunes, would be lessened due to reduced access to the beaches without ORVs.</p> <p>Resource management activities proposed under alternative D would provide slightly more beneficial impacts to seabeach amaranth than those proposed under alternative A (the no-action alternative) and alternative E (the no ORV alternative) because there would be more consistent training and supervision of resource staff conducting the surveys, closures for historical bird nesting areas would be erected by March 16 (rather than April 1), providing earlier protection of potential seabeach amaranth habitat and possibly seeds that could germinate if the habitat overlaps that of seabeach amaranth. Additional benefits would also result from increased education and public outreach measures that would be implemented under alternative D. Impacts from ORV use and other recreational uses under alternative D would be reduced when compared to alternative A. This is due to the expansion of pedestrian-use only areas by 10 miles. Additional benefits would occur from additional management measures that could be implemented under the adaptive management strategy if species indicators are triggered, the vehicle permit system, the ORV operator education certificate requirement, the limit on the number of vehicle permits that would be issued, and the likely increased compliance with resource closures due to increased law enforcement and interpretative staffing positions. Some adverse impacts that would occur under alternative D that would not occur under alternative A would result from the loss of habitat if the re-establishment of existing ramps after storms occurs in areas of suitable habitat for the plant. Compared to alternative E, alternative D would provide less protection for seabeach amaranth because ORV access would be permitted under alternative D whereas no impacts from ORVs would occur under alternative E and potential impacts from other recreational uses, especially camping near the toe of the primary dunes, would be lessened due to reduced access to the beaches without ORVs.</p> <p>The resource management activities proposed for alternative E (the no ORV alternative) are the same activities proposed for alternative A (the no-action alternative) and their impacts</p>

Impact Topic	Summary
	<p>would be the same. However, under alternative E there would be no public use of ORVs on the Seashore and surveying and monitoring protocols would be reviewed and may change due to the elimination of impacts from recreational ORV use and a reduction in the amount of impacts from pedestrians. Under alternative A, the North and South Core Banks of the Seashore would remain open to ORV use in designated routes and areas (as documented in the Superintendent's Compendium), except where resource or safety closures are present. When compared to alternative A, alternative E would provide more protection to seabeach amaranth because there would be no impacts related to ORV use and impacts related to other recreational uses would be reduced due to limited access to the ocean front beaches with no ORV use.</p>
State-listed and Special-status Species	<p>Under alternative B, impacts on state-listed and special-status bird species from resource management activities would be slightly less than impacts under alternatives A (the no-action alternative) and E (the no-ORV alternative) because there would be more consistent training and supervision of resource staff conducting the surveys, the limited predator removal in alternative B, establishing pre-nesting closures by March 16 (15 days earlier than under alternative A, not applicable to alternative E), and the increased education and research programs. ORV and other recreational use would result in long-term adverse impacts on state-listed and special-status bird species under alternative B. Allowing continued ORV access on approximately 81 percent (45 miles) of the Seashore would contribute to these long-term impacts, including noise disturbance, temporary displacement, and possibly injury/mortality of individuals. However, impacts under alternative B would be less than impacts incurred under alternative A (the no-action alternative) due to increased education and outreach, the closing of ORV routes where no ferry access is available, the prohibition on all high-performance sport-model and two-stroke ATVs and UTVs at the Seashore, prohibiting night driving from May 1 through August 31, the ORV permitting system, the likely increased compliance with resource closures due to increased law enforcement and interpretative staffing positions, and the more intensive management actions that could be implemented under the adaptive management strategy. However, the impacts on state-listed and special-status bird species from ORV and other recreational uses under alternative B would be greater than those incurred under alternative E because no public ORV access would be allowed at the Seashore under alternative E.</p> <p>Impacts on state-listed and special-status bird species from resource management activities under alternative C would be slightly less than for alternatives A (the no action alternative) and E (the no ORV alternative). This is due to more consistent training and supervision of resource staff conducting the surveys, the limited predator removal under alternative C, increased educational and research efforts, and the winter vehicle closure from December 16 through March 15 (not applicable to alternative E). Under alternative C, ORV and other recreational use would result in long-term adverse impacts on state-listed birds from noise disturbance, temporary displacement, and possibly injury/mortality of individuals. However, these impacts would be less than those incurred under alternative A, due to a seasonal prohibition on night driving from May 1 through September 14, the increase in the amount of pedestrian-only use areas by 4 miles, the closing of ORV routes where no ferry access is available, the prohibition on all high-performance sport-model and two-stroke ATVs and UTVs at the Seashore, shortening the timeframe that non-sport ATVs and UTVs would be permitted within the Seashore each year (reducing the March 16 through December 31 time under alternative A to September 15 through December 15), the reduction in the amount of Seashore open for ORV use, the fee-based ORV permitting system that would also limit the number of vehicles on the Seashore, the likely increased compliance with resource closures due to increased law enforcement and interpretative staffing positions, and the more intensive management actions that could be implemented under the adaptive management strategy. Compared to alternative E, the amount of impacts on state-listed and special-status bird species under alternative C would be greater due to public ORV use being allowed under alternative C whereas it would be prohibited under alternative E.</p> <p>Under alternative D, impacts on state-listed and special-status bird species from resource management activities would be less than those under alternatives A (the no-action alternative) and E (the no ORV alternative). This is due to more consistent training and supervision of resource staff conducting the surveys, the limited predator removal, expanded buffers around American oystercatchers, colonial waterbirds, and least terns, the expansion of brood buffers based on the mobility of the brood, and the increased education and monitoring efforts. ORV</p>

Impact Topic	Summary
	<p>and other recreational use would result in long-term adverse impacts on state-listed birds under alternative D from noise disturbance, temporary displacement, and possibly injury/mortality of individuals. However, these impacts would be less than those incurred under alternative A. This is due to the expansion of pedestrian-use only areas by 10 miles; the prohibition on night time driving from May 1 through September 14, the closing of ORV routes where no ferry access is available, the prohibition of all ATVs, as well as all high-performance sport-model and two-stroke UTVs at the Seashore, shortening the time frame that utility-model UTVs would be permitted within the Seashore each year (reducing the March 16 through December 31 time under alternative A to September 15 through December 15), the reduction in the amount of Seashore open for ORV use, the fee-based ORV permitting system with a limit on the number of vehicles allowed which would reduce the number of public ORVs allowed on the Seashore by 8 percent in order to keep the average vehicle density similar to historical use, the likely increased compliance with resource closures due to increased law enforcement and interpretative staffing positions, and the more intensive management actions that could be implemented under the adaptive management strategy. Compared to alternative E, the amount of impacts on state-listed and special-status bird species under alternative D would be greater due to public ORV use being allowed under alternative D whereas it would be prohibited under alternative E.</p> <p>The resource management activities proposed for alternative E (the no ORV alternative) are essentially the same activities proposed for alternative A (the no action alternative) except that no recreational ORV-specific closures would be established, and surveying and monitoring protocols would be reviewed and may change given the prohibition of ORVs on the Seashore, the likely lower pedestrian presence resulting from this, and the fact that with no ORV access, pedestrian use would likely be centered around the ferry landing areas, the cabins, and Power Squadron Spit where visitors can easily access the beach by their own boats. Under alternative A, the North and South Core Banks of the Seashore would remain open to ORV use in designated routes and areas (as documented in the Superintendent's Compendium), except where resource or safety closures are present. There would be no night driving restrictions under alternative A and no restrictions on the number of vehicles allowed on the Seashore either. Therefore, when compared to alternative A, alternative E would provide more protection to state-listed and special-status bird species because there would be no impacts related to public ORV use, and impacts related to other recreational uses would be reduced due to limited access to the ocean front beaches due to no public ORV use.</p>
Other Wildlife and Wildlife Habitat	<p>Alternative E would provide the highest level of protection and result in fewer adverse impacts compared to alternatives A, B, C, or D. Under alternative E, although continued pedestrian access would likely result in short-term disturbance (e.g., noise, temporary disturbance) of wildlife and wildlife habitat, long-term beneficial impacts would result from prohibiting ORV access at the Seashore as native habitat would have the opportunity to recover from heavy vehicle use and a considerable source of disturbance would be removed.</p> <p>Impacts of ORV and other recreational use would result in long-term adverse impacts on wildlife and wildlife habitat under alternative B. Allowing continued ORV access along approximately 81 percent (45 miles) of the Seashore would contribute to these long-term impacts, including noise disturbance, temporary displacement, and potentially injury/mortality of individuals. However, impacts would be reduced when compared to alternative A (the no-action alternative) due to increased education and outreach; the use of additional species management measures, such as a seasonal restriction on night driving from May 1 through August 31; and the prohibition on all high-performance sport-model and two-stroke ATVs and UTVs. Compared to alternative E, impacts on wildlife and wildlife habitat would be greater under alternative B, because alternative E prohibits public ORV use on the Seashore, eliminating this source of adverse impact to wildlife and wildlife habitat. Further, alternative E reduces the impact from pedestrians, who without transportation opportunities to more remote areas of the Seashore would likely be limited to areas in general proximity to the ferry landing areas.</p> <p>Under alternative C, the impacts of ORV and other recreational use would result in long-term adverse impacts on wildlife and wildlife habitat from noise disturbance, temporary displacement, and potentially injury/mortality of individuals. However, impacts would be reduced when compared to alternative A (the no-action alternative), due to increased education and outreach; the use of additional species management measures, such as a seasonal restriction on night driving from May 1 through September 14; the increase in the amount of</p>

Impact Topic	Summary
	<p>pedestrian-only use areas by 4 miles; the closing of ORV routes where no ferry access is available; the prohibition of all high-performance sport-model and two-stroke ATVs and UTVs at the Seashore; shorting the timeframe that non-sport ATVs and UTVs would be permitted within the Seashore each year (reducing the March 16 through December time under alternative A to September 15 through December 15); the reduction in the amount of Seashore open to public ORV use; and the fee-based ORV permitting system that would also limit the number of vehicles on the Seashore. Compared to alternative E, the severity of impacts on wildlife and wildlife habitat under alternative C would be greater due to public ORV use being allowed under alternative C, whereas it would be prohibited under alternative E. The prohibition of public ORV use under alternative E would also reduce the amount of impacts from pedestrians, because without ORVs to access remote areas of the Seashore, pedestrians would likely be limited to areas in general proximity to the ferry landing areas.</p> <p>Alternative D would also result in long-term adverse impacts on wildlife and wildlife habitat from disturbance, temporary displacement, and potentially injury/mortality of individuals. However, impacts would be reduced when compared to alternative A (the no-action alternative), due to increased education and outreach; the use of additional species management measures, such as a seasonal restriction on night driving from May 1 through September 14; the closing of ORV routes where no ferry access is available; the reduction in the amount of Seashore open to public ORV use; the implementation of a vehicle permit program and the reduction in the number of public ORVs allowed on the Seashore by 8 percent; the prohibition of all ATVs, as well as all high-performance sport-model and two-stroke UTVs at the Seashore; and the shortening of the timeframe that non-sport UTVs would be permitted within the Seashore each year (reducing the March 16 through December 31 timeframe under alternative A to September 15 through December 15). Compared to alternative E, impacts on wildlife and wildlife habitat under alternative D would be greater due to public ORV use being allowed under alternative D, whereas it would be prohibited under alternative E. The prohibition of public ORV use under alternative E would also reduce the amount of impacts from pedestrians, because without ORVs to access remote areas of the Seashore, pedestrians would likely be limited to areas in general proximity to the ferry landing areas.</p> <p>Under alternative E, prohibiting public ORV use at the Seashore would provide long-term beneficial impacts to wildlife and wildlife habitat compared to alternative A, under which public ORV use would be allowed along approximately 81 percent of the Seashore. While continued pedestrian access under alternative E could result in some short- and long-term disturbance (e.g., noise, temporary displacement, etc.) of wildlife, these impacts would be reduced compared to alternative A because without the use of ORVs, pedestrian use under alternative E would likely be limited to areas in the general proximity to the ferry landing areas. As a result, alternative E would provide more protection and result in fewer adverse impacts to wildlife and wildlife habitat compared to alternative A.</p>
Soundscapes/ Acoustic Environment	<p>Alternative B would result in fewer impacts than alternative A through various management measures, including prohibition of high-performance sport-model ATVs and limits on night driving. Alternative B would result in greater impacts to soundscapes than alternative E because ORV use would be permitted.</p> <p>Alternative C would result in fewer impacts than alternative A through various management measures, including reduced area of beach available for ORV use (74 percent of Seashore beach would be available for ORV use from the Friday preceding Memorial Day through Labor Day (compared to 81 percent under alternative A), a limit on vehicle permits, and limiting ATV use to the period between September 15 and December 15. Alternative C would result in greater impacts to soundscapes than alternative E because ORV use would be permitted.</p> <p>Alternative D would result in fewer impacts than alternative A through various management measures, including reduced area of beach available for ORV use (63 percent of Seashore beach would be available for ORV use from the Friday preceding Memorial Day through Labor Day (compared to 81 percent under alternatives A), a limits on vehicle permits, and prohibition of ATV use. Alternative D would result in greater impacts to soundscapes than alternative E because visitor auto/truck use would be permitted.</p> <p>Alternative E would result in fewer impacts to soundscapes than alternative A because all ORV use would be eliminated (low levels of NPS administrative ORV use would continue under alternative E).</p>

Impact Topic	Summary
Visitor Use and Experience	<p>Compared to alternative A, impacts on ORV users under alternative B would be slightly more adverse, due to the expanded rules and regulations that would be implemented under alternative B, such as night driving, vehicle requirements, and vehicle permits. Compared to alternative A, impacts on non-ORV users would not be noticeable. Compared to alternative E, impacts on ORV users under alternative B would be beneficial, as ORV use would be prohibited under alternative E. Compared to alternative E, impacts on non-ORV users would be noticeably adverse, due to the presence of ORVs under alternative B.</p> <p>Compared to alternative A, impacts on ORV users under alternative C would be slightly more adverse, due to the expanded rules and regulations that would be implemented under alternative C, such as night driving, vehicle requirements, vehicle permits, and vehicle restrictions. Compared to alternative A, impacts on non-ORV users would be beneficial. Compared to alternative E, impacts on ORV users under alternative C would be considerably beneficial, due to the prohibition of ORVs under alternative E. Compared to alternative E, impacts on non-ORV users would be noticeably adverse, due to the continued presence of ORVs under alternative C.</p> <p>Compared to alternative A, impacts on ORV users under alternative D would be more adverse, due to the expanded rules and regulations that would be implemented under alternative D, such as night driving, vehicle requirements, an 8 percent reduction in the number of vehicle permits, and vehicle restrictions. Compared to alternative A, impacts on non-ORV users would be slightly beneficial, due to the increase in pedestrian-only areas. Compared to alternative E, impacts on ORV users under alternative D would be considerably beneficial, due to the prohibition of ORVs under alternative E. Compared to alternative E, impacts on non-ORV users would be noticeably adverse, due to the presence of ORVs under alternative D.</p> <p>Compared to alternative A, impacts on ORV users under alternative E would be substantially adverse, as ORVs would be prohibited throughout the entire Seashore. Impacts on non-ORV users would be long-term and beneficial, as ORVs would be prohibited throughout the entire Seashore. However, the benefits of alternative E to non-ORV users would be primarily limited to the areas of the Seashore that are within reasonable walking distance of a ferry landing, and further limited if those areas become over-crowded with pedestrians.</p>
Socioeconomic Resources	<p>Alternative A would result in long-term, beneficial impacts relative to alternative E for businesses that serve current ORV visitors. Alternative A would result in continued revenue from ORV visitors, which would provide support for businesses that serve these visitors and the economy of the ROI.</p> <p>Alternatives B, C, and D may result in long-term adverse impacts resulting from a loss of visitor spending relative to alternative A for businesses that serve visitors using ORVs if the restrictions on ORVs such as the prohibition of night driving in the summer, loss of long-term parking, restrictions on ATVs and UTVs and the permit fee and education requirements result in fewer visitors and lower visitor spending. Adverse impacts relative to alternative A would be greater under alternatives C and D, than B, because additional use restrictions are added such as more pedestrian-only areas, no long-term parking available (under alternative D), additional limitations on ATV and UTV use, and a limit on the number of vehicle permits available. The smaller percentage of beach open to ORVs under alternative C compared to alternative A might result in increased crowding, which could result in a reduction in visitation and greater impacts to those businesses that rely on Seashore visitation. Under alternative D, additional adverse impacts would be realized from prohibitions on all ATVs and sport-model UTVs, seasonal restrictions on non-sport UTVs, and lower limits on vehicle permits, all of which would result in fewer visitors and less visitor spending. The loss of long-term parking under alternative D could have positive or negative impacts on the number of ferry trips visitors make relative to alternative A.</p> <p>Alternatives A, B, C, and D offer long-term, beneficial impacts for businesses serving ORV visitors and the economy of the ROI when compared to alternative E because these alternatives allow ORVs on the islands, which would result in more visitors and spending by visitors in the ROI. The benefits to the ROI from alternatives A, B, C, and D relative to alternative E are not expected to be noticeable because the revenue from ORV visitors is small compared to the size of the economy of the ROI. However, the specific businesses that serve ORV visitors would experience noticeable beneficial impacts under all the other alternatives relative to alternative E because they would continue to profit from ORV visitor traffic.</p>

Impact Topic	Summary
Seashore Management and Operations	<p>Compared to alternative A, implementation of alternatives B and C (which have the same impacts to Seashore management and operations) would result in long-term noticeable adverse impacts on Seashore management and operations due to the increase in staffing and personnel costs in order to enforce visitor compliance with ORV regulations and resource closures, enforce nighttime driving restrictions, work with vehicle ferry operators, provide visitors with ORV closure information, manage a vehicle permit system, develop, update and manage the education certificate, manage the ORV parking lots, record the number of vehicles operating or stored at the Seashore each day, attend meetings of local organizations and present information regarding ORV use and species protection, construct additional ramps along the back route, and designate emergency overnight parking areas. Total approximate annual cost to implement alternative B, as well as alternative C, would be \$941,000 (plus one-time, first-year cost of \$190,000), compared to an approximate annual cost of \$486,500 to implement alternative A, resulting in an increase of \$454,500 annually that would need to be covered with additional permit fees or new funding sources (including the one-time cost of \$190,000, the first-year cost would be \$1,131,000).</p> <p>Compared to alternative A, implementation of alternative D would result in long-term noticeable adverse impacts on Seashore management and operations. This is due to the considerable increase in staffing and funding needs in order to enforce visitor compliance with ORV regulations and resource closures over a 9-month visitor season, enforce nighttime driving restrictions, work with vehicle ferry operators, provide visitors with ORV closure information, manage a vehicle permit system, develop, update and manage the education certificate, manage the ORV parking lots, record number of vehicles operating or stored at the Seashore each day, attend meetings of local organizations and presenting information regarding ORV use and species protection, construct additional ramps along the back route, and designate emergency overnight parking areas. Total approximate annual cost to implement alternative D would be \$941,000, compared to an approximate annual cost of \$486,500 to implement alternative A, resulting in an increase of \$454,500 annually that would need to be covered with additional permit fees or new funding sources.</p> <p>Compared to alternative A, the implementation of alternative E would have long-term beneficial effects on Seashore management and operations. For alternative E, implementation would allow a decrease staffing, and a decrease in annual spending across all Seashore operations. Total approximate annual cost to implement alternative E would be \$398,500.</p>

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Acronyms

ATV	all-terrain vehicle
BOEM	Bureau of Ocean Energy Management
CEQ	Council on Environmental Quality
CUA	commercial use authorization
CZMA	Coastal Zone Management Act
CZMP	coastal zone management program
dB	decibel
dBA	A-weighted decibel
DPS	distinct population segments
EA	environmental assessment
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FONSI	Finding of No Significant Impact
FTE	full-time equivalent
GIS	Geographical Information System
MBTA	Migratory Bird Treaty Act
MLLW	mean lower low water
NCWRC	North Carolina Wildlife Resources
NEPA	National Environmental Policy Act
National Register	National Register of Historic Places
NPS	National Park Service
ORV	off-road vehicle
PCE	primary constituent element
PEPC	Planning, Environment and Public Comment
plan/EIS	Off-road Vehicle Management Plan / Environmental Impact Statement
ROD	Record of Decision
ROI	region of influence
RV	recreational vehicle
SHPO	State Historic Preservation Office
TNM	Traffic Noise Model
USFWS	U.S. Fish and Wildlife Service
UTV	utility-type vehicle

Chapter 1:

Purpose of and Need for Action

CHAPTER 1: PURPOSE OF AND NEED FOR ACTION

This “Purpose of and Need for Action” chapter explains what this plan intends to accomplish and why the National Park Service (NPS) is evaluating a range of alternatives and management actions for off-road vehicle (ORV) use at Cape Lookout National Seashore (the Seashore). This Off-road Vehicle Management Plan and Environmental Impact Statement (ORV management plan/EIS) presents four action alternatives for managing ORV use, and one action alternative prohibiting ORV use. It assesses the impacts that could result from continuing current management (the no-action alternative) or implementation of any of the action alternatives. At the conclusion of this plan and decision-making process, the alternative selected for implementation will become the ORV management plan, which will guide the management and control of ORVs at the Seashore for the next 15 to 20 years. It will form the basis for a special regulation to manage ORV use at the Seashore, if allowed. This plan covers private, recreational ORV use only. As stated in Executive Order 11644, vehicles that are authorized under a contract or used for official Seashore use are excluded from this plan. Brief summaries of the purpose and need are presented here; however, more information is available in the “Park Background” section in this chapter.

Off-road vehicle (ORV)—Any motorized vehicle designed for or capable of cross-country travel on or immediately over land, water, sand, snow, ice, marsh, swampland, or other natural terrain.

PURPOSE OF THE PLAN / ENVIRONMENTAL IMPACT STATEMENT

The purpose of this ORV management plan/EIS is to evaluate whether or not to allow ORV use. If ORV use is allowed, this ORV management plan/EIS will address how to manage that use in compliance with the Seashore’s enabling legislation, executive orders, NPS management policies, and other laws and regulations to ensure protection of the natural, cultural, and recreational values of the Seashore’s dynamic coastal barrier island environment for present and future generations.

NEED FOR ACTION

Cape Lookout National Seashore provides a variety of visitor experiences, including the use of ORVs. In addition to recreational opportunities, the Seashore is home to important habitats created by the Seashore’s dynamic environmental processes. Several habitats support federally listed species, including the piping plover (*Charadrius melodus*); four species of sea turtles (loggerhead (*Caretta caretta*), green (*Chelonia mydas*), Kemp’s Ridley (*Lepidochelys kempi*), and leatherback (*Dermochelys coriacea*)); and one plant species, the seabeach amaranth (*Amaranthus pumilus*). In addition to these listed species, the Seashore hosts colonial waterbirds, protected under the Migratory Bird Treaty Act (MBTA); the American oystercatcher (*Haematopus palliatus*), protected under the MBTA and listed as a species of special concern by the state of North Carolina; and other North Carolina species of special concern, such as the Wilson’s plover (*Charadrius wilsonia*), the least tern (*Sterna antillarum*), and the red knot (*Calidris canutus*). The Seashore is home to many other unique habitats such as marshes, tidal flats, and riparian areas (ecosystems that occur along watercourses or water bodies), all of which support a variety of wildlife species (NPS 2004a). This long-term ORV management planning effort is based on recognition by the NPS that if allowed, ORVs must be regulated in a manner that is consistent with applicable law, and in a manner that appropriately addresses resource protection (including protected, threatened, and endangered species), potential conflicts among the various Seashore users, and visitor safety.

Executive Order 11644, issued in 1972 and amended by Executive Order 11989 in 1977, states that federal agencies allowing ORV use must designate specific areas and trails on public lands where the use of ORVs may be permitted and areas where use is not permitted. Agency regulations that authorize ORV use provide that designation of such areas and trails will be based on the protection of the resources of public lands, promotion of the safety of all users of those lands, and minimization of conflicts among the various uses on those lands. Executive Order 11644, *Use of Off-road Vehicles on the Public Lands*, was issued in response to the widespread and rapidly increasing use of ORVs on public lands “often for legitimate purposes but also in frequent conflict with wise land and resource management practices, environmental values, and other types of recreational activity.” Title 36 of the Code of Federal Regulations (CFR), section 4.10(b) requires that “routes and areas designated for off-road motor vehicle use shall be promulgated as special regulations.” In addition, such routes and areas may only be designated in national recreation areas, national seashores, national lakeshores, and national preserves.

An ORV management plan for Cape Lookout National Seashore is needed at this time to

- Comply with Executive Orders 11644 and 11989 regarding ORV use, and with NPS laws and regulations (36 CFR 4.10) and policies to minimize impacts on Seashore resources and values;
- Establish an approved plan incorporating public input that evaluates whether or not to allow ORV use, and reduces the potential for inconsistent management of ORV use, user conflicts, and safety concerns where ORV use may be allowed;
- Provide for sustainable recreational use;
- Protect natural and cultural resources from potential effects of ORV use; and
- Provide for protected species management in relation to ORV and other uses and replace the *Cape Lookout National Seashore Interim Protected Species Management Plan / Environmental Assessment* (NPS 2006a) and associated *Biological Opinion* (USFWS 2007a) in compliance with all associated laws and regulations such as the Endangered Species Act (ESA) and MBTA.

OBJECTIVES IN TAKING ACTION

Objectives are “what must be achieved to a large degree for the action to be considered a success” (NPS 2001a). All alternatives selected for detailed analysis must meet project objectives to a large degree and resolve the purpose of and need for action. Objectives must be grounded in the Seashore’s enabling legislation, purpose, significance, and mission goals, and must be compatible with direction and guidance provided by the Seashore’s planning and management guidance. The following are objectives identified during public scoping and by NPS staff for developing this ORV management plan/EIS. Some objectives are only applicable to those alternatives allowing ORV use.

MANAGEMENT METHODOLOGY

- Establish ORV management practices and procedures that have the ability to adapt in response to changes in the Seashore’s dynamic physical and biological environment.
- Continue an ongoing and meaningful dialogue with the multiple public groups interested in and/or affected by ORV management.
- Establish procedures for prompt and efficient public notification of management actions (for example, beach access status) including any temporary ORV use restrictions for reasons such as resource and public safety closures or storm events.

- Build stewardship through public awareness and understanding of NPS resource management and visitor use policies and responsibilities as they pertain to the Seashore and ORV management.

NATURAL PHYSICAL RESOURCES

- Minimize impacts from ORV use to soils and topographic features; for example, dunes, ocean beach, wetlands, tidal flats, and other features.

THREATENED, ENDANGERED, AND OTHER PROTECTED SPECIES

- Provide protection for threatened, endangered, and other protected species (e.g., state-listed species) and their habitats, and minimize impacts related to ORV and other uses as required by laws and policies, such as the ESA, the MBTA, and NPS laws and management policies.

VEGETATION

- Minimize impacts on native plant species related to ORV use.

OTHER WILDLIFE AND WILDLIFE HABITAT

- Minimize impacts on other wildlife species and their habitats related to ORV use.

CULTURAL RESOURCES

- Protect cultural resources, such as shipwrecks, archeological sites, and cultural landscapes, from impacts related to ORV use.

VISITOR USE AND EXPERIENCE

- Manage ORV use to allow for a variety of appropriate visitor use experiences.
- Minimize conflicts between ORV use and other users. Retain an experience where typically a family or individual traveling by ORV can experience the Seashore by finding a remote and otherwise unused stretch of beach.
- Retain a non-ORV experience that allows access to a beach that is undisturbed by motorized uses.

VISITOR SAFETY

- Ensure that ORV management promotes the safety of all visitors.

PARK OPERATIONS

- Ensure that core operational needs and associated costs required to fully implement an ORV management plan and to monitor species and ORV use are identified.

PROJECT STUDY AREA AND SCOPE

The geographic study area for this ORV management plan/EIS is Cape Lookout National Seashore in North Carolina (figure 1), including all barrier islands within the Seashore from Ocracoke Inlet to Beaufort Inlet. As of December 2012, these islands included the North Core Banks, South Core Banks (collectively known together as the Core Banks), and Shackleford Banks. Should any inlets or new islands form due to natural processes within the study area during this decision-making process, those areas would be addressed with this plan. This plan addresses private recreational ORV use only. Commercial uses are addressed in the *Cape Lookout National Seashore Commercial Services Plan / Environmental Assessment*, and both commercial and administrative uses are by definition excluded as “off-road vehicles” by Executive Order 11644, section 2, subsection 3.

PARK BACKGROUND

HISTORY OF CAPE LOOKOUT NATIONAL SEASHORE

Cape Lookout National Seashore was authorized as a unit of the NPS on March 10, 1966. Congress authorized the establishment of Cape Lookout National Seashore as a unit of the NPS “to preserve for public use and enjoyment an area in the State of North Carolina possessing outstanding natural and recreational values.” In 1976, the NPS gained ownership of the land and the Seashore was established. Located approximately 3 miles off the mainland coast in the central coastal area of North Carolina, the Seashore occupies more than 29,000 acres of land and water from Ocracoke Inlet to Beaufort Inlet (figure 2). The 56 miles of barrier islands consist mostly of wide, bare beaches with low dunes covered by scattered grasses, flat grasslands bordered by dense vegetation, maritime forest on Shackleford Banks, and large expanses of salt marsh alongside the sound. Natural processes continually change the shape of the barrier islands; currently, Cape Lookout National Seashore is a string of barrier islands consisting of North Core Banks, South Core Banks, Middle Core Banks, and Shackleford Banks (figure 2). However, due to storm events, Middle Core Banks may connect or disconnect from North Core Banks or South Core Banks during the life of this plan.

The northernmost island, North Core Banks, is now approximately 22 miles long, extending from Ocracoke Inlet to “Ophelia Inlet,” a new inlet opened by Hurricane Ophelia in 2005. South Core Banks extends southward from the newly created inlet for 25 miles. These two islands, collectively known as the Core Banks, have a northeast to southwest orientation and exhibit a low profile landscape. The third island, Shackleford Banks, is 9 miles long and has an east-west orientation with a higher dune system and larger areas of vegetation. All of the islands of Cape Lookout National Seashore are subject to constant and dramatic change by the actions of wind and waves, and therefore the study area of this plan addresses the creation of new islands or the re-combination of existing islands.

SUMMARY OF CURRENT OFF-ROAD VEHICLE USE AND MANAGEMENT AT CAPE LOOKOUT NATIONAL SEASHORE

On-the-ground management currently allows ORVs to drive on the beach in front of the primary dune line and on designated routes. On North Core Banks, a designated ORV route, locally referred to as the back route, runs behind the primary dune line from mile marker 4 to mile marker 19. Due to the reopening of Old Drum Inlet the back route from mile marker 19 to Ophelia Inlet at mile marker 22 is currently closed. On South Core Banks, the back route runs from just south of Ophelia Inlet at mile marker 24 to the point of Cape Lookout at mile marker 44. This back route is critical for management of protected species and for allowing a safe route for ORV travel, allowing access around full beach closures or areas where the high tide line limits driving on the ocean beach.



FIGURE 1: CAPE LOOKOUT NATIONAL SEASHORE REGIONAL MAP

In areas where the back route is available, ramps to the beach exist every mile or so. Starting at mile marker 4 and continuing to the point of Cape Lookout at mile marker 44, the ramps allow vehicles to cross between the beach and the back route. Vehicles can only cross from the beach to the back route using ramps.

Sensitive habitat and species at the Seashore are managed within the context of a variety of visitor-use patterns, which include the use of ORVs. The number of recreational visitors to the Seashore fell from approximately 625,400 in 2001 to approximately 480,290 in 2012, a decline of approximately 23 percent. During these years, visitation fluctuated from year to year with a low of 480,290 in 2012, when the ferry service to the Seashore closed earlier than usual due to Hurricane Sandy, and a high of 860,602 in 2007. Visitors to the Seashore participate in a variety of recreational activities, including beach recreation (swimming, windsurfing, sunbathing, etc.), fishing (surf and boat), motorized boating, camping, shell collecting, historical tourism, nature/eco-studies (birding, horse watching), harvesting of shellfish, nonmotorized boating (sailing, kayaking, canoeing), hunting, hiking, and photography (NPS 2004a). For many visitors ORV use and beach driving provide access to these activities. The main user groups at the Seashore are campers, anglers, and day-use beach-goers.

ORV use at Cape Lookout National Seashore predates authorization of the Seashore in 1966. ORV use is not addressed in the Seashore's enabling legislation (16 USC 459 g-3); however, fishing is specifically authorized. Beginning in the 1930s, vehicles were transported to the banks by shallow draft ferries and were used to provide access to productive commercial and recreation fishing spots, as well as for other recreational pursuits such as sightseeing and camping. Today, ORVs provide vehicular access to the Seashore beaches for recreational purposes, including activities such as surf-fishing, surfing, sunbathing, swimming, bird-watching, and camping, visiting historic structures and site seeing, among other activities.

ORV routes are designated and ORV use is currently managed through the Superintendent's Compendium, which allows for ORV use from March 16 through December 31 (with a closure of the Seashore to ORVs from January 1 through March 15). Where authorized in the compendium, ORV routes are generally designated at the following locations:

- The ocean beach from the toe of the dune line forward to the water's edge.
- A designated and marked ORV back route running behind the primary dune line parallel to the ocean beach on about 85 percent of North Core Banks and South Core Banks. This sand route, referred to locally as the back route, provides an alternative ORV route allowing vehicles to get around high tide conditions and areas closed to vehicles for protection of resources.
- Designated/marked crossover routes (ramps) connecting the ocean beach to the back route, occurring at about every mile marker.
- Designated routes to provide limited soundside access, access to ferry locations and cabin camps, and NPS official access (referred to as administrative access).



FIGURE 2: CAPE LOOKOUT NATIONAL SEASHORE MAP

The *General Management Plan* (NPS 1980) identified 47 of the 56 miles of the Seashore as appropriate for controlled ORV use; the remaining 9 miles on Shackleford Banks is a proposed wilderness area under the Wilderness Act (P.L. 88–577) and is managed as wilderness and closed to vehicle use. Currently, of the 47 miles identified as appropriate for ORV use, 2 miles are closed to ORVs permanently on South Core Banks: approximately 0.7 mile in the vicinity of the lighthouse (mile marker 41–42) is closed as a pedestrian-only area for visitor safety, and 1.3 miles are closed at the end of Power Squadron Spit (mile marker 46–47) to provide visitors to this area with a nonmotorized recreational experience. Based on data collected by NPS staff from 2008 through 2013 (NPS pers. comm. 2013e), approximately 10 miles along the ocean beach are closed to ORV use periodically for resource protection during the nesting season (summer). Resource protection closures are temporary, lasting only during the nesting and fledgling or hatching (turtles) stages of the species. With the exception of turtle relocation areas, resource protection closure areas vary from year to year depending on the location of breeding activity. With these closures, approximately 35 miles of the Seashore are available for ORV use in the summer. Based on the same data, an average of 5.4 miles along the ocean beach are closed to ORV use periodically for resource protection during the fall (September through November). In December, the resource closures are not in place and approximately 45 miles of the Seashore are available for ORV use. ORV use is prohibited January 1 through March 15 by the Superintendent’s Compendium. Except for seasonal species closures, established in a manner consistent with the 2006 *Cape Lookout National Seashore Interim Protected Species Management Plan / Environmental Assessment*, and the 2 miles permanently closed on South Core Banks, 45 miles between North Core Banks and South Core Banks are authorized for ORV use.

Cape Lookout can only be accessed by boat. Visitors access the Seashore by passenger ferry (figure 3), vehicle ferry, or private vessels. Passenger ferries currently access the Seashore from Ocracoke, Morehead City, Harkers Island, and Beaufort. From these departure points, visitors access the Seashore at designated ferry landings at Portsmouth Village (North Core Banks), Cape Lookout Lighthouse (South Core Banks), and the east and west end of Shackleford Banks.



FIGURE 3: VEHICLE AND PASSENGER FERRIES AT CAPE LOOKOUT NATIONAL SEASHORE

Vehicle ferries depart from Atlantic (North Core Banks) and Davis (South Core Banks), and access the Seashore at designated ferry landings at Long Point and Great Island (figure 2). Pedestrians without ORVs may also use these ferries to access the Seashore. Long Point and Great Island are the locations of rustic cabins that visitors can rent (figure 4). Visitors can store vehicles in NPS-operated parking lots (one on North Core Banks and three on South Core Banks) for a current fee of \$15 per week during the period

that the islands are open to vehicles (currently March 16 through December 31) (figure 5). Vehicle storage at the Seashore is not permitted from January 1 through March 15.



FIGURE 4: RENTAL CABINS ON SOUTH CORE BANKS



FIGURE 5: OFF-ROAD VEHICLE PARKING LOT ON SOUTH CORE BANKS

The Seashore recommends ORV owners remove their vehicles from the Seashore when hurricanes or tropical storms are threatening the area. There is rarely enough lead-time to remove all the vehicles in the storage lots. The Seashore maintains records, from ferry operator data, about the number of vehicles transported to and from the Seashore by ferry. Obtaining exact counts of the number of ORVs actively being used on ORV routes at the Seashore at any given time is difficult because, once these vehicles reach the Seashore, they may stay for a day, a week, or the entire season, and because many of the vehicles are stationary within the parking lot. However, based on data collected from 2005 through 2010, it is estimated that approximately 2,500 ORVs are transported by ferry to North Core Banks (Long Point ferry landing), and approximately 3,000 ORVs are transported by ferry to South Core Banks (Great Island ferry landing) each year (NPS pers. comm. 2013f). Based on counts conducted by the Seashore from 2011 through 2013, as many as 124 vehicles are operated on North Core Banks at one time, and as many as 218 vehicles are operated on South Core Banks at one time (NPS pers. comm. 2013g).

Currently, the NPS manages ORVs at the Seashore through the *Interim Off-road Vehicle Management Report and Evaluation of Existing ORV Use at Cape Lookout National Seashore* (NPS 2007a) which implements the *Cape Lookout National Seashore Interim Protected Species Management Plan / Environmental Assessment* (NPS 2006a) and the associated *Biological Opinion* (USFWS 2007a) and *Finding of No Significant Impact* (FONSI) (NPS 2007b) as well as the Superintendent's Compendium (NPS 2013d). These documents will guide ORV use at the Seashore until this long-term ORV management plan/EIS is implemented.

PURPOSE AND SIGNIFICANCE OF CAPE LOOKOUT NATIONAL SEASHORE

All units of the national park system were formed for a specific purpose (its reason for being) and to preserve significant resources or values for the enjoyment of future generations through their enabling legislation. The Seashore's 1966 enabling legislation (16 USC 459g) provides the key purpose and significance for creating the Seashore as a national park unit. It states:

In order to preserve for public use and enjoyment an area in the State of North Carolina possessing outstanding natural and recreational values, there is hereby authorized to be established the Cape Lookout National Seashore.

The Seashore's 1966 enabling legislation also includes provisions for hunting and fishing and outdoor recreation and enjoyment. These provisions follow:

Section 459g-3: Hunting and fishing provisions: The Secretary shall permit hunting and fishing, including shellfishing, on lands, marshlands, and waters under his jurisdiction within the Cape Lookout National Seashore in accordance with the laws of the State of North Carolina and the United States, to the extent applicable, except that the Secretary may designate zones where, and establish periods when, no hunting or fishing shall be permitted for the reasons of public safety, administration, fish or wildlife management, or public use and enjoyment. Except in emergencies, any rules and regulations of the Secretary pursuant to this section shall be put into effect only after consultation with the North Carolina Wildlife Resources Commission (NCWRC) and the North Carolina Department of Conservation and Development.

Section 459g-4: Administration; public outdoor recreation and enjoyment; utilization of authorities for conservation and development of natural resources: (a) The Secretary shall administer the Cape Lookout National Seashore for the general purposes of public outdoor recreation, including conservation of natural features contributing to public enjoyment. In the administration of the seashore and the administrative site, the Secretary

may utilize such statutory authorities relating to areas administered and supervised by the Secretary through the National Park Service and such statutory authorities otherwise available to him for the conservation and management of natural resources as he deems appropriate to carry out the purposes [of this Act].

The purpose and significance identify uses and values that individual NPS plans should support.

The following provides background on the purpose and significance of Cape Lookout National Seashore, as stated in the Seashore's *Foundation Document* (NPS 2012s).

Purpose—The purpose of Cape Lookout National Seashore is to preserve the outstanding natural, cultural, and recreational resources and values of a dynamic, intact, natural barrier island system, where ecological processes dominate.

Significance—The following significance statements have been identified for Cape Lookout National Seashore (please note that the statements are in no particular order).

- Cape Lookout National Seashore, 56 miles of barrier islands off the North Carolina coast, is an outstanding example of a dynamic, intact, natural barrier island system, where ecological processes dominate.
- Cape Lookout National Seashore is one of the few remaining locations on the Atlantic coast where visitors can experience and recreate in a primarily undeveloped, remote barrier island environment, which can be reached only by boat.
- Cape Lookout National Seashore preserves a diversity of coastal habitats, which support aquatic and terrestrial plant and animal life, including several protected species, such as piping plovers, American oystercatchers, sea turtles, black skimmers, terns, and seabeach amaranth.
- The free-roaming Shackleford Banks wild horse herd is legislatively protected within Cape Lookout National Seashore.
- Cape Lookout National Seashore has a rich concentration of cultural resources that tell the history of people living at the edge of the sea, dating from approximately 3000 BC to the present.
- The Cape Lookout Lighthouse protected the nation's maritime commerce from one of the most significant hazards of the North Carolina coast—the Cape Lookout shoals.
- Cape Lookout National Seashore preserves Portsmouth Village, a National Register Historic District and unique, intact coastal Carolina community that played a critical role in the conduct of maritime commerce in North Carolina from the colonial period until the outbreak of the American Civil War.
- Cape Lookout National Seashore preserves the Cape Lookout Village, a National Register Historic District that was an important community for local families beginning with establishment of a life-saving station at the Cape in 1886.
- Cape Lookout National Seashore provides an outstanding natural laboratory for studying ecological and geological processes, as well as the effects of climate change and sea level rise on the Atlantic coast.

- Cape Lookout National Seashore provides a remote setting for visitors to experience unobstructed ocean views and one of the darkest publicly accessible areas along the East Coast for nighttime vantages.

CAPE LOOKOUT NATIONAL SEASHORE INTERIM PROTECTED SPECIES MANAGEMENT PLAN / ENVIRONMENTAL ASSESSMENT (2006) AND FINDING OF NO SIGNIFICANT IMPACT (2007)

The implementation of the *Cape Lookout National Seashore Interim Protected Species Management Plan / Environmental Assessment* (NPS 2006a) is considered the baseline or existing condition for this ORV management plan/EIS. The *Cape Lookout National Seashore Interim Protected Species Management Plan / Environmental Assessment* was developed to ensure the proper management of protected species and to comply with the ESA, while providing for appropriate use of the Seashore's recreational resources until this long-term ORV management plan/EIS for the Seashore could be implemented. The species addressed in the *Cape Lookout National Seashore Interim Protected Species Management Plan / Environmental Assessment* include species potentially affected by recreational use within the Seashore that are either federally or state-listed as threatened, endangered, or species of special concern and/or are of special concern to the Seashore.

To implement the interim plan, the NPS completed an environmental assessment in accordance with the National Environmental Policy Act (NEPA), and evaluated several alternatives. The actions described under the selected alternative in the *Cape Lookout National Seashore Interim Protected Species Management Plan / Environmental Assessment* are a component of the no-action alternative for this long-term ORV management plan/EIS. Although some elements of the *Cape Lookout National Seashore Interim Protected Species Management Plan / Environmental Assessment* may be incorporated into the action alternatives for this ORV management plan/EIS, the current *Cape Lookout National Seashore Interim Protected Species Management Plan / Environmental Assessment* is an interim document, and will be superseded by the ORV management plan/EIS and record of decision (ROD).

LEGAL FRAMEWORK AND HISTORY OF LITIGATION

One petition for rulemaking has been submitted to the NPS for consideration related to ORV use at the Seashore. This petition, submitted on December 9, 1999, on behalf of the Bluewater Network and 70 environmental organizations, requested rulemaking for all affected parks in the system, and Cape Lookout National Seashore was specifically listed. On November 29, 2005, Friends of the Earth (of which Bluewater Network is a part), with the National Parks Conservation Association, and Wildlands CPR took legal action, filing a lawsuit that claimed the NPS was not protecting park units against the damage caused by ORVs. In May 2008, a settlement was reached between these three groups and the NPS. In this settlement, the NPS was required to implement a pilot public education and deterrence program to curb the illegal use of ORVs in 10 park units, and develop an environmental impact statement (EIS) and a special regulation for ORV use at Cape Lookout National Seashore and Glen Canyon National Recreation Area.

A Notice of Intent was published in the Federal Register on August 7, 2007, announcing the beginning of the ORV planning process for Cape Lookout National Seashore (FR 2007).

SCOPING PROCESS AND PUBLIC PARTICIPATION

NEPA regulations require an “early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action.” To determine the scope of issues to

be analyzed in depth in this ORV management plan/EIS, meetings were conducted with NPS staff and other parties associated with preparing this document, including the public.

PUBLIC SCOPING MEETINGS

Three public scoping meetings were held in mid-September 2007. All three meetings were open-house style sessions with short presentations, which allowed the public to ask NPS staff questions and provide input to the Seashore in a casual atmosphere. These sessions were held September 11 at the Duke Marine Lab in Beaufort, NC; September 12 at North Carolina State University in Raleigh, NC; and September 13 at The Hut in Charlotte, NC. NPS representatives recorded comments from the public. A total of 38 people attended the meeting at the Duke Marine Lab, 26 at North Carolina State University, and 31 in Charlotte, NC.

To keep the public involved and informed following the public scoping meetings, individuals were given the option to receive notification of the availability of this document by either e-mail or mail, and the option to download a copy or have a hardcopy mailed.

The NPS provided the public with a 45-day opportunity to participate in public scoping through mail or online on the Planning, Environment, and Public Comment (PEPC) website. The NPS posted information on the public scoping meetings and additional opportunities to comment before the October 26, 2007, comment deadline.

Though comments varied greatly, most comments focused on the level of access ORVs should have at the Seashore, and on potential elements for managing ORVs. Commenters provided anecdotal information on the types of visitor use and experiences the Seashore provides.

In early April 2008, three additional public meetings were held to solicit public input, focusing on issues and potential alternative elements. The meetings were held on April 7 from 7:00 p.m. to 8:30 p.m. at the Duke Marine Lab in Beaufort, NC; April 8 from 7:30 p.m. to 9:00 p.m. at the McKimmon Center in Raleigh, NC; and April 9 from 7:00 p.m. to 8:30 p.m. at the Bass Pro Shop Outdoor World in Charlotte, NC. The primary goal of these meetings was to obtain public comment on a wide range of alternative elements developed by the interdisciplinary team and based on previous scoping. The public could provide additional alternative elements. Alternatives options workbooks were created to help facilitate and organize the public comments received. The workbooks were divided into six sections: ORV Management, Education and Outreach, Law Enforcement, ORV Permits, Other ORV Management Issues, and Species Protection. A range of preliminary alternative elements was provided in the workbooks and the public voiced their opinions and concerns related to those preliminary alternative options. Whereas some commenters simply agreed or disagreed with the alternative elements provided, others provided more substantive comments by including new alternative elements or by referencing research that helped shape their opinions regarding the elements. In all, a total of 91 completed workbooks were received.

Public comments from the alternatives options workbooks were used to develop distinct action alternatives for ORV management.

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In June 2012, the NPS published a newsletter with a draft range of alternatives for public comment. These alternatives were developed with input from comments received as a result of public scoping meetings and from public comments received on the alternatives options workbooks. Comments received on the newsletter included those in support or opposition of the various alternatives, with support provided for alternative A (no action) and alternative B. Other comments included suggestions on the extent and

location of pedestrian-only areas, suggestions for additional education and the permit system, providing new alternative elements to consider, and concerns about night driving, among others.

As a result of scoping efforts, several issues and impact topics were identified as requiring further consideration (refer to chapter 5 for additional information about scoping).

ISSUES AND IMPACT TOPICS

Issues associated with implementing an ORV management plan at the Seashore were identified by NPS staff during the internal scoping meeting using the Environmental Screening Form, and during public scoping. The issues identified are discussed below and formed the basis for the impact topics discussed in chapters 3 and 4 of this ORV management plan/EIS.

Federally Listed Endangered, Threatened, or Candidate Species

ORV use at the Seashore could impact federally threatened or endangered species and their habitats on the ocean beach of the Seashore. Conflicts between ORVs, other recreational users, and listed species could create direct or indirect losses to the species. Cape Lookout National Seashore is home to federally threatened and endangered species year-round. It is the southern end of the habitat range for some species, while being the northern end for others, including the piping plover and other shorebirds. In addition to these species being at the Seashore year-round, visitor use can occur year-round, increasing the possibility for conflicts between visitors and listed species. The Seashore is used by the Great Lakes population of piping plover (for wintering) and the Atlantic Coast population (for breeding and wintering). Piping plovers are known to exhibit site fidelity, making consistent protection of breeding sites important. The seabeach amaranth is another federally listed species found at the Seashore. Nesting sea turtles at the Seashore include the loggerhead, green, and leatherback turtles, with Kemp's ridley turtles being occasional visitors. As of September 2013, the red knot is proposed for federal ESA listing and is included in this analysis. Current and possible future management alternatives for ORV and other recreational uses would take into consideration the needs of federally listed threatened and endangered species in determining management measures.

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State-listed and Special-status Species

Habitat for locally sensitive species, such as the American oystercatcher, Wilson's plover, and other colonial beach nesters, may be vulnerable to disturbances caused by recreational uses, including ORV use. In 2004, the American oystercatcher was listed by the NCWRC as significantly rare. In October 2004, meetings held to discuss the status of some species in the state, including the American oystercatcher, resulted in adding the American oystercatcher and Wilson's plover to North Carolina's state list of species of special concern (effective May 1, 2008). Contributing to these low rates is the need for large undisturbed areas required for successful breeding. Frequent human disturbance can cause the abandonment of nest sites as well as direct loss of eggs and chicks. From 2004 through 2012 the number of American oystercatchers at the Seashore ranged from 52 to 62 pairs and the number of chicks fledged ranged from 15 to 45 (NPS 2004b, 2005c, 2006c, 2007n, 2008h, 2009e, 2010e, 2011e, 2012p).

Other Wildlife and Wildlife Habitat

Cape Lookout National Seashore is a dynamic coastal barrier ecosystem, resulting in frequent changes in the nature and extent of habitats on the Seashore that impact the management of recreational uses

(including ORVs) and natural resources. Natural processes including hurricanes and other storm events may alter, create, or remove areas of the Seashore used by both ORVs and sensitive species, requiring adaptive management of both recreational uses and natural resources to avoid conflicts. The USFWS describes coastal barrier systems as unique landforms 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 (USFWS n.d.a). Habitats at Cape Lookout National Seashore are constantly changing and adjusting to coastal barrier processes. Ongoing processes, such as rising sea level, have caused a landward migration of the islands. In addition to ongoing processes, storm events can change habitats on the island in a matter of hours, during which overwash occurs by the sea pushing sand to the mainland side in large quantities. As a result, habitats are transformed as dunes intrude into marine forests, areas once vegetated become open sandy beaches, and inlets are created or closed.

Cape Lookout National Seashore provides important habitats and plays a vital role in the survival of many wildlife species. Whether for nesting, resting, foraging, or feeding, the Seashore provides for a diverse assemblage of birds. Rich, varied habitats and the Seashore's location along the Atlantic Flyway attract birds. The American Bird Conservancy designated Cape Lookout National Seashore as a Globally Important Bird Area in recognition of the Seashore's value in bird migration, breeding, and wintering (NPS 2012s). This diverse ecosystem includes prey species that sensitive species rely on for survival, and predators of sensitive species. ORV use along the Seashore can disrupt habitat or cause a loss of habitat in high-use areas. Habitat loss due to ORV use could also occur indirectly as a result of the noise and disturbance from this activity.

Invertebrates are impacted by ORV use. Invertebrate species typically inhabit the intertidal sand flats, wrack line, and moist substrate habitat at the Seashore. Although ORVs are generally driven above the high tide line on the upper beach (especially at high tides), ORVs are driven into the intertidal zone when users seek firm sand when the tide is out. Driving on the sands of the intertidal zone would likely impact invertebrates due to the mortality of individual species caused by compaction under vehicle tires. Access to the intertidal zone often requires vehicles to cross over the wrack line, an area of high concentrations of invertebrates. Driving over the wrack line could crush and scatter seaweed, shells, and macroinvertebrates, causing damage to and dispersal of an important source of food and habitat for many beach invertebrates (Kluft and Ginsberg 2009; Stephenson 1999).

Mammalian species at the Seashore include red fox (*Vulpes vulpes*), gray fox (*Urocyon cinereoargenteus*), coyote (*Canis latrans*), raccoon (*Procyon lotor*), Virginia opossum (*Didelphis virginiana*), eastern cottontail (*Sylvilagus floridanus*), deer mice (*Peromyscus* spp.), white-tailed deer (*Odocoileus virginianus*), muskrat (*Ondatra zibethica*), nutria (*Myocastor coypus*), otter (*Lutra* spp.), mink (*Neovison vison*), and others. The alternatives discussed in this ORV management plan propose the removal of certain mammalian predators and therefore these species will be addressed in the EIS analysis.

Soundscapes/Acoustic Environment

The use of ORVs at the Seashore creates noise emissions that could impact the acoustic environment and the soundscape for visitors, wildlife, and wildlife habitats by adding noise to the ambient natural sound levels of the Seashore. Vehicular noise and the recreational uses associated with vehicles are a component of the acoustical environment at the Seashore. These uses could impact the Seashore acoustic environment by introducing an element that is incompatible with other recreational uses, such as bird-watching, camping, or enjoying the solitude and natural soundscape of the Seashore. The primary source of noise related to ORV use is engine noise. In addition to impacting soundscapes in relation to visitor enjoyment, engine and recreational noise could disturb wildlife and the acoustical environment itself.

Because of the nature of the Seashore environment, the wind and surf create a higher level of ambient noise than other park environments. This ambient noise may reduce the impact of noise at beach locations from vehicles, generators, and other sources. Motorized sources of noise not within the control of the Seashore that impact soundscapes include private boats, U.S. Marine Corps search and rescue helicopters, military aircraft crossing the Seashore from the oceanside headed to the U.S. Navy Cherry Point Range Complex inland from the Seashore, and private aircraft flying over the Seashore.

The U.S. Marine Corps conducts training flights in the Core Military Operations Area, which covers the North Core Banks and all but the southernmost portion of the South Core Banks. In 2013, the NPS and U.S. Marine Corps completed an environmental assessment that lowered the minimum altitude for tactical speed of the Core Military Operations Area from 10,000 feet to 3,000 feet above ground level. Results of soundscapes monitoring conducted in conjunction with a study of potential impacts on special-status bird species found that for 29 flights below 10,000 feet, the maximum sound level experienced at the Seashore was 67.7 A-weighted decibels (dBA). For eight flights near 3,000 feet above ground level, the monitoring showed a substantially higher maximum sound level on the ground at the Seashore—79.7 dBA (DeRose-Wilson et al. n.d.). The NPS and U.S. Marine Corps studies also provide an abundance of information on other types of sounds caused by humans at the Seashore, including ORVs. ORV passbys were more frequent than military aircraft flyovers, but had a lower sound level on average than aircraft flyovers (NCSU 2012).

Visitor Use and Experience

The Seashore's enabling legislation provides for the public use and enjoyment of natural and recreational values. ORV use at the Seashore is an integral component of the experience for some visitors and may be impacted by management activities, which intend to provide for continued visitor use while protecting and conserving natural resources and values. Some Seashore visitors do not use ORVs and may be impacted by ORV use. Currently, there is a mix of recreational uses at the Seashore including camping, fishing, day-use, swimming, bird-watching, and other uses. These recreational uses at the Seashore can be accessed by vehicle and passenger ferry, or personal boat. Although many visitors use an ORV to access specific areas of the Seashore, other visitors wish to engage in recreational activities on foot and away from the presence of motorized vehicles. If management requires restricting areas of the Seashore to ORVs, it could enhance the recreational experience for some and diminish the experience for others. Further, visitor experience could be impacted by conflicts between motorized and nonmotorized recreational users. A further component of visitor experience is providing for the safety of all visitors at the Seashore.

Other issues related to visitor use and experience includes viewsheds, aesthetics, and night skies. ORV use at the Seashore influences the aesthetics of the area. Visual signs of ORV use are present along the shoreline and may impact the viewshed and aesthetics at the Seashore. Some of these signs include numerous tire ruts and markings on the beach and on the vehicle routes behind the dune line. These signs may have negative impacts on the viewshed and aesthetics of the area for those who want a natural and un-impacted view. While just the sight of ORVs can destroy the viewshed and aesthetics for some visitors, they also change the viewshed by altering the natural landscape. ORV use impedes or destroys coastal features like wave or wind ripples in the sand, tide wrack lines, overwash deposits, wind sorted sediments, dune formation, etc. Installing posts around closure areas to protect species from ORVs could also impact the views and aesthetics of the area for those who want a natural view without evidence of manmade materials. However, some posted signs are to notify visitors of pedestrian closures.

Headlights and other artificial lights associated with nighttime ORV use may affect visitors' opportunities to enjoy night skies at the Seashore. Issues related to night skies include night driving, headlights, campfires, and all other light uses associated with human activity after dusk. Cape Lookout National

Seashore is one of the few places on the Atlantic Coast where visitors can experience the magnificence of a dark night sky, particularly when the only artificial light source is the periodic sweep of the Lighthouse beam. Cape Lookout National Seashore is ranked, along with Cape Hatteras National Seashore, as the 9th best national park system unit to view the night sky by the NPS Night Sky Program. The stars, planets, and moon are visible during clear nights and influence humans and many other species of animals, such as birds that navigate by the stars or prey animals that reduce their activities during moonlit nights. Additionally, the phosphorescence of waves on dark nights helps sea turtle hatchlings orient to the ocean. Pursuant to NPS *Management Policies 2006*, section 4.10 (NPS 2006d), to prevent the loss of natural night skies, the NPS should minimize light that emanates from park facilities, and seek the cooperation of park visitors, neighbors, and local government agencies to prevent or minimize the intrusion of artificial light into the night scene of the ecosystems of parks. Furthermore, the NPS will not use artificial lighting in areas such as sea turtle nesting locations where the presence of the artificial lighting could disrupt a park's dark-dependent natural resource components (NPS 2006d).

Socioeconomic Resources

Management or regulation of ORV use at the Seashore could impact the local economy by potentially changing the demand for goods and services from ORV users in these communities. Businesses around and on the way to the Seashore, including the communities of Davis and Atlantic, receive some level of economic benefit from this use as the ORV users take advantage of goods and services these communities offer. Community concerns could include any potential restrictions on ORV use reducing the level of visitation to the Seashore and, therefore, impacting local businesses.

Seashore Management and Operations

Accommodating recreational uses while protecting sensitive species requires sufficient NPS staffing and adequate funding. Park operations (staffing and funding) may both affect and be affected by ORV management strategies. Lack of funding may reduce management flexibility. Effective management of ORV use requires funding for activities such as resource monitoring, law enforcement, education and interpretation, and maintenance/administrative support. The current level of staffing to protect natural resources was funded, in part, by a temporary funding source that became unavailable after fiscal year 2010. This ORV management plan/EIS examines if, under each alternative, there would be enough personnel for ORV management and, if not, the level of staffing needed to effectively implement the alternatives.

ISSUES CONSIDERED BUT DISMISSED FROM FURTHER CONSIDERATION

The following impact topics and issues were dismissed from further analysis, as explained below.

Geologic Resources—ORV use may impact the ocean beach at Cape Lookout National Seashore by disturbing sand, compacting sand, creating ruts, and changing local topography. The paths made by, and maintained for, ORVs can channelize and direct the storm generated overwash flow, causing damage, or even island breaches. Maintenance of ORV routes is important to minimize such erosion. At Cape Lookout, soils at oceanside areas and behind the primary dune line—which consist of sand strand soils such as Newhan, Corolla and Duckston type soils—would continue to be subject to disturbances from ORV use, resulting in sand compaction and the net seaward displacement of sand, but under current levels of use these impacts would be minimal. Incremental contributions to the overall erosion rate would likely occur through the delivery of large quantities of sand to the swash zone, the alternately wet and dry area of the upper part of the beach where intense erosion occurs during storms. The loss of sand from the dune area to the swash zone would result in effects on dune topography and changes to the natural topography of the shoreline. Naturally occurring beach sand replenishment would reduce the impacts of ORV use

near the strand side of barrier islands. Effects from continued ORV use would be more intense and longer lasting further from the source of new sand, such as near dune edges and foredune areas. Impacts from vehicle-related soil disturbances would occur more readily at these locations. Although ORVs have the potential to create these impacts, under current levels of use at the Seashore, these impacts would be minimal, and would not result in noticeable changes to the geology or soils of the Seashore. As all alternatives evaluated would consider use levels generally at or below current levels, no increase in impacts is expected.

Other impacts would be related to where use would or would not be allowed. Currently, ORV use occurs along existing back routes and ramp locations. This includes a marked route from the beach to the Portsmouth Village parking area through the marked area of Portsmouth Flats and the marked back route on North Core and South Core banks, which is the route parallel to the ocean beach behind the primary dune. Soundside back routes are located in grassland and shrub/thicket areas of the barrier islands. These areas consist of Newhan, Corolla, and/or Duckston type soils (USDA 1992) which would continue to be subject to disturbances from ORV use. However, due to the low level of use at the Seashore, these impacts are not expected to result in modification of soil characteristics under any of the alternatives evaluated.

Although these potential impacts on the geology of the Seashore are present, the Seashore is part of a dynamic coastal barrier ecosystem, and visual effects of ORVs on ocean beaches may no longer be visible in a day due to daily tidal action, winds, rain, hurricanes, and other storm events. Although ORV use could impact geologic resources if ORVs are driven through dunes where there is no designated entrance, the use of ramps from the back route is strictly enforced and ORVs illegally cutting through dunes are infrequent occurrences at the Seashore. Therefore, this issue was dismissed from further analysis.

Geohazards—There are no known geohazards in the Seashore that would be affected by the implementation of an ORV management plan; therefore, this issue was dismissed from further analysis.

Floodplains and Wetlands—Although the entire ocean shoreline of the Seashore is classified as a marine or intertidal wetland (Cowardin et al. 1979), these areas are not measurably impacted by vehicle use due to the dynamic nature of the beach environment and the ability of the intertidal areas to “restore” themselves, since ruts from vehicle tires are filled in by wave action and moving sands. A study by Leatherman and Godfrey (1979) indicated that the intertidal ocean beach (sand beach area) is the most resistant to long-term vehicle impacts. Although no definite conclusions were drawn from the study, Leatherman and Godfrey indicated that natural changes to the beach appeared to overwhelm vehicle effects in this particular study. Given these studies, impacts to wetlands under all alternatives would not result in changes to the wetland system or function; therefore, these types of wetlands were dismissed from further analysis.

Executive Order 11988 and NPS *Management Policies 2006* require the NPS to consider impacts on floodplains in NPS undertakings. The intent of the order and guidelines is to provide for human safety and protect floodplain functions by preventing development in 100-year floodplains. Although actions in this plan/EIS are proposed within the floodplain, these actions do not have the potential to noticeably alter the natural values of the floodplain nor increase the exposure of humans to flood risk. Therefore, the impact topic of floodplains was considered but dismissed from further analysis.

Marine and Estuarine Resources—Marine and estuarine resources at Cape Lookout National Seashore that could be affected by ORV management-related activities include shallow benthic (bottom) habitats found in Pamlico, Core, and Back Sounds. These habitats include marine sediments and several species of submerged aquatic vegetation known as seagrasses. Seagrasses help to stabilize bottom sediments and improve water clarity by trapping fine particles that could otherwise remain suspended by wave and

current action. They bind shallow water sediments with their roots and rhizomes and help reduce wave and current energy with their leafy canopy. The physical stability, reduced mixing, and shelter provided by seagrasses make it a highly productive system. Mapping completed by the National Oceanic and Atmospheric Administration identified 980 acres of seagrass beds at Shackleford Banks, 1,100 acres at South Core Banks, and 130 acres at North Core Banks (NPS 2007e).

A variety of activities that take place at the Seashore could affect submerged aquatic vegetation by sediment disturbance (propeller scarring) and increased turbidity. These activities include commercial ferry travel across the sounds, the use of private boats, and the use of personal watercraft. Of these activities, vehicle ferry service, in particular, is related to ORV use at the Seashore. Ferry services transport vehicles (and pedestrians) to the Seashore from March 16 through December 31 each year.

During operating season, ferries have the potential to affect benthic habitats and aquatic resources by propeller scarring (also called “prop dredging”) that maintains the channels through daily use. Off-season (January 1 through March 15), the scars and channels created by the ferry service have been known to fill in as a result of the dynamic processes of the barrier island environment. Thus, in March of each year, ferry propellers may disturb and relocate marine sediments from shallow areas in long-established routes. This would result in localized and intermittent, long-term minor adverse impacts on benthic habitats and aquatic vegetation. In addition, there would be short-term increases in turbidity and adverse effects on water quality. Because ferry service is not managed under this ORV management plan/EIS, it is outside the scope of analysis for this plan.

When storm events cause the ferry channels to fill in or when routine vessel use fails to maintain the channels, operators have requested that the channels be dredged. The channel into Long Point at North Core Banks (outside of the park boundary) has been dredged twice since 1992, and the channel into Great Island (outside of the park boundary) has never been dredged. Dredging efforts were state-funded and the dredged material was pumped onto the beach. The Seashore had performed maintenance dredging (less than 1000 cubic yards) of the boat/ferry basins (inside of the park boundary) at both Long Point (twice in 20 years) and Great Island (three times in 20 years), and both basins were dredged again in calendar year 2010 as a result of hurricane impacts. If additional dredging occurs, there could be impacts on the Seashore’s marine and estuarine resources, particularly submerged aquatic vegetation beds.

Ferry services are managed under the *Cape Lookout National Seashore Commercial Services Plan Environmental Assessment / Assessment of Effect* (NPS 2007m). As stated in the plan, “The commercial ferry operations that transport visitors to Cape Lookout National Seashore comprise a very small fraction of the total boat traffic in the area. Implementation of the plan would not change the increment of boat traffic associated with the commercial ferry operations to the seashore.” During transit, ferry operations are managed under a variety of federal and state requirements and regulations. The *Cape Lookout National Seashore Commercial Services Plan Environmental Assessment / Assessment of Effect* dismissed submerged aquatic resources from full analysis, citing that proposed ferry management options would not result in new or changed impacts on these resources. Furthermore, this ORV management plan/EIS does not direct the management of ferry operations, channel maintenance, or the use of private boats and personal watercraft at the Seashore. None of the actions proposed in this plan would have new impacts on benthic habitats and submerged aquatic vegetation at the Seashore that are not explored under the *Cape Lookout National Seashore Commercial Services Plan Environmental Assessment / Assessment of Effect*. Therefore, this issue was dismissed from further analysis.

Water Quality—ORV use, human activities associated with ORV use, and operations associated with transporting ORVs may contribute to impacts on water quality at Cape Lookout National Seashore. Potential impacts on water quality could result from oil and other fluids dripping from vehicles and entering water bodies at the Seashore. Another potential impact on water quality at Cape Lookout

National Seashore is the introduction of human waste and dog waste into Seashore waters from ORV users on the beach. In addition to these direct impacts, indirect impacts include ferries transporting ORVs to the island, expelling oil and exhaust and increasing turbidity into sound waters. Vehicles submerged by hurricane or human error (e.g., getting stuck on the beach and submerged by the tide) could impact water quality, because oil, gas, and other materials in the vehicle could escape into the water. However, water quality impacts from these issues, including submerged vehicles, would not change the overall water quality characteristics at the Seashore, as long as the vehicle was removed from the water in a timely fashion. Therefore, this issue was dismissed from further analysis.

Wildlife and Wildlife Habitat – Fish and Marine Mammals—There is essential fish habitat at the Seashore on the soundside in areas of submerged vegetation. As previously discussed, water quality impacts from ORV use would not change the overall water quality characteristics at the Seashore and would be associated primarily with vehicle use on the oceanside. Therefore, there would be no impacts on essential fish habitat and it is not addressed as an impact topic in this ORV management plan/EIS. Although harassment of resting or stranded marine mammals on the beach could occur from various park users, including those using ORVs, the plan will include measures to educate all visitors about marine mammal protection to address and lessen these potential impacts. Therefore, this issue was dismissed from further analysis.

Air Quality—Currently, Cape Lookout National Seashore is located in an area classified by the U.S. Environmental Protection Agency (EPA) as being in attainment for all six criteria air pollutants. Activities associated with ORV use (such as driving or idling engines) result in the emission of criteria air pollutants; the pollutants of most concern for this project include nitrogen oxides, volatile organic compounds, and particulate matter. For ORV planning efforts at adjacent Cape Hatteras, where air quality conditions are similar, the NPS completed a modeling analysis to quantify the magnitude of annual emissions associated with ORV activities, and used these results to determine whether additional air quality modeling was necessary to estimate downwind pollutant concentrations and associated impacts.

Emission factor estimates were computed for Cape Hatteras National Seashore using the current EPA recommended model for mobile source emissions, the EPA-developed Mobile Source Emissions Model (MOBILE6), and ORV data specific to the Seashore. The results of this analysis show that for the current average vehicle use patterns on Cape Hatteras, emissions of volatile organic compounds, nitrogen oxides, and particulate matter are all individually below 5 tons per year. Emissions for these pollutants associated with the upper bound estimates for ORV use patterns (i.e., the highest estimates of observed ORV use anticipated to occur park-wide on an annual basis under any of the alternatives) are just above 5 tons per year, but all below 7 tons per year. Given these low annual emission levels, which would be expected to be similar or lower (due to a lower level of use) at the Seashore, daily pollutant concentrations resulting from ORV use are anticipated to be extremely low at Cape Lookout National Seashore and there would not be a noticeable change in overall air quality. Therefore, this issue was dismissed from further analysis. The MOBILE6 modeling results and report used to reach these conclusions can be found at the Cape Hatteras ORV management plan/EIS website at <http://parkplanning.nps.gov/CAHA>.

Land Use—Currently there are two or three private inholdings on North Core Banks, all with contested ownership. These areas could exclude access to NPS, or they could allow access to areas that are denied by the NPS. Bird closures may preclude access to those properties; this has occurred in the past when there was a closure near one of these properties. Because the inholdings are few and cover a very small area of the Seashore, the potential impacts on land use of these areas would not change the current land use or have impacts that prevent current uses from occurring. Since the Seashore is an island, there are no adjacent land uses that would be impacted by management of ORVs. Therefore, this issue was dismissed from further analysis.

Prime Farmlands—There are no designated prime farmland soils in the park; therefore, this issue was dismissed from further analysis.

Rare or Unusual Vegetation—Seabeach amaranth (covered under the impact topic “Federally Listed Endangered, Threatened, or Candidate Species”) and maritime forests are documented at the Seashore. A small area of forest exists on South Core Banks south of the Great Island concession lodging area (Guthrie’s Hammock) and on Shackleford Banks. Although these forests exist, they are not impacted by ORVs because ORV use is prohibited in these areas; therefore, there would be no effect on rare or unusual vegetation. Since there would be no impacts on these resources or the resources are already discussed under another topic, this issue was dismissed from further analysis.

Unique, Essential, or Important Fish Habitat—There are no threatened or endangered fish at the Seashore. ORV use occurs on the beach, and not in essential fish habitat. Therefore, this issue was dismissed from further analysis.

Streamflow Characteristics—Actions related to ORV management would not have an effect on streamflow characteristics. The proposed action would not occur in any area that would impact streamflow. Therefore, this issue was dismissed from further analysis.

Introduce or Promote Nonnative Species—Although there is the potential for vehicles to bring nonnative species to the Seashore, only a small number of nonnative species can live in the salt and wind of the seashore environment. Phragmites (common reed), a nonnative vegetative species, is present but is not likely to be transported by ORVs. Nutria (*Myocaster coypus*), a nonnative species present at the Seashore, is not likely to be influenced by the presence of ORVs. A small population of sand spurs (*Cenchrus echinatus*), a nonnative species, is present on Shackleford Banks, but would not be influenced by ORVs since ORV use is not permitted on that island. Therefore, this issue was dismissed from further analysis.

Cultural Resources

Archeological Resources—Artifacts indicate that the Seashore has been inhabited at least 5,000 years, when the Outer Banks is thought to have been occupied by small groups of people who subsisted by hunting, gathering, and fishing (NPS 1976, 2007o). The inhabitants of the Carolina coast first encountered by European settlers were the Neusiok, an Iroquois-speaking group considered part of the Tuscarora Nation (Wiss, Janney, Elstner Associates, Inc. and John Milner Associates, Inc. 2007). Little is known about the early inhabitants of the Seashore, and the dynamic nature of the barrier islands has destroyed or disturbed much of the archaeological evidence of their occupation (NPS 1976, 2007o). The NPS Southeast Archeological Center assessed archaeological and historic resources at the Seashore in the mid-1970s and found 10 prehistoric sites consisting of shell middens, ceramics, and tools eroding from dunes, beach wash, and along the edges of the salt marsh (NPS 1976). None of the prehistoric sites were considered scientifically or culturally significant enough for inclusion in the National Register of Historic Places (National Register) (NPS 1976).

Several historic archaeological resources have been identified at the Seashore. In addition to Portsmouth Village and the Cape Lookout Lighthouse—now listed in the National Register as a historic district and structure, respectively—the 1970s Southeast Archeological Center assessment of archaeological and historic resource identified a World War II gun emplacement, the Diamond City cemetery, and the remnants of Diamond City, a small community on Shackleford Banks. Only Portsmouth Village was considered eligible for inclusion in the National Register (NPS 1976). An archaeological reconnaissance of Portsmouth Island and a portion of Sheep Island conducted in 2007 resulted in the identification of 14 historic features, including two road traces, a schoolhouse, a dipping vat, seven house sites, a single

gravesite, and two cemeteries (Wiss, Janney, Elstner Associates, Inc. and John Milner Associates, Inc. 2007).

Although additional historic archaeological resources are suspected to exist within and near Cape Lookout Village and Portsmouth Village (Wiss, Janney, Elstner Associates, Inc. and John Milner Associates, Inc. 2005, 2007), there are no known historic archaeological resources considered eligible for the National Register identified within the Seashore (NPS 2007o). The Archeological Sites Management Information System, the NPS database of archeological resources, includes shipwrecks along the beach and in the dunes at the Seashore which are periodically exposed and reburied by storms. These resources are protected by federal and state law; however, they are generally lacking in integrity. Some of the alternatives discussed in this ORV management plan/EIS involve the construction of new roadside pull-outs and ramps along the back route. If one of these alternatives is selected for implementation, known archaeological sites would be avoided during ground disturbing activities (NPS pers. comm. 2013h). Because there would be no impacts on significant or National Register eligible resources, the topic of archeological resources was dismissed from further analysis.

Historic Districts, Structures, and Cultural Landscapes—The Seashore features five architectural resources listed on the National Register. These five resources consist of two historic districts, the Cape Lookout Village Historic District and the Portsmouth Village Historic District, as well as the Cape Lookout Coast Guard Station, the Cape Lookout Light Station, and the Salter-Battle Hunting and Fishing Lodge. The Cape Lookout Village Historic District, listed on the National Register in 2000, consists of 27 contributing elements including the Cape Lookout Light Station and the Cape Lookout Coast Guard Station. The Portsmouth Village Historic District, listed on the National Register in 1978, consists of 30 contributing elements.

Cultural landscapes are defined as “a geographic area, including both cultural and natural resources and the wildlife or domestic animals therein, associated with a historic event, activity, or person or exhibiting other cultural or aesthetic values” (NPS 2006d). There are two designated cultural landscapes at the Seashore: Cape Lookout Village and Portsmouth Village. The cultural landscapes at Cape Lookout Village and Portsmouth Village are documented in the following cultural landscape reports: *Cape Lookout Village Cultural Landscape Report* (Wiss, Janney, Elstner Associates, Inc. and John Milner Associates, Inc. 2005) and *Portsmouth Village Cultural Landscape Report Cape Lookout National Seashore, Carteret County, North Carolina* (Wiss, Janney, Elstner Associates, Inc. and John Milner Associates, Inc. 2007). The design, materials, and spatial organization of the historic buildings, structures, and features reflect cultural adaptations to the dynamic environment of the Seashore. Although only a few buildings and structures survive from the 19th century, and none exist from the 18th century, the remaining aspects of cultural landscapes have been identified as contributing elements to the Seashore’s historic districts (Wiss, Janney, Elstner Associates, Inc. and John Milner Associates, Inc. 2005, 2007).

The road network in Cape Lookout Village is considered a contributing element of the district, and vehicles are allowed to drive through the village. Private vehicles are not allowed to drive through or in the vicinity of Portsmouth Village, or in the vicinity of the Salter-Battle Hunting and Fishing Lodge. Some of the alternatives discussed in this ORV management plan/EIS allow for the continued use of ORVs within and in the vicinity of Cape Lookout Village, potentially impacting the setting, feeling, and association of the buildings and cultural landscape in the historic district. Although there may be impacts, under current levels of use these impacts would be minimal and would likely not result in noticeable changes to the integrity or character of the resources. One of the alternatives discussed in this ORV management plan/EIS would eliminate all private vehicles from the Seashore. If this alternative is selected for implementation, the cultural landscape and historic views would likely be enhanced, resulting in a long-term beneficial impact on the Cape Lookout Village Historic District. Because impacts on

National Register eligible resources would not occur or would be beneficial, the topic of architectural resources and cultural landscapes was dismissed from further analysis.

Ethnographic Resources—No ethnographic populations are documented at the Seashore; therefore, no ethnographic populations would be impacted by the implementation of an ORV management plan. Therefore, this issue was dismissed from further analysis.

Museum Collections—A portion of the Seashore’s collection is exhibited at the lighthouse; however, these collections would not be impacted by implementation of an ORV management plan. Therefore, this issue was dismissed from further analysis.

Minority and Low Income Populations, including Environmental Justice—These populations are present in the communities surrounding the Seashore, but the management of ORVs would not have any impact on these populations. Where ferries depart from the mainland (Davis, NC and Atlantic, NC), no minority or low-income populations exist (U.S. Census Bureau 2012a, 2012b); therefore, changes to ferry operations as a result of this plan would not impact these populations. Any issues related to minority or low-income populations are discussed under the socioeconomics impact topic, and were not carried forward for further analysis under this impact topic.

Energy Resources—This topic involves assessing energy requirements and the potential for energy conservation associated with the various alternatives, but is most relevant to facility construction projects. The majority of ORV use at the Seashore involves gaining access to fishing areas, where vehicles are then turned off once the desired fishing spot is reached. Vehicular access to the beach at current or reduced levels would be maintained under all but one alternative considered in this ORV management plan/EIS. As a result, no impacts to energy resources are expected because public fuel consumption would not be considerably affected. However, the application of a ban on ORV use at the Seashore under one of the alternatives considered in this plan would result in a measurable, albeit relatively small, reduction in the amount of fuel consumed and, thus, beneficial impacts on energy resources. Moreover, due to differences in management intensity among the alternatives, there could be additional differences in energy (fuel) consumption from implementation of the ORV management plan. The Seashore would continue to operate under the wise energy use guidelines and requirements stated in the *NPS Management Policies 2006* (NPS 2006d); Executive Order 13123, *Greening the Government Through Effective Energy Management*; Executive Order 13031, *Federal Alternative Fueled Vehicle Leadership*; Executive Order 13149, *Greening the Government Through Federal Fleet and Transportation Efficiency*; and the *1993 NPS Guiding Principles of Sustainable Design* (NPS 1993a). The application of these guidelines and requirements would also result in incremental benefits to energy resources from reductions in fuel consumption over time. Therefore, this issue was dismissed from further analysis.

Green House Gas Emissions and Climate Change—There is strong evidence linking global climate change to human activities, especially greenhouse gas emissions associated with the burning of fossil fuels (IPCC 2007). Some of the activities associated with ORV management and use would result in fossil fuel consumption, for example, vehicular trips by Seashore personnel conducting monitoring and management activities such as erecting, moving, or removing species closures; marking ORV corridors; and law enforcement patrol and response in ORV areas would consume fossil fuels. Equipment used to construct and maintain ramps, interdunal roads, and parking areas would also consume fossil fuels. Additionally, visitors driving ORVs on the Seashore beaches would result in fossil fuel consumption and release of greenhouse gas emissions. However, greenhouse gas emissions associated with the plan would be small in comparison to local, regional, and national greenhouse gas emissions. Therefore, this issue was dismissed from further analysis. However, climate change in general does have the potential to impact resources at the Seashore. Please refer to “Effects of Climate Change on Cape Lookout National

Seashore” in chapter 3, for a brief description on how climate change has impacted and may continue to impact resources at the Seashore.

Urban Quality, Gateway Communities—A gateway community is defined by the NPS *Management Policies 2006* as a community that exists in close proximity to a unit of the national park system whose residents and elected officials are often affected by the decisions made in the course of managing the park (NPS 2006d). Because of this, there are shared interests and concerns regarding decisions. Gateway communities usually offer food, lodging, and other services to park visitors. They also provide opportunities for employee housing and a convenient location to purchase goods and services essential to park administration. The communities adjacent to the Seashore (where vehicle and passenger ferries originate) are included in this definition and the issues and interests that would be impacted by this plan are addressed under the socioeconomics impact topic.

FEDERAL LAWS, POLICIES, REGULATIONS, AND PLANS DIRECTLY RELATED TO OFF-ROAD VEHICLE MANAGEMENT

EXECUTIVE ORDER 11644: USE OF OFF-ROAD VEHICLES ON THE PUBLIC LANDS

On February 8, 1972, President Richard Nixon issued Executive Order 11644 to “establish policies and provide for procedures that will ensure the use of off-road vehicles on public lands will be controlled and directed so as to protect the resources of those lands, to promote the safety of all users of those lands, and to minimize conflicts among the various uses of those lands.”

The executive order directs agencies to develop and issue regulations and administrative instructions to provide for administrative designation of the specific areas and trails on public lands on which the use of ORVs may be permitted, and areas in which the use of ORVs may not be permitted. According to the executive order, the designation of ORV areas and trails must meet the following requirements:

- Minimize damage to soil, watershed, vegetation, or other resources of the public lands;
- Minimize harassment of wildlife or significant disruption of wildlife habitats;
- Minimize conflicts between ORV use and other existing or proposed recreational uses of the same on neighboring public lands, and ensure the compatibility of such uses with existing conditions in populated areas, taking into account noise and other factors; and
- Areas and trails shall not be located in officially designated wilderness areas or primitive areas and shall be located in areas of the national park system, natural areas, or national wildlife refuges and game ranges only if the respective agency head determines that ORV use in such locations will not adversely affect their natural, aesthetic, or scenic values.

EXECUTIVE ORDER 11989: OFF-ROAD VEHICLES ON PUBLIC LANDS

This executive order, issued on May 24, 1977, by President Jimmy Carter, directs agencies to immediately close off-road areas or trails when it is determined that the use of ORVs will cause, or is causing, considerable adverse effects on the soil, vegetation, wildlife, wildlife habitat, or cultural or historic resources to the type of ORV causing such effects, until such time as determined that such adverse effects have been eliminated and measures have been implemented to prevent future recurrence. Also included in the executive order is the authority to adopt the policy that portions of the public lands under an agency’s jurisdiction shall be closed to use by ORVs except those areas or trails that are suitable and specifically designated as open to such use.

CODE OF FEDERAL REGULATIONS, TITLE 36, SECTION 4.10, TRAVEL ON PARK ROADS AND DESIGNATED ROUTES

The Code of Federal Regulations, Title 36, section 4.10 states that “operating a motor vehicle is prohibited except on park roads, in parking areas and on routes and areas designated for off-road motor vehicle use.” Additionally, routes and areas designated for ORV use shall be promulgated as special regulations, with designations complying with Executive Order 11644. As a result of this long-term ORV management plan/EIS and special regulation, Cape Lookout National Seashore will be in compliance with this regulation.

OTHER APPLICABLE FEDERAL LAWS, REGULATIONS, EXECUTIVE ORDERS, POLICIES, AND PLANS

Coastal Zone Management Act, 1966

The Coastal Zone Management Act (CZMA) (16 USC 1451 et seq.) seeks to preserve and protect coastal resources. Through the CZMA, states are encouraged to develop coastal zone management programs (CZMPs) to allow economic growth that is compatible with the protection of natural resources, the reduction of coastal hazards, the improvement of water quality, and sensible coastal development. The CZMA provides financial and technical incentives for coastal states to manage their coastal zones in a manner consistent with CZMA standards and goals. CZMA section 307 requires that federal agency activities that affect any land or water use or natural resource of the coastal zone must be consistent to the maximum extent practicable with the enforceable policies of the state CZMP. Federal agencies and applicants for federal approvals must consult with state CZMPs and must provide the CZMP with a determination or certification that the activity is consistent with CZMP enforceable policies, where those policies will have a possible effect on state coastal resources, as defined by the CZMP and local land use plans.

The Coastal Zone Management Act (CZMA) seeks to preserve and protect coastal resources.

The North Carolina Coastal Area Management Act establishes a cooperative program of coastal area management between local and state governments through comprehensive planning for the protection, preservation, orderly development, and management of the coastal area of North Carolina. The Coastal Area Management Act program was federally approved in 1978 and is the state’s CZMP under the CZMA. Localities are responsible for planning while the state establishes areas of environmental concern. A project must obtain a Coastal Area Management Act permit if it

- Is in one of the 20 counties covered by the act
- Is considered “development” under the act
- Is in or affects an area of environmental concern
- Does not qualify for an exemption.

As a part of this program, the Coastal Resources Commission designated “areas of environmental concern” in the 20 coastal counties and set rules for managing development in these areas. An area of environmental concern is an area of natural importance that may be easily destroyed by erosion or flooding or that may have environmental, social, economic, or aesthetic values that make it valuable to North Carolina. A determination would be made as to whether a long-term ORV management plan/EIS would have effects on state coastal zone management resources. If there is an effect, a consistency determination would be needed to identify the extent to which the long-term ORV management plan/EIS

must comply with Coastal Area Management Act permitting procedures, policies, and the Carteret County land use plan.

Endangered Species Act of 1973, as Amended

This act requires all federal agencies to consult with the Secretary of the Interior on all projects and proposals that have the potential to impact federally endangered or threatened plants and animals. It also requires federal agencies to use their authorities in furtherance of the purposes of the ESA by carrying out programs for the conservation of endangered and threatened species. Federal agencies are also responsible for ensuring that any action authorized, funded, or carried out by the agency is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of designated critical habitat.

Historic Sites Act of 1935

This act declares as national policy the preservation for public use of historic sites, buildings, objects, and properties of national significance. It authorizes the Secretary of the Interior and the NPS to restore, reconstruct, rehabilitate, preserve, and maintain historic or prehistoric sites, buildings, objects, and properties of national historical or archaeological significance.

Marine Mammal Protection Act, 1972

The Marine Mammal Protection Act prohibits, with certain exceptions, the taking of marine mammals in U.S. waters and by U.S. citizens on the high seas, and the importation of marine mammals and marine mammal products into the United States. The act defines “take” as “to harass, capture, kill, or attempt to harass, hunt, capture, or kill any marine mammal.” It defines harassment as “any act or pursuits, torment or annoyance which has the potential to injure a marine mammal or marine mammal stock in the wild; or has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering.” This act recognizes that some marine mammal species or stocks may be in danger of extinction or depletion as a result of human activities, and that these species or stocks must not be permitted to be depleted. The act, as amended in 1994, provides for certain exceptions to the take prohibitions, such as for Alaska Native subsistence and permits and authorizations for scientific research; a program to authorize and control the taking of marine mammals incidental to commercial fishing operations; preparation of stock assessments for all marine mammal stocks in waters under U.S. jurisdiction; and studies of pinniped-fishery interactions.

Migratory Bird Treaty Act of 1819

The MBTA implements various treaties and conventions between the United States and Canada, Japan, Mexico, and the former Soviet Union for the protection of migratory birds. Under this act, it is prohibited, unless permitted by regulations, to “pursue, hunt, take, capture, kill, attempt to take, capture or kill, possess, offer for sale, sell, offer to purchase, purchase, deliver for shipment, ship, cause to be shipped, deliver for transportation, transport, cause to be transported, carry, or cause to be carried by any means whatever, receive for shipment, transportation or carriage, or export, at any time, or in any manner, any migratory bird, included in the terms of this Convention...for the protection of migratory birds...or any part, nest, or egg of any such bird” (16 USC 703). Subject to limitations in the act, the Secretary of the Interior may adopt regulations determining the extent to which, if at all, hunting, taking, capturing, killing, possessing, selling, purchasing, shipping, transporting, or exporting of any migratory bird, part, nest or egg will be allowed, having regard for temperature zones, distribution, abundance, economic value, breeding habits, and migratory flight patterns.

National Environmental Policy Act, 1969, as Amended

Section 102(2)(c) of NEPA requires the preparation of an EIS for proposed major federal actions that may significantly affect the quality of the human environment. NEPA is implemented through regulations of the Council on Environmental Quality (CEQ) (40 CFR 1500-1508). The NPS 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* (NPS 2011h), and its accompanying handbook (NPS 2001a).

National Parks Concession Management Improvement Act of 1988

The National Parks Concession Management Improvement Act was enacted to ensure that public accommodations, facilities, and services are provided within national park system units, under carefully controlled safeguards against unregulated and indiscriminate use, so that

1. Visitation will not unduly impair park resources and values; and
2. Development of public accommodations, facilities, and services within national park system units can best be limited to locations that are consistent to the highest practicable degree with the preservation and conservation of the resources and values of such units.

Specific sections of this legislation that would relate to ORV planning at the Seashore include section 403, which sets out new policies and procedures requiring, in most circumstances, the competitive award of NPS concession contracts. This is a change from the 1965 Act and previous law, which does not require a fully competitive process in the award of concession contracts. Section 404 establishes concession contracts for a term of 10 years or less, although the Secretary may award a contract for a term of up to 20 years if the Secretary determines that the contract terms and conditions, including the required construction of capital improvements, warrant a longer term. Section 406 addresses the rates and charges concessioners require in providing facilities, goods, and services to the public.

National Historic Preservation Act of 1966, as Amended

Section 106 of this act requires federal agencies to consider the effects of their undertakings on properties listed or potentially eligible for listing on the National Register. All actions affecting the Seashore's cultural resources must comply with this legislation.

National Parks Omnibus Management Act of 1998

The National Parks Omnibus Management Act of 1998 (16 USC 5901 et seq.) underscores NEPA 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 provide options for resource impact analysis in this case.

NPS Organic Act and General Authorities Act

By enacting the NPS Organic Act of 1916, Congress directed the U.S. Department of the Interior and the NPS 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 NPS General Authorities Act of 1970 supplemented the Organic Act, providing (as codified at 16 USC 1a-1):

Congress declares that the National Park Service, which began with establishment of Yellowstone National Park in 1872, has since grown to include superlative natural, historic, and recreation areas in every major region of the United States, its territories and island possessions; that these areas, though distinct in character, are united through their inter-related purposes and resources into one national park system as cumulative expressions of a single national heritage; that, individually and collectively, these areas derive increased national dignity and recognition of their superb environmental quality through their inclusion jointly with each other in one national park system preserved and managed for the benefit and inspiration of all the people of the United States; and that it is the purpose of this Act to include all such areas in the System and to clarify the authorities applicable to the system.

Congress thus required the entire national park system to be managed as a whole, and not as constituent parts.

The 1978 Redwood Amendment reiterates these mandates by stating that the NPS 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). Congress intended the language of the 1978 Amendment (which was included in language expanding Redwood National Park) to reiterate the provisions of the Organic Act, not to create a substantively different management standard. The House committee report described the 1978 Amendment as a “declaration by Congress” that the promotion and regulation of the national park system is to be consistent with the Organic Act (NPS 2006d). The Senate committee report stated that under the 1978 Amendment, “The Secretary has an absolute duty, which is not to be compromised, to fulfill the mandate of the 1916 Organic Act to take whatever actions and seek whatever relief as will safeguard the units of the national park system” (NPS 2006d). Although the Organic Act and the 1978 Amendment use different wording (“unimpaired” and “derogation”) to describe what the NPS must avoid, both acts define a single standard for the management of the national park system—not two different standards. For simplicity, NPS *Management Policies 2006* uses “impairment,” not both statutory phrases, to refer to that single standard.

In the administration of authorized uses, park managers have the discretionary authority to allow and manage the use, if the use will not cause impairment or unacceptable impacts.

Despite these mandates, the Organic Act and its amendments afford the NPS latitude when making resource decisions to allow appropriate visitor use while preserving resources. Because conservation remains predominant, the NPS seeks to avoid or to minimize adverse impacts on park resources and values. The NPS does, however, have discretion to allow negative impacts when necessary (NPS 2006d, section 1.4.3, 10). Although some actions and activities cause impacts, the NPS cannot allow an adverse impact that impairs resources or values (NPS 2006d, section 1.4.3, 10). In the administration of authorized uses, park managers have the discretionary authority to allow and manage uses, if the uses will not cause impairment or unacceptable impacts. The Organic Act and 1978 Amendment prohibit actions that impair park resources unless a law directly and specifically allows for the action (16 USC 1a-1) (NPS 2006d, section 1.4.3.1).

Pursuant to the NPS Guidance for Non-Impairment Determinations and the NPS NEPA Process, a nonimpairment determination for the selected alternative will be appended to the ROD.

National Parks Omnibus Management Act of 1998

The National Parks Omnibus Management Act of 1998 (16 USC 5931 et seq.) provides direction for considering and using appropriate technical and scientific information in park management decisions.

CODE OF FEDERAL REGULATIONS, TITLE 36, SECTION 2.15, PETS

The Code of Federal Regulations, Title 36, section 2.15, provides regulations for visitors wishing to bring pets into national park units. Under this regulation, the following activities are prohibited in regards to pets at the Seashore (36 CFR 2.15):

1. Possessing a pet in a public building, public transportation vehicle, or location designated as a swimming beach, or any structure or area closed to the possession of pets by the superintendent. This subparagraph does not apply to guide dogs accompanying visually impaired persons or hearing ear dogs accompanying hearing-impaired persons.
2. Failing to crate, cage, restrain on a leash which shall not exceed six feet in length, or otherwise physically confine a pet at all times
3. Leaving a pet unattended and tied to an object, except in designated areas or under conditions which may be established by the superintendent
4. Allowing a pet to make noise that is unreasonable considering location, time of day or night, impact on park users, and other relevant factors, or that frightens wildlife by barking, howling, or making other noise.
5. Failing to comply with pet excrement disposal conditions that may be established by the superintendent.

Executive Order 13186: Responsibilities of Federal Agencies to Protect Migratory Birds

Migratory birds are of great ecological and economic value to this country and to other countries. They contribute to biological diversity and bring tremendous enjoyment to millions of people who study, watch, feed, or hunt these birds throughout the United States and other countries. The United States has recognized the critical importance of this shared resource by ratifying international, bilateral conventions for the conservation of migratory birds. Such conventions include the Convention for the Protection of Migratory Birds with Great Britain on behalf of Canada 1916, the Convention for the Protection of Migratory Birds and Game Mammals—Mexico 1936, the Convention for the Protection of Birds and Their Environment—Japan 1972, and the Convention for the Conservation of Migratory Birds and Their Environment—Union of Soviet Socialist Republics 1978. These migratory bird conventions impose substantive obligations on the United States for the conservation of migratory birds and their habitats, and through the MBTA, the United States has implemented these migratory bird conventions with respect to the United States. This executive order directs executive departments and agencies to take certain actions to further implement the MBTA.

Executive Order 11593: Protection and Enhancement of the Cultural Environment

This executive order directs federal agencies to support the preservation of cultural properties, to identify and nominate to the National Register cultural properties in the park, and to “exercise caution... to assure that any NPS-owned property that might qualify for nomination is not inadvertently transferred, sold, demolished, or substantially altered.”

Executive Order 11990: Protection of Wetlands

This executive order directs federal agencies to avoid, to the extent possible, the long- and short-term adverse impacts associated with the destruction or modification of wetlands, and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative.

Executive Order 11988: Floodplain Management

This executive order directs federal agencies to avoid, to the extent possible, the long- and short-term adverse impacts associated with the occupancy and modification of floodplains, and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative.

NPS MANAGEMENT POLICIES 2006

Several NPS management policies were considered in developing this ORV management plan/EIS. For example, NPS *Management Policies 2006* address management of ORVs in section 8.2.3.1, Off-road Vehicle Use. This section states (NPS 2006d):

Off-road motor vehicle use in national park units is governed by Executive Order 11644 (Use of Off-road Vehicles on Public Lands, as amended by Executive Order 11989), which defines off-road vehicles as “any motorized vehicle designed for or capable of cross-country travel on or immediately over, land, water, sand, snow, ice, marsh, swampland, or other natural terrain” (except any registered motorboat or any vehicle used for emergency purposes). Unless otherwise provided by statute, any time there is a proposal to allow a motor vehicle meeting this description to be used in a park, the provisions of the executive order must be applied.

In accordance with 36 CFR 4.10(b), routes and areas may be designated only in national recreation areas, national seashores, national lakeshores, and national preserves, and only by special regulation. In accordance with the executive order, they may be allowed only in locations where there will be no adverse impacts on the area’s natural, cultural, scenic, and esthetic values, and in consideration of other existing or proposed recreational uses. The criteria for new uses, appropriate uses, and unacceptable impacts listed in sections 8.1 and 8.2 must also be applied to determine whether off-road vehicle use may be allowed. As required by the executive order and the Organic Act, superintendents must immediately close a designated off-road vehicle route whenever the use is causing, or will cause, unacceptable impacts on the soil, vegetation, wildlife, wildlife habitat, or cultural and historic resources.

NPS administrative off-road motor vehicle use will be limited to what is necessary to manage the public use of designated off-road vehicle routes and areas; to conduct emergency operations; and to accomplish essential maintenance, construction, and resource protection activities that cannot be accomplished reasonably by other means.

Section 4.4.1 of NPS *Management Policies 2006* addresses resource protection. It instructs park units to maintain, as parts of the natural ecosystems of parks, all plants and animals native to the park ecosystems, in part by “minimizing human impacts on native plants, animals, populations, communities, and ecosystems, and the processes that sustain them” (NPS 2006d, section 4.4.1).

DIRECTOR’S ORDER 12: CONSERVATION PLANNING, ENVIRONMENTAL IMPACT ANALYSIS, AND DECISION-MAKING AND HANDBOOK

NPS Director’s Order 12 (NPS 2011h) and its accompanying handbook (NPS 2001a) lay the groundwork for how the NPS complies with NEPA.

NPS Director’s Order 12 requires the analysis of impacts on park resources in terms of their context, duration, and intensity. It is important 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. Director’s Order 12 also requires the analysis of impairment to park resources and values as part of the NEPA document.

DIRECTOR’S ORDER 28: CULTURAL RESOURCE MANAGEMENT

This director’s order sets forth the guidelines for management of cultural resources, including cultural landscapes, archeological resources, historic and prehistoric structures, museum objects, and ethnographic resources (NPS 1998a). This order calls for the NPS to protect and manage cultural resources in its custody through effective research, planning, and stewardship in accordance with the policies and principals contained in the *NPS Management Policies 2006* (NPS 2006d).

DIRECTOR’S ORDER 77: NATURAL RESOURCE PROTECTION

Director’s Order 77 (NPS 2002a) addresses natural resource protection, with specific guidance provided in the Natural Resource Management Reference Manual 77 (NPS 2004f).

RELATIONSHIP TO OTHER CAPE LOOKOUT NATIONAL SEASHORE PLANNING DOCUMENTS, POLICIES, AND ACTIONS

The following state and local documents, policies, actions, laws, and regulations are directly or indirectly related to ORV use, and were therefore considered during the development of this ORV management plan/EIS.

Cape Lookout National Seashore *Foundation Document*

The *Foundation Document* provides a formal statement of the core mission of Cape Lookout National Seashore in order to provide basic guidance for planning and management decisions. It serves as the underlying guidance for management and planning decisions for a national park unit and describes the core mission of the park unit by identifying the purpose, significance, fundamental and important resources and values, five interpretive themes, assessment of planning and data needs, special mandates and administrative commitments, and the unit’s setting in the regional context. The *Foundation Document* identifies the following key parkwide issues: implementing strategies to protect fundamental resources during storm events; stabilizing and rehabilitating priority historic structures; managing visitor use and encouraging responsible recreation; and developing partnerships to improve stewardship of the Seashore’s fundamental resources and values (NPS 2012s).

1983 General Management Plan

The *1983 General Management Plan for Cape Lookout National Seashore* provides Seashore-wide guidance for long range planning, addressing all aspects of park operations and management. In it, the NPS designates the barrier islands of the Seashore to be managed mostly as a natural area and, to meet

visitor needs, identifies the provision of administrative headquarters at the east end of Harkers Island and ferryboat landings and overland public transportation at the point of Cape Lookout. Notably, the plan allows the use of private motorized vehicles on Core Banks / Portsmouth Island. It also identifies measures to protect the threatened Atlantic loggerhead turtle and other endangered species and suggestions meant to avoid or minimize environmental harm during plan implementation, including close monitoring during construction.

The 1983 *General Management Plan Amendment* anticipated that dredging the ferry channels would be required, and further asserted that this would be the concessioner's responsibility (NPS 1983). Propeller wash from the ferries will generally keep these channels deep enough for ferry operation (NPS 1982), but during the winter months when the ferries are not running, the ferry channels may fill with sand and may become too shallow to navigate. Consequently, ferry operators have requested dredging. In 2010, maintenance dredging was conducted at the turning basins at the Long Point and Great Island ferry landings.

Cape Lookout National Seashore Interim Protected Species Management Plan / Environmental Assessment and Finding of No Significant Impact (2006)

Until the long-term ORV management plan/EIS is implemented, the NPS developed the *Cape Lookout National Seashore Interim Protected Species Management Plan / Environmental Assessment* and FONSI (NPS 2006a, 2007b) for Cape Lookout National Seashore to ensure for the proper management of protected species and to comply with the ESA, while also providing for appropriate use of the Seashore's recreation resources. The species addressed in the plan are those specifically affected by recreation on the Seashore, and that are listed federally or by the state as threatened, endangered, or species of special concern. The plan was completed in March 2006 and released to the public for comment. The FONSI was signed on July 13, 2007. The species protection measures in the *Cape Lookout National Seashore Interim Protected Species Management Plan / Environmental Assessment* are considered as part of the current condition, or no-action alternative, in this long-term ORV management plan/EIS.

Biological Opinion for Cape Lookout National Seashore Interim Protected Species Management Plan / Environmental Assessment (2006)

The *Biological Opinion* (USFWS 2006a) and *Amended Biological Opinion* (USFWS 2007a) associated with the *Cape Lookout National Seashore Interim Protected Species Management Plan / Environmental Assessment* were prepared by the USFWS Raleigh Field Office in response to their review of the Cape Lookout National Seashore 2006 Biological Assessment (NPS 2006e) and the *Cape Lookout National Seashore Interim Protected Species Management Plan / Environmental Assessment* (NPS 2006a). The *USFWS Biological Opinion* (USFWS 2006a) and amendment to the *Biological Opinion* (USFWS 2007a) evaluated the proposed action and its potential impact on protected species at the Seashore to determine if there would be a take under the ESA. The USFWS concluded that incidental taking of protected species would occur, but that these species were not in jeopardy of extinction. In 2007, the USFWS issued an amended *Biological Opinion* that added performance measures to determine the success of management actions at the Seashore in relation to the Incidental Take Permit (USFWS 2007a). The USFWS recommendations in the 2006 *Biological Opinion* and the 2007 *Amended Biological Opinion* were incorporated into the *Cape Lookout National Seashore Interim Protected Species Management Plan / Environmental Assessment* and made part of the selected alternative detailed in the FONSI (NPS 2007b).

Interim Off-road Vehicle Management Report (2007)

An ORV management report was prepared for Cape Lookout National Seashore (NPS 2007a). This report is, in part, based on the actions outlined in the *Cape Lookout National Seashore Interim Protected Species*

Management Plan / Environmental Assessment (NPS 2006a) and the Superintendent's Compendium (NPS 2013d), and details how ORV closures are established. The report addresses ranger patrols at current levels and discusses funding for NPS staff to be stationed at the vehicle landings at Long Point and Great Island from approximately April 15 through the end of September to inform Seashore users about the resources at the Seashore and the management measures in place to protect those resources. This report also discusses additional funding for monitoring and staff resource protection activities.

Commercial Services Plan (2007)

The *Cape Lookout National Seashore Commercial Services Plan Environmental Assessment / Assessment of Effect* (NPS 2007m) addresses the need for and desirability of a variety of visitor services provided by commercial enterprises, including such items as ferry operations, cabin rental, land transportation services, rentals, concession food, and supplies. The plan does not discuss economic viability of concessioners directly related to ORVs. Under the plan, Cape Lookout National Seashore would improve the management and operation of commercial visitor services such as land and ferry transportation, while providing both self-directed and facilitated visitor opportunities. This process began with an informational newsletter distributed in March 2007 (NPS 2007f), and the draft *Cape Lookout National Seashore Commercial Services Plan Environmental Assessment / Assessment of Effect* was released in November 2007 (NPS 2007m). The public comment period on this document closed on December 14, 2007, and the comments have been reviewed. The FONSI for the *Commercial Services Plan for Cape Lookout National Seashore* was signed by the Southeast Regional Director on October 17, 2008.

Passenger Ferry Departure Site Environmental Assessment (2011)

In the southern portion of the Seashore, ferry service to Shackleford Banks and the Cape Lookout Lighthouse is provided by six to eight individually permitted small-boat ferry operators. There is no assurance that these individual operators will continue to provide services in the long term. These operators do not provide a single, easily recognized gateway experience to introduce visitors to the park and its resources. These operators do not comply with the NPS Concession Management Improvement Act of 1998. The NPS proposes to come into compliance with the Concession Management Improvement Act by establishing and managing a concessions contract for a passenger ferry system that would provide access to the park from public lands while providing a unified message and interpretation of the park and its resources. Actions needed to achieve this goal include the development of landside locations for ferry arrivals and departures, identification of appropriate ferry routes, and the enhancement of the park's existing messaging and identification. Of the Morehead City and Town of Beaufort sites evaluated, the Seashore identified the Front Street site in Beaufort, NC, as the preferred location. In addition, the Harkers Island Visitor Center and boat basin was identified as the second departure site.

Harkers Island Passenger Ferry Departure Facility Environmental Assessment (ongoing)

After completing the *Passenger Ferry Departure Site Environmental Assessment* (NPS 2011j) described above, the Seashore initiated the process to improve the existing gateway facilities at the Harkers Island Visitor Center for passenger ferry service. The project is needed to improve the capacity of the existing NPS facilities on Harkers Island to accommodate passenger ferry service requirements and associated visitation. Under the only action alternative, improvements would include items such as a ticketing office, a queuing shelter, additional restrooms, expanded parking, and new docks. These improvements would be implemented in phases. The first phase is anticipated to be operational in 2014. Future items would be operational once funding becomes available.

Vehicle and Passenger Ferry Operations

Historically, three concessions have operated at the Seashore. One previously operated the vehicle/passenger ferry from Atlantic, North Carolina, to Long Point and the cabin lodging at Long Point. Until a new concession contract can be developed for these services, the ferry to Long Point is operated under an annual commercial use authorization (CUA), and the Long Point cabins are operated by the NPS.

The concession contract for the second operation, the vehicle/passenger ferry from Davis, North Carolina, to Great Island, lapsed in 2005. The ferry service is now provided by two operators on an interim basis under CUAs and the cabins at Great Island are operated by the NPS until a long-term concessions contract is completed and issued. It is the goal of the NPS to operate vehicle ferries under an NPS concession contract. Once these contracts are reestablished, the NPS will need to address issues related to ORVs if additional actions of the operations are required under this ORV management plan/EIS, such as providing vehicle counts, issuing permits, collecting fees, or distributing Seashore information.

Cabins are located at Long Point on North Core Banks and Great Island on South Core Banks; reservations are required. The cabins all have running water; generator power is provided at Long Point and at Great Island each cabin provides a shelter for visitors bring their own generators and provide electricity. Limited supplies, such as ice and gasoline, are available at each lodging area, but no food services are available on the Seashore.

At the lighthouse area on South Core Banks, shuttle services operating under a CUA run from the lighthouse area to the point of Cape Lookout; this shuttle includes a historical tour on request.

From the late 1980s until about 1993, a concession passenger ferry service operated from the Shell Point area on Harkers Island to the Cape Lookout lighthouse area. The *Cape Lookout National Seashore Commercial Services Plan / Environmental Assessment / Assessment of Effect* (2007m) and the *Passenger Ferry Departure Site Environmental Assessment / Assessment of Effect* (NPS 2011j) both conclude that passenger ferry service from the Morehead City, Beaufort, and Harkers Island areas should be operated under an NPS concessions contract. Public access to the Seashore is by private boat, vehicle/passenger ferry, or passenger-only ferry. Passenger-only ferries operate from Ocracoke to Portsmouth Village (North Core Banks); from Harkers Island and Beaufort to Shackleford Banks and the Cape Lookout lighthouse area (South Core Banks); and from Morehead City to Shackleford Banks. Three ferries with CUAs enable the public to transport their vehicles to the Cape Lookout National Seashore. One ferry service runs between Atlantic and Long Point on North Core Banks and currently two operators link Davis with Great Island on South Core Banks. These ferries operate on a regular basis from mid-March through November, on a more limited schedule through December, and are generally closed from January 1 through March 15, but are not prohibited from operating during this time. On an interim basis until a special regulation gets promulgated, regulations have been reinstated, prohibiting ORV use from January 1 through March 15.

Alternative Transportation Study

An alternative transportation study request was completed in 2012. As part of this effort, an inventory of existing conditions was conducted and a data collection plan developed to address any gaps in the data. The plan also included comprehensive surveys of parking and traffic counts around the visitor center.

Cape Lookout Village Historic Structure Reuse Implementation Plan (2007)

This planning and environmental assessment was required as a result of litigation, and addresses future reuse of structures within the Cape Lookout Village Historic District. Planning for reuse began in spring 2004, with a range of alternatives being presented to the public in January 2005. The *Cape Lookout National Seashore Village Historic Structures Reuse Implementation Plan Environmental Assessment / Assessment of Effect* was released to the public in February 2007, with public meetings on the draft held in March 2007. Under the selected alternative of this plan, the Seashore would stabilize several historic structures in the village area. This plan also accounts for associated utilities, including construction of a new central wastewater treatment system. Selected vegetation clearing would be undertaken to provide wildland fire protection and to provide more open views, such as those that existed during the district's period of significance. The FONSI for the *Cape Lookout National Seashore Village Historic Structure Reuse Implementation Plan* was signed by the Southeast Regional Director on July 27, 2007 (NPS 2007d).

Cultural Landscape Reports for Cape Lookout Village (2005) and Portsmouth Village (2007)

There are two designated cultural landscapes within Cape Lookout National Seashore: Portsmouth Village Historic District and the Cape Lookout Village Historic District. The reports provide important information on the history and evolution of landscape features at these locations. This information is necessary to inform future management of these areas. The *Cape Lookout Village Cultural Landscape Report* was completed May 9, 2005 (Wiss, Janney, Elstner Associates, Inc. and John Milner Associates, Inc. 2005); the *Portsmouth Village Cultural Landscape Report* was completed in 2007 (Wiss, Janney, Elstner Associates, Inc. and John Milner Associates, Inc. 2007).

Protection of Historic Structures Project at the Cape Lookout National Seashore Lighthouse Area (2007)

The Seashore recently completed historic structure protection activities at the Cape Lookout Lighthouse area. This project included adding sand to the shoreline for protection of historic structures at the Cape Lookout Lighthouse. Although this project has been completed, due to the dynamic environment and constant changes in the shoreline of the Seashore, similar projects may be required in the future for the protection of historic structures (NPS 2007g).

Ethnographic Overview and Assessment

The *Ethnohistorical Overview and Assessment Study of Cape Lookout National Seashore Including a Case Study of Harkers Island* (NPS 2007p) is a study of Harkers Island, Portsmouth Island, Cape Lookout, Diamond City, and Wades Shore; the areas that comprise the remaining portion of a broad cultural overview of Outer Banks communities adjoining Cape Lookout National Seashore. The primary goal of this research was to inventory, review, and synthesize disparate collections of primary and secondary source data, and collect new data when needed, in order to develop an ethnohistoric description of the past and present communities associated with Cape Lookout National Seashore. Phase I of this project (completed December 2007) focused on Harkers Island, whereas Phase II (completed in 2009) entailed archival research on the now extinct communities. The ethnohistorical study detailed the history of the Seashore communities from early European settlement to present day. While providing a relatively thorough cultural history of the area, it does not identify any present-day ethnographic resources within the Seashore, including Portsmouth Village. Portsmouth Village became part of Cape Lookout National Seashore a few years after the residents left the island in 1971. Portsmouth Village is listed on the National Register.

Long-Range Interpretive Plan (2011)

The *Long-Range Interpretive Plan*, completed in June, 2011, articulates the park's purpose, significance, and themes and is necessary to inform and guide the park's interpretive and education programs into the next decade. This plan also provides an overall framework for the park's efforts to improve and expand upon visitor services including ranger-led programs, exhibits, and facilities (NPS 2007g).

Exhibit Plan at Harkers Island and Cape Lookout National Seashore Keepers' Quarters (2007)

This project involved exhibit planning and design for new exhibits. The Harkers Island exhibits orient visitors to the breadth of resources and recreational opportunities within the park. The Keepers' Quarters exhibits orient visitors to the Seashore and interpret the history of the lighthouse's complex and associated historic resources. The planning and installation for these exhibits is complete (NPS 2007g).

Opening of the Lighthouse to the Public and Increased Visitor Amenities (2010)

In 2006–2007, Cape Lookout National Seashore increased visitor amenities, including a new visitor center / bookstore, shelter, and restrooms at the passenger ferry landing by the lighthouse on South Core Banks. These improvements also include a new boardwalk and new exhibits at the lighthouse Keepers' Quarters. The Cape Lookout lighthouse opened to the public in 2010. These improvements have the possibility of bringing more visitors to the lighthouse area on South Core Banks (NPS 2007g).

Horse Management Plan

The Seashore plans to update the *Horse Management Plan* (NPS 2007h). This plan defines how the culturally significant feral horse population on Shackleford Banks is cooperatively managed by both the NPS and the Foundation of Shackleford Horses. This congressionally mandated cooperative partnership began in 1999 and operates under a memorandum of understanding that states that the herd size will be maintained at 110–130 animals (NPS 2000b).

Critical Habitat Designation

Critical wintering habitat for piping plovers is identified by the USFWS in six geographic locations of Cape Lookout National Seashore. These areas are located within the NC-6, NC-7, and NC-8 designation areas. Figures 6 and 7 show these designated critical habitat areas within the Outer Banks of North Carolina (USFWS 2001).



Note: Only NC-6 is located within Cape Lookout National Seashore

FIGURE 6: CRITICAL HABITAT DESIGNATIONS IN THE NORTH PORTION OF CAPE LOOKOUT NATIONAL SEASHORE



Note: Only NC-7 and NC-8 are located within Cape Lookout National Seashore.

FIGURE 7: CRITICAL HABITAT DESIGNATIONS IN THE SOUTHERN AREAS OF CAPE LOOKOUT NATIONAL SEASHORE

Predator Study (2008)

The Seashore conducted a predator study to evaluate ways to alleviate threats to threatened and endangered species at the Seashore. A three-year research study evaluated the response of both predator (raccoon) and prey populations to raccoon removal. The study examined the ecology of raccoons on South Core Banks in 2007 and 2008, estimated the population size, and evaluated the response of raccoon, shorebird, and turtle populations to an experimental removal of raccoons in late 2008. The ecological information gathered on raccoons and their prey helped NPS managers determine if raccoon removal is an effective tool for maintaining viable raccoon, shorebird, and sea turtle populations at Cape Lookout National Seashore. The study provided the NPS with long-term monitoring protocols for the raccoons on Cape Lookout National Seashore and guidelines for future management. The NPS implemented the preferred alternative (experimental reduction of raccoon population to evaluate removal as an option for protected species management) to address the disproportionate effect of raccoons on nesting shorebirds and sea turtles at the Seashore. The FONSI was signed by the acting Superintendent on November 20, 2008 and by the NPS Southwest Regional Director on November 25, 2008 (NPS 2008a).

Interim Protected Species Management Strategy / Environmental Assessment and Long-term Off-road Vehicle Management Plan / Environmental Impact Statement for Cape Hatteras National Seashore

ORV management at Cape Lookout National Seashore is influenced by ORV management at the adjacent Cape Hatteras National Seashore, which developed a short-term interim protected species management strategy, similar to the effort at Cape Lookout National Seashore (NPS 2006b).

The FONSI for the strategy / environmental assessment at Cape Hatteras National Seashore (NPS 2007b) was signed on July 13, 2007, and provided the interim guidance for protected species at Cape Hatteras National Seashore while a long-term ORV management plan/EIS and special regulation were developed (NPS 2012i). The long-term ORV management plan/EIS and regulation were developed concurrently with a stakeholder committee under the Negotiated Rulemaking Act that provided input into the process, but did not agree on any formal recommendations. On December 28, 2012, the Notice of Availability for the final plan/EIS at Cape Hatteras was published (NPS 2012j), followed by the publication of the final rule on January 23, 2012 (NPS 2012k).

Weather Events, Hurricane and Storm Recovery Plans

Storms and other weather events, part of the dynamic Cape Lookout National Seashore ecosystem, must be factored into any planning efforts at the Seashore. A single storm event can dramatically change the face of the landscape at the Seashore, and any management measures for ORVs or other recreational uses should be adaptive to the changing environment. The storm recovery plan uses geographic information system (GIS) data to determine priorities for recovery after a storm hits the islands (ramps and historical structures are generally first priority). As needed for post-storm replacement and configuration of ramps, the Seashore will evaluate new designs or reconfiguration of ramps and ORV routes that are more sustainable in a dynamic environment and better accommodate ongoing sea level rise and storm events. This data were considered in the development of this ORV management plan/EIS.

RELATIONSHIP TO OTHER FEDERAL PLANNING DOCUMENTS, POLICIES, AND ACTIONS

Piping Plover Atlantic Coast Population Recovery Plan (1996)

ORV management activities at Cape Lookout National Seashore need to account for the USFWS *Piping Plover Atlantic Coast Population Recovery Plan* (USFWS 1996a). This population of piping plovers was listed as threatened in 1986 and has increased from approximately 800 pairs to almost 1,350 pairs in 1995. However, pressure on Atlantic Coast beach habitat from development and human disturbance is pervasive and unrelenting, and the species is sparsely distributed. Increased visitation to Atlantic Coast parks, which includes increased ORV use, is cited as one of the many reasons the piping plover was listed (USFWS 1996a).

Piping Plover Great Lakes Populations Recovery Plan (2003)

An ORV management plan at Cape Lookout National Seashore must consider the USFWS *Recovery Plan for the Great Lakes Piping Plover*. The Great Lakes population, which winters at the Seashore, was listed as endangered under provisions of the ESA on January 10, 1986. Critical habitat was designated on the Great Lakes breeding grounds on May 7, 2001, and for all populations of piping plovers on the wintering grounds on July 10, 2001. The Great Lakes population had declined from a historic size of several hundred breeding pairs to 17 at the time of listing. From 1986 through 2002, the population fluctuated between 12 and 51 breeding pairs, with breeding areas remaining largely confined to Michigan. The restricted breeding range of this population creates a gap in the distribution of piping plovers across North America, with the Great Lakes population isolated from the two other breeding populations (Atlantic and Northern Great Plains) (USFWS 2003a).

Atlantic Green, Hawksbill, Leatherback, Kemp's Ridley, and Loggerhead Turtle Recovery Plans

The USFWS and the National Marine Fisheries Service recovery plans for the U.S. population of Atlantic green, hawksbill, leatherback, Kemp's ridley, and loggerhead sea turtles must be considered when drafting an ORV management plan. Each of these species is federally listed and the Seashore must consider the individual recovery plans (NMFS and USFWS 1991, 1992, 2008; NMFS, USFWS, and SEMARNAT 2011).

Marine Mammal Recovery Efforts by the National Marine Fisheries Service

Implementation of an ORV management plan would need to take into consideration the *Marine Mammal Recovery Efforts of the National Marine Fisheries Service*. The National Marine Fisheries Service Office of Protected Resources is charged with implementing the Marine Mammal Protection Act and the ESA with respect to marine mammal species under the National Oceanic and Atmospheric Administration Fisheries jurisdiction: whales (Order: Cetacea, Suborder: Mysticeti, Odontoceti), dolphins (Order: Cetacea, Family: Delphinidae), porpoises (Order: Cetacea, Family: Phocoenidae), seals (Order: Pinnipedia, Family: Phocidae), and sea lions (Order: Pinnipedia, Family: Otariidae). As part of the Marine Mammal Protection Act mandate, the Office of Protected Resources works in collaboration with the National Oceanic and Atmospheric Administration Fisheries Regions and Fisheries Science Centers to develop and implement a variety of programs for the protection, conservation, and recovery of marine mammals. The Office of Protected Resources also establishes cooperative agreements with states regarding marine mammal resources, identifies important research needs to collect appropriate

information for management decisions, and administers the activities of the Marine Mammal Health and Stranding Response Program (NOAA n.d.).

Area U.S. Navy Operations

U.S. Navy (Navy) operations in the area of Cape Lookout National Seashore were considered in the development of this long-term ORV management plan/EIS. The Seashore recently received a request from the Navy to allow increased capabilities for offshore training. This request was received with a notification of the *Navy Atlantic Fleet Training and Testing EIS / Overseas EIS*. Under this action, which focuses on exercises and other actions in the ocean environment, the Navy will evaluate the potential environmental effects associated with maintaining military readiness training and research, development, test, and evaluation activities (referred to as “training and testing”) conducted in the Atlantic Fleet Training and Testing Study Area. The Study Area consists of the seaspace and airspace within at-sea portions of the range complexes and testing and training ranges, select Navy pierside locations, and transit areas between the range complexes (U.S. Navy 2007, 2012). The *Navy Atlantic Fleet Training and Testing EIS / Overseas EIS* study area is the U.S. Navy Cherry Point Range Complex, which consists of surface and subsurface operating areas, special use airspace, and instrumented ranges. The need for the proposed action is to maintain current levels of military readiness; accommodate future increases in operational training tempo and support the rapid deployment of naval units; achieve and sustain readiness in ships and squadrons so that the Navy can quickly surge significant combat power in the event of a national emergency; support the testing and training needed for new aircraft, vessels, weapons systems, and missions; and maintain the long-term viability of the U.S. Navy Cherry Point Range Complex while protecting human health and the environment (FR 2007).

RELATIONSHIP TO OTHER STATE AND LOCAL PLANNING DOCUMENTS, POLICIES, AND ACTIONS

North Carolina Division of Marine Fisheries Regulations (2011)

Recreational fishing at the Seashore is guided by the North Carolina Division of Marine Fisheries regulations. This agency is responsible for the management of all marine and estuarine resources in the state. As part of this function, a twice a year recreational fishing guide is published that sets minimum lengths and bag limits for various species. As of January 1, 2007, the state of North Carolina requires recreational anglers to have a license for saltwater fishing.

North Carolina State Motor Vehicle Regulations

Title 36 section 4.2(a) of the Code of Federal Regulations states:

- (a) Unless specifically addressed by regulations in this chapter, traffic and the use of vehicles within a park area are governed by State law.

Accordingly, North Carolina State motor vehicle codes that do not conflict with Title 36 of the Code of Federal Regulations are assimilated by the NPS and enforced within Cape Lookout National Seashore. The Seashore has concurrent jurisdiction with the state and enforces state motor vehicle codes on Seashore beaches, ramps, and the back route.

One exception to the assimilation of nonconflicting North Carolina motor vehicle codes is in the North Carolina provision that defines Cape Lookout National Seashore beaches as public vehicular areas, which is the same designation and management that parking lots in the state receive. Because only a very limited number of state motor vehicle codes apply to public vehicular areas, the Superintendent’s Compendium

(NPS 2013d) clarifies the public vehicular area designation by requiring drivers and vehicles to comply with all applicable North Carolina motor vehicle codes “as if the vehicle or driver were operating on North Carolina highways.” Regulations on beach driving at the Seashore are a combination of 36 CFR, the Superintendent’s Compendium and the North Carolina motor vehicle codes. An additional provision within 2013 Superintendent’s Compendium requires all-terrain vehicle (ATV) operators and riders to wear helmets and eye protection while operating or riding on an ATV anywhere in the Seashore. Should the selected alternative allow for ORV use, requirements in the Superintendent’s Compendium related to ORV management would become part of the special regulation.

North Carolina Wildlife Resources Commission Nongame and Endangered Wildlife Program

The Nongame and Endangered Wildlife Program, established in North Carolina in 1983, aims to prevent species from becoming endangered through maintaining viable, self-sustaining populations of all native wildlife, with an emphasis on species in decline. The NCWRC has a Comprehensive Wildlife Strategy to protect state-listed species. This strategy includes securing funding for state fish and wildlife agencies to take preventative actions that help keep rare species from becoming endangered and keep common species common (NCWRC n.d.). Species listed through this program as state threatened, endangered, or of special concern were taken into consideration during the development of this long-term ORV management plan/EIS. Endangered and threatened wildlife and wildlife species of special concern are protected under Article 25 of Chapter 113 of the North Carolina General Statutes.

North Carolina Wildlife Resource Commission Handbook for Sea Turtle Volunteers in North Carolina (2006)

The NCWRC is responsible for publishing the Handbook for Sea Turtle Volunteers in North Carolina (NCWRC 2006). The handbook provides guidance to volunteers in conducting biologically sound management projects to benefit sea turtles and to help ensure compliance with laws pertaining to rare and endangered species at all levels of government. This guidance includes descriptions to aid volunteers. An annual permit is issued to the Seashore by the NCWRC under the authority of the USFWS and USFWS recovery plans referenced.

Outer Banks National Scenic Byway (2009)

The North Carolina Department of Transportation, in coordination with the local Economic Development Council, was successful in establishing the Outer Banks National Scenic Byway which runs from the North River bridge north of Beaufort to Cedar Island and on to Ocracoke and Cape Hatteras National Seashore. The 138-mile corridor along North Carolina Route 12 and North Carolina Route 70 has been designated a National Scenic Byway (America’s Byways 2012).

Carteret County Comprehensive Plan (2004)

The development and implementation of this long-term ORV management plan/EIS takes into account the planning efforts of Carteret County, in part through a Coastal Area Management Act Consistency Determination. The *Carteret County Comprehensive Plan* provides policies and programs to promote continued quality of life and a sustainable development pattern over a 20-year period. Goals and objectives are set out for economic development, education, the environment, health care, quality of life, recreation, cultural and natural resources, regional relations, and transportation.

Chapter 2: Alternatives

CHAPTER 2: ALTERNATIVES

The National Environmental Policy Act (NEPA) requires federal agencies to explore a range of reasonable alternatives that address the purpose of and need for the action. The alternatives under consideration must include the “no-action” alternative as prescribed by 40 CFR 1502.14. Action alternatives may originate from the proponent agency, local government officials, or members of the public at public meetings or during the early stages of project development. Alternatives may also be developed in response to comments from coordinating or cooperating agencies.

The alternatives analyzed in this document, in accordance with NEPA, are the result of internal scoping and public scoping. These alternatives meet the management objectives of the Seashore, while also meeting the overall purpose of and need for the proposed action. Alternative elements that were considered but were not technically or economically feasible, did not meet the purpose of and need for the project, created unnecessary or excessive adverse impacts on resources, and/or conflicted with the overall management of the Seashore or its resources were dismissed from further analysis.

The National Park Service (NPS) explored and objectively evaluated five alternatives in this environmental impact statement (EIS). Tables 3 and 4 at the end of this chapter summarize elements of the alternatives and maps illustrating these alternatives are included at the end of this chapter. The following is a brief overview of each of the proposed alternatives with each alternative discussed in more detail below. For all alternatives, the percentages listed are simply a starting point, and do not account for any other safety or resource closures that may be implemented, as needed, that may adjust the percentages.

- Alternative A is a continuation of existing conditions and management policies under the *Cape Lookout National Seashore Interim Protected Species Management Plan / Environmental Assessment*, the Biological Opinion, the Amended Biological Opinion, and the Finding of No Significant Impact (FONSI). All-terrain vehicles (ATVs) and/or utility-type vehicles (UTVs) use would continue to be managed in the same manner as off-road vehicle (ORV) use. Approximately 81 percent of the entire length of the Seashore would be potentially available for ORV use from March 16 through December 31.

How the Alternatives are Organized

This chapter provides an overview of the alternatives considered in the EIS planning process. A brief summary of the alternatives is provided, followed by a more detailed discussion of each alternative. The alternatives are discussed as follows:

- *Elements common to all alternatives (A – E)*
- *Discussion of alternative A*
- *Elements common to action alternatives (B, C, and D (not E))*
- *Discussion of alternative B*
- *Discussion of alternative C*
- *Discussion of alternative D*
- *Discussion of alternative E*
- *Alternatives considered but dismissed from further analysis*

At the end of this chapter is a table that summarizes all of the alternatives and allows the reader to compare the differences between alternatives.

All-terrain Vehicle (ATV)—

A motorized off-highway vehicle designed to travel on four low-pressure tires, having a seat designed to be straddled by the operator and handlebars for steering control.

- Alternative B would maintain existing opportunities for ORV experiences on the Core Banks; vehicle permits would be required, but there would be no limits on the number of vehicle permits issued; ORV use and density could increase; existing management practices at the Seashore would continue; an annual operator education certificate would be required; plus additional education and outreach and species management measures, such as seasonal restrictions on night driving, would be implemented. Non-sport ATVs and UTVs would be allowed at the Seashore from March 16 through December 31, and all high-performance sport-model and two-stroke ATV and UTVs would be prohibited year-round. High-performance sport-model and two-stroke ATV and UTVs would be phased out after a five-year grace period. Approximately 81 percent of the entire length of the Seashore would be potentially available for ORV use from March 16 through December 31.
- Alternative C would create three new seasonal pedestrian-only areas, and expand one existing pedestrian-only area; vehicle permits would be required that would keep use at historic levels, but which could allow an increase in ORV density (use levels would be monitored and management actions could be triggered if density increases); existing management practices at the Seashore would continue; an annual operator education certificate would be required; plus additional education and outreach and species management measures, such as seasonal restrictions on night driving would be implemented. Alternative C would implement a seasonal prohibition of ATVs and UTVs; would prohibit high-performance sport-model and two-stroke ATVs and UTVs, and would implement restrictions on trailers, all with a five-year grace period. Approximately 79 percent of the entire length of the Seashore would be potentially available for ORV use from March 16 through the Thursday preceding Memorial Day and from the day after Labor Day through December 15. Approximately 74 percent of Seashore beach would be available for ORV use from the Friday preceding Memorial Day through Labor Day.
- Alternative D would provide increased opportunities for year-round pedestrian experiences; vehicle permits would be required and would be limited to keep the number of permits issued at 8 percent below current ORV use levels; existing management practices at the Seashore would continue; plus a requirement for

Utility-type Vehicle (UTV)—

A motorized vehicle designed and manufactured for general maintenance, security, recreational, and landscaping purposes, but does not include vehicles designed and used primarily for the transportation of persons or property on a street or highway.

High-performance ATVs and UTVs are designed for high performance, such as racing, jumping, and/or sliding around corners, with high acceleration motors, long traveling shocks, low center of gravity, light weight features, and for speeds over 50 mph. They are not equipped for utility work and typically lack the following: front and rear racks (ATVs), utility bed (UTVs), tow bar/hitch, and low geared motors. They generally lack lights, (headlights and tail lights), full protective fenders, and running boards, and are lighter than utility models.

Utility-model ATVs are designed to be used in utilitarian ways, such as towing, hauling, and transporting equipment, and generally utility models have a maximum speed of approximately 45 mph, although some models are capable of higher speeds. Utility ATVs generally have headlights and tail lights, both front and back racks for hauling items, a bracket to hook up a trailer, large diameter shocks to support loads, and lower end gearing for pulling and towing.

an annual operator education certificate, increased education and outreach and additional species management measures, such as seasonal restrictions on UTV use, night driving and a year-round prohibition of ATVs, high-performance sport-model and two-stroke UTVs, implemented after a five-year grace period. ORV trailers (anything that is pulled behind another vehicle) would be prohibited; UTV trailers 5 feet or less would be allowed. Approximately 73 percent of the entire length of the Seashore would potentially be available for ORV use from March 16 through December 15, with the exception that during the period from the Friday preceding Memorial Day through Labor Day, 63 percent of Seashore beach would be available for ORV use.

- Alternative E would not provide or designate any public ORV routes, therefore alternative E would not allow for ORV use at the Seashore. No special regulation would be promulgated. Essential vehicles would continue to use routes as designated in alternative A and all existing species management measures would continue.

ELEMENTS COMMON TO ALL ALTERNATIVES

The following describes elements of the alternatives common to all alternatives. Alternative E would not allow for ORV use at the Seashore, therefore, elements related to vehicle use would not be applicable to alternative E. This is noted where applicable.

About ORV Routes and Designated Areas

- Cape Lookout National Seashore encompasses 56 miles of beach along the North Carolina coast including three main islands, North Core Banks, South Core Banks and Shackleford Banks. Other islands, such as Middle Core Banks, are smaller and have been created as a result of storm activity and other natural processes.
- ORV use under the no-action alternative has historically been allowed only on the Core Banks. The 9 mile Shackleford Banks was designated as a “Proposed Wilderness” area under the Wilderness Act in 1984 and accordingly, ORV use on Shackleford Banks cannot be considered in this Off-road Vehicle Management Plan and Environmental Impact Statement (ORV management plan/EIS) under any alternative. However, when calculating the percentage of Seashore as available for ORV use (or as pedestrian-only areas), the 56 miles of the Seashore will be used as a baseline and Shackleford Banks will be counted as a pedestrian-only area. For all alternatives, the percentages listed are simply a starting point, and do not account for any other safety or resource closures that may be implemented, as needed, that may adjust the percentages.
- In the event that an island is severed from another island (due to storms, flooding, etc.), the island would allow ORV use only if there is a ferry landing location on that island. If the island does not contain a ferry landing, then ORV use would be prohibited. For example, as of January 2013, Middle Core Banks is severed from ferry service and is closed to ORV use; the island and its portion of the back route would become accessible to ORV use if Old Drum Inlet closes and Middle Core Banks becomes accessible to vehicles (i.e., if Middle Core Banks reconnects to an island that has ferry service).

Closures for Public Safety (Not Applicable under Alternative E)

- This ORV management plan/EIS does not limit, or supersede existing authorities under NPS regulations contained at 36 CFR Part 1 et seq., which details the general provisions applicable to all national park system units.

- ORV safety closures would be implemented in the event of a threat of significant bodily injury or death, and/or damage to personal property, including vehicles and their contents. ORV safety closures would preclude ORV access, while pedestrian access could be maintained through most safety closures. Conditions that could justify an ORV closure include, but are not limited to the following:
 - Deep beach cuts that block the beach from dune to surf with no obvious way around.
 - Obstacles, such as exposed stumps, shipwrecks, or debris, that cannot be safely bypassed or that block the entire width of the beach and cannot be easily removed.
 - Severe beach slope that puts vehicles in an unsafe position (slanted) and increases the chances of the loss of vehicular control.
 - A high concentration of pedestrian users coupled with a narrow beach.
- NPS staff would monitor ORV safety closures on a regular basis. Sufficient reduction or elimination of the conditions prompting the closure, so there is no longer an imminent hazard, would constitute the condition for reopening a closure.

Vehicle and Pedestrian Safety (Not Applicable under Alternative E)

- Provisions related to vehicle and pedestrian safety currently exist under 36 CFR 4.20 (Right of way) and 36 CFR 4.22 (Unsafe operation). These provisions state that motor vehicle operators shall
 - Yield the right of way to pedestrians (failure to yield the right of way is prohibited)
 - Maintain that degree of control of a motor vehicle necessary to avoid danger to persons, property, or wildlife.
- As noted in the Superintendent's Compendium (NPS 2013d) for the Seashore, the following provisions apply to vehicle and pedestrian safety:
 - Driving a vehicle in a manner that needlessly ruts the sand is prohibited.
 - Failing to fill to the original level any hole caused by excavating a vehicle from the sand is prohibited.
 - Upon approaching within 100 feet of any person, vehicle, campsite, other structure or while traveling within a lease area, the speed limit is reduced to 15 miles per hour.

Shade Shelters

- Shelters provide emergency protection from sudden storms. The existing shelters are at the following locations:
 - Shackleford Banks – near the horse pens
 - Cape Lookout Light Station – on the beach, at the pavilion and near the dock, and at the transportation hub
 - Great Island Cabin Area – near the dock
 - Long Point Cabin Area – near the dock and near the beach.

Speed Limits

- According to 36 CFR 4.21, speed limits are designated annually in the Superintendent's Compendium. The Superintendent's Compendium is reviewed annually and is subject to change. The 2013 Superintendent's Compendium states,
 - The maximum speed limit on the beach is 25 miles per hour or as otherwise posted.
 - The maximum speed limit on designated routes is 25 miles per hour or as otherwise posted.
 - Upon approaching within 100 feet of any person, vehicle, campsite, other structure or while traveling within a lease area, the speed limit is reduced to 15 miles per hour.
 - The maximum speed limit while carrying passengers in a trailer or other mode of conveyance towed behind the motor vehicle specifically designed for carrying passengers while being towed is 15 miles per hour.

Exemptions for Essential Vehicles

- Essential vehicles are only allowed in pedestrian-only areas for law enforcement, emergencies, or safety concerns.

Alternative Transportation

- According to the *Commercial Services Plan / Environmental Assessment / Assessment of Effects* (NPS 2007m) for Cape Lookout National Seashore, the NPS would consider authorization of commercial beach shuttle services departing from each of the following developed nodes: Portsmouth Village / mile marker 1, Long Point, Great Island, the Cape Lookout Light Station, and the Cape Village Historic District.¹
- Currently, a concession contract authorizes through 2024 a beach shuttle service on South Core Banks departing from the lighthouse area. An ATV and UTV tour has historically been permitted under an annual commercial use authorization (CUA) on North Core Banks from mile marker 0.0. CUAs are reviewed and issued annually based on applicable laws and policies.

General Species Management

The following description of elements common to all alternatives relates specifically to species management requirements. These species management measures are consistent across the alternatives unless otherwise noted below (refer to table 5 at the end of this chapter). Also, note that species management measures under alternative E are generally the same as alternative A but without ORV specific closures. Although ORVs would not be allowed under alternative E, areas may still be closed to pedestrians for resource protection.

- For bird species, the description of alternatives and the alternative element summary table (refer to table 4 at the end of this chapter) describe how actions change with the specific life stages of

¹ Executive Order 11644, Use of ORVs on public lands, Section 3(C), defines ORVs, and excludes "any vehicle whose use is expressly authorized by the respective agency head under a permit, lease, license, or contract." This definition is incorporated by reference into 36 CFR 4.10 governing ORVs in park units. Therefore, commercial vehicle uses, including CUAs, do not require routes designated by special regulation.

each species. The alternatives were organized in this way to reflect that the biological needs and, hence, the management needs of each species change as a function of life stage. These life stages are explained in the following sections in chapter 3: “Federally Listed Endangered, Threatened, or Candidate Species,” “State-listed and Special-status Species,” and “Other Wildlife and Wildlife Habitat.”

- The timing of each life stage varies according to the species in question; however, there is much overlap among species. For example, surveying for piping plover is conducted at the same time as surveying for colonial waterbirds (e.g., least terns, common terns, and black skimmers). There would likely be overlap among the established closures, because the preferred habitat is similar between similar species (e.g., piping plover and Wilson’s plover). Therefore, some closures would likely occur at the same time and in the same place for multiple species. Specific survey requirements are provided in appendix A.

Closures for Species Management

- | | |
|---|---|
| <ul style="list-style-type: none"> • Closures for bird species would vary by alternative and are discussed under each alternative below. • For sea turtles, ORVs would be prohibited from entering sea turtle closures from 50 days after the nest is laid until after the nest has hatched. ORV access would be provided around the nest by either routing ORVs around the closure, where possible, or creating a ramp-to-ramp closure and routing ORVs to the back route where the buffer does not allow an ORV to be routed around the nest on the beach. • ORV closures are created when they are necessary for species protection, and are detailed in tables 4 and 5 at the end of this chapter. Under all alternatives, pedestrians would be allowed in these ORV closures. ORV closures would not occur under alternative E. Pedestrians would not be allowed in full recreational closures under any alternative. | <hr/> <p>ORV Closures—in these areas, ORV use is prohibited, but other recreational users such as pedestrians and leashed pets are allowed.</p> <p>Full Recreational Closures—in these areas, all recreational users are prohibited, including pedestrians, their pets, and ORVs.</p> <hr/> |
|---|---|
- In accordance with existing regulations (36 CFR 2.15) pets would be required to be leashed or otherwise physically confined at all times in all areas of the Seashore.
 - Camping and beach fires would be prohibited in turtle nest closures.
 - Visitors staying in Seashore cabins would be encouraged to minimize use of outside lights to prevent disturbance of hatchlings from artificial light.

Species Surveying and Management

- The *Cape Lookout National Seashore Interim Protected Species Management Plan / Environmental Assessment*, the Biological Opinion, the Amended Biological Opinion, and the FONSI, are the most recent Seashore planning guidance documents for species management.
- Table 1 presents an overview of the conservation and performance measures for species identified during Endangered Species Act (ESA) section 7 consultation with U.S. Fish and Wildlife Service (USFWS) for the *Cape Lookout National Seashore Interim Protected Species Management Plan / Environmental Assessment*, the Biological Opinion, the Amended Biological Opinion, and the FONSI. These species conservation and performance measures are subject to change based on on-going section 7 consultation.

TABLE 1: SPECIES CONSERVATION AND PERFORMANCE MEASURES FROM THE *CAPE LOOKOUT NATIONAL SEASHORE INTERIM PROTECTED SPECIES MANAGEMENT PLAN / ENVIRONMENTAL ASSESSMENT*, BIOLOGICAL OPINION, AMENDED BIOLOGICAL OPINION, AND FONSI

[Note: These species conservation and performance measures are subject to change based on ongoing section 7 consultation.]

Species	Conservation Measures	Performance Measures
Piping Plover	<ul style="list-style-type: none"> • Monitor abundance and distribution of wintering plovers through specific winter surveys. Provide monitoring data to the USFWS so the information may be combined with data from other monitoring efforts to determine the significance of Seashore breeding or wintering population segments to the state, region (middle Atlantic coast), or Atlantic coast population changes and trends. Document violations of closures by ORVs, pedestrians, and leashed and unleashed pets. • Monitor plover breeding activities at nesting sites to identify factors that may be limiting abundance of nesting plovers and productivity. • Monitor the impact of mammalian and bird predators on piping plover breeding productivity. • The NPS would seek funds for intensive research studies and surveys to address the following issues relative to the piping plover and other shorebirds: <ol style="list-style-type: none"> 1. Study the role of habitat in fledging success of piping plover chicks; 2. Partner with the Navy overflight study to measure the impact of overflights on shorebirds (this study was completed in June 2012). • Study the response of migrating and wintering piping plovers to disturbance by ORVs, pedestrians and pets. Determine the flushing distance for each of these disturbances. 	<p>Measure 1, Number of Breeding Pairs—The goal is 25 or more breeding pairs of piping plovers at the Seashore per year. Since 1989, the number of breeding pairs of piping plovers has ranged from 13 to 39 pairs with an average of 25 pairs of breeding plovers.</p> <p>Measure 2, Number of Piping Plover Nests—The goal is at least one nest per breeding pair of piping plovers at the Seashore per year. Since 1989, the number of nests per breeding pair has ranged from 1.0 to 1.7. Having a greater number of nests per breeding pair would indicate a greater loss of nests, and having fewer nests than breeding pairs could indicate disturbance of breeding pairs.</p> <p>Measure 3, Number of Chicks Fledged—The goal is at least 0.75 chicks fledged per breeding pair at the Seashore per year. Since 1989, the number of chicks fledged per breeding pair has ranged from 0.09 to 0.92 with an average fledging rate of 0.48 chicks fledged per breeding pair.</p> <p>Measure 4, Monitoring Procedures—Cape Lookout National Seashore would consult with the USFWS to develop monitoring procedures and goals for wintering piping plovers. Until standard monitoring procedures are developed, the Seashore would monitor migrating piping plovers at least once per month around the 15th of the month from August through March. Surveys would not include Middle Core Banks or Ophelia Banks unless one of these inlets closes. To investigate the movement of birds through the area around Ocracoke Inlet, counts would be made every two weeks from Ocracoke Inlet south 4 miles, from the end of July through mid-October.</p> <p>Re-initiation of Consultation if Performance Measure Goals Not Met—If one or more performance measures are not met, the Seashore would reinitiate consultation with USFWS as part of the annual review process identified in the USFWS Amended Biological Opinion (USFWS 2007a), unless the Seashore and the USFWS mutually agree that the failure to meet the goal was caused by factors beyond management control or influence of the Seashore.</p>

Species	Conservation Measures	Performance Measures
Sea Turtle	<ul style="list-style-type: none"> • Monitor the number of nesting females and their reproductive success so that the current contribution of the Seashore to regional population dynamics can be better understood. • Monitor the impacts of predators on sea turtle nests. • Document violations of sea turtle closures by ORVs. • The NPS would seek funds for intensive research studies and surveys to determine the effects of night driving on nesting sea turtles at the Seashore. 	<p>Measure 5, False Crawl Ratio—The goal is that the sea turtle false crawl to nest ratio (all species) is less than or equal to 1:1 (annually). Since 1990, the false crawl to nest ratio at the Seashore has ranged from 0.56:1 to 1.58:1 with an average ratio of 0.96:1. If the Seashore finds a body pit of sea turtle activity but does not find the eggs and the activity is washed away, or if eggs do not hatch, then the activity is considered a false crawl. This definition of a false crawl potentially makes the ratio of false crawls to nests higher.</p> <p>Measure 6, Percentage of Sea Turtle Nests in the State—The goal is that the percentage of the state's total sea turtle nests (all species) would be greater than or equal to 20 percent annually of the statewide average for the previous five years. Since 1996, the percentage of sea turtle nests in the state that occur at the Seashore has ranged from 12 to 25 percent with an average of 20 percent.</p> <p>Re-initiation of Consultation if Performance Measure Goals Not Met—If one or more performance measures are not met, the Seashore would reinitiate consultation with USFWS as part of the annual review process identified in the USFWS Amended Biological Opinion (USFWS 2007a), unless the Seashore and the USFWS mutually agree that the failure to meet the goal was caused by factors beyond management control or influence of the Seashore.</p>
Seabeach Amaranth	<ul style="list-style-type: none"> • Monitor the effects of nutria grazing on seabeach amaranth at the Seashore. • NPS would seek funds for intensive research studies and surveys to address the following issues relative to seabeach amaranth: <ol style="list-style-type: none"> 1. Determine and assess effects of both natural and human disturbances, including ORV use, to the species at the Seashore. 2. Determine the effect of webworm herbivory on seabeach amaranth at the Seashore. 	Performance measures are not applicable to seabeach amaranth.

- Consultation with the USFWS regarding ESA compliance measures would continue under all alternatives.
- Additional species surveying measures from the *Cape Lookout National Park Interim Protected Species Management Plan / Environmental Assessment* are included in table 4 at the end of this chapter. Additional elements that would be implemented under each alternative are included in table 5 at the end of this chapter.

ALTERNATIVE A: NO ACTION

The Department of the Interior regulations implementing NEPA state that there are two interpretations of the term “no-action.” First, “no-action” may mean “no change” from a current management direction or level of management intensity (e.g., if no ground disturbance is currently underway, no action means no ground disturbance). Second, “no-action” may mean “no project” in cases where a new project is

proposed for implementation (43 CFR 46.30). The no-action alternative is developed for two purposes: a no-action alternative may represent the agency's past and current actions or inaction on an issue continued into the future and may also describe existing impacts continued into the future. The no-action alternative presented in this ORV management plan/EIS meets both of these purposes and represents no change from the current level of management direction and level of management intensity.

In compliance with the settlement agreement reached in *Friends of the Earth v. Department of Interior* (478 F. Supp 2d 11, D.C. Dist. Ct. (2007)), Cape Lookout National Seashore (Seashore) implemented interim ORV management planning pursuant to the *Cape Lookout National Seashore Interim Protected Species Management Plan / Environmental Assessment*, Biological Opinion and Amended Biological Opinion, and FONSI, which serve in part as the no-action alternative for this ORV management plan/EIS and will be in effect until its completion. The no-action alternative reflects long-standing ORV use at the Seashore and is consistent with park planning documents over previous decades, including the Seashore's *General Management Plan* (NPS 1982), and *General Management Plan Amendment* (NPS 2001d), which allow ORV use.

As stated in chapter 1, in order to allow off-road use, NPS must promulgate a special regulation authorizing use at the Seashore. Without a special regulation, continued off-road use would conflict with NPS regulations (36 CFR 4.10). Therefore, to implement the no-action alternative, NPS would need to promulgate a special regulation.

NPS recognizes that because there is currently no regulation in place allowing ORV use, a number of commenters on this process have advocated that a "no off-road vehicle use" alternative should be the no-action alternative. However, NPS does not believe that a "no off-road vehicle use" alternative would fully serve the function of a no-action alternative. Given the history of continuous ORV use since the 1930s, almost 50 years before the Seashore was established, as well as the allowance of ORV use since the Seashore's establishment, and its allowance in park planning documents and a settlement agreement, a complete off-road use prohibition cannot be considered as the "current management direction or level of management intensity." NPS notes that if a "no off-road vehicle use" alternative had been chosen as the no-action alternative, a regulation terminating ORV use, pursuant to 36 CFR 1.5(b), may have also been required to implement that alternative. Thus, without action, ORV use would likely continue.

The anticipated benefits and other impacts of a complete prohibition of ORV use are fully discussed in the environmental impact analysis for alternative E and compared to the impacts of other alternatives and the existing condition in the discussion section, but cannot substitute as the baseline of existing impacts. Therefore, NPS believes that the best representation of the no-action alternative is the current condition, as described in previous planning documents (including the *Cape Lookout National Seashore Interim Protected Species Management Plan / Environmental Assessment*) and on-the-ground current management.

The elements proposed under alternative A are summarized below and fully detailed in tables 3, 4, and 5 at the end of this chapter.

Designated Vehicle Routes and Pedestrian-Only Areas—Eighty one percent (45 of 56 miles) of the entire length of the Seashore would be available for ORV use from March 16 through December 31. Areas and routes open to ORV use, unless closed for safety or resource protection, would be identical to those areas and routes currently marked and designated in the 2013 Superintendent's Compendium.

Pedestrian-only areas (constituting 19 percent of the entire length of the Seashore year-round and 100 percent of the entire length of the Seashore from January 1 through March 15) would include all soundside beaches (except for the one designated vehicle soundside access area on each island),

Portsmouth Village; the lighthouse beach; Power Squadron Spit from about mile marker 46 to the end of the spit; and all of Shackleford Banks.

For all alternatives, these percentages are simply a starting point, and do not account for any other safety or resource closures that may be implemented, as needed, that may adjust the percentages.

Back Route Access and Configuration—At North Core Banks, the back route would parallel the beach behind the primary dune line from approximately 0.5 miles south of Portsmouth Flats at mile marker 4 to 0.5 mile north of Old Drum Inlet at mile marker 18 with the exception there is no back route at Kathryn-Jane Flats from mile 6 to mile 7.

At Middle Core Banks, the back route would parallel the beach behind the primary dune line from south of Old Drum Inlet at ramp 19 to north of New Drum Inlet at ramp 21.

At the South Core Banks, the back route would parallel the beach behind the primary dune line approximately 1 mile south of Ophelia Inlet at mile marker 24 to the point of Cape Lookout at mile marker 44. A section of back route from mile marker 44 to mile marker 45 would be opened when temporary resource closures at the point of Cape Lookout prevent vehicles from driving past the point.

Use of ATV and UTVs at the Seashore—ATV and UTVs would be allowed from March 16 through December 31 at the Seashore with no limitations on type.

Vehicle Permits and Fees and Education Requirements—No vehicle permit would be required. No vehicle limits would be established and no operator education certificate would be required.

Vehicle Delivery, Storage and Fees—Visitors would be allowed to deliver ATV and UTVs in their personal vessels to the Seashore for personal use at designated and marked soundside access points. Other ORVs may only be delivered via NPS authorized vehicle ferries.

Long-term vehicle storage and parking would be available at four lots at the Seashore: Long Point (North Core Banks), Great Island main lot (South Core Banks), Great Island Carly Dock lot (South Core Banks), and the lighthouse complex (South Core Banks). A parking permit would be required for long-term vehicle storage. The fee for the parking permit would be established to ensure the recovery of the cost of managing the parking permit program and is subject to change. Fees would be nonrefundable and nontransferable. There would be no limits on the number of long-term parking permits issued.

Miscellaneous Vehicle and Operator Requirements—Vehicle and operator requirements would be established by the following authorities:

- 36 CFR, including a Cape Lookout National Seashore Special ORV Regulation
- North Carolina Motor Vehicle Codes (as adopted by 36 CFR 4.2)
- Superintendent's Compendium and 36 CFR 4.2 (updated each year).

Species Management Measures—Species management measures would be the same as those outlined in “Elements Common to All Alternatives” previously in this chapter. In addition, for protected bird species, ORVs would be allowed in a corridor along the shoreline where 150-foot buffers can be maintained for colonial nesting species and 600-foot buffers can be maintained for foraging piping plover chicks. If a piping plover chick is found using the ocean beach, the 600-foot buffer would be put in place immediately and ORVs would be routed to the back route, if necessary. If no back route is available the beach would be closed to vehicles. If NPS staff are available, a vehicle escort program could be used on a very limited

case-by-case basis around bird closures to maintain access to Portsmouth Village, the interior of the point of Cape Lookout, or areas with no back route access. Escorts would be led by trained NPS staff and would be limited to 25 vehicles or less. A minimum 300-foot buffer and full beach ramp-to-ramp ORV closure would be provided for mobile American oystercatcher chicks and would be adjusted to follow chick movement. Access would be allowed through American oystercatcher closures if no back route access is available. ORVs would be routed around colonial waterbird closures where a 150-foot buffer cannot be maintained. Management measures for all protected species are detailed in tables 3, 4, and 5 at the end of this chapter.

Education and Outreach—A variety of methods would be used to communicate to visitors about species, resource information, and ORV program information, such as the following:

- Post signage at the Seashore to make information on beach closures and Seashore resources readily available. Present information in a clear manner to the public.
- Notify the public of species management closures and beach access status through press releases, email updates, and postings at the Seashore visitor center and on the Seashore website.
- At the Seashore visitor center and on the Seashore website, provide education and outreach materials regarding protected species and actions to protect nesting birds and sea turtles. These materials would include regulations regarding trash disposal, wildlife feeding, and pets, and the impacts of such activities on sensitive Seashore species, as well as information on dynamic coastal processes, climate change (e.g., sea level rise, storms) and the important role that ORV drivers play in protecting habitat, and preventing erosion and corridors that can channel overwash.
- Provide education and outreach materials regarding visitor safety at the Seashore visitor center and on the Seashore website.
- Provide education and outreach materials regarding ORV driving requirements at the Seashore visitor center and on the Seashore website.
- Solicit input from interested parties regarding how to convey information about the species management program.
- Publish annual protected species reports on the Seashore website regarding the previous breeding season.

ACTION ALTERNATIVES

The action alternatives (except alternative E) would establish designated ORV routes and areas, with some alternatives integrating additional designated areas that would provide visitors with a pedestrian-only visitor experience. Elements common to action alternatives B, C, and D are discussed below, followed by a discussion of each alternative.

ELEMENTS COMMON TO ACTION ALTERNATIVES B, C, AND D

The following describes elements of the management actions common to the action alternatives B, C, and D. These alternative elements are not common to alternative E because alternative E would eliminate ORV use throughout the Seashore.

The Back Route

- All action alternatives would include establishment of pull-outs along the back route, to allow vehicles to pass other oncoming vehicles.
- The back route on South Core Banks from mile marker 44 to about mile marker 45 section would only be open when full beach closures at the Cape would otherwise prevent vehicles from driving past the Cape.
- The back route would be re-established when it is impacted by a storm event, for resource protection and safety

Operator Education Certificates

- A free operator education certificate would be required for a licensed driver to operate a vehicle at the Seashore.
- The education certificate would be issued in a manner to be determined. The following options would be considered: at the Seashore headquarters on Harkers Island, on-line, or on special request for groups.
- The free certificate would be valid for the calendar year.
- Drivers would be required to carry this certificate with them at all times when operating a vehicle on the Seashore.

Vehicle Permits and Vehicle Permit Fees

- A vehicle permit would be required, issued under Special Use Permit authority. This permit would be nontransferable, and attached to an individual vehicle. The permit would be valid on a long-term (annual) or short-term (10-day) basis.
- It is the Seashore's goal to make the vehicle permit convenient to obtain. NPS reserves the right to change the permit system over time, such as to implement a lottery or partial lottery system. The goal is to ensure the permit system is simple, straightforward, fair, accessible, and cost efficient to manage.
- A long-term (annual) and short-term (10-day) vehicle fee would be established; the amount of the fee would be based on guidance in NPS Director's Order and Reference Manual 53, which focuses on cost recovery (including route maintenance, law enforcement, species protection, permit issuance, and other associated program costs). The fee is estimated to be \$150 for long-term (annual) permits or \$80 for short-term (10-day) permits. The long-term (annual) permit fee would not be prorated for partial years.

Miscellaneous Vehicle and Operator Requirements

The following vehicles would be prohibited anywhere within the Seashore:

- High-performance sport-model and two-stroke ATV and UTVs (after a five-year grace period)
- Vehicles with three wheels or less
- Tracked vehicles
- Farm vehicles

- Vehicles with two-stroke engines
- Combination vehicles (i.e., amphibious ATVs, amphibious aircraft, aircraft).

Shade Shelters

NPS would construct up to six additional shelters located along the islands, generally near the back route (two new shelters would be constructed on North Core Banks, and four new shelters would be constructed on South Core Banks). Shade shelters are intended to provide visitors and staff emergency shelter for sudden storms.

Adaptive Management Strategy

An adaptive management strategy would be implemented that evaluates species disturbance. Disturbance to American oystercatcher (an indicator species) would be monitored, primarily related to impacts from ORVs. American oystercatchers are used as an indicator species because they are solitary nesters and are among the bird species at the Seashore, they are the most sensitive to disturbance. If species indicators are triggered (described below), the following actions would take place:

- Step 1: Where two of the four species indicators have reached moderate impacts, more intensive management actions could be implemented. The following are management actions the Seashore may conduct at any time; however, under the adaptive management strategy additional resources would be focused on these actions:
 - Additional, focused trash management and fish scrap disposal
 - Additional predator control
 - Additional education with testing
 - Additional, focused enforcement
 - ORV route restrictions
 - Increased species buffers
 - Reduction in the number of long-term (annual) and/or short-term (10-day) vehicle permits issued, and manage the size of parking (vehicle storage lots).
- Step 2: If species indicators are triggered for two consecutive years after implementing Step 1, then the following management actions shall be taken. These management actions would not occur where the Seashore is able to show that species indicators were triggered due to hurricanes or other strong storms, predators, or other natural conditions not tied to impacts from visitor use.
 - Reduction in the number of long-term (annual) and/or short-term (10-day) vehicle permits issued
 - Increased species protection buffers.

Species indicators will be reevaluated after a five-year grace period, and possibly changed, based on new information. The following indicators are as follows:

- **Breeding population size.** Target 60 breeding pairs. Minor impact: <55 breeding pairs. Moderate impact: <50 breeding pairs.

- **Nest survival.** Target >30% of nests initiated hatch one or more chicks. Minor impact: 25%–30%. Moderate impact: <25%.
- **Chicks fledged per breeding pair per year.** Target > 0.40. Minor impact: 0.40–0.30. Moderate impact: < 0.30.
- **Mammal predation.** Target <20% of nests lost to mammals per year. Minor impact: 20%–25%. Moderate impact: >25%.

Education and Outreach

A variety of methods would be used to communicate to visitors about species, resource information, wise use, and ORV program information. In addition, educational materials would be actively provided to Seashore users through the educational certificate requirement (discussed above). This information would be updated annually based on issues identified from the previous season and other adaptive management needs.

Additional ORV specific education could include the following:

- On-the-ground interpretive programs related to ORV use
- Work with vehicle ferry operators to have them distribute educational materials on ORV rules and regulations
- Provision of a regularly updated map of closures—online and posted within the Seashore where possible.

DISCUSSION OF ACTION ALTERNATIVES

ALTERNATIVE B

Alternative B would maintain existing opportunities for ORV experiences on the Core Banks; vehicle permits would be required, but there would be no limits on the number of vehicle permits issued; ORV use and density could increase; existing management practices at the Seashore would continue; an annual operator education certificate would be required, plus additional education and outreach and species management measures, such as seasonal restrictions on night driving would be implemented. In addition there would be a phase out of high-performance sport-model and two-stroke ATV and UTVs after a five-year grace period. The elements proposed under alternative B, are described below.

Designated Vehicle Routes and Pedestrian-Only Areas—Eighty one percent (45 of 56 miles) of the entire length of the Seashore would be potentially available for ORV use from March 16 through December 31. Routes within the Cape Lookout Village Historic District would be open to through vehicle traffic.

Pedestrian-only areas (constituting 19 percent of the entire length of the Seashore year-round and 100 percent of the entire length of the Seashore from January 1 through March 15) would include the following: Portsmouth Village, the lighthouse beach (ramp 41a to 41b), and Power Squadron Spit from about mile marker 46 to the end of the spit, and all of Shackleford Banks.

Back Route Access and Configuration—At North Core Banks, the back route would parallel the beach behind the primary dune line from approximately 0.5 miles south of Portsmouth Flats at mile marker 4 to

0.5 mile north of Old Drum Inlet at mile marker 18 with the exception there is no back route at Kathryn-Jane Flats from mile 6 to mile 7.

At Middle Core Banks, the back route would parallel the beach behind the primary dune line from south of Old Drum Inlet at ramp 19 to north of New Drum Inlet at ramp 21. (Note: As of January 2013, Middle Core Banks is severed from ferry service and is closed to ORV use; the island and its portion of the back route will again become accessible to ORV use if Middle Core Banks becomes accessible to vehicles (i.e., if Middle Core Banks reconnects to an island that has ferry service)).

At South Core Banks, the back route would parallel the beach behind the primary dune line approximately 1 mile south of Ophelia Inlet at mile marker 24 to the point of Cape Lookout at mile marker 44. Additionally, the back route on South Core Banks would be extended from mile marker 44 to about mile marker 45 to allow vehicles to bypass bird closures at the Cape without going through the Cape Village Historic District.

Up to four additional ramps may be created on North Core Banks and five on South Core Banks. Pull-outs would be established along the back route that allows northbound and southbound vehicles to more easily pass one another along the route. Ramps would be sited to minimize impacts to the dunes, generally maintaining a spacing of a mile between ramps; locations of ramps may change after storm events.

Use of ATV and UTVs at the Seashore—Non-sport ATVs and UTVs would be allowed from March 16 through December 31 within the Seashore provided the vehicles have not been modified and still meet the manufacturer’s original specifications for a utility model. All high-performance sport-model and two-stroke ATV and UTVs (as defined by the manufacturer) would be prohibited after a five-year grace period.

Rationale for limiting high-performance ATVs/UTVs—Although the Seashore allows ATV and UTV use for transportation within its boundaries, the use of the vehicles for performance riding is generally not consistent with the Seashore’s purpose or NPS *Management Policies 2006*. These high performance vehicles are generally faster, noisier, and less safe than utility models. The two-stroke models generally produce more pollutants than the four-stroke models. They are by design made for racing, jumping, and moving at high speeds, instead of used as a tool for access to the Seashore.

Vehicle Permits and Fees and Education Requirements—A nontransferable short-term (10-day) or long-term (annual) vehicle permit would be required. The fee is estimated to be \$150 for long-term (annual) permits or \$80 for short-term (10-day) permits.

There would be no limit on the number of permits issued, except as recommended to implement adaptive management.

An operator education certificate would be required for a licensed driver to operate a vehicle at the Seashore as described in “Elements Common to Action Alternatives B, C, and D.”

The superintendent may revoke a vehicle permit and/or an operator education certificate for violation of applicable park regulations or terms and conditions of the permit.

Vehicle Delivery, Storage and Fees—Visitors would be allowed to deliver via their personal vessel ATVs and/or UTVs to the Seashore for personal use at designated soundside access points. Other ORVs may only be delivered via NPS authorized vehicle ferries.

Long-term vehicle storage and parking would be provided at four lots at the Seashore: Long Point (North Core Banks), Great Island main lot (South Core banks), Great Island Carly Dock lot (South Core Banks), and the lighthouse complex (South Core Banks).

A parking permit would be required for long-term vehicle storage. The fee for the parking permit would be valid on a monthly basis, based on guidance in NPS Director's Order and Reference Manual 53 (NPS 2000e). A parking permit would be expected to cost between \$60 and \$80 per month. Fees would be nonrefundable and nontransferable.

The number of parking permits issued monthly would be limited, based on the vehicle capacity of the lot; permits would be issued on a first-come, first-served basis. The parking lots would have the following vehicle capacity, though this capacity may be reduced for adaptive management strategies:

- Spring/Summer Season (from March 15 through September 14)
 - Long Point = 20 vehicles
 - Great Island = 90 vehicles (Includes Great Island main lot and Great Island Carly Dock lot)
 - Lighthouse Complex = 20 vehicles
- Fall Season (from September 15 through December 15)
 - Long Point = 50 vehicles
 - Great Island = 150 vehicles (Includes Great Island main lot and Great Island Carly Dock lot)
 - Lighthouse Complex = 35 vehicles.

Long-term vehicle lots would be closed from December 16 through March 15.

Under alternative B, emergency (storm refuge) parking could be provided, on a case-by-case basis, in designated areas along the back route. This would allow for overnight vehicle parking during times of adverse weather or unusually high tide events. Table 2 shows the approximate location for each overnight emergency parking area, and the approximate number of vehicles they would allow.

Miscellaneous Vehicle and Operator Requirements—Miscellaneous vehicle and operator requirements would be the same as those outlined above under “Elements Common to Action Alternatives B, C, and D.” In addition, there would be further requirements under alternative B.

Number of axles and wheels—There would be a two-axle maximum for vehicles (UTVs are allowed three axles), and vehicles with a maximum of six wheels would be allowed (dual wheels allowed)—this is the axle maximum for the powered vehicle and does not include additional number of axles on towed trailers.

Vehicle Length—The maximum vehicle length is 30 feet (this is the maximum length for the powered vehicle, including all attachments, and does not include the additional length of a towed trailer).

Trailers—Trailers would be limited to no more than two axles (and except for ATV and UTV trailers), must be street legal, and can be no longer than 30 feet including all attachments.

- ATV and UTV trailers can be no longer than 5 feet, including all attachments.
- Passengers would not be allowed to ride in or on a trailer, unless authorized by a commercial use or other written NPS authorization.

TABLE 2: OVERNIGHT EMERGENCY PARKING AREAS AND NUMBER OF VEHICLES ALLOWED

North Core Banks	Approximate Number of Vehicles Allowed
Mile marker 1.5	1–3
Mile marker 9	3–4
Mile marker 11	4–6
Mile marker 14	2–3
Mile marker 16–17	4–6
Mile marker 18	2
Mile marker 18b	2–3
Mile marker 21–22	2–4
South Core Banks	Approximate Number of Vehicles Allowed
Mile marker 26–27	4–6
Mile marker 29–31	4–6
Mile marker 33	2–3
Mile marker 35–36	3–4
Mile marker 38–39	4–6
Mile marker 42–43	6–8
Mile marker 42–43	2–4
Mile marker 42–43	4–6
Mile marker 43–44	2–3

Species Management Measures—Species management measures would be the same as those outlined above under “Elements Common to All Alternatives.” In addition, for protected bird species ORVs would be allowed in a corridor along the shoreline where 150-foot buffers can be maintained for colonial nesting species and 600-foot buffers can be maintained for foraging piping plover chicks. If a piping plover chick is found using the ocean beach, the 600-foot buffer would be put in place immediately and ORVs would be routed to the back route if necessary. If no back route is available the beach would be closed to vehicles. Vehicle escorts could be implemented as described under alternative A. A minimum 300-foot buffer and ramp-to-ramp full beach ORV closure would be established for mobile American oystercatcher chicks and would be adjusted to follow chick movement. Access would be allowed through American oystercatcher closures if no back route access is available. ORVs would be routed around colonial waterbird closures where a 150-foot buffer cannot be maintained.

Night driving restrictions would also be implemented from May 1 through August 31 to reduce potential impacts to turtles and bird chicks.

Under alternative B, the Seashore would perform limited removal of mammalian predators, when predation is observed that impacts federally listed species or species of special concern.

Management measures for all protected species are fully detailed in tables 3, 4, and 5 at the end of this chapter.

ALTERNATIVE C

Alternative C would create three new seasonal pedestrian-only areas, and expand one existing pedestrian-only area; vehicle permits would be required that would keep growth at historic levels, but could allow an increase in ORV density (use levels would be monitored and management actions could be triggered if

density increases); existing management practices at the Seashore would continue; an annual operator education certificate would be required, plus additional education and outreach and species management measures, such as seasonal restrictions on night driving would be implemented. Alternative C would implement a seasonal prohibition of ATVs and UTVs; would prohibit high-performance sport-model and two-stroke ATVs and UTVs, and would implement restrictions on trailers, all with a five-year grace period.

The elements proposed under alternative C, are described below.

Designated Vehicle Routes and Pedestrian-Only Areas—Seventy nine percent of the entire length of the Seashore (44 of 56 miles) would be potentially available for ORV use from March 16 through the Thursday preceding Memorial Day and from the day after Labor Day through December 15. Seventy four percent of the entire length of the Seashore (41 of 56 miles) would be available for ORV use from the Friday preceding Memorial Day through Labor Day. Routes within the Cape Lookout Village Historic District would be open to through vehicle traffic.

Pedestrian-only areas (constituting 21 percent of the entire length of the Seashore from March 16 through the Thursday preceding Memorial Day and from the day after Labor Day through December 15, 26 percent of the entire length of the Seashore from the Friday preceding Memorial Day through Labor Day, and 100 percent of the entire length of the Seashore from December 16 through March 15) would include the following: Portsmouth Village, an expanded lighthouse beach, and Power Squadron Spit from approximately mile marker 46 to the end of the spit, and all of Shackleford Banks.

Pedestrian-only areas would be expanded during the summer (defined as from the Friday preceding Memorial Day through Labor Day) would include the following:

- Long Point: On the ocean beach at the Long Point Cabin Camp for a day-use beach and a separate tent camping area for a total pedestrian-only area of about 0.50 miles, to be determined by beach profile.
- Great Island: On the ocean beach at the Great Island Cabin Camp for a day-use beach and a separate tent camping area for a total pedestrian-only area of 1.9 miles, to be determined by beach profile.
- Codds Creek: On the ocean beach near Codds Creek for a total closure of 0.8 miles between mile marker / ramps 35a and 35b for pedestrians only. Camping would be allowed in this area, except for the north end turtle relocation site.
- Light Station: The pedestrian-only area at the lighthouse would be expanded approximately 0.7 miles to the south and would run from ramp 41a to ramp 42a (at the NOAA weather buoy) for a total closure of about 1.4 miles year-round, to provide visitors at the ferry hub a bigger stretch of vehicle-free beach.

Back Route Access and Configuration—At the North Core Banks, the back route would parallel the beach behind the primary dune line from approximately 0.5 miles south of Portsmouth Flats at mile marker 4 to 0.5 mile north of Old Drum Inlet at mile marker 18 with the exception there is no back route at Kathryn-Jane Flats from mile 6 to mile 7.

At the South Core Banks, the back route would parallel the beach behind the primary dune line approximately 1 mile south of Ophelia Inlet at mile marker 24 to the point of Cape Lookout at mile marker 44. Additionally, the back route on South Core Banks would be extended from mile marker 44 to

mile marker 45; this section of back route would only be open when the area of the Cape closes to through traffic.

Up to four additional ramps may be created on North Core Banks and five on South Core Banks. Pull-outs would be established along the back route that allows northbound and southbound vehicles to more easily pass one another along the route. Ramps would be sited to minimize impacts to the dunes, generally maintaining a spacing of a mile between ramps; locations of ramps may change after storm events.

Use of ATV and UTVs at the Seashore—Non-sport ATVs and UTVs would be allowed from September 15 through December 15 within the Seashore, provided they have not been modified and still meet the manufacturer’s original specifications for a utility model. All high-performance sport-model and two-stroke ATVs and UTVs would be prohibited after a five-year grace period, for the same reasons as discussed under alternative B.

Vehicle Permits and Fees and Education Requirements—A nontransferable short-term (10-day) or long-term (annual) vehicle permit would be required. The fee is estimated to be \$150 for long-term (annual) permits or \$80 for short-term (10-day) permits.

The initial limit on the number of vehicle permits issued would be 2,500 permits annually for the North Core Banks and 3,000 permits annually for the South Core Banks, which is based on the average number of ORVs delivered to each island from 2005 through 2012. A limit on the number of vehicle permits issued per year would be established in year 4 of this ORV management plan/EIS, based on the average number of permits issued per island in years 1–3. Permits would be issued on a first-come, first-served basis. An annual lottery may be established to equitably allocate permits. The NPS would be required to maintain ORV use data such as, (1) the number of annual and weekly permits sold including the date sold, and daily vehicle use data; and (2) the total number of vehicles operating and stored on the islands each day. Adaptive management could apply, if necessary, to reduce use from the limit established in year 4 (refer to the “Adaptive Management Strategy” section earlier in this chapter).

An operator education certificate would be required for a licensed driver to operate a vehicle at the Seashore, as described above under “Elements Common to Action Alternatives B, D, and D.” The free certificate would be valid for one calendar year.

The Superintendent may revoke a vehicle permit and/or an operator education certificate for violation of applicable park regulations or terms and conditions of the permit.

Vehicle Delivery, Storage and Fees—Vehicles may only be transported to the Seashore via NPS authorized ferries. Transport of any ORV, including ATVs and UTVs, by personal vessel would be prohibited.

Long-term vehicle storage and parking would continue to operate with the same limits discussed in alternative B, except there would be three lots instead of four. The parking lots at the Great Island area would be consolidated at the north end of Great Island, near Great Island Carly Dock, while still accommodating the number of vehicles described under alternative B.

Under alternative C, emergency (storm refuge) parking could be provided, on a case-by-case basis, in designated areas along the back route. This would allow for overnight vehicle parking during times of adverse weather or unusually high tide events.

Miscellaneous Vehicle and Operator Requirements—Miscellaneous vehicle and operator requirements would be the same as described under alternative B, except restrictions on trailers would be implemented after a five-year grace period, and non-sport ATVs and UTVs would only be allowed from September 15 through December 15 at the Seashore.

Species Management Measures—Species management measures under alternative C would be the same as under alternative B with the following exceptions:

- Night driving restriction would be in place from May 1 through September 14 to reduce potential impacts to turtles and bird chicks.
- The winter Seashore closure would be extended to a total of 90 days: from December 16 through March 15.

Management measures for all protected species are fully detailed in tables 3, 4, and 5 at the end of this chapter.

ALTERNATIVE D

Alternative D would provide increased opportunities for year-round pedestrian experiences; vehicle permits would be required and would be limited to keep the number of permits issued at 8 percent below current ORV use levels; existing management practices at the Seashore would continue, plus a requirement for an annual operator education certificate, increased education and outreach and additional species management measures, such as, night driving, and a year-round prohibition of ATVs, high-performance sport-model and two-stroke UTVs, implemented after a five-year grace period (with non-sport UTVs allowed only seasonally).

The elements proposed under alternative D are described below.

Designated Vehicle Routes and Pedestrian-Only Areas—Approximately 73 percent (41 of 56 miles) of the entire length of the Seashore would be potentially available for ORV use from March 16 through the Thursday preceding Memorial Day and from the day after Labor Day through December 15. Sixty-three percent (35 of 56 miles) of the entire length of the Seashore would be available for ORV use from the Friday preceding Memorial Day through Labor Day. Routes within the Cape Lookout Village Historic District would be closed to through vehicle traffic. A short-term parking area would be designated for those people driving to the village to visit and there would be a 0.2-mile bypass route around the district.

Pedestrian-only areas would include Portsmouth Village, an expanded lighthouse beach, Power Squadron Spit from approximately mile marker 46 to the end of the spit, and all of Shackleford Banks. This constitutes 27 percent of the entire length of the Seashore from March 16 through the Thursday preceding Memorial Day and from the day after Labor Day through December 31, 37 percent of the entire length of the Seashore from the Friday preceding Memorial Day through Labor Day, and 100 percent of the entire length of the Seashore from December 16 through March 15.

Additional year-round pedestrian-only areas would include the following:

- Long Point: On the ocean beach at the Long Point Cabin Camp for a day-use beach and a separate tent camping area for a total pedestrian-only area of about 0.50 miles, to be determined by beach profile.

- Great Island: On the ocean beach at the Great Island Cabin Camp for a day-use beach and a separate tent camping area for a total pedestrian-only area of 1.9 miles, to be determined by beach profile.
- Codd's Creek: On the ocean beach near Codd's Creek for a total closure of 0.8 miles between mile marker / ramps 35a and 35b for pedestrians only. Camping would be allowed in this area, except for the north end turtle relocation site.
- Light Station: The pedestrian-only area at the lighthouse would be expanded approximately 0.7 miles to the south and would run from ramp 41a to ramp 42a (at the NOAA weather buoy) for a total closure of about 1.4 miles, to provide visitors at the ferry hub a bigger stretch of vehicle-free beach.

Additional seasonal pedestrian-only areas from the Friday preceding Memorial Day through Labor Day would include the following:

- Johnson's Creek: area closed is from a new ramp at approximately mile marker 31 (near Guthrie's Hammock) opposite the sound access to the next ramp south for approximately 0.5 miles. This is a popular kayak area. A new ramp would be constructed 1/2 mile in front of Johnson's Creek.
- Middle Core Banks: closed to ORVs whether or not unified with North Core Banks for 3.6 miles (currently is a separate island).
- Portsmouth Beach: from the Portsmouth Village access route north to demarcation line.

Back Route Access and Configuration—At the North Core Banks, the back route would parallel the beach behind the primary dune line from approximately 0.5 miles south of Portsmouth Flats at mile marker 4 to 0.5 mile north of Old Drum Inlet at mile marker 18 with the exception that there is no back route at Kathryn-Jane Flats from mile 6 to mile 7.

At Middle Core Banks, the back route would parallel the beach behind the primary dune line from south of Old Drum Inlet at ramp 19 to north of New Drum Inlet at ramp 21. (Note: as of January 2013, Middle Core Banks is severed from ferry service and is closed to ORV use; the island and its portion of the back route will again become accessible to ORV use if Middle Core Banks becomes accessible to vehicles (i.e., if Middle Core Banks reconnects to an island that has ferry service)).

At the South Core Banks, the back route would parallel the beach behind the primary dune line approximately 2.5 miles south of New Drum Inlet at mile marker 24 to the point of Cape Lookout at mile marker 44. Additionally, the back route on South Core Banks from mile marker 44 to mile marker 45 would be open from March 16 through December 15 through construction of bridges over low-lying areas. This bypass route would facilitate access around the point when resource closures are in effect, and also facilitate the closure of Cape Lookout Village Historic District roads to through traffic.

Demarcation Line—The North Carolina Division of Marine Fisheries uses as the boundary between the Atlantic Ocean and the inside sounds a federally designated line. This line delineates "International Regulations for Preventing Collisions at Sea" (COLREGS Lines of Demarcation) which were established by the Coast Guard to designate where "International Rules of the Road" separate from "U.S. Inland Rules." Individual lines were established where practical, by physical objects like fixed aids to navigation or prominent points of land, because they are readily discernible by the eye rather than by instruments.

Up to four additional ramps may be created on North Core Banks and five on South Core Banks. Pull-outs would be established along the back route to allow northbound and southbound vehicles to more easily pass one another along the route. Ramps would be sited to minimize impacts to the dunes, generally maintaining a spacing of a mile between ramps; locations of ramps may change after storm events.

Use of ATV and UTVs at the Seashore—Non-sport UTVs would be allowed from September 15 through December 15 after the bird nesting season has concluded, provided they have not been modified and still meet the manufacturer’s original specifications for a utility model. All ATVs and high-performance sport-model and two stroke UTVs would be prohibited after a five-year grace period, for the same reasons as described under alternative B.

Vehicle Permits and Fees and Education Requirements—As under alternative C, a nontransferable 10-day or annual vehicle permit would be required. The fee is estimated to be \$150 for long-term (annual) permits or \$80 for short-term (10-day) permits.

The limit on the number of permits issued would be determined in year 4 of the ORV plan from the average number of permits issued per island in years 1–3 of the ORV plan, minus 8 percent, which is intended to keep ORV density roughly the same due to the 8 percent increase in pedestrian-only areas over the no action alternative. The average number of permits issued under alternative D is likely to be lower than the average number of vehicles delivered to the islands because the number of vehicles delivered to the islands does not account for repeat visitors, thus allowing for some growth in the number of ORVs.

An operator education certificate would be required for a licensed driver to operate a vehicle at the Seashore, as described above under “Elements Common to Action Alternatives B, C, and D.” The free certificate would be valid for one calendar year.

The Superintendent may revoke a vehicle permit, and/or an operator education certificate for violation of applicable park regulations or terms and conditions of the permit.

Vehicle Delivery, Storage and Fees—Vehicles may only be transported to the Seashore via NPS authorized ferries.

No long-term vehicle storage and parking would be provided at the Seashore. The areas of the long-term parking / vehicle storage lots would be designated as overnight emergency (storm refuge) parking areas on a case-by-case basis, to allow for overnight vehicle parking during times of adverse weather or unusually high tide events.

Miscellaneous Vehicle and Operator Requirements—Miscellaneous vehicle and operator requirements would be the same as described under alternative B, except ATVs and trailers would be prohibited after a 5-year grace period; UTV trailers (5 feet or less) would continue to be allowed.

Species Management Measures—Species management measures under alternative D would be the same as under alternative B with the following exceptions:

- Additional species management measures would be implemented for bird species, including the following:

- Increasing the buffers during courtship/mating including increasing the colonial water bird buffers to 600 feet; increasing the least tern buffers to 300 feet; and increasing the American oystercatcher buffers to 450 feet.
- Increase buffers during nesting including increasing the colonial water bird buffers to 600 feet; increasing the least tern buffers to 300 feet; and increasing the American oystercatcher buffers to 450 feet. Where American oystercatcher nests are present, vehicles would be routed around American oystercatcher nests or chicks where the back route is available (no pass-through zone in American oystercatcher buffers) during the nesting season, typically from mid-May through the end of July. If no back route is available, a pass-through zone would be allowed (refer to alternative A).
- The following management measures would be implemented for unfledged piping plovers:
 - Monitor all broods during the chick-rearing phase of the breeding season, with frequency of monitoring same as alternative A, and;
 - Pedestrian-only areas would be established in the vicinity of unfledged broods based on the mobility of broods observed on the site in past years and on the frequency of monitoring as follows: unless substantial data from past years show that broods on a site stay close to their nest locations, pedestrian-only areas should extend at least 650 feet on each side of the nest site during the first week following hatching. The size and location of the protected area should be adjusted in response to the observed mobility of the brood, but in no case should be reduced to less than 650 feet on each side. In some cases, highly mobile broods may require protected areas up to 3,250 feet, even when intensively monitored. Protected areas should extend from the oceanside low water line to the bayside low water line or the farthest extent of dune habitat. Vehicles may be allowed to pass through portions of protected area that are considered inaccessible (as above). This is a seasonal closure from May through August.
- A night driving restriction would be in place from May 1 through September 14 to reduce potential impacts to turtles and bird chicks (same as alternative C).
- The Seashore would be closed to ORV use from December 16 (same as alternative C) through March 15.

Management measures for all protected species are fully detailed in tables 3, 4, and 5 at the end of this chapter.

ALTERNATIVE E

Under alternative E, the entire area of the Core Banks would be closed to public ORV use. Entry by public vehicles into these areas would be prohibited. Use by NPS essential vehicles, and other vehicle use authorized by the NPS would continue.

The elements proposed under alternative E are described below.

Designated Vehicle Routes and Pedestrian-Only Areas—The entire Seashore would be closed to public recreational ORV use. Entry by public vehicles into these areas would be prohibited, and only use by NPS essential vehicles, and other vehicle use authorized by the NPS, would be allowed (concession vehicles included).

Year-round pedestrian-only areas would extend to the entire area of the Core Banks and Shackleford Banks.

Back Route Access and Configuration—No back route access would be provided. The entire area of the Core Banks and Shackleford Banks would be closed to public ORV use. However, the back route would be maintained to allow for official NPS use and other vehicle use authorized by the NPS, (concession vehicles included).

Use of ATV and UTVs at the Seashore—No public ORV use of any kind would be allowed at the Seashore.

Vehicle Permits and Fees and Education Requirements—No public ORV use of any kind would be allowed at the Seashore.

Vehicle Delivery, Storage and Fees—No public ORV use of any kind would be allowed at the Seashore.

Miscellaneous Vehicle and Operator Requirements—No public ORV use of any kind would be allowed at the Seashore.

Species Management Measures—Species management measures under alternative E would be the same as alternative A except there would be no ORV specific closures. Management measures for all protected species are fully detailed in tables 3, 4, and 5 at the end of this chapter.

Education and Outreach—All education efforts would be directed toward pedestrian use as ORVs would not be allowed at the Seashore.

ALTERNATIVE ELEMENTS CONSIDERED BUT DISMISSED FROM FURTHER ANALYSIS

USE AREAS, ORV MANAGEMENT, AND VISITOR USE

Open the Seashore Year-round and Encourage Winter Use

During public scoping, some commenters asked that the Seashore be open year-round to ORV use. Other commenters suggested that the Seashore encourage winter use. As described in chapter 1, critical wintering habitat for piping plovers has been identified by the USFWS in six geographic locations of Cape Lookout National Seashore. These areas are located in the NC-6, NC-7, and NC-8 designation areas. Maintaining the closure of the Seashore in the winter months would further protect this area of wintering habitat for the piping plover, which is in compliance with the Seashore's enabling legislation, executive orders, NPS *Management Policies 2006*, and other regulations to ensure the protection of threatened and endangered species. Opening the Seashore year-round to ORV use would not meet the objectives of the ORV management plan/EIS to minimize impacts on natural physical resources, wildlife, and wildlife habitat and vegetation. Under alternatives A and B, the Seashore is open to ORV use through December 31, and under alternatives C and D the Seashore is open to ORV use through December 15. This leaves a maximum of three months of the year when ORV use is not allowed (from December 16 through March 15). The Seashore also did not include an alternative that would include year-round ORV use because the winter closure allows for the mandatory removal of all vehicles from the Seashore once a year. By making sure all of these vehicles are removed at least once a year, the Seashore can ensure vehicles are in running order and maintained, reducing the possibility for derelict vehicles on the island. There can be a substantial cost involved in removing stranded vehicles. The maximum three-month ORV-free time would also allow the island time for natural recovery from the impacts of ORV use. Because natural resource and law enforcement staff duties are at their lowest level during this time, it would reduce the cost and time burden on the Seashore for enforcement in this area when visitation would be the

lowest. For these reasons, the Seashore believes opening the Seashore year-round would not be consistent with the purposes of this ORV management plan/EIS. Because it does not meet the purpose and objectives of this ORV management plan/EIS, this element was not carried forward for further analysis.

Close the Back Route to ORV Access

Commenters suggested closing the back route to regular ORV access. Some suggested this route should be used only as a way to get around resource closures, not on a regular basis. This element was not carried forward in any of the alternatives because the Seashore believes this route is necessary not only for driving around resource closures, but for safety to provide access around high tide areas. Since the Seashore is not able to predict where these areas would occur, it is necessary to keep the entire length of the back route available. Closing the back route to regular ORV use would not be consistent with the objective of this ORV management plan/EIS to ensure the safety of all visitors. Further, allowing ORV use on the back route gives the park the ability to allow visitor use in times of extensive or full-beach resource protection closures. This is consistent with the objective of this ORV management plan/EIS to establish ORV management practices and procedures that have the ability to adapt in response to changes in the Seashore's dynamic physical and biological environment. Because closing the back route to regular ORV access does not meet the objectives of this ORV management plan/EIS, this element was not carried forward for further analysis.

Require Vehicle Inspections by NPS Staff as a Permit Requirement

Commenters suggested that the management of ORVs include a required vehicle inspection, possibly as part of a permitting system. The Seashore believes the expense of such an inspection regime would outweigh its utility. This ORV management plan/EIS proposes a limited number of specific equipment requirements that are specific to ORV use, and monitoring for such requirements could be done coincidental with enforcement. More comprehensive safety and environmental inspections are required under the various state motor vehicle laws and the Seashore would continue to require all vehicles to comply with state law. Because this element is already addressed in the alternatives to a degree, and because the proposed education elements would help ensure visitors are aware of the required and recommended equipment, a separate inspection of vehicles by NPS was not carried forward as an alternative element in this ORV management plan/EIS because it would not help further meet objectives related to resource protection.

Provide Round-the-Clock Enforcement

Commenters suggested that round-the-clock enforcement would ensure resource protection. The Seashore has no source of funding for continuous enforcement in all areas at all times, even with the increased funding envisioned in this ORV management plan/EIS. The level of funding available, combined with the large geographic area covered by the park, does not allow for staffing levels to provide this type of enforcement. This suggested level of enforcement is not the norm for any national seashore. The action alternatives provide for increased outreach and education to help improve voluntary compliance, but round-the-clock enforcement would not be feasible and was not included in any alternatives.

Give Preferred Status to Human Visitors

Commenters suggested that the NPS should give preferred status to human visitors, and should not include restrictions on human use to benefit various natural resources. Other commenters suggested that some types of human uses should be given precedence over other types. The NPS has a primary mandate to preserve the Seashore's natural and cultural resources unimpaired for the enjoyment of future generations. Furthermore, the courts have held that in the case of conflict, resource conservation must

predominate (refer to “Other Applicable Federal Laws, Regulations, Executive Orders, Policies, and Plans” in chapter 1). This ORV management plan/EIS makes every effort to provide for a wide variety of visitor uses while maintaining fidelity to its primary mandates to protect natural and cultural resources. However, giving preferred status to human visitors implies that natural and cultural resource protection is a secondary concern. This would violate the NPS primary mandate to preserve the Seashore’s natural and cultural resources unimpaired for the enjoyment of future generations, and therefore was not carried forward for detailed analysis.

ALLOW ORV USE ON SHACKLEFORD BANKS

The *General Management Plan* (NPS 1980) identified 47 of the 56 miles of the Seashore as appropriate for controlled ORV use; the remaining 9 miles on Shackleford Banks is a proposed wilderness area under the Wilderness Act (P.L. 88–577), and pursuant to NPS *Management Policies 2006* is managed as wilderness and closed to vehicle use. Therefore, ORV use on Shackleford Banks was not carried forward for further analysis.

ADDITIONAL SPECIES PROTECTION MEASURES THAT WERE DISMISSED

Although all of the alternatives include extensive species protection measures, additional or alternative measures were suggested by the public during scoping. All elements related to species protection must take into consideration all applicable laws and policies. As a federal agency, the NPS has responsibilities under the ESA to protect the ecosystem as well as the species that depend on it. The purpose of the ESA is to “provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved” (section 2[b]). Protecting the ecosystem is also necessary to meet the requirements of the NPS Organic Act, which mandates the NPS to conserve Seashore wildlife (refer to “Guiding Laws, Regulations, and Policies” in chapter 1). Further, a number of laws, regulations, and policies, in addition to the ESA and NPS Organic Act, guide species management at the Seashore, including the NPS Organic Act, the Migratory Bird Treaty Act (MBTA), NPS regulations and policies, Executive Order 13186: *Responsibilities of Federal Agencies to Protect Migratory Birds*, and others (refer to chapter 1). Several approaches for species protection beyond those included in the alternatives were considered by NPS staff. Many of the elements identified below do not assist the NPS in meeting these mandates.

Minimize Closures for Birds and Turtles

Public comments were received suggesting different buffer sizes, or minimizing buffers and their associated closures, or reducing buffer sizes to smaller than known best practices established by a study of peer reviewed literature. Buffers smaller than those analyzed in the alternatives would result in subjecting the Seashore population’s listed species under the ESA and protected species under the MBTA to increased rates of disturbance and mortality. Breeding and the buffers required for successful breeding are essential for a species to perpetuate itself. Failure to adequately protect breeding individuals, nests, and young using measures such as closures would result in further species decline. In addition, any unauthorized harm, injury, or mortality of protected species under the ESA would result in a violation of federal law, potential fines, and other criminal charges. The combination of laws, regulations, and policies included in this section of the ORV management plan/EIS create the framework in which the alternatives are developed, which includes proposed buffer sizes. Because minimizing closures for birds and turtles would not meet NPS responsibilities under these acts, this element was considered but eliminated from further analysis.

Open Turtle Closures after Hatchlings Have Gone Out to Sea

Current management practices at the Seashore implement this action. Once a nest has hatched and has been excavated by NPS staff to determine hatching success the closure is reopened.

Relocate Bird and Turtle Nests

Commenters suggested that the Seashore relocate bird or turtle nests to areas of the beach already closed to ORV use or relocate nests to smaller, more compact areas to facilitate management. These alternatives have been considered but are not carried forward for reasons discussed below.

Birds

Nest abandonment by piping plovers and American oystercatchers are documented sources of nest failure on Cape Lookout National Seashore. Relocating nests would likely result in increased nest abandonment and failure. Moving nests into one compact area would not be feasible. Plovers and oystercatchers are solitary rather than colonial nesters (i.e., they nest away from others of their species). Plovers sometimes nest near tern colonies to benefit from the aggressive behavior of terns protecting their colonies; however, they typically do not nest with other plovers. Since moving nests would reduce the species' ability to reproduce, it would not be consistent with the objectives of this ORV management plan/EIS, including providing protection for threatened, endangered, and other protect species, and minimizing impacts to these species, as required by the ESA, the MBTA, and NPS laws and management policies. Because it is not consistent with the purpose of this plan, moving nests was eliminated from further analysis.

Turtles

Individual Nest Relocation—Turtles do not face the same nest abandonment issues as those described for birds. Parental investment in the young ends with the laying and burying of eggs. However, studies indicate that the determination of the hatchling sex ratio depends on the temperature at which the eggs incubate. Changes in these temperatures due to moving the eggs may result in changes to the sex ratio, having implications for the species as a whole. Handling eggs can result in increased hatch failure. When relocating nests, there is a risk of disrupting the membranes inside the egg, which can kill the embryo. Although nests in some states may be moved to avoid damage from beach nourishment or in highly developed urban areas (e.g., along some urban areas of Florida's Atlantic coast), typically, nest relocation is seen as part of an attempt to keep the species from going extinct, whereas allowing for natural breeding and nesting is the ideal option whenever available. Currently, in North Carolina, the state permits sea turtle nest relocations for research or when there is an imminent threat and potential loss of the nest due to erosion or frequent flooding, but not to accommodate recreational uses. Consequently, routine relocation of all nests to allow for recreational access is not considered in this ORV management plan/EIS. The NPS would continue its current practice of coordinating with the State of North Carolina to consider relocating a nest facing inundation or other adverse factors.

Turtle Hatcheries—Moving all nests or all relocated nests into one hatchery area is not fully analyzed as part of any alternative. Sea turtle nests may be moved to a guarded hatchery to provide needed protection from poaching in developing countries where participation in hatchery operations may be used as an eco-tourism opportunity. Some county or privately owned beaches in Florida or Georgia may use hatcheries for sea turtle eggs in some circumstances, such as to allow beach nourishment. However, county responsibilities for endangered or threatened species differ from federal, and particularly from NPS, responsibilities for these protected species. As a federal agency, the NPS has responsibilities under the ESA to protect the ecosystem as well as the species that depend on it. The purpose of the ESA is to "provide a means whereby the ecosystems upon which endangered species and threatened species depend

may be conserved” (sec. 2(b)). Protecting the ecosystem, rather than relocating the nests to allow the preferred use, is also necessary to meet the requirements of the Organic Act, which mandates the NPS to conserve Seashore wildlife (refer to “Other Applicable Federal Laws, Regulations, Executive Orders, Policies, and Plans” in chapter 1).

Loggerhead, leatherback and green sea turtles are all currently listed pursuant to the ESA. Any actions that would likely reduce productivity and cause a decline in the species would not be consistent with the purpose of the Act, or the objective under this ORV management plan/EIS to provide protection to threatened or endangered species and their habitats. The revised *Loggerhead Sea Turtle Recovery Plan* (NMFS and USFWS 2008) recommends the discontinuance of the use of hatcheries as a nest management technique and states that relocating nests into hatcheries concentrates eggs in an area and makes them more susceptible to catastrophic events and predation from both land and marine predators. Therefore, use of hatcheries was not considered in this ORV management plan/EIS.

Open Closed Areas after Breeding Season is Over

Commenters suggested that any closed areas should be reopened after the breeding season ends. Closed areas would likely be reopened after the breeding season. Resource staff survey most closures on a daily basis and would reopen areas that are no longer needed. Areas may not reopen immediately at the end of the breeding season if unfledged chicks or turtle eggs are still present. Therefore, some areas may be reopened, but automatically opening all closed areas after the breeding season would be inconsistent with the Seashore’s responsibility under various statutes, including its enabling legislation, the NPS Organic Act, and the NPS *Management Policies 2006* (NPS 2006d, section 4.4.2.3). The alternatives in this ORV management plan/EIS do consider various ways to address resource-based closures, but the alternatives do not allow for automatic opening after the breeding season is over if species are still present.

Give Special Consideration Only to Flora and Fauna Listed as Threatened and Endangered and/or Only Enact Closures When a Certain Minimum Number of Breeding Pairs is Met

Commenters suggested that only those species listed as threatened or endangered under the federal ESA should be considered in this ORV management plan/EIS or that certain benchmarks should be hit before protection is enacted. As stated above, the NPS has legal responsibilities under the ESA and its own policies to protect threatened and endangered species. Further, in addition to the ESA, a number of laws, regulations, and policies, guide species management at the Seashore, including section 4 of the NPS *Management Policies 2006*, NPS Organic Act, the MBTA, NPS regulations and policies, Executive Order 13186: *Responsibilities of Federal Agencies to Protect Migratory Birds*, and others (refer to chapter 1). The combination of laws, regulations, and policies included in this section of this ORV management plan/EIS create the framework in which the alternatives are developed, which includes the need to manage species of special concern, such as state-listed species, or those addressed by the MBTA. Along these same lines, this protection extends to all individuals, and does not require meeting a certain threshold before enacting management measures. This element also does not meet the objectives of this ORV management plan/EIS, such as providing protection for threatened, endangered, and other protect species, and minimizing impacts to these species, as required by the ESA, the MBTA, and NPS laws and management policies. Because of the NPS responsibilities explained above, this element was not included in the alternatives for this ORV management plan/EIS.

OTHER ISSUES

Provide an Area for Off-leash Dogs

Commenters suggested that dogs be allowed off leash at the Seashore, either seasonally, in certain areas of the Seashore under voice control, or through the creation of a dog training area. Currently, pets at the Seashore are regulated under 36 CFR 2.15, which prohibits pet owners from “failing to crate, cage, restrain on a leash which shall not exceed six feet in length, or otherwise physically confine a pet at all times.” Creation of off-leash areas would not be consistent with 36 CFR 2.15 and would require promulgation of a special regulation allowing off-leash dog use, which is outside the scope of this ORV management plan/EIS. Therefore, this element was not carried forward in any alternative.

Increase Fines for People Breaking Rules

This element was suggested during the NEPA process for the *Cape Lookout National Seashore Interim Protected Species Management Plan / Environmental Assessment* (NPS 2006a), and again during public scoping on this ORV management plan/EIS. The amount of a fine is determined by the federal courts and not the Seashore, though the Seashore will continue to work with the federal courts to recommend fines that are appropriate.

Provide Additional Amenities and Concessioner-operated Shuttles as an Alternative to Personal Vehicle Use

Many commenters requested that the Seashore provide additional amenities such as restrooms, water pumps, and dumpsters. The Seashore determined that since these elements were not directly related to ORV use, but a larger visitor use issue, they are outside the scope of this ORV management plan/EIS. Other commenters suggested that the Seashore provide an alternative transportation system. The consideration of future alternative transportation projects would be dependent on available funding. The Sarbanes TRIP Program (a federal funding source for alternative transportation projects) was eliminated in 2012 by Congress under the Moving Ahead for Progress in the 21st Century Act (MAP 21). Consequently, this important funding source is no longer available for NPS sponsored/funded transportation plans. These issues will be revisited and reconsidered in future Seashore planning efforts.

HOW ALTERNATIVES MEET OBJECTIVES

As stated in chapter 1 in this document, all action alternatives selected for analysis must meet all objectives to a large degree. The action alternatives must also address the stated purpose of taking action and resolve the need for action. Therefore, the alternatives were individually assessed in light of how well they would meet the objectives for this ORV management plan/EIS, which are stated in chapter 1 in this document. Alternatives that did not meet the objectives were not analyzed further (refer to “Alternative Elements Considered but Dismissed from Further Analysis” earlier in this chapter).

All action alternatives fully meet the objectives related to management methodology, except the objective to “establish ORV management practices and procedures that have the ability to adapt in response to the changes in the Seashore’s dynamic physical environment.” This objective is not fully met by alternative A, which does not provide for adaptive management that adjusts to changing resource conditions.

Generally, alternative A, the no-action alternative, meets objectives related to natural resource protection (natural physical resources, threatened and endangered species, vegetation, and other wildlife) partially, but no more than to a moderate degree. Although routes are informally designated, there is no permitting

system or other way to keep use numbers at a sustainable level, and no additional education would be required through the permit system. Current species management measures would continue to be implemented, but there would not be additional measures, such as restrictions on night driving. Alternatives B and C would meet these same objectives to a greater degree than alternative A, but less so than alternatives D or E. Under alternatives B and C, a permit system would be implemented. Alternative B would not limit the number of permits, whereas alternative C would limit the number of permits to current conditions. Placing no limits on growth (under alternative B), or limiting the number of permits to current conditions (under alternative C) would result in more impacts on resources than alternatives D or E, but less than alternative A, which has no permit system and no limits. Additional species measures under alternative C would be established, including night driving restrictions. The back route would be regularly maintained, which would reduce impacts on soils at the Seashore. Adaptive management would be implemented that would allow for additional management measures for species protection, if warranted. In terms of impacts to vegetation, the additional pedestrian-only areas under alternative C would provide for additional resource protection when compared to alternative B.

Alternative D would meet more objectives fully or to a large degree. Many elements of alternative D are the same as alternatives B and C, including the use of permits, limits, and restrictions on night driving. However, under alternative D, the limitation on the number of permits would be increased, limiting future growth; more pedestrian-only areas would be added; and additional species buffers would be provided. These aspects of alternative D all lead to greater protection of the Seashore's natural resources.

Alternative E would fully meet all objectives related to resource protection because recreational ORV use would not be allowed and Seashore resources would remain free from disturbance.

Objectives related to visitor use aim to allow for a variety of appropriate visitor use experiences and reduce conflicts between ORV users and other users. All alternatives would allow for a variety of experiences, except for alternative E, which would not allow for recreational ORV use and does not meet the objective of allowing for a variety of visitor use experiences. The remaining alternatives meet this to varying degrees. Alternatives A and B would moderately meet the objective because these alternatives would allow for multiple uses, but would place limited restrictions on motorized uses, such as ATVs and UTVs. Alternative C would allow for a variety of uses to a large degree, but the requirement for an educational permit may create a perception of limitation to some users, and there would be limitations on the type and times of ATV use. Alternative C would limit ORV growth, but these limits would be expected to accommodate all visitor experience. Alternative D would provide a variety of experiences to a large degree, even though the limitations on permit numbers would be increased, parking lots would be eliminated, and ATVs would be further restricted. The objective to reduce visitor conflict would be met to some degree under alternatives A, B, and E, but the lack of use limits under alternatives A and B, and the inability of users to access remote areas of the Seashore under alternative E, may impact some visitors more than others and result in perceived conflicts. Alternatives C and D would meet this objective to a large degree because additional pedestrian-only areas would be established. Under all alternatives, the objective to ensure that ORV management promotes the safety of all visitors would be fully met.

For park operations, it is the objective of the Seashore to ensure that core operational needs and associated costs are available to fully implement this ORV management plan/EIS. All action alternatives would meet this objective to a moderate degree. Under alternative A, most funding would be in place to implement this alternative, with additional funding needs possible. Alternatives B, C, and D would require additional staff and funding from new education and permitting programs, as well as additional law enforcement needs for night driving restrictions. These funds would, in part, be addressed with permit fees, but additional funds may be needed. Alternative E would fully meet this objective because it would be implemented with existing and expected funding, with no additional costs beyond current operations.

CONSISTENCY WITH THE PURPOSES OF THE NATIONAL ENVIRONMENTAL POLICY ACT

The NPS requirements for implementing NEPA include an analysis of how each alternative meets or achieves the purposes of NEPA, as stated in sections 101(b) and 102(1). The Council on Environmental Quality (CEQ) has promulgated regulations for federal agencies' implementation of NEPA (40 CFR 1500–1508). CEQ Regulation 1500.2 establishes policy for the implementation of NEPA by federal agencies. Federal agencies shall, to the fullest extent possible, interpret and administer the policies, regulations, and public laws of the United States in accordance with the policies set forth in NEPA (sections 101(b) and 102(1)); therefore, other acts and NPS policies are referenced as applicable in the following discussion. Each alternative analyzed in a NEPA document must be assessed as to how it meets the following purposes:

1. Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations.

All of the alternatives proposed would manage ORV use in a manner to protect the resources, but the degree to which each alternative accomplishes this goal would vary. Alternative A would meet the five resource-related objectives (natural physical resources; threatened, endangered, and other protected species; other wildlife and wildlife habitat; vegetation; and cultural resources) to a minor degree because ORV use would be permitted at the Seashore under this alternative, but with varying restrictions. The use of ORVs would result in slight disturbances to threatened, endangered, and other protected species, as well as other wildlife and wildlife habitat. The analysis conducted for this plan/EIS has shown that although impacts to these resources would occur, they would be well below any regulatory standard and within the provisions in NPS *Management Policies 2006*. The analysis has also shown that although ORV use would occur, the resources would be preserved for succeeding generations. Alternative A would include ORV management measures such as designated ORV routes/areas, back route access and configuration, winter closures, miscellaneous vehicle and operator requirements, education and outreach, pedestrian-only areas, and research and monitoring, which would further act to preserve Seashore resources.

Alternatives B, C, and D would also allow ORV use at the Seashore. Alternatives B, C, and D would meet the five resource-related objectives (natural physical resources; threatened, endangered, and other protected species; other wildlife and wildlife habitat; vegetation; and cultural resources) to a moderate degree because ORV use would be permitted at the Seashore under these alternatives, but with varying restrictions. The use of ORVs under alternatives B, C, and D would result in slight disturbances to threatened, endangered, and other protected species, as well as other wildlife and wildlife habitat. The analysis conducted for this plan/EIS has shown that although impacts to these resources would occur, they would be well below any regulatory standard and within the provisions of NPS *Management Policies 2006*. The analysis has also shown that although ORV use would occur, the resources would be preserved for succeeding generations. Alternatives B, C, and D would include ORV management measures such as designated ORV routes/areas, back route access and configuration, winter closures, restrictions on ATV/UTVs, miscellaneous vehicle and operator requirements, pedestrian-only areas, vehicle permits, ORV operator education requirements, night driving restrictions, and research and monitoring, which would further act to preserve Seashore resources. Further, alternatives B, C, D, and E would implement an adaptive management strategy, if research and monitoring indicate that the American oystercatcher (an indicator species) is being disturbed by ORV use.

Alternative E would meet the five resource-related objectives (natural physical resources; threatened, endangered, and other protected species; other wildlife and wildlife habitat; vegetation; and cultural resources) to a large degree because ORV use would no longer be permitted at the Seashore. The absence of ORV use would result in an absence of disturbances to threatened, endangered and other protected species, as well as other wildlife and wildlife habitat, from this source. Alternative E would most fully meet the purpose of fulfilling the responsibilities of each generation as trustee of the environment for succeeding generations, by providing the Seashore free of impacts to natural and cultural resources from ORV use.

2. Ensure for all Americans safe, healthful, productive, and esthetically and culturally pleasing surroundings.

All alternatives meet this purpose to some degree because the Seashore is a safe visitor destination that is both esthetically and culturally pleasing. Alternative A would maintain existing safety measures at the Seashore by actively communicating species, resource, wise use, and ORV program information to visitors. Further, under alternative A educational materials would be provided on a variety of topics related to resources and ORV use, such as ORV management, night driving, trash disposal, wildlife feeding, impact of fish carcasses, ORV safety and general safety, and information about ORV closures and the removal of those closures. As a result, alternative A would meet this purpose to a moderate degree.

Alternatives B, C, and D would increase safety to a degree by maintaining the existing safety and educational measures currently in place at the Seashore, and would augment education and outreach related to ORV use, including requiring an ORV operator education certificate for all ORV users at the Seashore. The ORV operator education certificate would be required for a licensed driver to operate a vehicle at the Seashore. The education certificate would be issued in a manner to be determined, but it would include the options of obtaining the certificate at the Seashore headquarters on Harkers Island, online, or at special request for groups. The free certificate would be valid for one calendar year. Drivers would be required to carry this certificate with them at all times when operating a vehicle on the Seashore. As a result, alternatives B, C, and D would meet this purpose to a large degree.

Alternative E would prohibit ORV use at the Seashore. However, the ability for visitors to access remote areas of the Seashore under alternative E would be limited, due to the prohibition of ORV use. Further, in times of severe weather events, visitors may not be able to seek shelter as quickly as they would be able to with an ORV. As a result, alternative E would meet this purpose to a moderate degree.

3. Attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences.

Alternatives A, B, C, and D offer a wide range of visitor use opportunities, including ORV use. Alternatives A and B would allow for ORV use levels that are similar to recent years, which would provide for a variety of uses and resource protection. Based on monitoring results of recent use, visitors would have various opportunities for use and resources would still be offered protection. As a result, alternatives A and B would meet this purpose to a large degree.

Alternative C would limit overall ORV use to 2,500 ORVs on North Core Banks, and 3,000 ORVs on South Core Banks. However, these numbers represent the average ORV use numbers based on 2005–2012 user data, therefore these limits would not be expected to impact ORV use. The limit on ORVs allowed at the Seashore could result in less disturbance to resources than

allowed under alternatives A and B, therefore alternative C would meet this purpose to a moderate degree. Alternative D would further limit ORV use by 8 percent, based on the average number of ORV permits issued per island in years 1–3 of this ORV management plan/EIS. The 8 percent reduction is based on the percentage increase of year-round pedestrian-only areas under alternative D, and is intended to keep average vehicle density similar to current use. Therefore, alternative D would meet this purpose to a moderate degree.

Alternative E would allow for non-motorized use at the Seashore, but would not allow for ORV use. Due to the length of the Seashore and the difficulty in accessing remote areas of the Seashore without the use of an ORV, many visitors would not be able to reach desirable areas of the Seashore; therefore, alternative E would meet this purpose to a minor degree.

4. 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.

Because none of the alternatives would result in impacts to cultural or historic resources that would exceed minor, these topics were dismissed from further analysis in this ORV management plan/EIS. Overall, because any impacts to cultural or historic resources would not exceed minor, all alternatives would preserve important historic and cultural aspects of our national heritage in the long term and would meet this purpose to a large degree. For natural resources, all alternatives would meet objectives to a moderate degree. However, alternative E would more fully meet this objective because ORV use would be prohibited at the Seashore, which would reduce the impacts on natural resources that are caused by ORV use. As discussed under criterion 3, alternatives A and B would best support diversity and variety of individual choice (to a large degree) because of the lack of limits on ORV permits available. Alternatives C and D would provide for ORV access, but there would be limitations on the number of ORV permits available. Alternative E (meeting the criteria to some degree) would limit the variety of choice by discontinuing ORV use at the Seashore.

5. Achieve a balance between population and resource use that will permit high standards of living and a wide sharing of life's amenities.

Balancing population and resource use under this ORV management plan/EIS would include protecting the resources unimpaired for the enjoyment of present and future generations and providing access for visitors to experience the natural resources of the Seashore. NPS *Management Policies 2006* states that the enjoyment contemplated by the Organic Act is broad; it is the enjoyment of all the people of the United States and includes enjoyment both by people who visit parks and by those who appreciate them from afar. It also includes deriving benefit (including scientific knowledge) and inspiration from parks, as well as other forms of enjoyment and inspiration. For all alternatives, visitors would continue to have opportunities to enjoy the Seashore from afar through programs such as information and literature posted online. As described in this chapter, alternatives A, B, C, and D would provide for ORV use at the Seashore, with various management measures, and use levels (there are limits on the number of ORV permits that would be allowed under alternatives C and D) that would provide a level of protection to park resources to allow for their future enjoyment. Likewise, alternative E, which would not allow for ORV use, would protect park resources. All of the alternatives evaluated would meet this purpose.

6. Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

Each of the alternatives would require the park to continue to operate under the energy use guidelines and requirements stated in the NPS *Management Policies 2006*; Executive Order 13123, Greening the Government through Effective Energy Management; Executive Order 13031, Federal Alternative Fueled Vehicle Leadership; Executive Order 13149, Greening the Government Through Federal Fleet and Transportation Efficiency; and the 1993 NPS Guiding Principles of Sustainable Design. Therefore each alternative would fully meet this purpose.

ENVIRONMENTALLY PREFERABLE ALTERNATIVE

The NPS is required to identify the environmentally preferable alternative in its NEPA documents for public review and comment. The NPS, in accordance with the Department of the Interior NEPA Regulations (43 CFR Part 46) and CEQ's Forty Questions, defines the environmentally preferable alternative (or alternatives) as the alternative that best promotes the national environmental policy expressed in NEPA (section 101(b)) (516 DM 4.10). The CEQ's Forty Questions (46 FR 18026) (Q6a) further clarifies the identification of the environmentally preferable alternative stating, "this means the alternative that causes the least damage to the biological and physical environment; it also means the alternative which best protects, preserves, and enhances historic, cultural, and natural resources."

Alternative E was identified as the environmentally preferable alternative because public ORV use would no longer be allowed within the Seashore. With ORV use limited to minimal administrative use for species management and law enforcement, there would be the least amount of impact on the biological and physical environment within the park. As noted previously, alternative E would meet the objectives related to resources (federally listed endangered, threatened, or candidate species; state-listed and special-status species; other wildlife and wildlife habitat; soundscapes) to the greatest degree due to the lack of recreational ORV use. By best meeting these objectives, alternative E would cause the least amount of damage to the biological and physical environment. Although administrative ORV use and nonmotorized use would be allowed, the use levels would be low and impacts on resources would be minimal.

NATIONAL PARK SERVICE PREFERRED ALTERNATIVE

The "agency's preferred alternative" is the alternative that the agency believes would fulfill its statutory mission and responsibilities, giving consideration to economic, environmental, technical, and other factors. NPS identified the preferred alternative as alternative C, as described above.

TABLE 3: ALTERNATIVE ELEMENT SUMMARY—VEHICLES					
Management Activity	Alternative A: No-Action	Alternative B	Alternative C	Alternative D	Alternative E
ORV Routes and Areas/Regulations					
Designated Vehicle Routes/Areas and Seasons/Times Open to ORV use					
Area of Seashore Open to ORV Use [How to interpret the percentages for ORV access— For all alternatives, the percentages listed do not account for any other safety or resource closures that may be implemented, as needed, which may adjust the percentages at right. The amount of beach available to ORVs on the Core Banks may be reduced by temporary species and safety related closures. Based on data from NPS staff from 2008 through 2013, safety and resource ORV closures average approximately 10 miles in the summer months, and 5.4 miles in the fall. In the fall, an average of 5.4 miles is closed to ORV use. Resource closures occur primarily in the nesting seasons for birds and sea turtles (from March 16 through September 14).]	81% of the entire length of the Seashore would be potentially available for ORV use from March 16 through December 31.	81% of the entire length of the Seashore would be potentially available for ORV use from March 16 through December 31.	Same as alternative B, except <ul style="list-style-type: none">79% of the entire length of the Seashore would be potentially available for ORV use from March 16 through the Thursday preceding Memorial Day and from the day after Labor Day through December 15.74% of the entire length of the Seashore would be potentially available for ORV use from the Friday preceding Memorial Day through Labor Day.	Same as alternative B, except <ul style="list-style-type: none">73% of the entire length of the Seashore would be potentially available for ORV use from March 16 through the Thursday preceding Memorial Day and from the day after Labor Day through December 15.63% of the entire length of the Seashore would be potentially available for ORV use from the Friday preceding Memorial Day through Labor Day.	The entire area of the Core Banks and Shackleford Banks would be closed to public ORV use. Entry by public vehicles into these areas would be prohibited. Use by NPS essential vehicles, and other vehicle use authorized by the NPS (such as concession vehicles) for official business would continue as required for general park management, law enforcement, and safety.
Designated ORV Routes	Areas and routes open to ORV use, unless closed for safety or resource protection, would be designated; the designated areas would be identical to those areas and routes currently marked and designated under the Superintendent’s Compendium (NPS 2013d), these areas include <ul style="list-style-type: none">The oceanside beach of North and South Core Banks from the primary dune line to the water.A marked route from the beach to the Portsmouth Village parking area through the marked area of Portsmouth Flats.The marked back route on North Core and South Core Banks, which is the route parallel to the ocean beach behind the primary dune.Marked crossover routes or “ramps” between the ocean beach and back route.Designated routes within the Long Point and Great Island Cabin Camp areas including vehicle ferry landings.Designated long-term and short term parking areas at Long Point, Great Island, and the lighthouse area, and the marked routes to these areas.Routes within the Cape Lookout Village Historic District.	Same as alternative A, except <ul style="list-style-type: none">ORV use would be discontinued (i.e., designated routes would be closed) on sections of the Core Banks where no ferry landing access is available (i.e., such as the case of Middle Core Banks and Ophelia Banks that were cut off from North and South Core Banks). This applies to new land areas created and cut off from existing ferry access areas by storm events. In the event that a previously cut off area rejoins an area with ferry access (i.e., when an inlet fills in naturally), ORV use would resume in the area previously closed to ORV use on the designated routes and areas in that area.Routes within the Cape Lookout Village Historic District would be open to through vehicle traffic.The Seashore would provide users a map showing where designated routes, areas, and ramps exist.	Same as alternative B.	Routes within the Cape Lookout Village Historic District would be closed to through-vehicle traffic. A short-term parking area would be designated for those people driving to the village to visit.	

Management Activity	Alternative A: No-Action	Alternative B	Alternative C	Alternative D	Alternative E
Designated ORV Routes (continued)	<p>Marked soundside access routes, as follows:</p> <ul style="list-style-type: none">• North Core Banks—mile marker 9• North Core Banks—mile marker 12: Former Wilbers/Nelson Camp also called the “Web”• North Core Banks—mile marker 19: 0.5 miles north of the location of Old Drum Inlet (Honey Hole)• South Core Banks—mile marker 26.5: Gun Club• South Core Banks—mile marker 31.5: 0.5 miles south of Great Island Cabin Camp• South Core Banks—mile marker 41: Lookout Bight-“Barden Beach” near the 1907 Keepers’ Quarters• South Core Banks—mile marker 45: from ramp 45 to the U.S. Coast Guard Dock. <p>No ORV use would be allowed on Portsmouth Flats (except the designated route from the ocean beach to the village), on the beach between mile marker 41a and 41b, the interior of the point of Cape Lookout (at mile marker 44), and at Power Squadron Spit (from mile marker 46.2 to the end of the spit).</p> <p>No soundside driving would be allowed except designated access points.</p> <p>No ORV use would be allowed at Shackleford Banks; this area is a designated Proposed Wilderness Zone.</p> <p>The superintendent may temporarily limit, restrict, or terminate access to the areas designated for motorized vehicles off-road after taking into consideration public health and safety, natural and cultural resource protection, and other management activities and objectives, such as those described in this ORV management plan/EIS. The public would be notified of such closures through one or more methods listed in 36 CFR 1.7(a). Violation of any closure is prohibited.</p>				

Table 3: Alternative Element Summary—Vehicles

Management Activity	Alternative A: No-Action	Alternative B	Alternative C	Alternative D	Alternative E
<p>Back Route Access and Configuration</p> <p>■■■■</p> <p>[Note: The “back route” is a term used locally and by the visiting public. Divisions between North Core, Middle Core, and South Core Banks reflects the division of the islands in 2012. Such divisions may change as the locations of inlets change. Locations of the back route and ramps are more consistently identified by the approximate mile marker that is noted for each.]</p>	<p>North Core Banks:</p> <ul style="list-style-type: none">• The back route would parallel the beach behind the primary dune line from approximately 0.5 miles south of Kathryn-Jane Flats at mile marker 4 to 0.5 mile north of Old Drum Inlet at mile marker 18.• Ramps: 4a, 4b, 5a, 5b, 6, 7a, 7b, 8a, 8b, 9, 10a, 10b, 11a, 11b, 12, 13a, 13b, 14, 15a, 15b, 16, 17a, 17b, 18a, 18b. <p>Middle Core Banks:</p> <ul style="list-style-type: none">• The back route would parallel the beach behind the primary dune line when Middle Core Banks becomes accessible to vehicles (i.e., when Middle Core Banks reconnects to an island that has ferry service.)• Ramps: 19, 20, 21. <p>South Core Banks:</p> <ul style="list-style-type: none">• The back route would parallel the beach behind the primary dune line approximately 2.5 miles south of New Drum Inlet at mile marker 24 to the point of Cape Lookout at mile marker 44.• A section of back route from mile marker 44 to mile marker 45 would be opened when temporary resource closures at the point of Cape Lookout prevent vehicles from driving past the point of Cape Lookout.• Cape Lookout Village Historic District routes would remain open to through traffic.• Ramps: 24, 25, 26a, 26b, 27, 28, 29, 30, 31, 32, 33, 34, 35a, 35b, 36, 37a, 37b, 38, 39, 40, 41a, 41b, 44, 44a, 44b, 45. <p>General:</p> <ul style="list-style-type: none">• The back route and other routes would be reestablished to the same or equivalent locations when they are impacted by a storm event for resource protection and safety.• The number of ramps and location of ramps may be adjusted, when they are impacted by a storm event, for resource protection and safety. Ramps would be located or re-established on flat sand, between dunes where there would be fewer impacts.• Occasional maintenance of the back route would be performed as needed but only to correct serious deficiencies and safety hazards.• The back routes are important to management of ORV access and species protection since they provide an alternative for vehicle traffic when the entire beach must be closed. They are also important for visitor safety, as alternative routes when beaches are impassible due to tides.)	<p>Same as alternative A +</p> <ul style="list-style-type: none">• The back route on South Core Banks would be extended from mile marker 44 to mile marker 45; this section of back route would only be open when the area of the Cape closes to through traffic.• Up to four additional ramps may be created on North Core Banks and five on South Core Banks. Ramps would be sited to minimize impacts to the dunes, generally maintaining a spacing of a mile between ramps; locations of ramps may change after storm events. Maintenance of the back route would occur as necessary; sensitive areas would be avoided.• Pull-outs would be established along the back route that allow northbound and southbound vehicles to more easily pass one another along the route. These pull-outs would be located between ramps, with one to two pull-outs between each ramp, depending on back route topography and configuration (i.e., may need more than one pull-out for passing if there is a bend in the back route that limits visibility).• Designated overnight emergency (storm refuge) parking areas would be established on each island along the back route, authorized on a case-by-case basis, to allow for overnight vehicle parking during times of adverse weather or unusually high tide events. (These emergency refuge parking areas would be established in areas that are not sensitive habitat for birds, turtles, or seabeach amaranth. Locations would also take into account topography, wetlands, and other potential limitations.)• Designated campsites may be established on each island accessible from the back route pursuant to the Superintendent's Compendium authority in 36 CFR.• NPS would construct up to six additional shelters generally along the back route distributed throughout the park in convenient access locations.	<p>Same as alternative B.</p>	<p>Same as alternative A +</p> <ul style="list-style-type: none">• Ramp locations may change after storm events. They would be sited to minimize impacts to the dunes, generally maintaining a spacing of a mile between ramps.• In the case of extreme high tides or other emergencies, the area of the former long-term vehicle storage / parking lots would be open to temporary overnight use, for the duration of time that extreme conditions last. <p>Except:</p> <ul style="list-style-type: none">• The back route on South Core Banks from ramp 44a to ramp 44b would be open from March 16 through December 15 (through construction of bridges over low-lying areas; this bypass route would allow access around the Cape when resource closures are in effect).• This bypass route would facilitate closure of Cape Lookout Village Historic District routes to through traffic.	<p>The entire area of the Core Banks and Shackleford Banks is closed to public ORV use.</p> <p>Entry by public vehicles into these areas is prohibited.</p> <p>Use by NPS essential vehicles, and other vehicle use authorized by the NPS for official business would continue as required for general park management, law enforcement, and safety.</p>


Management Activity	Alternative A: No-Action	Alternative B	Alternative C	Alternative D	Alternative E
Shade Shelters 	<p>Shelters provide emergency protection from sudden storms. Over time, a number of shelters located throughout the Seashore have been destroyed by successive storms (Wallace Dock, North Core Banks mid-Island, Codd's Creek, the point of Cape Lookout, and on the spit. Shelters that remain are located at</p> <ul style="list-style-type: none">• Shackleford Banks—near the horse pens• Cape Lookout Light Station—on the beach, at the pavilion and near the dock, and at the transportation hub• Great Island Concession Cabin Area—near the dock• Long Point Concession Cabin Area—near the dock and near the beach.	<p>Same as alternative A +</p> <ul style="list-style-type: none">• The NPS would construct up to six additional shelters on the back route distributed throughout the park in convenient access locations (two new shelters would be constructed on North Core Banks and four new shelters would be constructed on South Core Banks).	Same as alternative B.	Same as alternative B.	Same as alternative B.
Operator and Vehicle Requirements					
Vehicle Equipment Requirements <p>All equipment requirements defined in Title 36 CFR, North Carolina Motor Vehicle Code and the Superintendent's Compendium apply while operating within the Seashore.</p> <p>All North Carolina Motor Vehicle Codes apply to motor vehicles (but not ATVs or UTVs), all vehicles must operate on Seashore beaches as if they were operating on North Carolina highways.</p>	<p>There would be no additional equipment requirements, except:</p> <ul style="list-style-type: none">• ATV operators and riders would be required to wear helmets and eye protection while operating ATVs within the Seashore.	<p>The following equipment would be required:</p> <ul style="list-style-type: none">• All vehicles (except ATVs and UTVs) shall contain a tire gauge (capable of registering 15–20 psi), shovel, jack, and jack support board (if wood, size requirement = 10×12×1.5 inches, if plywood, size requirement = 10×12×0.75 inches).• All ATV users must wear a Department of Transportation-approved helmet and eye protection. <p>The following would be recommended:</p> <ul style="list-style-type: none">• A full sized spare tire, first aid kit, fire extinguisher, trash bag or container, flashlight (if night driving), and tow strap are recommended.• When driving on designated routes, tire pressure must be lowered sufficiently (to 15–20 psi) to maintain adequate traction in order to float on the sand.• Four-wheel drive passenger vehicles are recommended; full-time all-wheel-drive passenger vehicles are not recommended.	Same as alternative B.	Same as alternative B.	<p>Not applicable—public ORV use would not be allowed at the Seashore.</p>

Table 3: Alternative Element Summary—Vehicles

Management Activity	Alternative A: No-Action	Alternative B	Alternative C	Alternative D	Alternative E
Use of ATV and UTVs at the Seashore	ATV and UTVs would be allowed from March 16 through December 31 at the Seashore.	Non-sport ATVs and UTVs would be allowed from March 16 through December 31 within the Seashore, provided they have not been modified and still meet the manufacturer's original specifications for a utility model. All high-performance sport-model and two-stroke ATV and UTVs (as defined below*), would be prohibited after a five-year grace period.	Non-sport ATVs and UTVs would be allowed from September 15 through December 15 within the Seashore, provided the non-sport ATVs and UTVs have not been modified and still meet the manufacturer's original specifications for a non-sport or utility model. All high-performance sport-model and two-stroke ATV and UTVs (as defined below*) would be prohibited. Closure of the Seashore to high-performance sport-model ATV and UTVs would begin after a five-year grace period.	Non-sport UTVs would be allowed from September 15 through December 15 within the Seashore, provided the UTVs have not been modified and still meet the manufacturer's original specifications for a non-sport or utility model. All ATVs are prohibited. All high-performance sport-model and two-stroke UTVs (as defined below*) would be prohibited. Closure of the Seashore to ATVs and high-performance sport-model UTVs would begin after a five-year grace period.	Not applicable—public ORV use would not be allowed at the Seashore.
<p>*Note: The definition of a high-performance or sport model ATV/UTV for this document is as follows:</p> <p>An ATV/UTV designed for high performance, such as racing, jumping, and/or sliding around corners, with high acceleration motors, long traveling shocks, low center of gravity, light-weight features, and for speeds over 50 mph. They are not equipped for utility work and typically lack the following: front and rear racks (ATVs), utility bed (UTVs), tow bar/hitch, and low geared motors. They generally lack lights, (both headlights and tail lights), full protective fenders, and running boards, and are lighter than utility models.</p> <p>In contrast, a utility-model ATV is designed by the manufacturer to be used in a utilitarian way, such as towing, hauling, and transporting equipment, and generally has a maximum speed of approximately 45 mph, although some models are capable of higher speeds. Utility ATVs generally have headlights and tail lights, both front and back racks for hauling items, a bracket to hook up a trailer, large diameter shocks to support loads, and lower end gearing for pulling and towing.</p>					
Vehicle Delivery	Visitors would be allowed to deliver ATVs or UTVs to the Seashore non-commercially for personal use at designated and marked soundside access points. Other ORVs may only be delivered via NPS authorized vehicle ferries.	Same as alternative A.	Vehicles may only be transported to the Seashore via NPS authorized ferries.	Same as alternative C.	Not applicable—public ORV use would not be allowed at the Seashore.

Management Activity	Alternative A: No-Action	Alternative B	Alternative C	Alternative D	Alternative E
Miscellaneous Vehicle and Operator Requirements	<p>Vehicle and operator requirements would be established by the following authorities:</p> <ul style="list-style-type: none">• Title 36, Code of Federal Regulations (36 CFR), including a Cape Lookout National Seashore Special ORV Regulation• North Carolina Motor Vehicle Codes (as outlined in 36 CFR 4.2)• Superintendent’s Compendium (updated each year). <p>The following highlight some of the rules contained in the above authorities:</p> <ul style="list-style-type: none">• All vehicles (except ATV and UTVs) must be registered, licensed, inspected, and insured for highway use and comply with state inspection regulations within the state, county, or province where the vehicle is registered.• Notwithstanding the definition of public vehicular area in North Carolina State law, the operator of any motor vehicle at the Seashore, whether in motion or parked, must at all times comply with all North Carolina traffic laws that would apply as if operating on a North Carolina highway.• To operate a vehicle at the Seashore (including ATVs and UTVs), operators must possess a valid state driver’s license.• To operate a vehicle at the Seashore (including ATVs and UTVs), operators must be at least 16 years of age.• Motor vehicles with less than three wheels are prohibited (i.e., motorcycles and all tracked motor vehicles).• All ATV users must wear a Department of Transportation-approved helmet and eye protection.• Open containers of any type of alcoholic beverage are prohibited in the portion of a vehicle accessible to the driver.• ORV drivers and/or passengers are prohibited from sitting on the tailgate or roof or hanging outside of moving vehicles. Those in truck beds must be seated on the floor, and children under 16 years of age in truck beds must be accompanied by an adult.	<p>Same as alternative A +</p> <ul style="list-style-type: none">• The following vehicles would be prohibited on the barrier islands of the Seashore after a one-year grace period:<ul style="list-style-type: none">– Vehicles with three wheels or less– Tracked vehicles– Farm vehicles– Vehicles with two-stroke engines– Combination vehicles (i.e., amphibious ATVs, amphibious aircraft, aircraft)– Sport or high-performance ATVs and UTVs. <p>(The above types of vehicles are generally less stable, not fully regulated by states, are unsuitable, may potentially create greater impact, are more polluting, or are generally prohibited in NPS areas.)</p> <ul style="list-style-type: none">• Number of axles and wheels—There would be a two axle maximum for vehicles (UTVs are allowed three axles), and vehicles with a maximum of six wheels would be allowed (dual wheels allowed)—this is the axle maximum for the powered vehicle and does not include additional number of axles on towed trailers.• Vehicle Length—The maximum vehicle length is thirty feet (this is the maximum length for the powered vehicle, including all attachments, and does not include the additional length of a towed trailer).• Trailers—Trailers would be limited to no more than two axles (and except for ATV and UTV trailers) must be street legal and can be no longer than 30 feet including all attachments.<ul style="list-style-type: none">– ATV and UTV trailers can be no longer than 5 feet, including all attachments.– Passengers would not be allowed to ride in or on a trailer, unless authorized by a commercial use or other written NPS authorization. <p>(Note: Vehicle and trailer length limits are helpful to limit impact on ferry, on parking spaces in the long-term lots and on vehicle turning radius while traveling on the back route and ramps).</p>	<p>Same as alternative B, except</p> <ul style="list-style-type: none">• Restrictions on trailers would be implemented (after a five-year grace period).• Non-sport ATVs and UTVs would only be allowed from September 15 through December 15 at the Seashore.	<p>Same as alternative B, except</p> <ul style="list-style-type: none">• ATVs would be prohibited after a five-year grace period.• No trailers would be allowed after a five-year grace period; UTV trailers (5 feet or less) would continue to be allowed. (Trailers are difficult to move in a storm event as they require another vehicle to come onto the island to remove it, are difficult to tow on the beach, and increase the chance that the towing vehicle would get stuck on the beach.)	<p>Not applicable—public ORV use would not be allowed at the Seashore.</p>

Table 3: Alternative Element Summary—Vehicles

Management Activity	Alternative A: No-Action	Alternative B	Alternative C	Alternative D	Alternative E
Pedestrian-only Areas					
Summary of Pedestrian-only Areas	<p>19% of Seashore beaches (11 of 56 miles) would be available as a pedestrian-only beach year-round.</p> <p>100% of the Seashore (56 of 56 miles) would be available as a pedestrian-only beach from January 1 through March 15 each year.</p>	Same as alternative A.	<p>Alternative C would add about 4 miles of pedestrian-only areas (0.7 miles year-round and 3.1 miles in the summer).</p> <p>The increase in year-round closures for pedestrians from 2 miles to 2.7 miles increases the amount of pedestrian-only areas by 2%.</p> <p>21% of Seashore beach (12 of 56 miles) will be available as pedestrian-only from March 16 through the Thursday preceding Memorial Day and from the day after Labor Day through December 15.</p> <p>26% of Seashore beach (15 of 56 miles) will be available as pedestrian-only from the Friday preceding Memorial Day through Labor Day.</p> <p>100% of the Seashore (56 of 56 miles) will be available as a pedestrian-only beach from December 16 through March 15 each year.</p>	<p>Alternative D would add about 10 miles of pedestrian-only areas (4.2 miles year-round and 5.7 miles in the summer).</p> <p>The increase in year-round pedestrian closures from 2 miles to 6.2 miles increases the amount of pedestrian areas by 8%.</p> <p>27% of Seashore beach (15 of 56 miles) would be available as pedestrian-only beach from March 16 through the Thursday preceding Memorial Day and from the day after Labor Day through December 15.</p> <p>37% of Seashore beach (21 of 56 miles) would be available as pedestrian-only beach from the Friday preceding Memorial Day through Labor Day.</p> <p>100% of the Seashore (56 of 56 miles) would be available as pedestrian-only beach from December 16 through March 15 each year.</p>	<p>The entire Seashore would be closed to public ORV use.</p> <p>Entry by public vehicles into these areas would be prohibited.</p> <p>Use by NPS essential vehicles and other vehicle use authorized by the NPS for official business would continue.</p>

Management Activity	Alternative A: No-Action	Alternative B	Alternative C	Alternative D	Alternative E
Pedestrian-only Areas	<p>Pedestrian-only areas would include</p> <ul style="list-style-type: none">• All soundside beaches, except designated vehicle soundside access areas (soundside beach is delineated as all beach inland from the U.S. Coast Guard demarcation line as shown on charts)• Portsmouth Village• The lighthouse beach (ramp 41a to ramp 41b)• Power Squadron Spit from mile marker 46.2 west to the end of the spit• All of Shackleford Banks. <p>Entry by vehicles into these areas would be prohibited, except for essential vehicles, as authorized by the NPS and described below.</p> <ul style="list-style-type: none">• Routes within the Cape Lookout Village Historic District would remain open to vehicle through-traffic.	<p>Same as alternative A.</p>	<p>Same as alternative A, except</p> <ul style="list-style-type: none">• Additional pedestrian-only areas as follows:<ul style="list-style-type: none">– Seasonal closure from the Friday preceding Memorial Day through Labor Day:– Long Point—on the ocean beach at the Long Point Cabin Camp for a day-use beach and a separate tent camping area for a total closure of 0.50 miles, to be determined by beach profile.– Great Island—on the ocean beach at the Great Island Cabin Camp for a day-use beach and a separate tent camping area for a total closure of 1.9 miles, to be determined by beach profile.– Codds Creek—on the ocean beach near Codds Creek for a total closure of 0.8 miles between mile marker / ramps 35a and 35b for pedestrians only. Camping would be allowed in this area, except for the north end turtle relocation site.• Year-round closure:<ul style="list-style-type: none">– Light Station—the pedestrian-only area at the lighthouse would be expanded approximately 0.7 miles to the south and would run from ramp 41a to ramp 42a (at the NOAA weather buoy) for a total closure of about 1.4 miles, to provide visitors at the ferry hub a larger stretch of vehicle-free beach.• Routes within the Cape Lookout Village Historic District would remain open to vehicle through-traffic.	<p>Same as alternative A, except</p> <ul style="list-style-type: none">• Additional pedestrian-only areas as follows:<ul style="list-style-type: none">– Seasonal closure from the Friday preceding Memorial Day through Labor Day:– Johnson’s Creek—area closed from a new ramp opposite the sound access to the next ramp south for approximately 0.5 miles. This is a popular kayak area. A new ramp would be constructed ½ mile in front of Johnson’s Creek (one of five possible new ramps on South Core Banks).– Middle Core Banks—closed to ORVs whether or not unified with North Core Banks for 3.6 miles (this is currently is a separate island).– Portsmouth Beach—from the Portsmouth Village access route north to demarcation line for 1.6 miles.• Year-round closure:<ul style="list-style-type: none">– Long Point—on the ocean beach at the Long Point Cabin Camp for a day-use beach and a separate tent camping area for a total closure of 0.50 miles, to be determined by beach profile.– Great Island—on the ocean beach at the Great Island Cabin Camp for a day-use beach and a separate tent camping area for a total closure of 1.9 miles, to be determined by beach profile.– Codds Creek—on the ocean beach near Codds Creek for 0.8 mile, between mile marker / ramps 35a and 35b for pedestrians only. Camping would be allowed in this area, except for the north end turtle relocation site.– Light Station—the pedestrian-only area at the lighthouse would be expanded approximately 0.9 miles to the south and would run from ramp 41a to ramp 42b (the village road) for a total closure of about 1.6 miles, to provide visitors at the ferry hub a bigger stretch of vehicle-free beach, as well as provide a complete closure in front of Les and Sally’s complex. Area north of lighthouse is not closed, but south of lighthouse is, which is a more heavily used pedestrian-only area.• Routes within the Cape Lookout Village Historic District would be closed to through vehicle traffic. Soundside access from the bridge to Barden Inlet and from ramp 45 to the U.S. Coast Guard dock would remain open to vehicles.	<p>The entire area of the Core Banks and Shackleford Banks would be closed to public ORV use.</p> <p>Entry by public vehicles into these areas would be prohibited.</p> <p>Use by NPS essential vehicles, and other vehicle use authorized by the NPS for official business would continue.</p>

Table 3: Alternative Element Summary—Vehicles

Management Activity	Alternative A: No-Action	Alternative B	Alternative C	Alternative D	Alternative E
Vehicle Permits, Education Certificates, and Fees					
Vehicle Permits and Vehicle Permit Fees	Not applicable—no vehicle permit would be required.	<p>A vehicle permit would be required, issued under Special Use Permit authority. This permit will be nontransferable, and would be attached to an individual vehicle. The permit would be valid on a long-term (annual) or short-term (10-day) basis.</p> <p>An NPS goal is to make the vehicle permit convenient to obtain. The NPS reserves the right to change the reservation system over time, such as to a lottery or partial lottery system. An NPS goal is to ensure the permit system is simple, straightforward, fair, accessible, and cost efficient to manage.</p> <p>A long-term (annual) and short-term (10-day) vehicle fee would be established; the amount of the fee would be based on guidance in NPS Director's Order and Reference Manual 53, which focuses on cost recovery (including route maintenance, law enforcement species protection, permit issuance, and other associated program costs). The fee is estimated to be \$150 for long-term (annual) permits or \$80 for short-term (10-day) permits.</p> <p>The long-term (annual) permit fee would not be prorated for partial years.</p>	Same as alternative B.	Same as alternative B.	Not applicable—public ORV use would not be allowed at the Seashore.

Management Activity	Alternative A: No-Action	Alternative B	Alternative C	Alternative D	Alternative E
Number of Vehicle Permits Available (annual and weekly)	Not applicable—no vehicle limits would be established.	<p>There would be no limit on the number of long-term (annual) and short-term (10-day) vehicle permits issued, except as recommended to implement adaptive management (refer to the “Adaptive Management Strategy” section in this chapter).</p> <p>The NPS would be required to maintain ORV use data such as:</p> <ul style="list-style-type: none">• The number of annual and weekly vehicle permits sold including the date sold, and daily vehicle use data.• The total number of vehicles operating and stored on the islands each day.	<p>A limit on the number of long-term (annual) and short-term (10-day) vehicle permits issued per year would be established. Each island would have an individual permit.</p> <p>The limit on the number of long- and short-term vehicle permits issued would be determined in year 4 of this ORV management plan/EIS and will be based on the average number of permits issued per island in years 1–3 of this ORV management plan/EIS.</p> <p>(The average number of permits issued in years 1–3 of this ORV management plan/EIS is likely to be lower than the average number of vehicles delivered to the islands because number of vehicles delivered to the islands includes multiple repeat visitors.)</p> <p>The initial limit on the number of vehicle permits issued is based on 2005–2012 user data for the average number of vehicles delivered to each island; 2008 data was not available. The initial limit would be as follows:</p> <ul style="list-style-type: none">• North Core Banks: 2,500 permits annually• South Core Banks: 3,000 permits annually. <p>Permits would be issued on a first-come, first-served basis. An annual lottery may be established to equitably allocate permits.</p> <p>The NPS would be required to maintain ORV use data such as</p> <ul style="list-style-type: none">• The number of annual and 10-day permits sold including the date sold, and daily vehicle use data.• The total number of vehicles operating and stored on the islands each day. <p>Adaptive management could apply, if necessary, to reduce use from the limit established in year 4 (refer to “Adaptive Management Strategy” in this chapter).</p> <p>(Keeping the number of vehicle permits issued at the level of historical use while increasing the number of pedestrian-only areas by 2% could increase average vehicle density in the remainder of the ORV use areas by up to 2%.)</p>	<p>Same as alternative C, except:</p> <p>The limit on the number of long-term (annual) and short-term (10-day) vehicle permits issued would be determined in year 4 of this ORV management plan/EIS and would be based on the average number of permits per island issued in years 1–3 of this ORV management plan/EIS. (This three-year average may be adjusted to exclude events deemed to reduce visitation numbers, such as hurricanes.)</p> <p>(The reduction of 8% is based on percentage increase of year-round pedestrian-only areas; this reduction is intended to keep average vehicle density similar to current use.)</p>	Not applicable—public ORV use would not be allowed at the Seashore.

Table 3: Alternative Element Summary—Vehicles

Management Activity	Alternative A: No-Action	Alternative B	Alternative C	Alternative D	Alternative E
Operator Education Certificates	Not applicable—no operator education certificate would be required.	An operator education certificate would be required for a licensed driver to operate a vehicle at the Seashore. The education certificate would be issued in a manner to be determined; alternatives include: at the Seashore headquarters on Harkers Island, on-line or at special request for groups. The free certificate would be valid for one calendar year. Drivers would be required to carry this certificate with them at all times when operating a vehicle on the Seashore.	Same as alternative B.	Same as alternative B.	Not applicable—public ORV use would not be allowed at the Seashore.
Revocation of Vehicle Permits and Operator Education Certificates	Not applicable—there would be no vehicle permits under alternative A.	The superintendent may revoke a vehicle permit, and/or an operator education certificate for violation of applicable park regulations or terms and conditions of the permit. The revocation period could range from the balance of the current calendar year to the current calendar year plus the entire next calendar year, or as specified by the court. The permit fee would not be refunded if a vehicle permit is revoked.	Same as alternative B.	Same as alternative B.	Not applicable—public ORV use would not be allowed at the Seashore.

Management Activity	Alternative A: No-Action	Alternative B	Alternative C	Alternative D	Alternative E
Parking/Camping					
<div>Long-Term Vehicle Storage and Parking</div> <div><div>P</div></div> <div>Number of Lots</div> <div>Parking Permits and Fees</div> <div>Lot Sizes and Capacities</div>	<p>Parking and Permits—long-term vehicle storage and parking would be provided at four lots at the Seashore.</p> <p>A parking permit would be required for long-term vehicle storage. The fee for the parking permit, as of 2010, was \$15 per week. Fees are nonrefundable and nontransferable.</p> <p>Permit Limits—there would be no limits on the number of long-term parking permits issued.</p> <p>Lot Capacity—in 2010, the parking lots accommodated approximately the following number of vehicles:</p> <p>March 16 through December 31</p> <ul style="list-style-type: none">• North Core Banks Long Point = 32 vehicles• South Core Banks Great Island = 150 vehicles (Includes South Core Banks Great Island main lot and Great Island Carly Dock lot)• South Core Banks Light Station = 34 vehicles. <p>Parking lots are for vehicle storage only. Day use and camping within storage lots is not allowed.</p> <p>Long-term vehicle storage and parking lots would be closed from January 1 through March 15.</p> <p>(Annual closure of the lots and required removal of all vehicles from the island helps ensure that vehicles are properly inspected and that they remain operational.)</p>	<p>Parking and Permits—long-term vehicle storage and parking would be provided at four lots at the Seashore.</p> <p>A parking permit would be required for long-term vehicle storage. The fee for the parking permit would be valid on a monthly basis, and be based on guidance in NPS Director's Order and Reference Manual 53. Fees would be nonrefundable and nontransferable.</p> <p>Permit Limits—the number of permits issued monthly would be limited, based on the average vehicle capacity of the lot and the season; permits would be issued on a first-come, first-served basis.</p> <p>Lot Capacity—the parking lots would have the following vehicle capacity:</p> <p>Spring/Summer Season (from March 15 through September 14).</p> <ul style="list-style-type: none">• North Core Banks Long Point = 20 vehicles• South Core Banks Great Island = 90 vehicles (Includes South Core Banks Great Island main lot and Great Island Carly Dock lot)• South Core Banks Light Station = 20 vehicles. <p>Fall Season (September 15 through December 15)</p> <ul style="list-style-type: none">• North Core Banks Long Point = 50 vehicles• South Core Banks Great Island = 150 vehicles (Includes South Core Banks Great Island main lot and Great Island Carly Dock lot)• South Core Banks Light Station = 35 vehicles. <p>Long-term vehicle lots would be closed from December 16 through March 15.</p> <p>The capacity of lots may be lowered as an adaptive management strategy.</p> <p>Parking lots are for vehicle storage only. Day use and camping within storage lots would not be allowed. However, designated vehicle campsites along the back route proposed for both islands would serve as emergency parking during storms.</p>	<p>Same as alternative B, except</p> <ul style="list-style-type: none">• Long-term vehicle storage and parking would be provided at three lots at the Seashore. The parking lots at Great Island would be consolidated by moving the current large lot next to the smaller lot to the north, near Great Island Carly Dock, while still accommodating the number of vehicles shown.	<p>No long-term vehicle storage and parking would be provided at the Seashore.</p> <p>Parking lots would be retained as emergency overnight parking areas.</p> <p>(Parking areas, located mostly within the cabin areas are by some accounts obtrusive.)</p>	<p>Not applicable—public ORV use would not be allowed at the Seashore.</p>

Table 3: Alternative Element Summary—Vehicles

Management Activity	Alternative A: No-Action	Alternative B	Alternative C	Alternative D	Alternative E
Camping [Note: Camping is defined in 36 CFR 1.4 as the erecting of a tent or shelter of natural or synthetic material, preparing a sleeping bag or other bedding material for use, parking of a motor vehicle, motor home, or trailer, or mooring of a vessel for the apparent purpose of overnight occupancy.]	<p>Per 36 CFR 2.10—camping in NPS areas is prohibited, except in designated areas.</p> <p>Camping would be allowed on all beaches of the Seashore that are not otherwise closed by the Superintendent's Compendium, closed for species protection or closed for safety.</p> <p>The following areas are closed to camping (to reduce potential impacts to species):</p> <ul style="list-style-type: none">• Areas within the 300-foot buffer (100-yard) around American oystercatcher nests (also no stopping of vehicles within this buffer)• Turtle closures (turtle relocation areas). <p>Camping would not be allowed in areas closed for the protection of chicks.</p>	<p>Same as alternative A +</p> <ul style="list-style-type: none">• Emergency (storm refuge) parking could be provided, on a case-by-case basis, in designated areas along the back route. This would allow for overnight vehicle parking during times of adverse weather or unusually high tide events.	<p>Same as alternative B.</p>	<p>Same as alternative A +</p> <ul style="list-style-type: none">• Long-term parking lots would be retained as emergency overnight parking areas.	<p>Same as alternative A.</p>

Management Activity	Alternative A: No-Action	Alternative B	Alternative C	Alternative D	Alternative E
Education and Outreach					
Education and Outreach Component	<p>A variety of methods would be used to communicate to visitors about species, resource information, wise use, and ORV program information, such as the following:</p> <ul style="list-style-type: none">• Park website, bulletins and newspaper press releases• Bulletin boards at each camp, at each parking lot, at the Lighthouse and Harkers Island Visitor Centers• Interpretive exhibits• Signs• Personnel—law enforcement, roving interpretation, resource management staff, and Cabin Camp Office staff at ferry landings• News releases on significant, full beach closures• Outreach to organizations. <p>Educational materials would be provided on a variety of topics related to resources and ORV use, such as</p> <ul style="list-style-type: none">• ORV Management, night driving• Trash disposal, impact of fish carcasses, wildlife feeding, fireworks, pets, and predators• ORV safety, general safety• Regulations and violations• Camping and sanitation• Endangered species and species reports• Visitor use. <p>The Seashore would provide visitors with timely notification of closures and removal of closures as follows:</p> <ul style="list-style-type: none">• At the camps (on bulletin boards)• On the web (via notices) and using selected social media via news releases for significant, full beach closures• A telephone number for visitors to report law enforcement violations is provided.	<p>Same as alternative A +</p> <p>Educational materials would be actively provided to Seashore users through the educational certificate requirement; to obtain the vehicle permit, ORV operators would be required to attend or watch an educational program. This information would be updated annually based on violations and other adaptive management needs. The educational certificate would be required for each and every driver (not each vehicle). Additional ORV specific education would include</p> <ul style="list-style-type: none">• On the ground interpretive programs related to ORV use• Work with vehicle ferry operators to have them distribute educational materials on ORV rules and regulations• Provision of a regularly updated map of closures—online and post within the Seashore where possible• Provision of a uniform system of resource closure signage, possibly color coded (for example, a white sign could represent areas closed to all users, a yellow sign could represent areas where ORVs must slow down, and a red sign could represent those areas closed to ORVs, but open to pedestrian use)• Provision of information on the “state of the species” throughout the Seashore to show visitors the results of species management measures• Provision of an information packet about ORV rules and species protection in the cabins; look to work with existing materials provided and reduce waste• Establishment of a telephone number for visitors to report law enforcement violations• A key NPS goal is to make the education certificate convenient to obtain. NPS may make this a web-based system, and will strive to make it geographically convenient. NPS staff may give presentations to meetings of local organizations regarding ORV use and species protection. (If a certain attendance level is met, and if requested, the Seashore could present the operator education information required for the educational certificate, allowing users to comply with this requirement by attending a meeting.)	Same as alternative B.	Same as alternative B.	<p>Same as alternative A.</p> <p>However, all efforts would be directed toward pedestrian use because ORVs would not be allowed at the Seashore.</p>

TABLE 4: ALTERNATIVE ELEMENT SUMMARY—SPECIES (APPLICABLE TO ALL ALTERNATIVES)

	Species Survey	Species Management
Birds – Pre-nesting	<p>Piping plover—Survey active nesting areas for piping plover arrival and pre-nesting behavior beginning March 16, at least once per week on North Core Banks and South Core Banks. Beginning April 1, surveying in these areas will increase to three times a week (or every other day). The survey will include potential new habitat and historic nesting areas as determined appropriate by a qualified staff biologist. Monitoring reports will include descriptions of management measures in place and document piping plover behavior sufficient to evaluate the effects of management actions at the site.</p> <p>American oystercatcher—Survey all North Core Banks and South Core Banks beaches for American oystercatcher activity two days per week beginning mid-April. Surveys cease when all chicks have fledged or are lost.</p> <p>Colonial waterbird—Survey active nesting areas for colonial waterbird at least three days per week when piping plover monitoring occurs. Survey potential new habitat and historic nesting areas as time permits. Surveys cease when all chicks have fledged or are lost.</p> <p>Every three years during the statewide census, map colonies using GPS.</p> <p>Wilson’s plover—No survey.</p>	<p>Piping plover—April 1, establish full recreational closure in active, historic, and potential new habitat as determined by a qualified staff biologist.</p> <p>Enlarge protected areas where piping plover observed prospecting for territories outside of full recreational closure area (same as alternative A).</p> <p>If birds do not use site, open by July 15.</p> <p>Colonial waterbird—April 1, establish full recreational closure in active colonial waterbird nesting areas. Establish ORV closures in historic least tern and black skimmer nesting areas and any potential new habitat where, from site inspection, a qualified staff biologist determines that nesting may be likely to occur.</p> <p>Expand closures as necessary when nests or nest scrapes are found in new areas.</p>
Birds – Courtship/Mating	<p>Piping plover—Survey, seven days per week North Core Banks and South Core Banks and other areas at least one day per week, locations where territorial, courtship, or mating behavior observed. Monitoring will include descriptions of the management measures in place and human activity observed in the areas where courting behavior occurred.</p> <p>American oystercatcher—Survey number (pair/single), behavior, courtship, and evidence of scrapes.</p> <p>Colonial waterbird— Record territorial/mating behavior if observed during piping plover surveys.</p> <p>Wilson’s plover—No monitoring.</p>	<p>Piping plover—Expand full recreational closures to provide for a 150-foot buffer in areas of territorial, courtship, or mating (scrapes) behavior occurring outside existing closures.</p> <p>American oystercatcher—No closures.</p> <p>Wilson’s plover—Post Wilson’s plover nests or scrapes found outside existing closures on North Core Banks and South Core Banks.</p>
Birds – Nesting	<p>Piping plover—Survey nests seven days per week on North Core Banks and South Core Banks. Survey nests at least one day per week if they occur elsewhere. Record (1) date and time; (2) nest number; (3) nest location with a GPS unit (one time) [nest markers should not be placed in the sand]; (4) number of eggs (if bird is not flushed, record that the bird was incubating and number of eggs was not observed); (5) habitat; (6) status of nest (laying, incubating, lost, abandoned, hatching, hatched); (7) presence and behavior of the adults [incubating eggs, shading eggs, resting, foraging, disturbed (record source), territorial flight, territorial encounter, distraction display or other defensive behavior toward predator or pedestrian, courtship, other behavior (describe)]; (8) presence of potential predators, humans, pets, or ORVs within 300 feet and locations relative to the nest; (9) evidence (i.e., trails) and number of potential predators, humans, pets, or ORVs within posted areas, including distance to the nest; and (10) suspected cause of nest loss, if apparent. Include other specific data such as the number of observations of plovers performing territorial defense or courtship displays outside symbolic fencing and making nest scrapes outside the symbolic fencing. Data will include a description of the management measures in place where the above behaviors are observed.</p> <p>After incubation starts, observe incubating bird with optical equipment from appropriate distance that does not disturb the birds.</p> <p>American oystercatcher—Survey nests every two days on North Core Banks and South Core Banks, other areas one day per week. Record (1) nest locations with GPS and mile marker locations; (2) number of eggs present and hatch date; (3) presence or evidence of predators, including trails within 90 feet of the nest; and (4) human or ORV tracks within 90 feet of a nest.</p> <p>Colonial waterbird—Survey nests at least once every two days on North Core Banks and South Core Banks and one day per week elsewhere when piping plover monitoring occurs. Record center of colony using GPS. Record same information as piping plover except regular counts of colonial waterbird are not performed and productivity information is not recorded.</p> <p>Wilson’s plover—Census Wilson’s plover during annual piping plover window census (first week of June).</p>	<p>Piping plover—Expand full recreational closures to provide for a 150-foot buffer around nests. Place predator exclosures over nest as allowed by the USFWS. Areas remain closed until chicks fledge or are lost. When possible, report from the field any nest that appears to be at risk to the Seashore biologist. Piping plovers at the north end of South Core Banks should have ORV closure in place before chicks hatch, three days before expected hatch</p> <p>American oystercatcher—Mark nest in an unobtrusive manner and establish a 10-square-foot full recreational closure around the nest if nest in area subject to ORV or pedestrian traffic. Generally, nests found in the dunes are not posted because there is concern that predators might learn to associate posts with nests. American oystercatcher nests should have ORV ramp-to-ramp closures in place before chicks hatch, three days before expected hatch date.</p> <p>Colonial waterbird—Expand full recreational closure to provide for a 150-foot buffer from all nests.</p> <p>Wilson’s plover—Post Wilson’s plover nests or scrapes found outside existing closures on North Core Banks and South Core Banks.</p>

	Species Survey	Species Management
Birds – Unfledged Chicks	<p>Piping plover—Survey brood seven days per week on North Core Banks and South Core Banks; at least once per week elsewhere. Record (1) date and time; (2) nest/brood number; (3) location of brood; (4) number of chicks; (5) brood age (this is known from other data on hatch date); (6) brood behavior [foraging, resting/brooding, disturbed (record source), other]; (7) presence and behavior of adults [foraging, brooding, resting, disturbed (record source), territorial flight, territorial encounter, distraction display or other defensive behavior toward predator or pedestrian, courtship, other behavior (describe)]; (8) presence or evidence of potential predators, humans, or ORVs within 300 feet and location relative to the brood including tracks within closures; (9) cause of chick loss, if carcass is found, and source of mortality apparent. Include data on the interaction between people and plovers, including instances where vehicles, pedestrians, or pets are observed within the symbolic fencing and the type of response exhibited by the plovers. Seashore will ensure park users, concessioners, and contractors are aware of the piping plover protection measures implemented within the Seashore boundaries, including any measures related to lighting.</p> <p>American oystercatcher—Survey brood at least once every two days on North Core Banks and South Core Banks. Surveys cease when all chicks have fledged or are lost.</p> <p>Colonial waterbird—Survey brood at least once every two days when piping plover monitoring occurs. Surveys cease when all chicks have fledged or are lost.</p> <p>Wilson's plover—No survey.</p>	<p>Piping plover—After nest hatches, when a chick is found using the ocean beach, expand buffer to include a 600-foot ORV closure around each brood. Route ORVs to a back route or, if there is no route, the Seashore will consider an escort. An escort program may be used on a case-by-case basis to maintain access to Portsmouth Village or areas with no back route access if staffing allows. Establish a 2-mile ORV closure (now 1.25 miles due to Hurricane Ophelia) at the north end of South Core Banks from the first nest hatch until last chick has fledged or is lost. Increase enforcement of public compliance with closures. Remove closures when the last chick is fledged or is lost.</p> <p>American oystercatcher—Establish ramp-to-ramp ORV closures if are chicks present on the beach (route ORV traffic to back route via designated ramps) unless no back route is present, then ORVs will be allowed at 15 mph, with signs warning operators of flightless chicks in the area. Adjust ORV closures based on chick movement, providing a minimum 300-foot buffer around brood. Move closures with chicks. Reopen closed areas to ORVs after the last chick has fledged or is lost.</p> <p>Colonial waterbird—Establish ORV closures that provide at least a 150-foot buffer around broods when chicks present at the point of Cape Lookout beach. In other areas, route traffic around ORV closures if chicks are in danger of being run over.</p> <p>Wilson's plover—Post areas where Wilson's plover chicks are found outside existing closures on North Core Banks and South Core Banks.</p>
Birds – Nonbreeding (migrating / wintering)	<p>Piping plover—Survey entire Seashore nonbreeding population once per month from August 1 through March 31. Coordinate with Cape Hatteras National Seashore to conduct simultaneous surveys or receive survey data from Portsmouth Island during winter, since, based on past banding data, wintering birds move across Ocracoke Inlet. Send data on winter birds to North Carolina Wildlife Resources Commission (NCWRC). Record: (1) date; (2) weather variables [air temperature, wind speed and direction, visibility, percent cloud cover (estimate by eye), precipitation; (3) tidal stage (hours after high tide); (4) number of birds; (5) habitat; (6) behavior of majority of birds in flock [foraging, resting, disturbed (record source), other]; and (7) check for band combination of any banded birds, using reporting protocols developed by staff for band color and location. Keep a log that records the date, time, and purpose of each official trip through areas where unfledged chicks are present. Monitors, law enforcement personnel, and other NPS staff will record all observations of violations of dog leashing requirements in plover breeding areas, both inside and outside posted habitat.</p> <p>American oystercatcher—No survey of nonbreeding individuals.</p> <p>Red knot—Survey in spring and fall on North Core Banks and South Core Banks following International shorebird survey protocols on frequency and timing.</p>	<p>Closures not specifically implemented for wintering/ migrating shorebird protection. Permanent ORV closures at Shackleford Banks, Portsmouth Flats, the interior of point of Cape Lookout, beach between mile markers 41a and 41b, Power Squadron Spit, and soundside beaches on North and South Core Banks are maintained.</p>

Table 4: Alternative Element Summary—Species (Applicable to all Alternatives)

	Species Survey	Species Management
Sea Turtles	<p>From May 1 through September 15, survey for crawls/nests before 12 p.m. daily on South Core Banks and North Core Banks; Shackleford Banks two or three days per week; Middle Core Banks monitored irregularly (difficult access). Monitoring procedures and data collection follow the monitoring and reporting guidelines in the Handbook for Sea Turtle Volunteers in North Carolina (NCWRC 2006) and the USFWS Index Nesting Beach Survey Protocol. Periodically monitor (e.g., every two or three days) for unknown nesting and emerging hatchlings will continue, especially in areas that are not surveyed regularly or that receive high visitor use, through November 15. Monitoring for post-hatchling washbacks during periods where there are large quantities of seaweed washed ashore or following severe storm events.</p> <p>Before May 1, NPS staff conduct piping plover monitoring and, if possible, note any turtle crawls/nests.</p> <p>Record (1) date and time; (2) species, if known; (3) whether it is a false or nesting crawl; (4) sequential nest number; (5) whether nest was relocated, original and relocation site names, and coordinates of original and relocation sites in latitude/longitude; (6) distance from nest to tideline, in meters; (7) date when nest excavation conducted; (8) date(s) of nest overwash; (9) sources of egg or whole nest loss, if apparent; and (9) geographic coordinates of false crawls when first found. Monitor the effects of management actions on nesting, hatching, and stranded sea turtles on specified beaches within Seashore boundaries.</p> <p>Conduct a nest excavation inventory to determine nest success after hatching.</p>	<p>Nest Protection</p> <p>Immediately mark each located nest with stakes.</p> <p>Fifty days after nest laid, establish a funnel-shaped ORV closure from the nest to 15 feet below high tide line. The ORV closure is 30 feet wide at the nest and 60 feet wide below high tide line, with a minimum 10-foot buffer duneward of the nest. If 10-foot minimum buffer is not possible, establish a ramp-to-ramp ORV closure (route vehicles around nest via back route). Remove ORV closure after the nest hatches.</p> <p>Nest Relocation</p> <p>Relocate nests laid at or below high tide line or in areas where they are likely to be washed away or are in danger of erosion, according to USFWS recommendations.</p> <p>Three nest relocation areas (up to 1 mile in length) are designated on South Core Banks and North Core Banks where ORV traffic is prohibited beginning 50 days after first nest relocated to area. Relocate nests to the nearest designated area. No ORVs are allowed on Shackleford Banks, so relocate nests to the nearest suitable habitat.</p> <p>Relocate nests within 12 hours after eggs are laid or 14 days after the nest was laid.</p> <p>Nest Excavations</p> <p>Excavate the nest the 5th day after a major hatch (indicated by distinctive hatchling tracks), 10 days after depression forms, or 75 days after nest was laid if no sign of hatching. Excavations may take longer than 75 days if environmental conditions or species warrant as allowed by the North Carolina Wildlife Commission Sea Turtle Handbook.</p> <p>If the nest is outside of a designated relocation area, remove the ORV closure after excavation.</p> <p>Predator Management</p> <p>Use screens or cages used to protect nests and prevent egg loss to raccoons.</p> <p>Light Management</p> <p>Prohibit camping and campfires in nest relocation areas to prevent disturbance of hatchlings from artificial lights. Encourage concessioners and people staying in cabins to minimize use of outdoor lights. Seashore will also ensure park users, concessioners, and contractors are aware of the sea turtle protection measures implemented within the Seashore boundaries.</p> <p>For nests in locations deemed vulnerable to light pollution, install 2-foot high plywood barriers behind and to the sides of the nest 10 days before estimated hatch date.</p> <p>Fireworks are prohibited within the Seashore. The Seashore will coordinate with USFWS to develop and implement measures to further minimize beach lighting threats.</p>
Seabeach Amaranth	<p>June 1, begin monitoring habitat outside existing bird closures one to two days per week for seedlings/juvenile plants.</p> <p>Conduct annual survey in late-July or early-August. Survey habitat but concentrate on where plants have been found before. Conducted surveys in all areas of suitable habitat and results mapped using a geographic information system (GIS). Data collected will include number of plants; general distribution of plants; general proportions of seedlings, medium and large plants at the time of the survey; and overall health (signs of stress, damage, disease or herbivory, etc.).</p> <p>Surveys will be used to identify potential closures.</p>	<p>Establish ORV closure around all emergent plants. Base the closure size on best professional judgment but with a minimum 30-foot buffer around the plant.</p> <p>Survey bird/turtle closures prior to reopening to ORV traffic. Do not allow tent camping in ORV closure areas.</p> <p>Open closed area at the end of the growing season.</p>

TABLE 5: ADDITIONAL SPECIES MANAGEMENT MEASURES NOT IN THE *CAPE LOOKOUT NATIONAL SEASHORE INTERIM PROTECTED SPECIES MANAGEMENT PLAN / ENVIRONMENTAL ASSESSMENT*, BIOLOGICAL OPINION, AMENDED BIOLOGICAL OPINION, OR FONSI

Management Activity	Alternative A: No-Action	Alternative B	Alternative C	Alternative D	Alternative E
Birds—Prenesting		Historical shorebird nesting areas will be posted prior to opening the beach to vehicles (March 16).	Same as alternative B	Same as alternative B	Same as alternative A, but no ORV specific closures (may still be closed to pedestrians).
Birds—Courtship/Mating	Species Management per the Cape Lookout National Seashore <i>Interim Protected Species Management Plan / Environmental Assessment</i>	Same as alternative A.	Same as alternative A.	Species Management Colonial waterbirds—Increase buffers to 600 feet. Least tern—Increase buffers to 300 feet. American oystercatcher—Increase buffers to 450 feet	Same as alternative A, but no ORV specific closures (may still be closed to pedestrians).
Birds—Nesting	Species Management per the Cape Lookout National Seashore <i>Interim Protected Species Management Plan / Environmental Assessment</i> American oystercatcher—Where nests are present on the beach, establish pass-through only areas for American oystercatcher nests providing a minimum 300-foot buffer around nest.	Same as alternative A.	Same as alternative A.	Species Management Colonial waterbirds—Increase buffers to 600 feet. Least Tern—Increase buffers to 300 feet. American oystercatcher: Increase buffers to 450 feet Where American oystercatcher nests are present, vehicles would be routed around American oystercatcher nests or chicks where the back route is available (no pass-through zone in American oystercatcher buffers) during the nesting season, typically from mid-May through the end of July. If no back route is available, a pass-through zone would be allowed (refer to alternative A).	Same as alternative A, but no ORV specific closures (may still be closed to pedestrians).

Management Activity	Alternative A: No-Action	Alternative B	Alternative C	Alternative D	Alternative E
Birds—Unfledged Chicks	Species Management per the Cape Lookout National Seashore <i>Interim Protected Species Management Plan / Environmental Assessment</i>	Same as alternative A.	Same as alternative A.	<p>Species Management</p> <p>Piping plover—</p> <ol style="list-style-type: none">1. Monitor all broods during the chick-rearing phase of the breeding season, with frequency of monitoring same as alternative A, <p>AND</p> <ol style="list-style-type: none">2. Minimum size of pedestrian-only areas to be established in the vicinity of unfledged broods based on the mobility of broods observed on the site in past years and on the frequency of monitoring as follows: Unless substantial data from past years show that broods on a site stay close to their nest locations, pedestrian-only areas should extend at least 650 feet on each side of the nest site during the first week following hatching. The size and location of the protected area should be adjusted in response to the observed mobility of the brood, but in no case should be reduced to less than 650 feet on each side. In some cases, highly mobile broods may require protected areas up to 3250 feet, even when intensively monitored. Protected areas should extend from the oceanside low water line to the bayside low water line or the farthest extent of dune habitat. Vehicles may be allowed to pass through portions of protected area that are considered inaccessible (as above). This would be a seasonal closure from May through August. <p>In a few cases, where several years of data document that piping plovers on a particular site feed in only certain habitat types, the USFWS or the state wildlife management agency may provide written concurrence that vehicles pose no danger to plovers and other specified habitats on that site.</p> <p>Colonial waterbirds—Increase buffers to 600 feet.</p> <p>Least Tern—Increase buffer to 600 feet.</p> <p>American oystercatcher—Increase buffers to 600 feet</p>	Same as alternative A, but no ORV specific closures (may still be closed to pedestrians).
Sea Turtles	Nest Protection—Increase width of funnel shaped closure from 60 feet at the high tide line to 150 feet plus 30 feet on either side of the nest and fifteen feet behind the nest	Same as alternative A.	Same as alternative A.	Same as alternative A.	Same as alternative A, but no ORV specific closures (may still be closed to pedestrians). Also, no camping in turtle closures.

Table 5: Additional Species Management Measures not in the Cape Lookout National Seashore Interim Protected Species Management Plan / Environmental Assessment, Biological Opinion, Amended Biological Opinion, or FONSI

Management Activity	Alternative A: No-Action	Alternative B	Alternative C	Alternative D	Alternative E
Adaptive Management	Not applicable—No adaptive management strategy used.	<p>The adaptive management strategy evaluates species disturbance.</p> <p>Species Indicators—American oystercatcher (determined to be an indicator species) disturbance would be monitored specifically related to impacts from ORV. American oystercatchers are used as an indicator species because they are solitary nesters and are among the most sensitive of the bird species at Cape Lookout National Seashore to disturbance. If species indicators are triggered (described below), the following actions would take place:</p> <ul style="list-style-type: none">• Step 1: Where 2 of the 4 species indicators have reached moderate impacts more intensive management actions could be implemented. The following are management actions the Seashore may conduct at any time, however, under adaptive management strategy additional resources would be focused on these actions:<ul style="list-style-type: none">– Additional, focused trash management and fish scrap disposal– Additional predator control– Additional education with testing– Additional, focused enforcement– ORV route restrictions– Increased species buffers– Reduction in the number of long-term (annual) and/or short-term (10-day) vehicle permits issued, and manage the size of parking (vehicle storage lots).• Step 2: If species indicators are triggered for two consecutive years after implementing Step 1, then the following management actions shall be taken. These management actions would not occur where the Seashore is able to show that species indicators were triggered due to hurricanes or other strong storms, predators, or other natural conditions not tied to impacts from visitor use.<ul style="list-style-type: none">– Reduction in the number of long-term (annual) and/or short-term (10-day) vehicle permits issued– Increased species protection buffers. <p>Species indicators will be reevaluated after a five-year period, and possibly changed, based on new information. The following indicators are as follows:</p> <ul style="list-style-type: none">• Breeding population size. Target 60 breeding pairs. Minor impact: <55 breeding pairs. Moderate impact: <50 breeding pairs.• Nest survival. Target >30% of nests initiated hatch one or more chicks. Minor impact: 25%–30%. Moderate impact: <25%.• Chicks fledged per breeding pair per year. Target > 0.40. Minor impact: 0.40–0.30. Moderate impact: < 0.30.• Mammal predation. Target <20% of nests lost to mammals per year. Minor impact: 20%–25%. Moderate impact: >25%.			
Predator Management	Exclosures would be placed on piping plover nests and sea turtle nests to help protect the nests from predators.	<p>Same as alternative A +</p> <p>The Seashore would perform limited removal of mammalian predators, when predation is observed that impacts federally listed species or species of special concern.</p> <p>(Removal of predator species reduces cumulative impacts to sensitive species; removal of nonnative predator species is consistent with NPS policy; removal of native predator species is based on research that shows that the populations of certain predator species, such as raccoons, increase unnaturally due to human interaction, from trash and fish remains left by anglers.)</p>	Same as alternative B.	Same as alternative B.	Same as alternative A, but no ORV specific closures (may still be closed to pedestrians).

Management Activity	Alternative A: No-Action	Alternative B	Alternative C	Alternative D	Alternative E
Night Driving Restrictions	There would be no restrictions on night driving.	<p>The night driving restriction would be in place from May 1 through August 31 to reduce potential impacts to turtles and bird chicks</p> <p>Restrictions would be in place from 9 pm to 6 am. The longer range of dates would account for late nesters and would bring this date into alignment with the break between the spring/summer and fall seasons.</p> <p>Night driving would be allowed in the Great Island and Long Point cabin areas.</p>	<p>A night driving restriction would be in place from May 1 through September 14 to reduce potential impacts to turtles and bird chicks.</p> <p>Restrictions would be in place from 9 pm to 6 am. The longer range of dates would account for late nesters and would bring this date into alignment with the break between the spring/summer and fall seasons.</p>	Same as alternative C.	Not applicable—ORVs would not be allowed at the Seashore.
Winter and Wintering Closures	<p>The Seashore would be closed to vehicles from January 1 through March 15 of each year.</p> <p>(This would provide habitat for wintering species, allows the beach profile to recover from heavy fall fishing use, and would ensure that all vehicles are removed from the Seashore at least once a year so that state vehicle safety inspections could be updated and maintenance completed.)</p>	Same as alternative A.	<p>The Seashore would be closed to vehicles from December 16 through March 15 of each year.</p> <p>(The December 16 annual vehicle closure would coincide better with the time that cabin camps close, and routine ferry operations stop.)</p>	Same as alternative C.	Not applicable—ORVs would not be allowed at the Seashore.
Research and Monitoring	<p>Examples of ongoing research at the Seashore would include:</p> <ul style="list-style-type: none">Monitoring and Management of American oystercatcher on Cape Lookout National Seashore” conducted by Dr. Ted Simons, Cooperative Research Group, North Carolina State University. The study will monitor American oystercatcher nesting and chick success/survival and document causes of chick mortality.	<p>Same as alternative A +</p> <p>Monitoring of visitor compliance with regulations to determine success with or the need to re-focus enforcement and education efforts.</p> <p>Through the issuance of a research permit, the NPS may authorize qualified researchers associated with recognized academic or research institutions to conduct additional scientific research on the respective species that will add to the existing knowledge of shorebird and waterbird species, sea turtles, and seabeach amaranth, or improve resource protection within the Seashore. Establishment of Research Areas may be authorized under such a permit.</p> <p>Support research efforts looking at the sex ratio of turtles.</p> <p>Conduct or authorize a new visitor use and experience study.</p>	Same as alternative B.	Same as alternative B.	Same as alternative A.

TABLE 6: ENVIRONMENTAL IMPACT SUMMARY

Impact Topic	Summary
Federally Listed Endangered, Threatened, or Candidate Species	
Piping Plover	<p>Under alternative B, impacts on piping plovers from resource management activities would be slightly less than impacts under alternatives A (the no-action alternative) and E (the no-ORV alternative). This is because there would be more consistent training and supervision of resource staff conducting the surveys, the limited predator removal under alternative B, establishing pre-nesting closures by March 16 (15 days earlier than under alternative A, not applicable to alternative E), and the increased education and research programs. Impacts on piping plovers from ORV use and other recreational uses under alternative B would be less than the impacts incurred under alternative A. This is due to the closing of ORV routes where no ferry access is available, the prohibition on all high-performance sport-model and two-stroke ATVs and UTVs at the Seashore, the night driving restriction from May 1 through August 31, the likely increased compliance with resource closures due to increased law enforcement and interpretative staffing positions, the ORV permitting system, and the more intensive management actions that could be implemented under the adaptive management strategy. However, the impacts on piping plovers from recreational uses under alternative B would be greater than those incurred under alternative E because no public ORV access at the Seashore is allowed under alternative E.</p> <p>Impacts on piping plovers from resource management activities under alternative C would be slightly less than from alternatives A (the no action alternative) and E (the no ORV alternative). This is due to more consistent training and supervision of resource staff conducting the surveys, the limited predator removal under alternative C, increased educational and research efforts, and the winter vehicle closure from December 16 through March 15 (not applicable to alternative E). Impacts of ORV use and other recreational uses under alternative C would be less than those incurred under alternative A. This is due to a seasonal restriction on night driving from May 1 through September 14, the increase in the amount of pedestrian-only use areas by 4 miles, the closing of ORV routes where no ferry access is available, the prohibition on all high-performance sport-model and two-stroke ATVs and UTVs at the Seashore, shortening the timeframe that utility-model ATVs and UTVs would be permitted within the Seashore each year (reducing the March 16 through December 31 time under alternative A to September 15 through December 15), the reduction in the amount of Seashore open for ORV use, the fee-based ORV permitting system that would also limit the number of vehicles on the Seashore, the likely increased compliance with resource closures due to increased law enforcement and interpretative staffing positions, and the more intensive management actions that could be implemented under the adaptive management strategy. Compared to alternative E, the amount of impacts on piping plovers under alternative C would be greater due to public ORV use being allowed under alternative C whereas it would be prohibited under alternative E.</p> <p>Under alternative D, impacts on piping plovers from resource management activities would be less than those under alternatives A (the no-action alternative) and E (the no ORV alternative). This is due to more consistent training and supervision of resource staff conducting the surveys, the limited predator removal, slightly expanded buffers around chicks on the beach (650 feet under alternative D compared to 600 feet under alternatives A and E), the expansion of brood buffers based on the mobility of the brood, and the increased education and monitoring efforts. Impacts from ORV use and other recreational uses would be reduced when compared to alternative A. This is due to the expansion of pedestrian-use only areas by 10 miles, night time driving restrictions from May 1 through September 14, the closing of ORV routes where no ferry access is available, the prohibition on all ATVs as well as all high-performance sport-model and two-stroke UTVs at the Seashore, shortening the timeframe that utility-model UTVs would be permitted within the Seashore each year (reducing the March 16 through December 31 time under alternative A to September 15 through December 15), the reduction in the amount of Seashore open for ORV use, the fee-based ORV permitting system with a limit on the number of vehicles allowed (which would be 8 percent less than current use), the likely increased compliance with resource closures due to increased law enforcement and interpretative staffing positions, and the more intensive management actions that could be implemented under the adaptive management strategy. Compared to alternative E, the amount of impacts on piping plovers under alternative D would be greater due to public ORV use being allowed under alternative C whereas it would be prohibited under alternative E.</p>

Impact Topic	Summary
	<p>The resource management activities proposed for alternative E (the no ORV alternative) are essentially the same activities proposed for alternative A (the no action alternative) except that with no public ORV use allowed on the Seashore under alternative E, there would be no recreational ORV-specific closures established and surveying and monitoring protocols would be reviewed and may change due to the elimination of impacts from recreational ORV use and a reduction in the amount of impacts from pedestrians. Under alternative A, the North and South Core Banks of the Seashore would remain open to ORV use in designated routes and areas (as documented in the Superintendent's Compendium), except where resource or safety closures are present. There would be no night driving restrictions under alternative A and no restrictions on the number of vehicles allowed on the Seashore either. Therefore, when compared to alternative A, alternative E would provide more protection to piping plovers because there would be no impacts related to public ORV use, and impacts related to other recreational uses would be reduced due to limited access to the ocean front beaches due to no public ORV use.</p>
Red Knot	<p>Impacts of ORV and other recreational use would result in long-term adverse impacts on red knots under alternative B. Allowing continued ORV access along 81 percent (45 miles) of the Seashore would contribute to these long-term impacts, including noise disturbance, temporary displacement, and possibly injury/mortality of individuals. However, impacts would be reduced when compared to alternative A (the no-action alternative) due to increased education and outreach; the use of additional species management measures, such as focused predator management, and the prohibition of all high-performance sport-model and two stroke ATVs and UTVs, and the more intensive management actions that could be implemented under the adaptive management strategy. Red knots are active at night, so additional benefits would also result from a seasonal restriction on night driving from May 1 through August 3; however, benefits from this restriction would be limited since it does not cover the red knot's spring migration period when it is most numerous at the Seashore. Compared to alternative E, impacts on red knots would be greater under alternative B would provide less protection for red knots, because while alternative B allows public ORV use which can adversely impact red knots, under alternative E public ORV use on the Seashore would be prohibited, eliminating this source of adverse impact and reducing the impact from pedestrians, who without transportation opportunities to more remote areas of the Seashore would likely be limited to areas in general proximity to the ferry landing areas.</p> <p>Under alternative C, the impacts of ORV and other recreational use would result in long-term adverse impacts on red knots from noise disturbance, temporary displacement, and possibly injury/mortality of individuals. However, impacts would be reduced when compared to alternative A (the no-action alternative), due to increased education and outreach; the use of additional species management measures, such as expanded species closures (for other protected birds); the increase in the amount of pedestrian-only use areas by 4 miles; the expansion of the winter vehicle closure timeframe (changing it to December 16 through March 15 compared to January 1 through March 15 under alternative A); the closing of ORV routes where no ferry access is available; the prohibition on all high-performance sport-model and two-stroke ATVs and UTVs at the Seashore; shortening the timeframe that non-sport ATVs and UTVs would be permitted within the Seashore each year (reducing the March 16 through December time under alternative A to September 15 through December 15); the reduction in the amount of Seashore open to public ORV use; and the fee-based ORV permitting system that would also limit the number of vehicles on the Seashore, and the more intensive management actions that could be implemented under the adaptive management strategy. Red knots are active at night, so additional benefits would also result from a seasonal restriction on night driving from May 1 through September 14; however, benefits from this restriction would be limited since it does not cover the red knot's spring migration period when it is most numerous at the Seashore, and most birds have already left the Seashore prior to the latter portion of the period. Compared to alternative E, the amount of impacts on red knots under alternative C would be greater due to public ORV use being allowed under alternative C, whereas it would be prohibited under alternative E. The prohibition of public ORV use under alternative E would also reduce the amount of impacts from pedestrians, because without ORVs to access the more remote areas of the Seashore pedestrians would likely be limited to areas in general proximity to the ferry landing areas.</p> <p>Alternative D would also result in long-term adverse impacts on red knots from disturbance, temporary displacement, and possibly injury/mortality of individuals. However, impacts would</p>

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Impact Topic	Summary
	<p>be reduced when compared to alternative A (the no-action alternative), due to increased education and outreach; the use of additional species management measures, such as expanded buffers/closures (for other protected birds); the closing of ORV routes where no ferry access is available; the reduction in the amount of Seashore open to public ORV use; the implementation of a vehicle permit program and the reduction in the number of public ORVs allowed on the Seashore by 8 percent; the prohibition of all ATVs, as well as all high-performance sport-model and two-stroke UTVs at the Seashore; and the shortening of the timeframe that non-sport UTVs would be permitted within the Seashore each year (reducing the March 16 through December 31 timeframe under alternative A to September 15 through December 15), and the more intensive management actions that could be implemented under the adaptive management strategy. Red knots are active at night, so additional benefits would also result from a seasonal restriction on night driving from May 1 through September 14; however, benefits from this restriction would be limited since it does not cover the red knot's spring migration period when it is most numerous at the Seashore, and most birds have already left the Seashore prior to the latter portion of the period. Compared to alternative E (the no ORV alternative), impacts on red knots under alternative D would be greater due to public ORV use being allowed under alternative D, whereas it would be prohibited under alternative, eliminating because ORV access would continue to be permitted under alternative D. The prohibition of public ORV use under alternative E would also reduce the amount of impacts from pedestrians, because without ORVs to access the more remote areas of the Seashore pedestrians would likely be limited to areas in general proximity to the ferry landing areas.</p> <p>Under alternative E, prohibiting public ORV use at the Seashore would provide long-term beneficial impacts compared to alternative A where public ORV use would be allowed along 81 percent of the Seashore. While continued pedestrian access under alternative E would result in some short- and long-term disturbance (e.g., noise, temporary displacement, etc.) of red knots, these impacts would be reduced compared to alternative A because without the use of ORVs to access more remote areas of the Seashore, pedestrian use under alternative E would likely be limited to areas in the general proximity to the ferry landing areas. As a result, overall, alternative E would provide more protection and result in fewer adverse impacts to red knots compared to alternative A.</p>
Sea Turtles	<p>Resource management activities proposed under alternative B would provide slightly more beneficial impacts to sea turtles than those proposed under alternative A (the no-action alternative) because there would be more consistent training and supervision of resource staff conducting the surveys, the limited removal of native and nonnative mammalian predators, and the increased education and public outreach measures that would be implemented under alternative B. In comparison to alternative E (the no ORV alternative), the limited removal of native and nonnative mammalian predators under alternative B would provide slightly more beneficial impacts to sea turtles than alternative E. Adverse impacts from ORV use and other recreational uses under alternative B would be less than those incurred under alternative A. This is due to the night driving restrictions that would be put into place under alternative B from 9 p.m. to 6 a.m. from May 1 through August 31, the additional management measures that could be implemented under the adaptive management strategy if species indicators are triggered, the vehicle permit system, the ORV operator education certificate requirement, and the likely increased compliance with resource closures due to increased law enforcement and interpretative staffing positions. However, adverse impacts from ORV use and other recreational uses under alternative B would be greater than those under alternative E. This is because no ORV use would be allowed on the Seashore under alternative E, eliminating all impacts on sea turtles from ORV use and reducing impacts from other recreational uses due to the reduced access to the beaches without ORVs.</p> <p>Resource management activities under alternative C would provide slightly more beneficial impacts on sea turtles than they would under alternative A (the no-action alternative). This is because there would be more consistent training and supervision of resource staff conducting the surveys, the limited removal of native and nonnative mammalian predators, and the increased education and public outreach measures that would be implemented under alternative C. In comparison to alternative E (the no ORV alternative), the limited removal of native and nonnative mammalian predators under alternative C would provide slightly more beneficial impacts to sea turtles than alternative E. Adverse impacts from ORV use and other recreational uses under alternative C would be less than those incurred under alternative A. This is due to the expansion of pedestrian-only use areas by 4 miles, night time driving</p>

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	<p>restrictions from 9 p.m. to 6 a.m. from May 1 through September 14, the additional management measures that could be implemented under the adaptive management strategy if species indicators are triggered, the likely increased compliance with resource closures due to increased law enforcement and interpretative staffing positions, the vehicle permit system, the ORV operator education certificate requirement, and the limit on the number of vehicle permits that would be issued. However, adverse impacts from ORV use and other recreational uses under alternative C would be greater than those under alternative E. This is because no ORV use would be allowed on the Seashore under alternative E eliminating all impacts on sea turtles from ORV use and reducing impacts from other recreational uses due to the reduced access to the beaches without ORVs.</p> <p>Resource management activities under alternative D would provide slightly more beneficial impacts on sea turtles than they would under alternative A (the no-action alternative). This is because there would be more consistent training and supervision of resource staff conducting the surveys, the limited removal of native and nonnative mammalian predators, and the increased education and public outreach measures that would be implemented under alternative D. In comparison to alternative E (the no ORV alternative), the limited removal of native and nonnative mammalian predators under alternative C would provide slightly more beneficial impacts to sea turtles than alternative E. Adverse impacts from ORV use and other recreational uses under alternative D would be less than those incurred under alternative A. This is due to the expansion of pedestrian-only use areas by 10 miles, night time driving restrictions from 9 p.m. to 6 a.m. from May 1 through September 14, the additional management measures that could be implemented under the adaptive management strategy if species indicators are triggered, the likely increased compliance with resource closures due to increased law enforcement and interpretative staffing positions, the vehicle permit system, the ORV operator education certificate requirement, and the limit on the number of vehicle permits that would be issued. Compared to alternative E, adverse impacts from ORV use and other recreational uses under alternative D would be greater. This is because no ORV use would be allowed on the Seashore under alternative E eliminating all impacts on sea turtles from ORV use and reducing impacts from other recreational uses due to the reduced access to the beaches without ORVs.</p> <p>The resource management activities proposed for alternative E (the no ORV alternative) are the same activities proposed for alternative A (the no-action alternative) and their impacts would be the same. However, unlike alternative A, under alternative E there would be no public ORV use on the Seashore and surveying and monitoring protocols would be reviewed and may change due to the elimination of impacts from recreational ORV use and a reduction in the amount of impacts from pedestrians. Under alternative A, the North and South Core Banks of the Seashore would remain open to ORV use in designated routes and areas (as documented in the Superintendent's Compendium), except where resource or safety closures are present. There would be no night driving restrictions under alternative A and no permitting system for ORV use at the Seashore. Therefore, when compared to alternative A, alternative E would provide more protection to sea turtles because there would be no impacts related to ORV use and impacts related to other recreational uses would be reduced due to limited access to the ocean front beaches with no ORV use.</p>
Seabeach Amaranth	<p>Resource management activities proposed under alternative B would provide slightly more beneficial impacts to seabeach amaranth than those proposed under alternative A (the no-action alternative) and alternative E (the no ORV alternative) because there would be more consistent training and supervision of resource staff conducting the surveys, closures for historical bird nesting areas would be erected by March 16 (rather than April 1), providing earlier protection of potential seabeach amaranth habitat and possibly seeds that could germinate if the habitat overlaps that of seabeach amaranth. Additional benefits would also result from increased education and public outreach measures that would be implemented under alternative B. Adverse impacts from ORV use and other recreational uses under alternative B would be less than those incurred under alternative A. This is due to regular maintenance of the back route which would encourage its use rather than the ocean beach, the additional management measures that could be implemented under the adaptive management strategy if species indicators are triggered, the vehicle permit system, the ORV operator education certificate requirement, and the likely increased compliance with resource closures due to increased law enforcement and interpretative staffing positions. Some adverse impacts that would occur under alternative B that would not occur under alternative A would result from</p>

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	<p>the loss of habitat if construction of new ramps or the re-establishment of existing ramps after storms occur in areas of suitable habitat for the plant. Adverse impacts from ORV use and other recreational uses under alternative B would be greater than those under alternative E because no public ORV use would be allowed on the Seashore under alternative E, eliminating all impacts on seabeach amaranth from public ORV use and reducing impacts from other recreational uses, especially camping near the toe of the primary dunes, due to the reduced access to the beaches without ORVs.</p> <p>Resource management activities proposed under alternative C would provide slightly more beneficial impacts to seabeach amaranth than those proposed under alternative A (the no-action alternative) and alternative E (the no ORV alternative) because there would be more consistent training and supervision of resource staff conducting the surveys, closures for historical bird nesting areas would be erected by March 16 (rather than April 1), providing earlier protection of potential seabeach amaranth habitat and possibly seeds that could germinate if the habitat overlaps that of seabeach amaranth. Additional benefits would also result from increased education and public outreach measures that would be implemented under alternative C. Adverse impacts from ORV use and other recreational uses under alternative C would be less than those incurred under alternative A. This is due to the expansion of pedestrian-only use areas by 4 miles, the additional management measures that could be implemented under the adaptive management strategy if species indicators are triggered, the vehicle permit system, the ORV operator education certificate requirement, the limit on the number of vehicle permits that would be issued, and the likely increased compliance with resource closures due to increased law enforcement and interpretative staffing positions. Some adverse impacts that would occur under alternative C that would not occur under alternative A would result from the loss of habitat if construction of new ramps or the re-establishment of existing ramps after storms occurs in areas of suitable habitat for the plant. Compared to alternative E, alternative C would provide less protection for seabeach amaranth because ORV access would be permitted under alternative C whereas no impacts from recreational ORVs would occur under alternative E and potential impacts from other recreational uses, especially camping near the toe of the primary dunes, would be lessened due to reduced access to the beaches without ORVs.</p> <p>Resource management activities proposed under alternative D would provide slightly more beneficial impacts to seabeach amaranth than those proposed under alternative A (the no-action alternative) and alternative E (the no ORV alternative) because there would be more consistent training and supervision of resource staff conducting the surveys, closures for historical bird nesting areas would be erected by March 16 (rather than April 1), providing earlier protection of potential seabeach amaranth habitat and possibly seeds that could germinate if the habitat overlaps that of seabeach amaranth. Additional benefits would also result from increased education and public outreach measures that would be implemented under alternative D. Impacts from ORV use and other recreational uses under alternative D would be reduced when compared to alternative A. This is due to the expansion of pedestrian-only areas by 10 miles. Additional benefits would occur from additional management measures that could be implemented under the adaptive management strategy if species indicators are triggered, the vehicle permit system, the ORV operator education certificate requirement, the limit on the number of vehicle permits that would be issued, and the likely increased compliance with resource closures due to increased law enforcement and interpretative staffing positions. Some adverse impacts that would occur under alternative D that would not occur under alternative A would result from the loss of habitat if the re-establishment of existing ramps after storms occurs in areas of suitable habitat for the plant. Compared to alternative E, alternative D would provide less protection for seabeach amaranth because ORV access would be permitted under alternative D whereas no impacts from ORVs would occur under alternative E and potential impacts from other recreational uses, especially camping near the toe of the primary dunes, would be lessened due to reduced access to the beaches without ORVs.</p> <p>The resource management activities proposed for alternative E (the no ORV alternative) are the same activities proposed for alternative A (the no-action alternative) and their impacts would be the same. However, under alternative E there would be no public use of ORVs on the Seashore and surveying and monitoring protocols would be reviewed and may change due to the elimination of impacts from recreational ORV use and a reduction in the amount of impacts from pedestrians. Under alternative A, the North and South Core Banks of the Seashore would remain open to ORV use in designated routes and areas (as documented in the</p>

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	<p>Superintendent's Compendium), except where resource or safety closures are present. When compared to alternative A, alternative E would provide more protection to seabeach amaranth because there would be no impacts related to ORV use and impacts related to other recreational uses would be reduced due to limited access to the ocean front beaches with no ORV use.</p>
State-listed and Special-status Species	<p>Under alternative B, impacts on state-listed and special-status bird species from resource management activities would be slightly less than impacts under alternatives A (the no-action alternative) and E (the no-ORV alternative) because there would be more consistent training and supervision of resource staff conducting the surveys, the limited predator removal in alternative B, establishing pre-nesting closures by March 16 (15 days earlier than under alternative A, not applicable to alternative E), and the increased education and research programs. ORV and other recreational use would result in long-term adverse impacts on state-listed and special-status bird species under alternative B. Allowing continued ORV access on approximately 81 percent (45 miles) of the Seashore would contribute to these long-term impacts, including noise disturbance, temporary displacement, and possibly injury/mortality of individuals. However, impacts under alternative B would be less than impacts incurred under alternative A (the no-action alternative) due to increased education and outreach, the closing of ORV routes where no ferry access is available, the prohibition on all high-performance sport-model and two-stroke ATVs and UTVs at the Seashore, prohibiting night driving from May 1 through August 31, the ORV permitting system, the likely increased compliance with resource closures due to increased law enforcement and interpretative staffing positions, and the more intensive management actions that could be implemented under the adaptive management strategy. However, the impacts on state-listed and special-status bird species from ORV and other recreational uses under alternative B would be greater than those incurred under alternative E because no public ORV access would be allowed at the Seashore under alternative E.</p> <p>Impacts on state-listed and special-status bird species from resource management activities under alternative C would be slightly less than for alternatives A (the no action alternative) and E (the no ORV alternative). This is due to more consistent training and supervision of resource staff conducting the surveys, the limited predator removal under alternative C, increased educational and research efforts, and the winter vehicle closure from December 16 through March 15 (not applicable to alternative E). Under alternative C, ORV and other recreational use would result in long-term adverse impacts on state-listed birds from noise disturbance, temporary displacement, and possibly injury/mortality of individuals. However, these impacts would be less than those incurred under alternative A, due to a seasonal prohibition on night driving from May 1 through September 14, the increase in the amount of pedestrian-only use areas by 4 miles, the closing of ORV routes where no ferry access is available, the prohibition on all high-performance sport-model and two-stroke ATVs and UTVs at the Seashore, shortening the timeframe that non-sport ATVs and UTVs would be permitted within the Seashore each year (reducing the March 16 through December 31 time under alternative A to September 15 through December 15), the reduction in the amount of Seashore open for ORV use, the fee-based ORV permitting system that would also limit the number of vehicles on the Seashore, the likely increased compliance with resource closures due to increased law enforcement and interpretative staffing positions, and the more intensive management actions that could be implemented under the adaptive management strategy. Compared to alternative E, the amount of impacts on state-listed and special-status bird species under alternative C would be greater due to public ORV use being allowed under alternative C whereas it would be prohibited under alternative E.</p> <p>Under alternative D, impacts on state-listed and special-status bird species from resource management activities would be less than those under alternatives A (the no-action alternative) and E (the no ORV alternative). This is due to more consistent training and supervision of resource staff conducting the surveys, the limited predator removal, expanded buffers around American oystercatchers, colonial waterbirds, and least terns, the expansion of brood buffers based on the mobility of the brood, and the increased education and monitoring efforts. ORV and other recreational use would result in long-term adverse impacts on state-listed birds under alternative D from noise disturbance, temporary displacement, and possibly injury/mortality of individuals. However, these impacts would be less than those incurred under alternative A. This is due to the expansion of pedestrian-use only areas by 10 miles; the prohibition on night time driving from May 1 through September 14, the closing of ORV routes where no ferry access is</p>

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	<p>available, the prohibition of all ATVs, as well as all high-performance sport-model and two-stroke UTVs at the Seashore, shortening the time frame that utility-model UTVs would be permitted within the Seashore each year (reducing the March 16 through December 31 time under alternative A to September 15 through December 15), the reduction in the amount of Seashore open for ORV use, the fee-based ORV permitting system with a limit on the number of vehicles allowed which would reduce the number of public ORVs allowed on the Seashore by 8 percent in order to keep the average vehicle density similar to historical use, the likely increased compliance with resource closures due to increased law enforcement and interpretative staffing positions, and the more intensive management actions that could be implemented under the adaptive management strategy. Compared to alternative E, the amount of impacts on state-listed and special-status bird species under alternative D would be greater due to public ORV use being allowed under alternative D whereas it would be prohibited under alternative E.</p> <p>The resource management activities proposed for alternative E (the no ORV alternative) are essentially the same activities proposed for alternative A (the no action alternative) except that no recreational ORV-specific closures would be established, and surveying and monitoring protocols would be reviewed and may change given the prohibition of ORVs on the Seashore, the likely lower pedestrian presence resulting from this, and the fact that with no ORV access, pedestrian use would likely be centered around the ferry landing areas, the cabins, and Power Squadron Spit where visitors can easily access the beach by their own boats. Under alternative A, the North and South Core Banks of the Seashore would remain open to ORV use in designated routes and areas (as documented in the Superintendent's Compendium), except where resource or safety closures are present. There would be no night driving restrictions under alternative A and no restrictions on the number of vehicles allowed on the Seashore either. Therefore, when compared to alternative A, alternative E would provide more protection to state-listed and special-status bird species because there would be no impacts related to public ORV use, and impacts related to other recreational uses would be reduced due to limited access to the ocean front beaches due to no public ORV use.</p>
Other Wildlife and Wildlife Habitat	<p>Alternative E would provide the highest level of protection and result in fewer adverse impacts compared to alternatives A, B, C, or D. Under alternative E, although continued pedestrian access would likely result in short-term disturbance (e.g., noise, temporary disturbance) of wildlife and wildlife habitat, long-term beneficial impacts would result from prohibiting ORV access at the Seashore as native habitat would have the opportunity to recover from heavy vehicle use and a considerable source of disturbance would be removed.</p> <p>Impacts of ORV and other recreational use would result in long-term adverse impacts on wildlife and wildlife habitat under alternative B. Allowing continued ORV access along approximately 81 percent (45 miles) of the Seashore would contribute to these long-term impacts, including noise disturbance, temporary displacement, and potentially injury/mortality of individuals. However, impacts would be reduced when compared to alternative A (the no-action alternative) due to increased education and outreach; the use of additional species management measures, such as a seasonal restriction on night driving from May 1 through August 31; and the prohibition on all high-performance sport-model and two-stroke ATVs and UTVs. Compared to alternative E, impacts on wildlife and wildlife habitat would be greater under alternative B, because alternative E prohibits public ORV use on the Seashore, eliminating this source of adverse impact to wildlife and wildlife habitat. Further, alternative E reduces the impact from pedestrians, who without transportation opportunities to more remote areas of the Seashore would likely be limited to areas in general proximity to the ferry landing areas.</p> <p>Under alternative C, the impacts of ORV and other recreational use would result in long-term adverse impacts on wildlife and wildlife habitat from noise disturbance, temporary displacement, and potentially injury/mortality of individuals. However, impacts would be reduced when compared to alternative A (the no-action alternative), due to increased education and outreach; the use of additional species management measures, such as a seasonal restriction on night driving from May 1 through September 14; the increase in the amount of pedestrian-only use areas by 4 miles; the closing of ORV routes where no ferry access is available; the prohibition of all high-performance sport-model and two-stroke ATVs and UTVs at the Seashore; shorting the timeframe that non-sport ATVs and UTVs would be permitted within the Seashore each year (reducing the March 16 through December time under alternative A to September 15 through December 15); the reduction in the amount of Seashore open to public</p>

Impact Topic	Summary
	<p>ORV use; and the fee-based ORV permitting system that would also limit the number of vehicles on the Seashore. Compared to alternative E, the severity of impacts on wildlife and wildlife habitat under alternative C would be greater due to public ORV use being allowed under alternative C, whereas it would be prohibited under alternative E. The prohibition of public ORV use under alternative E would also reduce the amount of impacts from pedestrians, because without ORVs to access remote areas of the Seashore, pedestrians would likely be limited to areas in general proximity to the ferry landing areas.</p> <p>Alternative D would also result in long-term adverse impacts on wildlife and wildlife habitat from disturbance, temporary displacement, and potentially injury/mortality of individuals. However, impacts would be reduced when compared to alternative A (the no-action alternative), due to increased education and outreach; the use of additional species management measures, such as a seasonal restriction on night driving from May 1 through September 14; the closing of ORV routes where no ferry access is available; the reduction in the amount of Seashore open to public ORV use; the implementation of a vehicle permit program and the reduction in the number of public ORVs allowed on the Seashore by 8 percent; the prohibition of all ATVs, as well as all high-performance sport-model and two-stroke UTVs at the Seashore; and the shortening of the timeframe that non-sport UTVs would be permitted within the Seashore each year (reducing the March 16 through December 31 timeframe under alternative A to September 15 through December 15). Compared to alternative E, impacts on wildlife and wildlife habitat under alternative D would be greater due to public ORV use being allowed under alternative D, whereas it would be prohibited under alternative E. The prohibition of public ORV use under alternative E would also reduce the amount of impacts from pedestrians, because without ORVs to access remote areas of the Seashore, pedestrians would likely be limited to areas in general proximity to the ferry landing areas.</p> <p>Under alternative E, prohibiting public ORV use at the Seashore would provide long-term beneficial impacts to wildlife and wildlife habitat compared to alternative A, under which public ORV use would be allowed along approximately 81 percent of the Seashore. While continued pedestrian access under alternative E could result in some short- and long-term disturbance (e.g., noise, temporary displacement, etc.) of wildlife, these impacts would be reduced compared to alternative A because without the use of ORVs, pedestrian use under alternative E would likely be limited to areas in the general proximity to the ferry landing areas. As a result, alternative E would provide more protection and result in fewer adverse impacts to wildlife and wildlife habitat compared to alternative A.</p>
Soundscapes/ Acoustic Environment	<p>Alternative B would result in fewer impacts than alternative A through various management measures, including prohibition of high-performance sport-model ATVs and limits on night driving. Alternative B would result in greater impacts to soundscapes than alternative E because ORV use would be permitted.</p> <p>Alternative C would result in fewer impacts than alternative A through various management measures, including reduced area of beach available for ORV use (74 percent of Seashore beach would be available for ORV use from the Friday preceding Memorial Day through Labor Day (compared to 81 percent under alternative A), a limit on vehicle permits, and limiting ATV use to the period between September 15 and December 15. Alternative C would result in greater impacts to soundscapes than alternative E because ORV use would be permitted.</p> <p>Alternative D would result in fewer impacts than alternative A through various management measures, including reduced area of beach available for ORV use (63 percent of Seashore beach would be available for ORV use from the Friday preceding Memorial Day through Labor Day (compared to 81 percent under alternatives A), a limits on vehicle permits, and prohibition of ATV use. Alternative D would result in greater impacts to soundscapes than alternative E because visitor auto/truck use would be permitted.</p> <p>Alternative E would result in fewer impacts to soundscapes than alternative A because all ORV use would be eliminated (low levels of NPS administrative ORV use would continue under alternative E).</p>

Table 6: Environmental Impact Summary

Impact Topic	Summary
Visitor Use and Experience	<p>Compared to alternative A, impacts on ORV users under alternative B would be slightly more adverse, due to the expanded rules and regulations that would be implemented under alternative B, such as night driving, vehicle requirements, and vehicle permits. Compared to alternative A, impacts on non-ORV users would not be noticeable. Compared to alternative E, impacts on ORV users under alternative B would be beneficial, as ORV use would be prohibited under alternative E. Compared to alternative E, impacts on non-ORV users would be noticeably adverse, due to the presence of ORVs under alternative B.</p> <p>Compared to alternative A, impacts on ORV users under alternative C would be slightly more adverse, due to the expanded rules and regulations that would be implemented under alternative C, such as night driving, vehicle requirements, vehicle permits, and vehicle restrictions. Compared to alternative A, impacts on non-ORV users would be beneficial. Compared to alternative E, impacts on ORV users under alternative C would be considerably beneficial, due to the prohibition of ORVs under alternative E. Compared to alternative E, impacts on non-ORV users would be noticeably adverse, due to the continued presence of ORVs under alternative C.</p> <p>Compared to alternative A, impacts on ORV users under alternative D would be more adverse, due to the expanded rules and regulations that would be implemented under alternative D, such as night driving, vehicle requirements, an 8 percent reduction in the number of vehicle permits, and vehicle restrictions. Compared to alternative A, impacts on non-ORV users would be slightly beneficial, due to the increase in pedestrian-only areas. Compared to alternative E, impacts on ORV users under alternative D would be considerably beneficial, due to the prohibition of ORVs under alternative E. Compared to alternative E, impacts on non-ORV users would be noticeably adverse, due to the presence of ORVs under alternative D.</p> <p>Compared to alternative A, impacts on ORV users under alternative E would be substantially adverse, as ORVs would be prohibited throughout the entire Seashore. Impacts on non-ORV users would be long-term and beneficial, as ORVs would be prohibited throughout the entire Seashore. However, the benefits of alternative E to non-ORV users would be primarily limited to the areas of the Seashore that are within reasonable walking distance of a ferry landing, and further limited if those areas become over-crowded with pedestrians.</p>
Socioeconomic Resources	<p>Alternative A would result in long-term, beneficial impacts relative to alternative E for businesses that serve current ORV visitors. Alternative A would result in continued revenue from ORV visitors, which would provide support for businesses that serve these visitors and the economy of the ROI.</p> <p>Alternatives B, C, and D may result in long-term adverse impacts resulting from a loss of visitor spending relative to alternative A for businesses that serve visitors using ORVs if the restrictions on ORVs such as the prohibition of night driving in the summer, loss of long-term parking, restrictions on ATVs and UTVs and the permit fee and education requirements result in fewer visitors and lower visitor spending. Adverse impacts relative to alternative A would be greater under alternatives C and D, than B, because additional use restrictions are added such as more pedestrian-only areas, no long-term parking available (under alternative D), additional limitations on ATV and UTV use, and a limit on the number of vehicle permits available. The smaller percentage of beach open to ORVs under alternative C compared to alternative A might result in increased crowding, which could result in a reduction in visitation and greater impacts to those businesses that rely on Seashore visitation. Under alternative D, additional adverse impacts would be realized from prohibitions on all ATVs and sport-model UTVs, seasonal restrictions on non-sport UTVs, and lower limits on vehicle permits, all of which would result in fewer visitors and less visitor spending. The loss of long-term parking under alternative D could have positive or negative impacts on the number of ferry trips visitors make relative to alternative A.</p> <p>Alternatives A, B, C, and D offer long-term, beneficial impacts for businesses serving ORV visitors and the economy of the ROI when compared to alternative E because these alternatives allow ORVs on the islands, which would result in more visitors and spending by visitors in the ROI. The benefits to the ROI from alternatives A, B, C, and D relative to alternative E are not expected to be noticeable because the revenue from ORV visitors is small compared to the size of the economy of the ROI. However, the specific businesses that serve ORV visitors would experience noticeable beneficial impacts under all the other alternatives relative to alternative E because they would continue to profit from ORV visitor traffic.</p>

Impact Topic	Summary
Seashore Management and Operations	<p>Compared to alternative A, implementation of alternatives B and C (which have the same impacts to Seashore management and operations) would result in long-term noticeable adverse impacts on Seashore management and operations due to the increase in staffing and personnel costs in order to enforce visitor compliance with ORV regulations and resource closures, enforce nighttime driving restrictions, work with vehicle ferry operators, provide visitors with ORV closure information, manage a vehicle permit system, develop, update and manage the education certificate, manage the ORV parking lots, record the number of vehicles operating or stored at the Seashore each day, attend meetings of local organizations and present information regarding ORV use and species protection, construct additional ramps along the back route, and designate emergency overnight parking areas. Total approximate annual cost to implement alternative B, as well as alternative C, would be \$941,000 (plus one-time, first-year cost of \$190,000), compared to an approximate annual cost of \$486,500 to implement alternative A, resulting in an increase of \$454,500 annually that would need to be covered with additional permit fees or new funding sources (including the one-time cost of \$190,000, the first-year cost would be \$1,131,000).</p> <p>Compared to alternative A, implementation of alternative D would result in long-term noticeable adverse impacts on Seashore management and operations. This is due to the considerable increase in staffing and funding needs in order to enforce visitor compliance with ORV regulations and resource closures over a 9-month visitor season, enforce nighttime driving restrictions, work with vehicle ferry operators, provide visitors with ORV closure information, manage a vehicle permit system, develop, update and manage the education certificate, manage the ORV parking lots, record number of vehicles operating or stored at the Seashore each day, attend meetings of local organizations and presenting information regarding ORV use and species protection, construct additional ramps along the back route, and designate emergency overnight parking areas. Total approximate annual cost to implement alternative D would be \$941,000, compared to an approximate annual cost of \$486,500 to implement alternative A, resulting in an increase of \$454,500 annually that would need to be covered with additional permit fees or new funding sources.</p> <p>Compared to alternative A, the implementation of alternative E would have long-term beneficial effects on Seashore management and operations. For alternative E, implementation would allow a decrease staffing, and a decrease in annual spending across all Seashore operations. Total approximate annual cost to implement alternative E would be \$398,500.</p>

Maps of the Alternatives

Cape Lookout National Seashore North Carolina

National Park Service
U.S. Department of the Interior



Year-Round Pedestrian Area

Portsmouth Village
Ocean beach from the demarcation line at Ocracoke Inlet, west to Portsmouth Village

Portsmouth Flats
No ORV use permitted except the designated route from the ocean beach to the village.

North Core Banks Map 1 of 3

Alternative A

ORV Route - Open during ORV Season Only

ORV Route - Locally Known as the Backroad

Pedestrian-only Areas

Cape Lookout National Seashore Boundary

Passenger Ferry

Vehicle Ferry

Parking

Restrooms

mile marker

Vehicle ramp Location

Kayak Access

Sanitary Disposal Station

Ranger Station

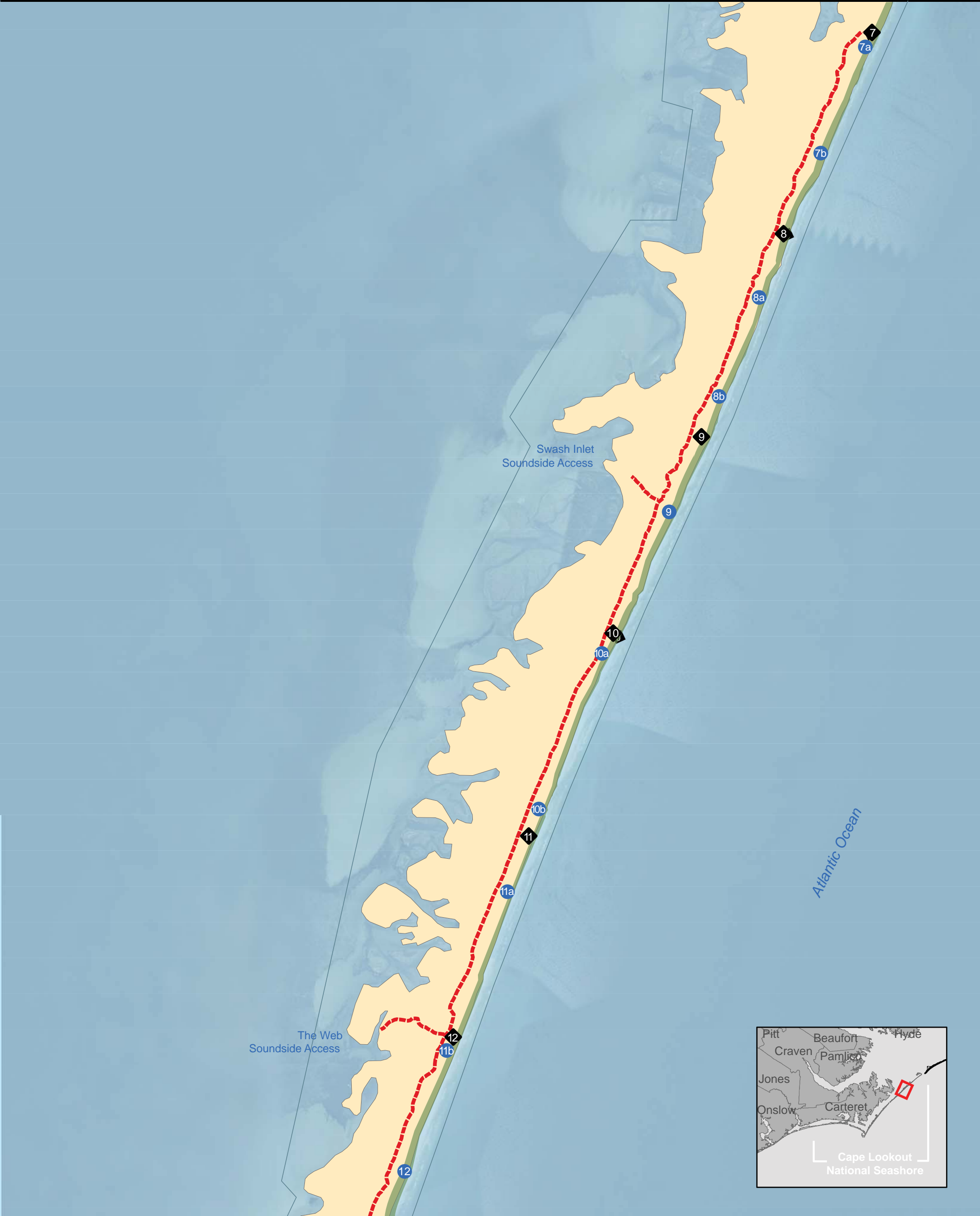
Tidal Flat

0 0.5 1 1.5 Miles

* Areas open to ORV use are always subject to temporary closures for species management or safety concerns.

Cape Lookout National Seashore North Carolina

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North Core Banks Map 2 of 3

Alternative A

- ORV Route - Open during ORV Season Only

ORV Route - Locally Known as the Backroad

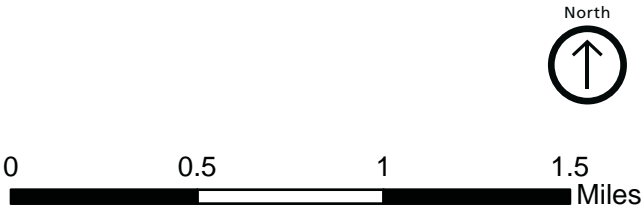
Pedestrian-only Areas

Cape Lookout National Seashore Boundary
- Passenger Ferry

Vehicle Ferry

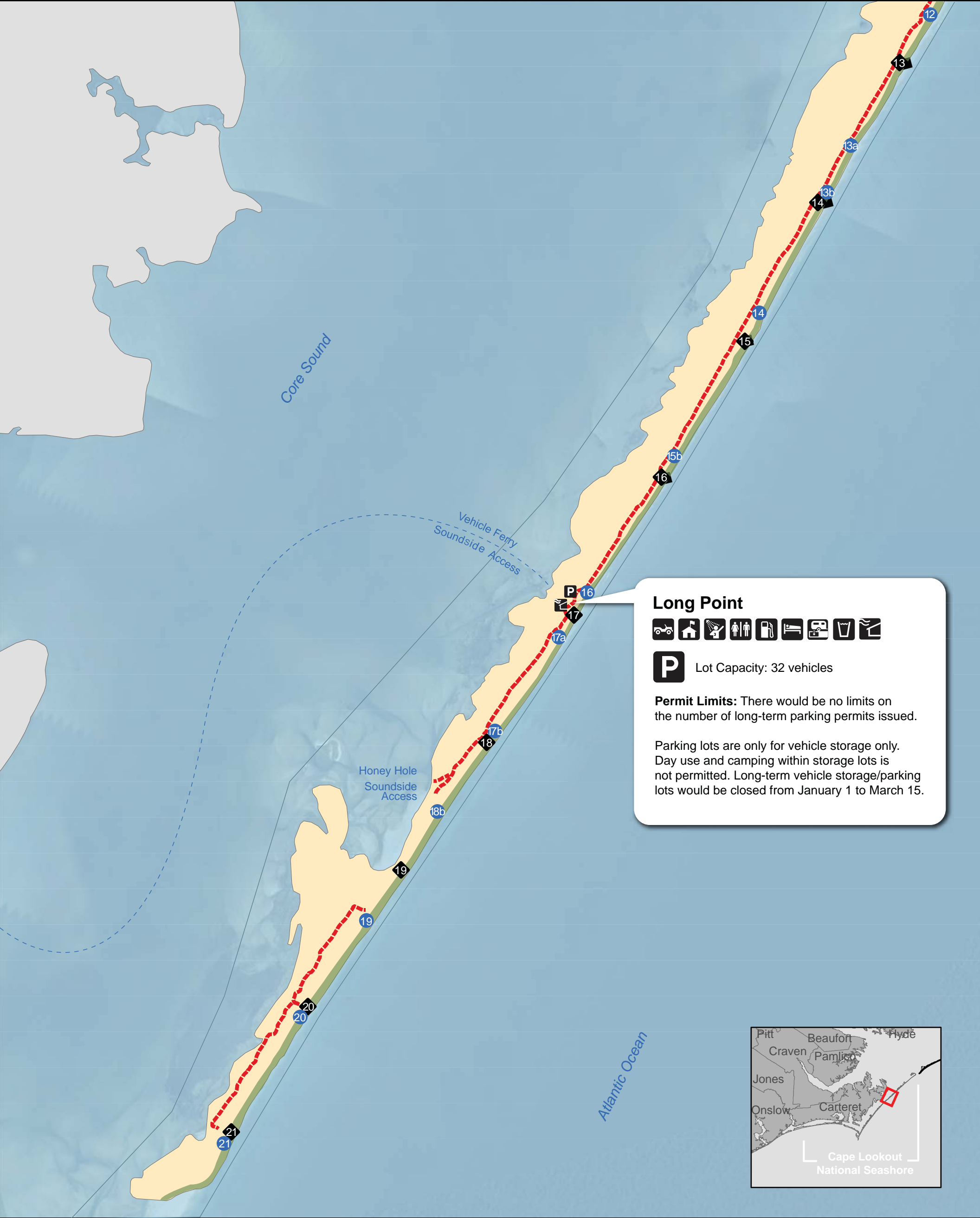
Parking
- mile marker

Vehicle ramp Location



Cape Lookout National Seashore North Carolina

National Park Service
U.S. Department of the Interior



North Core Banks Map 3 of 3

Alternative A

ORV Route - Open during ORV Season Only

ORV Route - Locally Known as the Backroad

Pedestrian-only Areas

Cape Lookout National Seashore Boundary

Passenger Ferry

Vehicle Ferry

Parking

Ranger Station

Showers

Restrooms

Gas Station

Lodging

Sanitary Disposal Station

Drinking Water

Shade Shelter

mile marker

Vehicle ramp Location

00.511.5

Miles

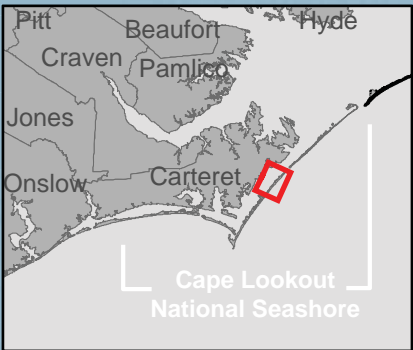
* Areas open to ORV use are always subject to temporary closures for species management or safety concerns.

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South Core Banks Map 1 of 3

Alternative A

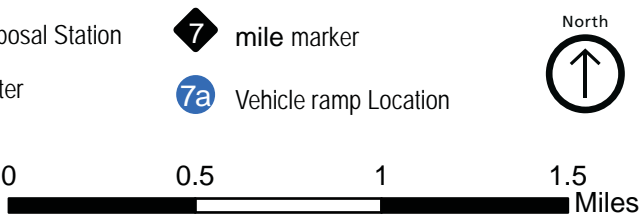
- ORV Route
- ORV Route - Locally Known as the Backroad
- Pedestrian-only Areas
- Cape Lookout National Seashore Boundary

- Passenger Ferry
- Vehicle Ferry
- Parking
- Ranger Station

- Showers
- Restrooms
- Gas Station
- Lodging
- Shade Shelter

- Sanitary Disposal Station
- Drinking Water
- Shelter
- Kayak Access

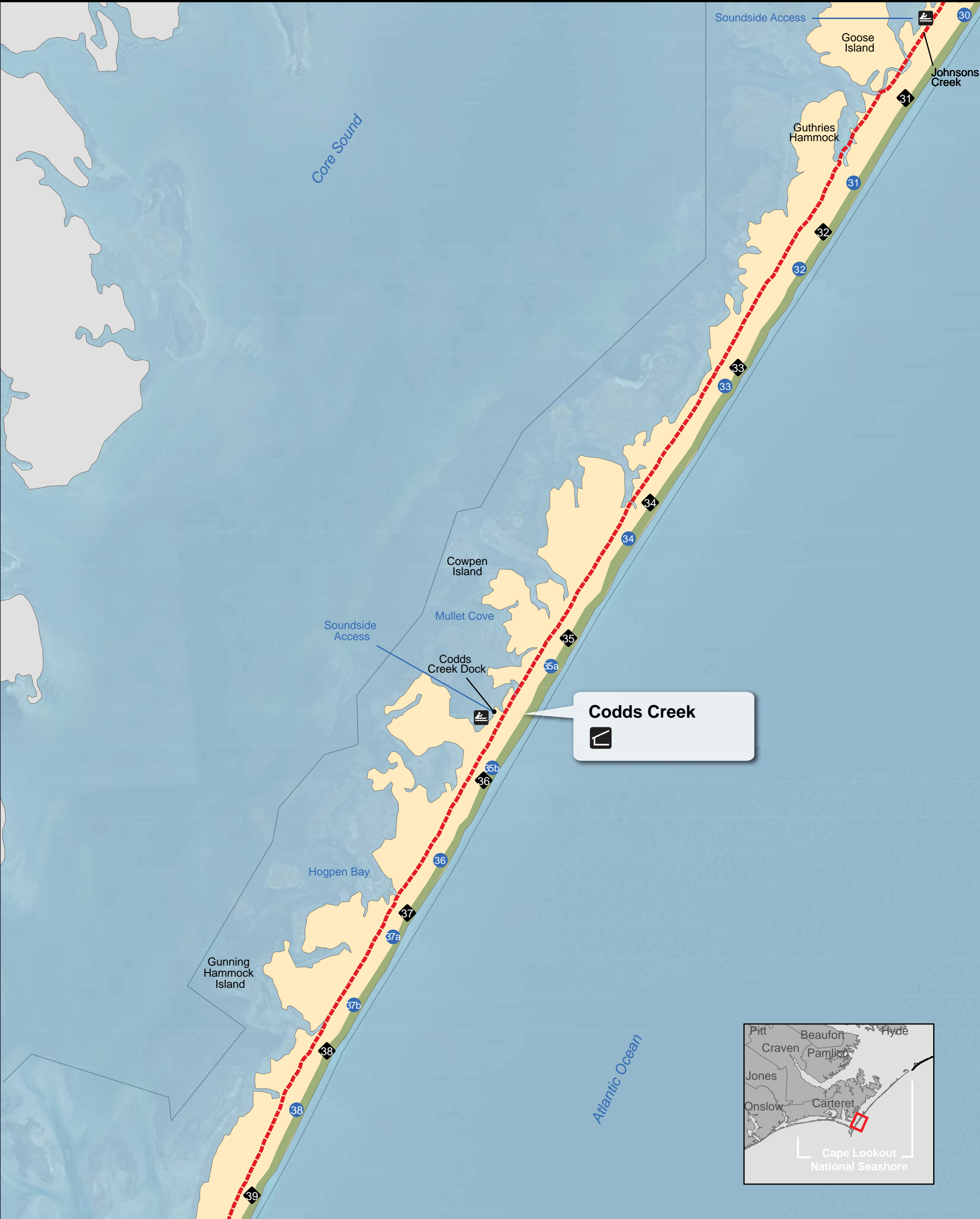
- 7 mile marker
- 7a Vehicle ramp Location



* See ORV Plan for open/closed dates; areas open to ORV use are always subject to temporary closures for species management or safety concerns.

Cape Lookout National Seashore North Carolina

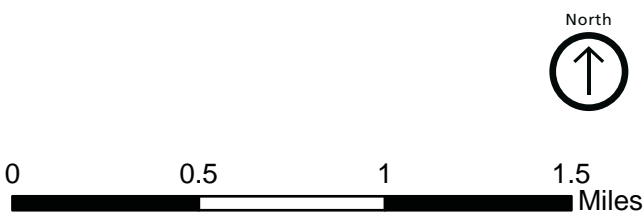
National Park Service
U.S. Department of the Interior



South Core Banks Map 2 of 3

Alternative A

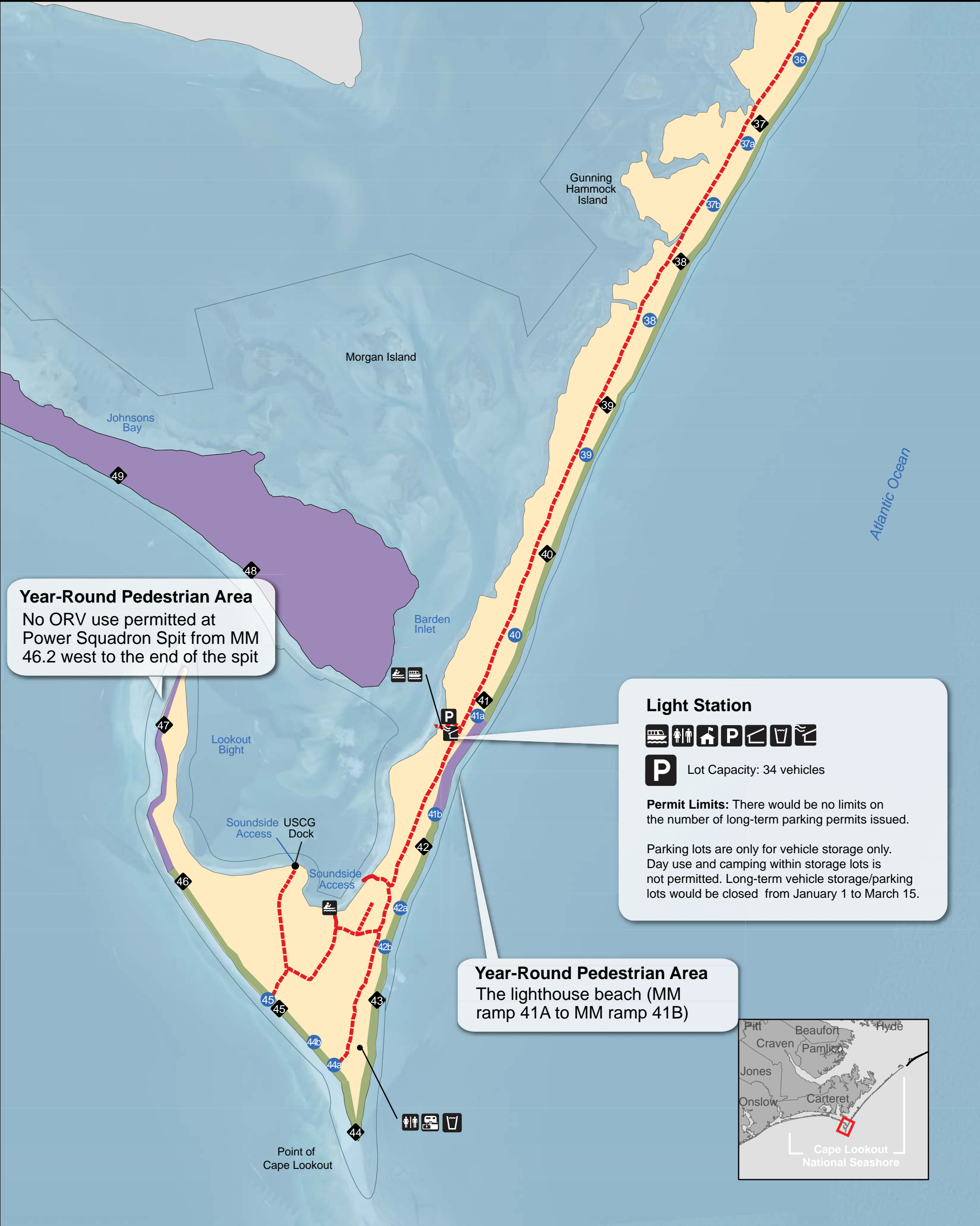
- | | | |
|---|-----------------|-----------------------|
| ORV Route | Passenger Ferry | mile marker |
| ORV Route - Locally Known as the Backroad | Vehicle Ferry | Vehicle ramp Location |
| Pedestrian-only Areas | Parking | Kayak Access |
| Cape Lookout National Seashore Boundary | Shelter | |



* See ORV Plan for open/closed dates; areas open to ORV use are always subject to temporary closures for species management or safety concerns.

Cape Lookout National Seashore North Carolina

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South Core Banks Map 3 of 3

Alternative A

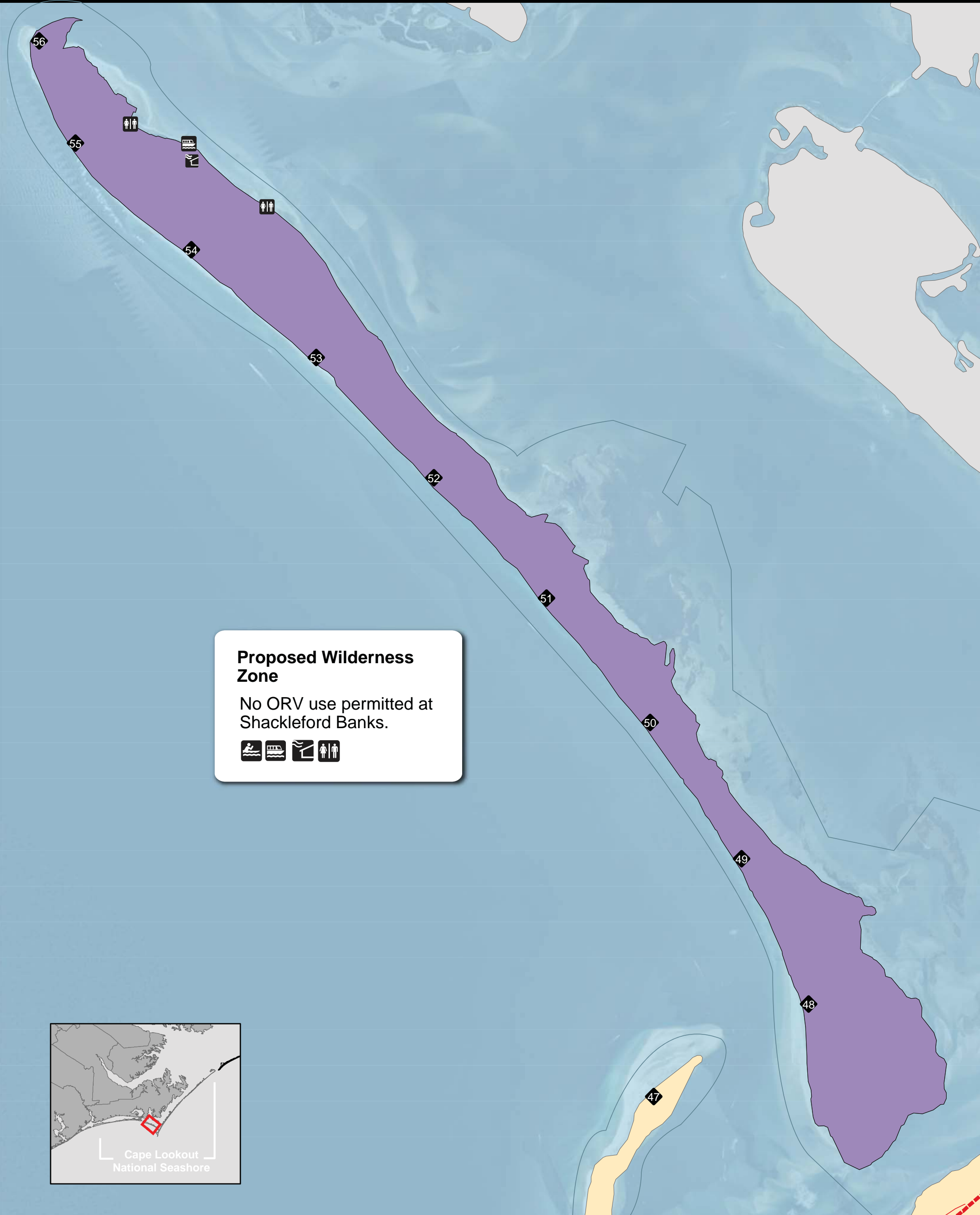
- ORV Route
- ORV Route - Locally Known as the Backroad
- Pedestrian-only Areas
- Cape Lookout National Seashore Boundary
- Passenger Ferry
- Vehicle Ferry
- Parking
- Kayak Access
- mile marker
- Vehicle ramp Location
- Restrooms
- Sanitary Disposal Station

- Ranger Station
- Shelter
- Drinking Water
- 0 0.5 1 1.5 Miles

* See ORV Plan for open/closed dates; areas open to ORV use are always subject to temporary closures for species management or safety concerns.

Cape Lookout National Seashore North Carolina

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U.S. Department of the Interior



Shackleford Banks Map 1 of 1

Alternative A, B, C, D & E

- ORV Route - Open during ORV Season Only

ORV Route - Locally Known as the Backroad

Pedestrian-only Areas

Cape Lookout National Seashore Boundary
- Passenger Ferry

Vehicle Ferry

P

Parking

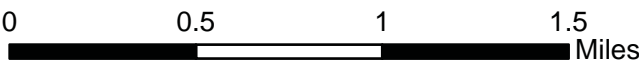
Shade Shelter
- 7

mile marker

7a

Vehicle ramp Location

Kayak Access



* Areas open to ORV use are always subject to temporary closures for species management or safety concerns.

Cape Lookout National Seashore North Carolina

National Park Service
U.S. Department of the Interior



Year-Round Pedestrian Area

Portsmouth Village
Ocean beach from the demarcation line at Ocracoke Inlet, west to Portsmouth Village

Portsmouth Flats
No ORV use permitted except the designated route from the ocean beach to the village.

North Core Banks Map 1 of 3

Alternative B

ORV Route - Open during ORV Season Only

ORV Route - Locally Known as the Backroad

Pedestrian-only Areas

Cape Lookout National Seashore Boundary

Passenger Ferry

Vehicle Ferry

Parking

Restrooms

mile marker

Vehicle ramp Location

Kayak Access

Sanitary Disposal Station

Ranger Station

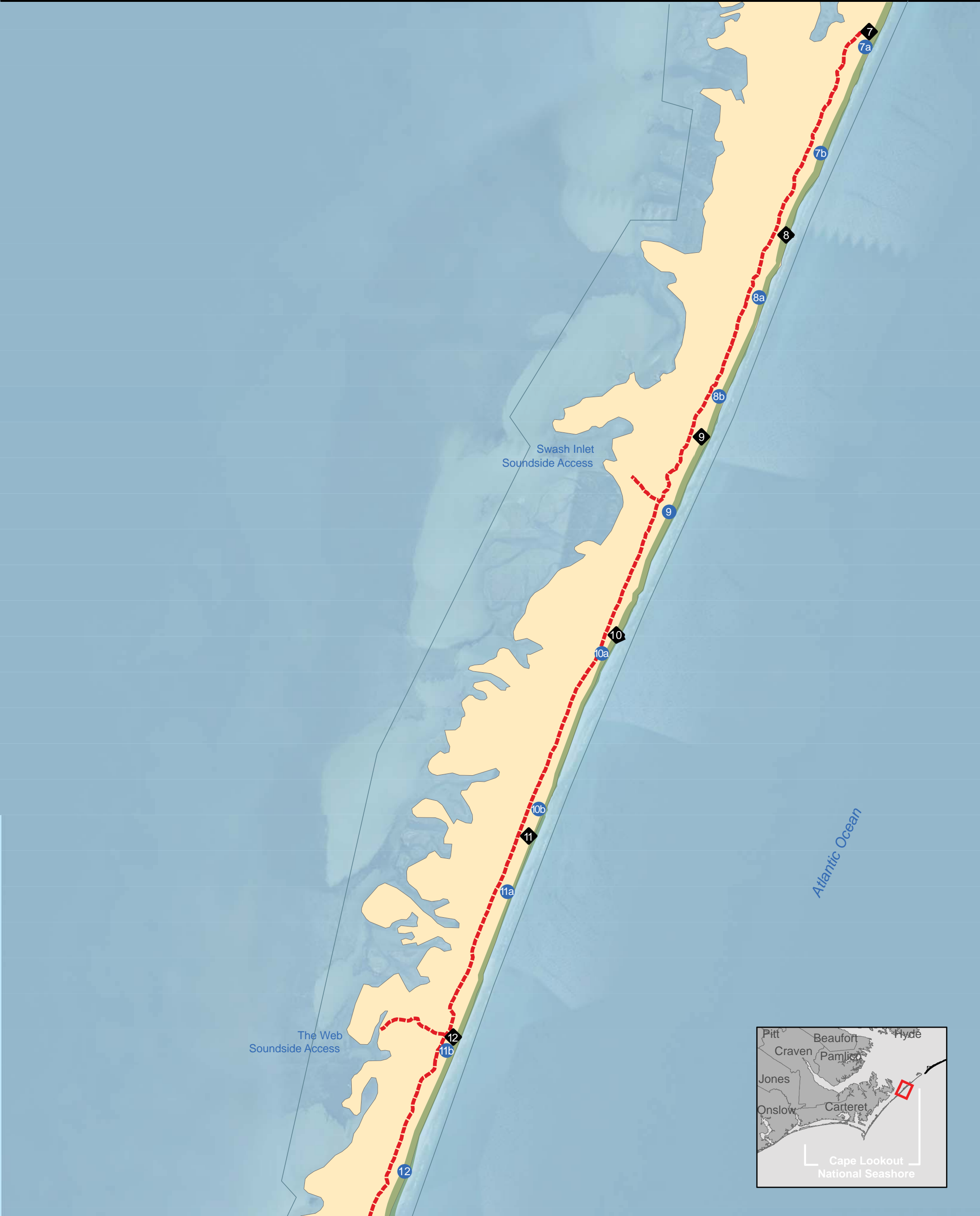
Tidal Flat

0 0.5 1 1.5 Miles

* Areas open to ORV use are always subject to temporary closures for species management or safety concerns.

Cape Lookout National Seashore North Carolina

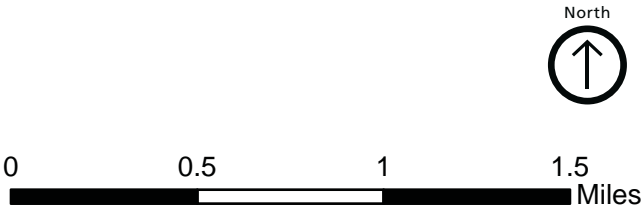
National Park Service
U.S. Department of the Interior



North Core Banks Map 2 of 3

Alternative B

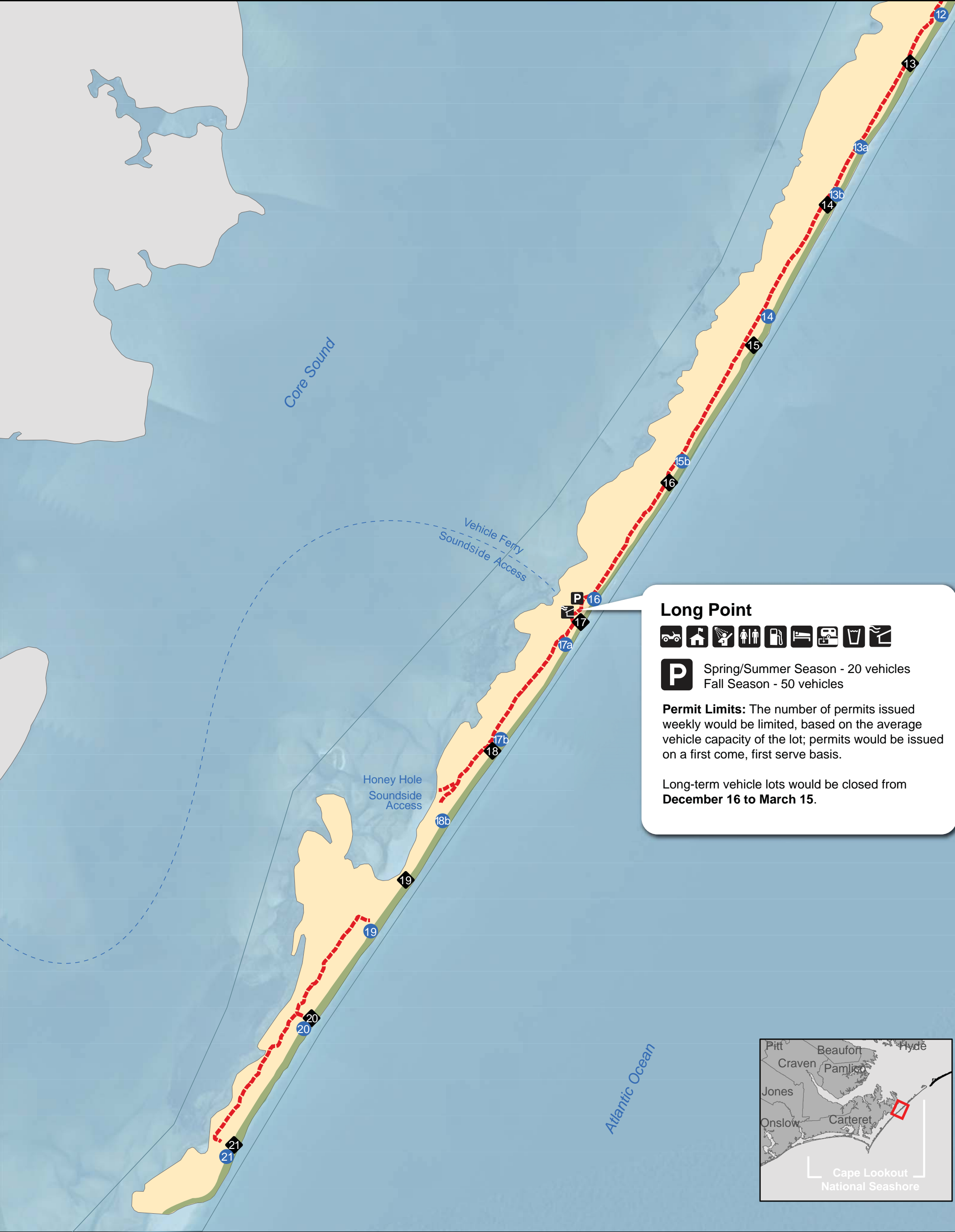
- ORV Route - Open during ORV Season Only
- ORV Route - Locally Known as the Backroad
- Pedestrian-only Areas
- Cape Lookout National Seashore Boundary
- Passenger Ferry
- Vehicle Ferry
- Parking
- mile marker
- Vehicle ramp Location



* Areas open to ORV use are always subject to temporary closures for species management or safety concerns.

Cape Lookout National Seashore North Carolina

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U.S. Department of the Interior



North Core Banks Map 3 of 3

Alternative B

ORV Route - Open during ORV Season Only

ORV Route - Locally Known as the Backroad

Pedestrian-only Areas

Cape Lookout National Seashore Boundary

Passenger Ferry

Vehicle Ferry

Parking

Ranger Station

Showers

Restrooms

Gas Station

Lodging

Sanitary Disposal Station

Drinking Water

Shade Shelter

mile marker

Vehicle ramp Location

North

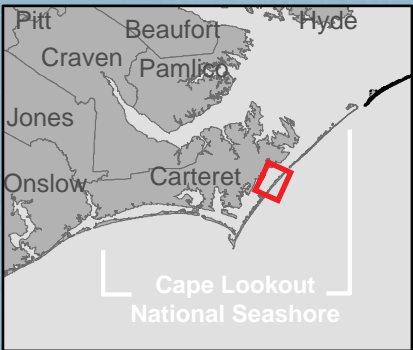
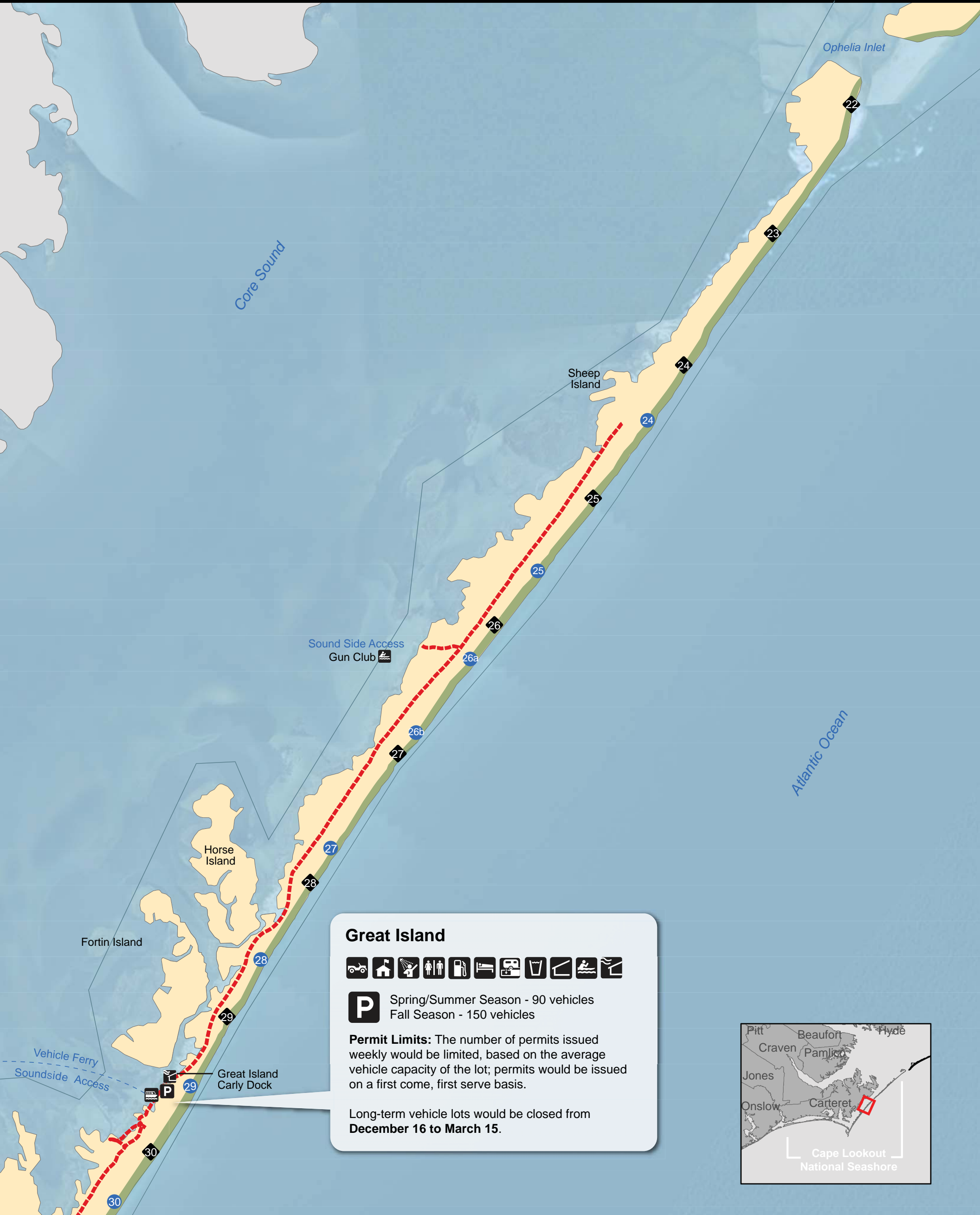
00.511.5

Miles

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South Core Banks Map 1 of 3

Alternative B

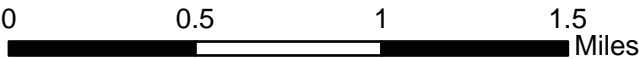
- ORV Route
- ORV Route - Locally Known as the Backroad
- Pedestrian-only Areas
- Cape Lookout National Seashore Boundary

- Passenger Ferry
- Vehicle Ferry
- Parking
- Ranger Station

- Showers
- Restrooms
- Gas Station
- Lodging
- Shade Shelter

- Sanitary Disposal Station
- Drinking Water
- Shelter
- Kayak Access

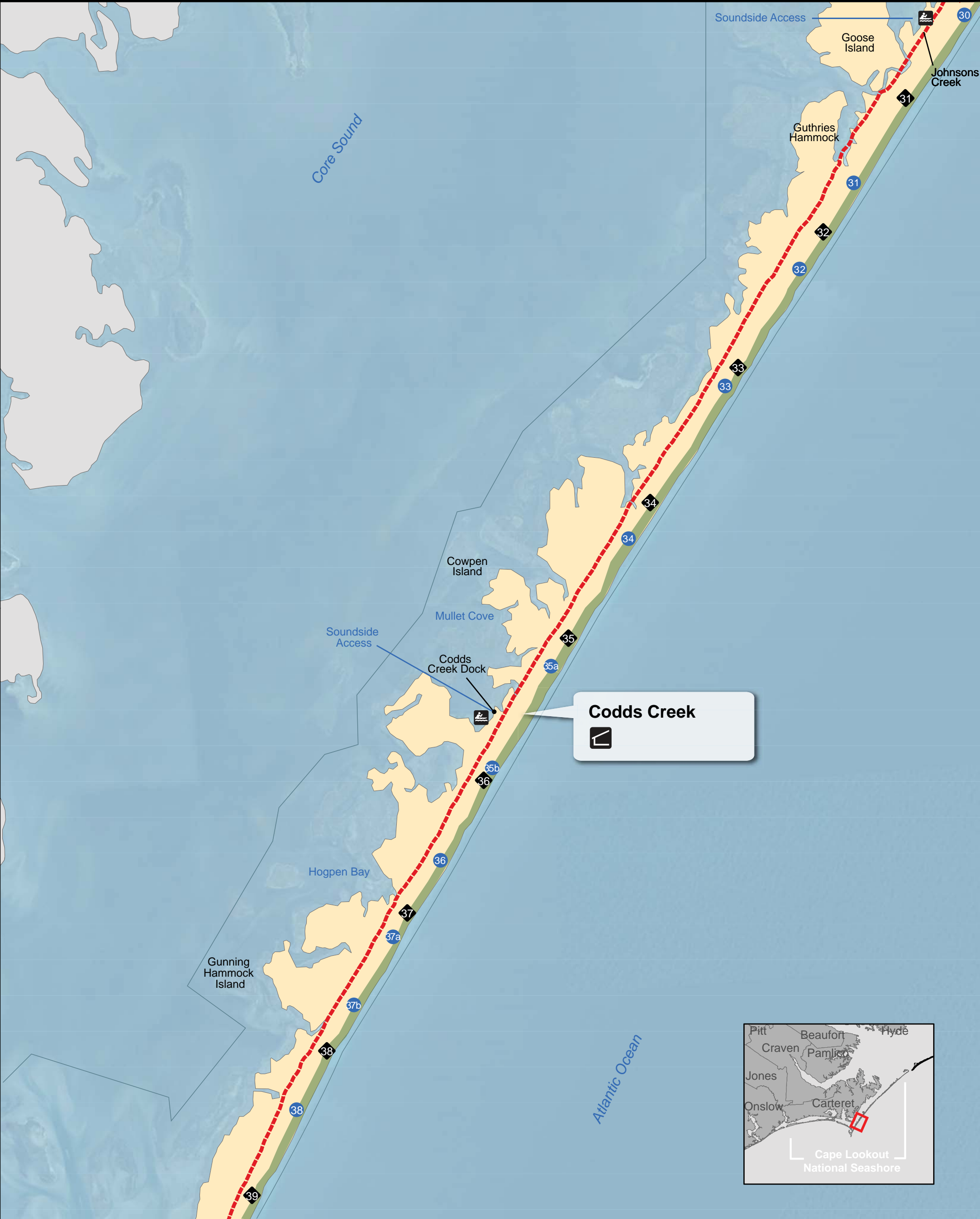
- 7 mile marker
- 7a Vehicle ramp Location



* See ORV Plan for open/closed dates; areas open to ORV use are always subject to temporary closures for species management or safety concerns.

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South Core Banks Map 2 of 3

Alternative B

- ORV Route

ORV Route - Locally Known as the Backroad

Pedestrian-only Areas

Cape Lookout National Seashore Boundary
- Passenger Ferry

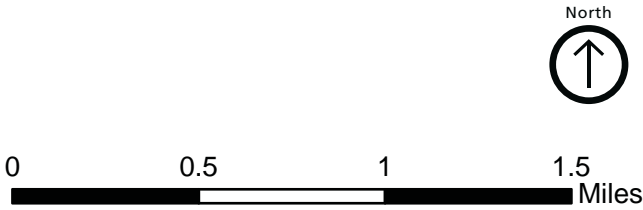
Vehicle Ferry

Parking

Shelter
- mile marker

Vehicle ramp Location

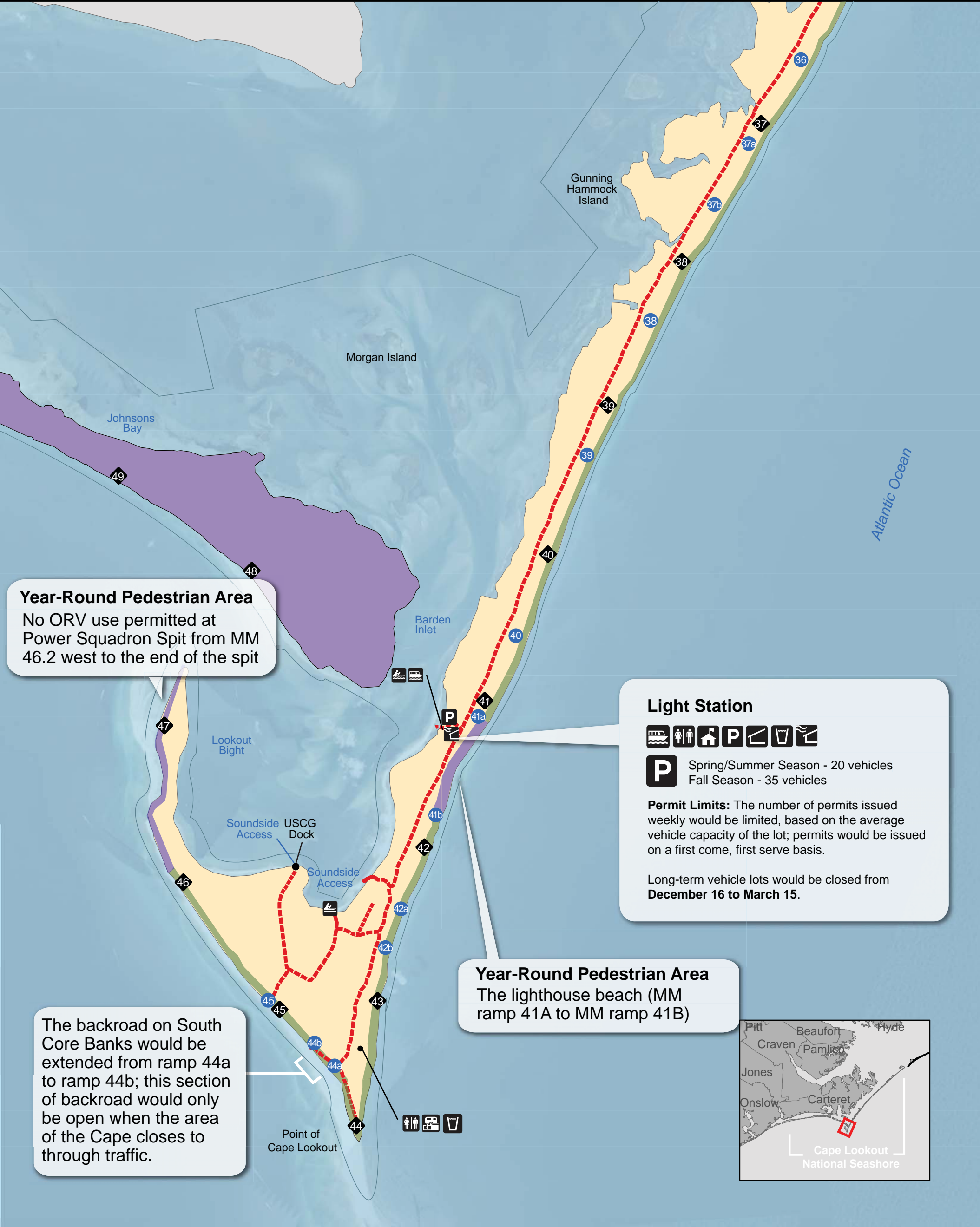
Kayak Access



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South Core Banks Map 3 of 3

Alternative B

- ORV Route

ORV Route - Locally Known as the Backroad

Pedestrian-only Areas

Cape Lookout National Seashore Boundary
- Passenger Ferry

Vehicle Ferry

Parking

Kayak Access
- mile marker

Vehicle ramp Location

Restrooms

Sanitary Disposal Station

- Ranger Station

Shelter

Drinking Water
- 0

0.5

1

1.5

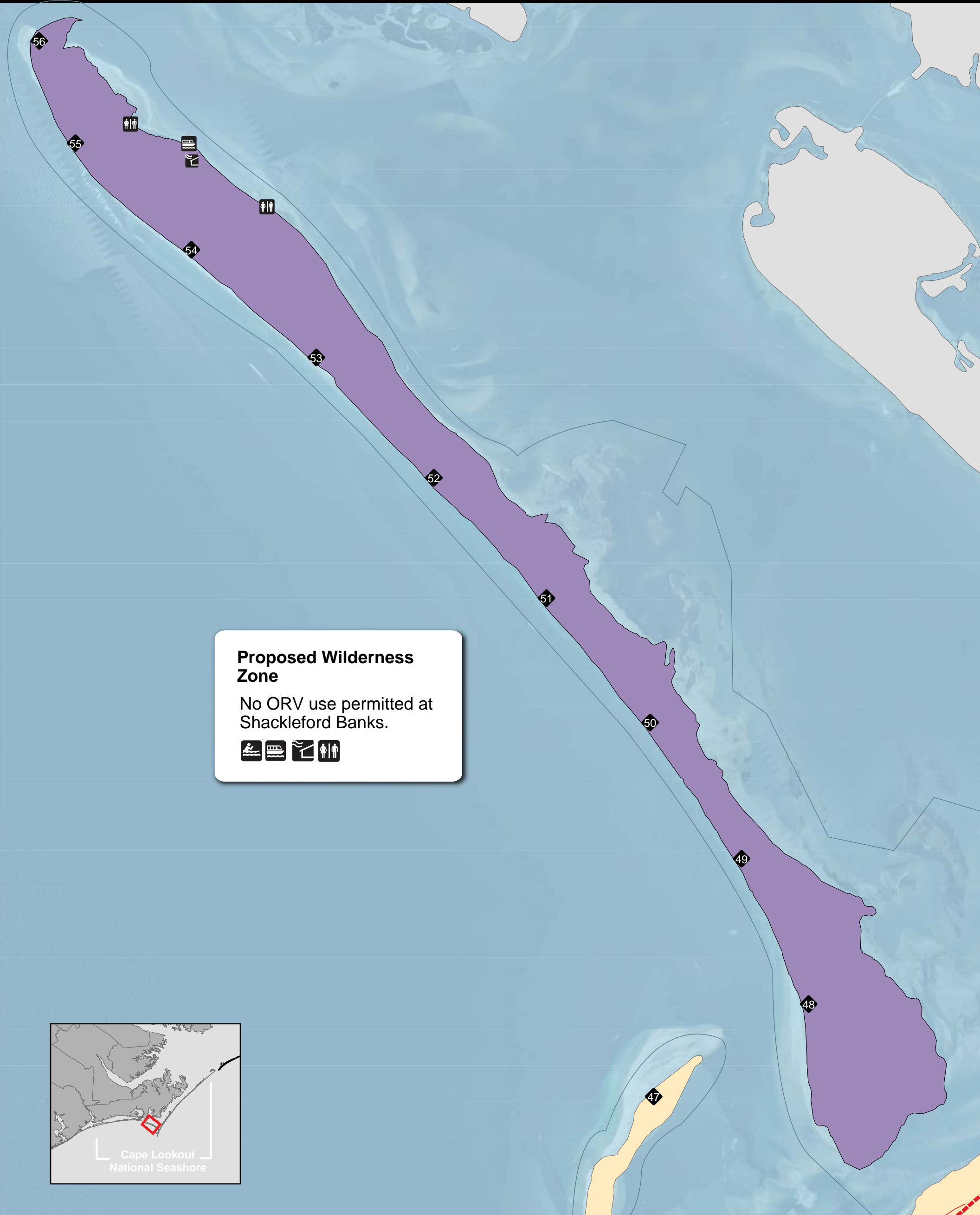
Miles
- North

↑

* See ORV Plan for open/closed dates; areas open to ORV use are always subject to temporary closures for species management or safety concerns.

Cape Lookout National Seashore North Carolina

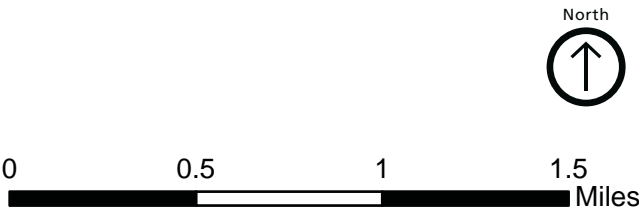
National Park Service
U.S. Department of the Interior



Shackleford Banks Map 1 of 1

Alternative A, B, C, D & E

- | | | |
|---|-----------------|-----------------------|
| ORV Route - Open during ORV Season Only | Passenger Ferry | mile marker |
| ORV Route - Locally Known as the Backroad | Vehicle Ferry | Vehicle ramp Location |
| Pedestrian-only Areas | Parking | Kayak Access |
| Cape Lookout National Seashore Boundary | Shade Shelter | |



* Areas open to ORV use are always subject to temporary closures for species management or safety concerns.

Cape Lookout National Seashore North Carolina

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U.S. Department of the Interior



Year-Round Pedestrian Area

Portsmouth Village
Ocean beach from the demarcation line at Ocracoke Inlet, west to Portsmouth Village

Portsmouth Flats
No ORV use permitted except the designated route from the ocean beach to the village.

North Core Banks Map 1 of 3

Alternative C

ORV Route - Open during ORV Season Only

ORV Route - Locally Known as the Backroad

Pedestrian-only Areas

Cape Lookout National Seashore Boundary

Passenger Ferry

Vehicle Ferry

Parking

Restrooms

mile marker

Vehicle ramp Location

Kayak Access

Sanitary Disposal Station

Ranger Station

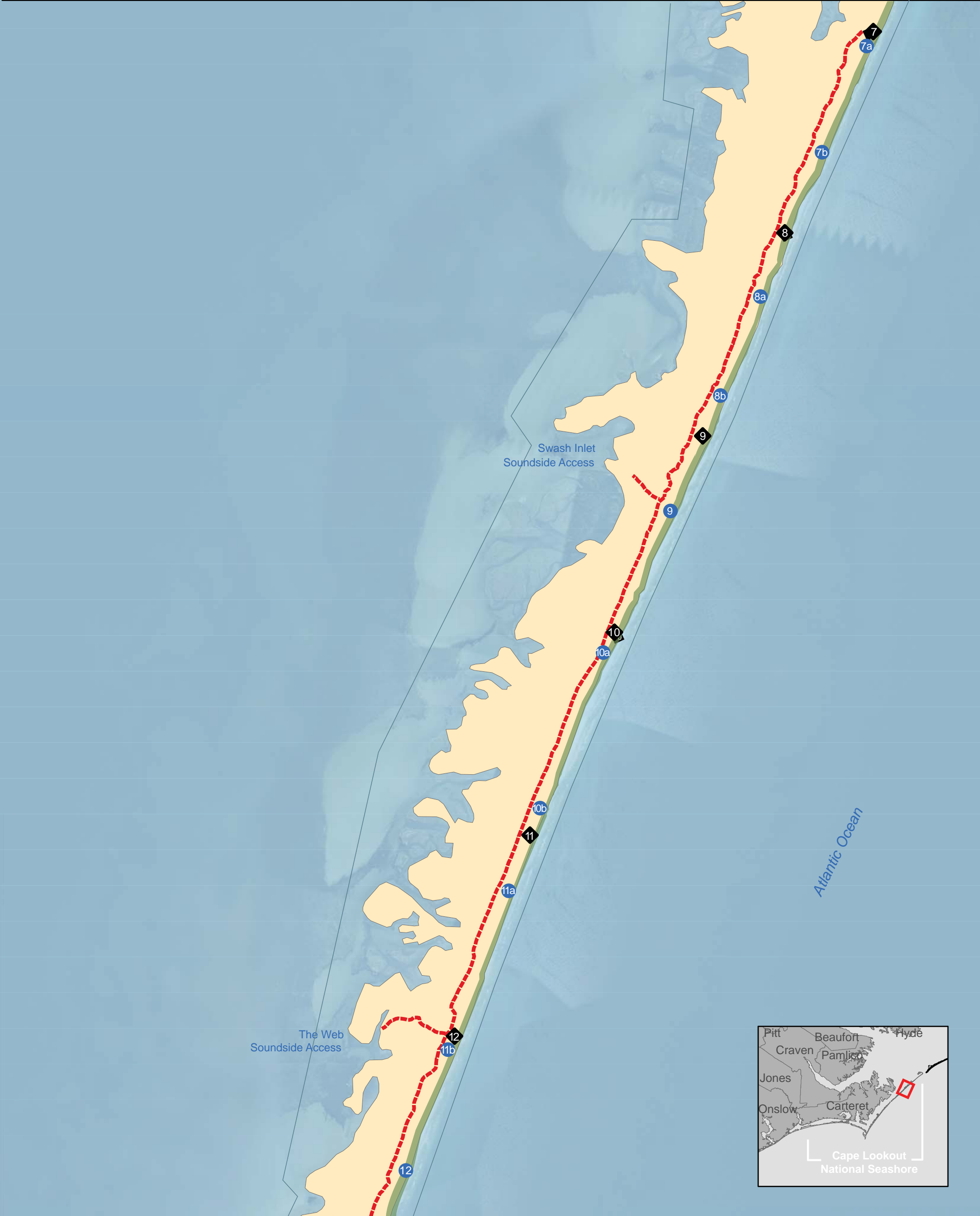
Tidal Flat

0 0.5 1 1.5 Miles

* Areas open to ORV use are always subject to temporary closures for species management or safety concerns.

Cape Lookout National Seashore North Carolina

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U.S. Department of the Interior



North Core Banks Map 2 of 3

Alternative C

- ORV Route - Open during ORV Season Only

ORV Route - Locally Known as the Backroad

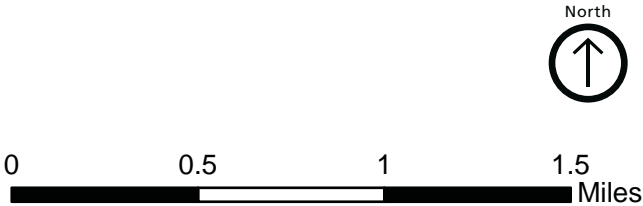
Pedestrian-only Areas

Cape Lookout National Seashore Boundary
- Passenger Ferry

Vehicle Ferry

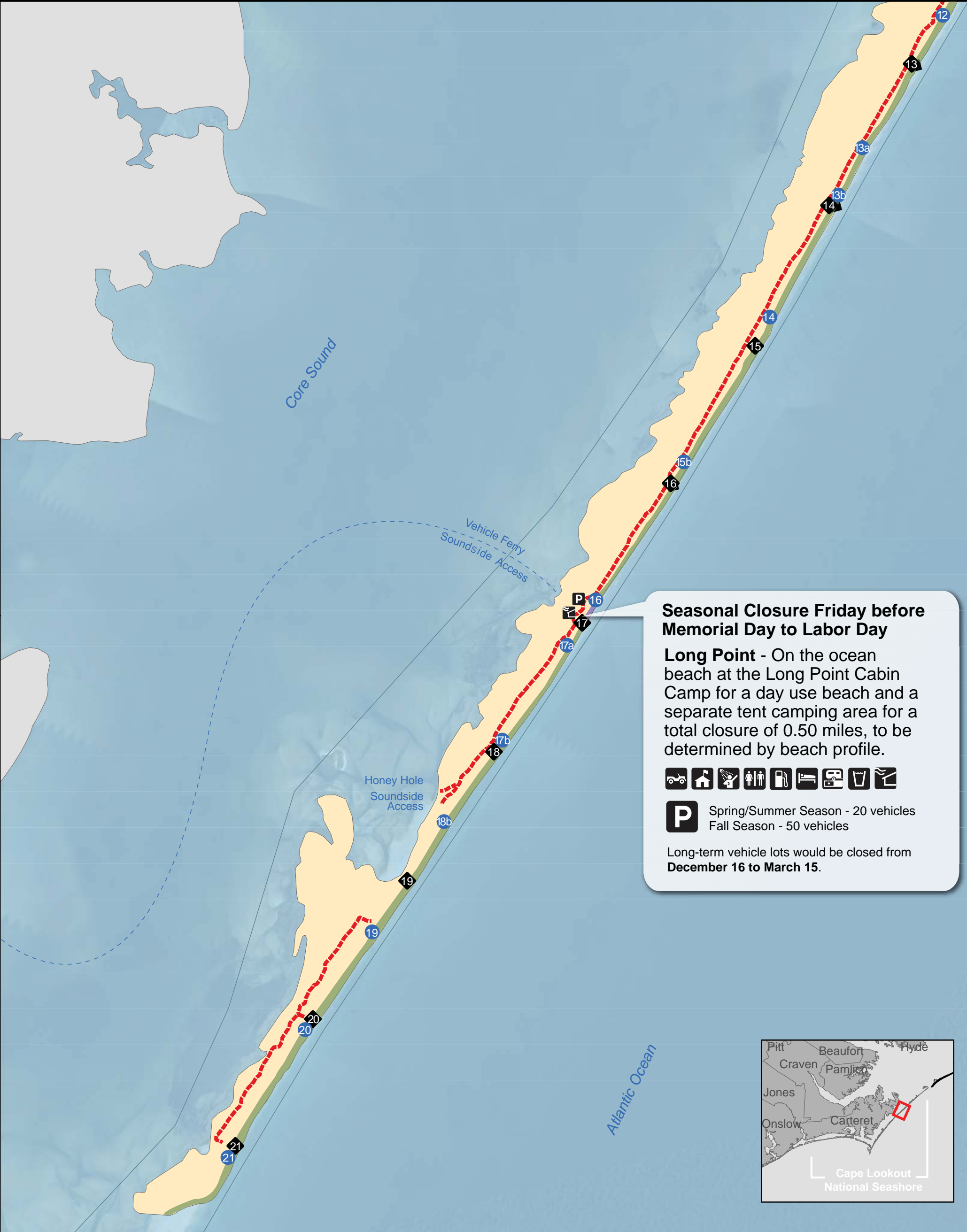
Parking
- mile marker

Vehicle ramp Location



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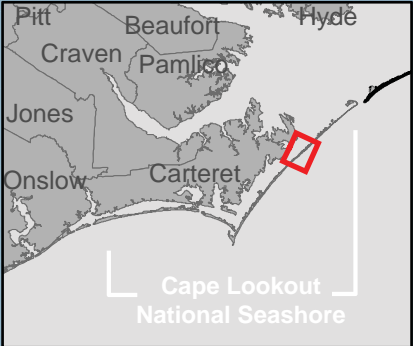
Seasonal Closure Friday before Memorial Day to Labor Day

Long Point - On the ocean beach at the Long Point Cabin Camp for a day use beach and a separate tent camping area for a total closure of 0.50 miles, to be determined by beach profile.



P Spring/Summer Season - 20 vehicles
Fall Season - 50 vehicles

Long-term vehicle lots would be closed from **December 16 to March 15.**



North Core Banks Map 3 of 3

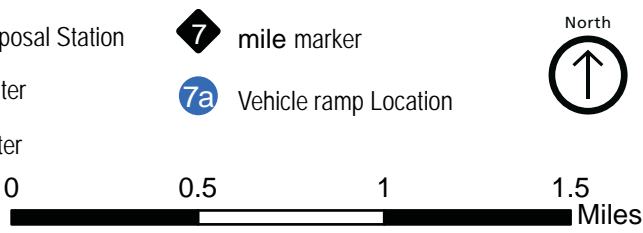
Alternative C

- ORV Route - Open during ORV Season Only
- ORV Route - Locally Known as the Backroad
- Pedestria-only Areas
- Cape Lookout National Seashore Boundary

- Passenger Ferry
- Vehicle Ferry
- Parking
- Ranger Station
- Showers
- Restrooms
- Gas Station
- Lodging

- Sanitary Disposal Station
- Drinking Water
- Shade Shelter

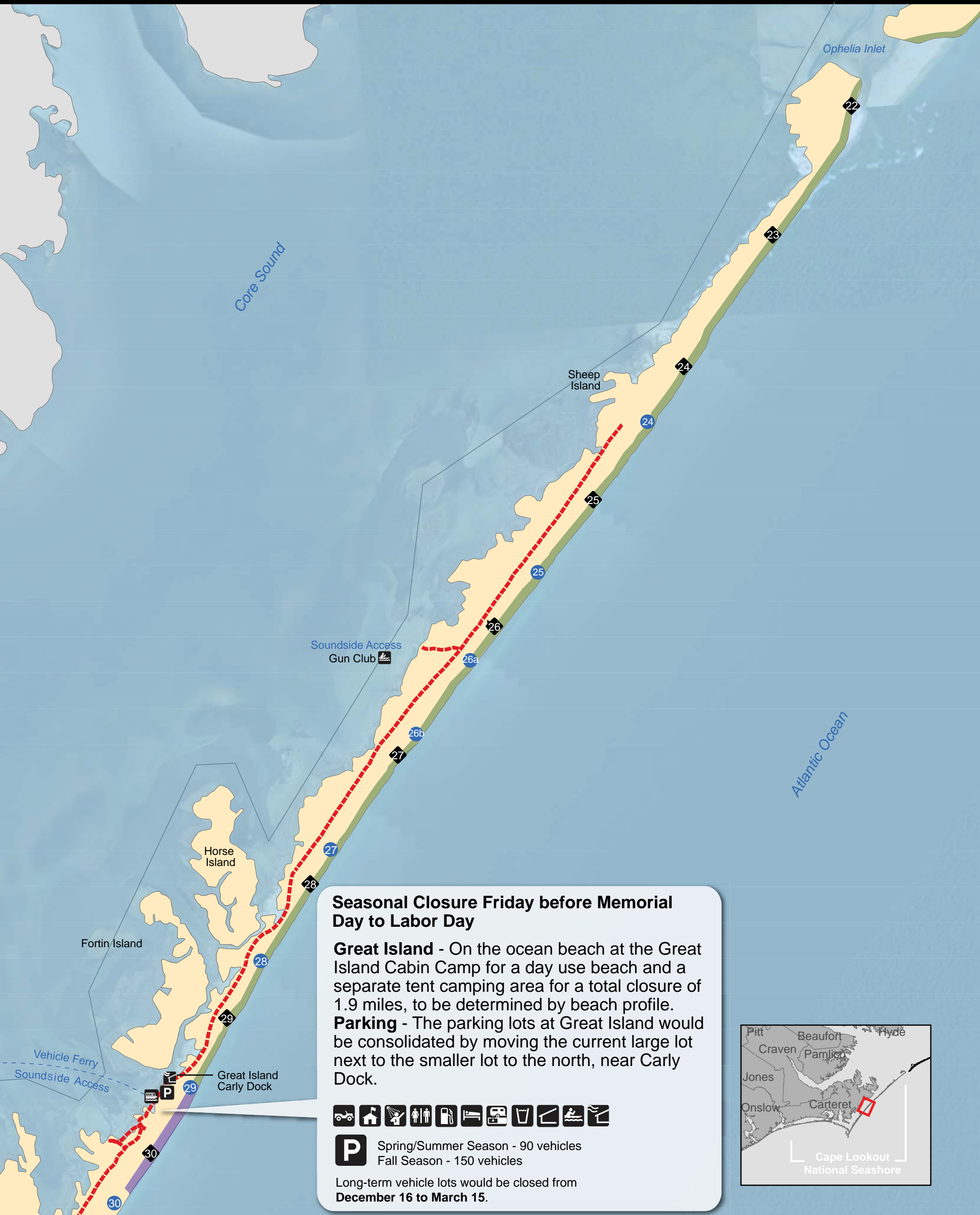
- 7 mile marker
- 7a Vehicle ramp Location



* Areas open to ORV use are always subject to temporary closures for species management or safety concerns.





Cape Lookout National Seashore North Carolina





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South Core Banks Map 1 of 3

Alternative C

-  ORV Route
-  ORV Route - Locally Known as the Backroad
-  Pedestrian-only Areas
-  Cape Lookout National Seashore Boundary

-  Passenger Ferry
-  Vehicle Ferry
-  Parking
-  Ranger Station

- Showers
- Restrooms
- Gas Station
- Lodging
- Shade Shelter

- | Facility | Count |
|---------------------------|-------|
| Sanitary Disposal Station | 0 |
| Drinking Water | |
| Shelter | |
| Kayak Access | |

- 7 mile marker
- 7a Vehicle ramp Location

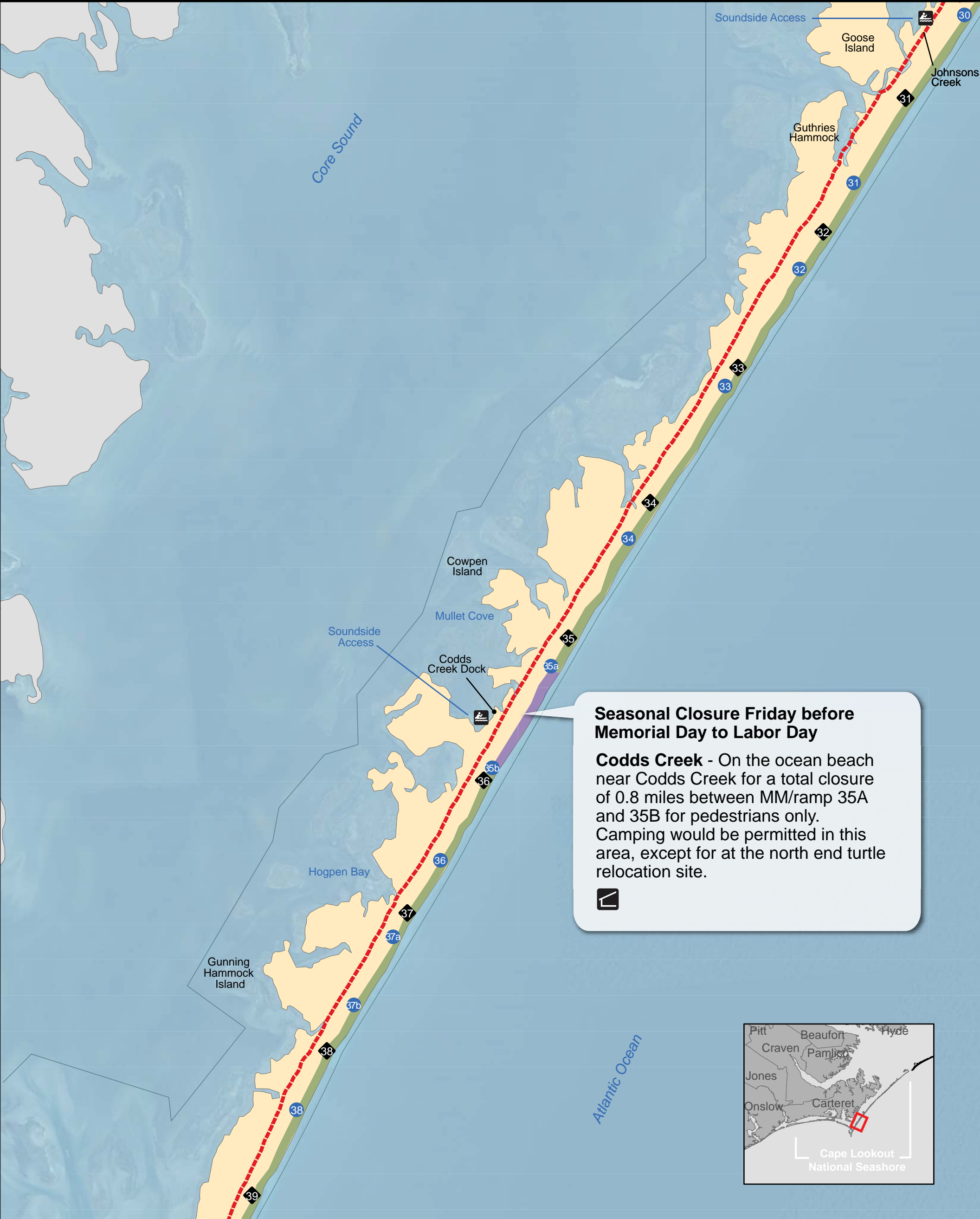


* See ORV Plan for open/closed dates; areas open to ORV use are always subject to temporary closures for species management or safety concerns.

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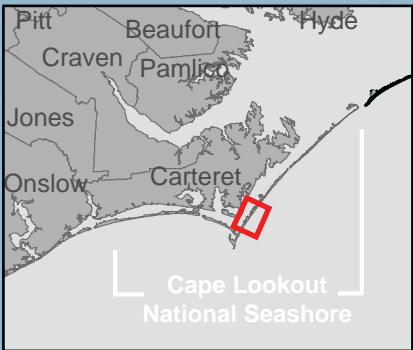
Cape Lookout National Seashore North Carolina

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Seasonal Closure Friday before Memorial Day to Labor Day

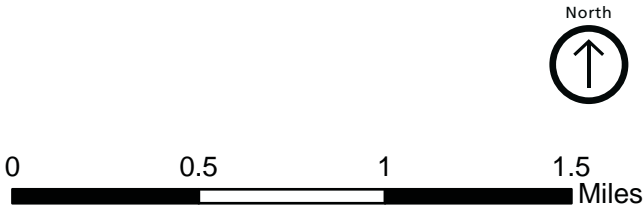
Codd's Creek - On the ocean beach near Codd's Creek for a total closure of 0.8 miles between MM/ramp 35A and 35B for pedestrians only. Camping would be permitted in this area, except for at the north end turtle relocation site.



South Core Banks Map 2 of 3

Alternative C

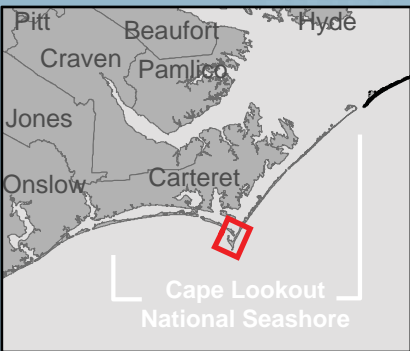
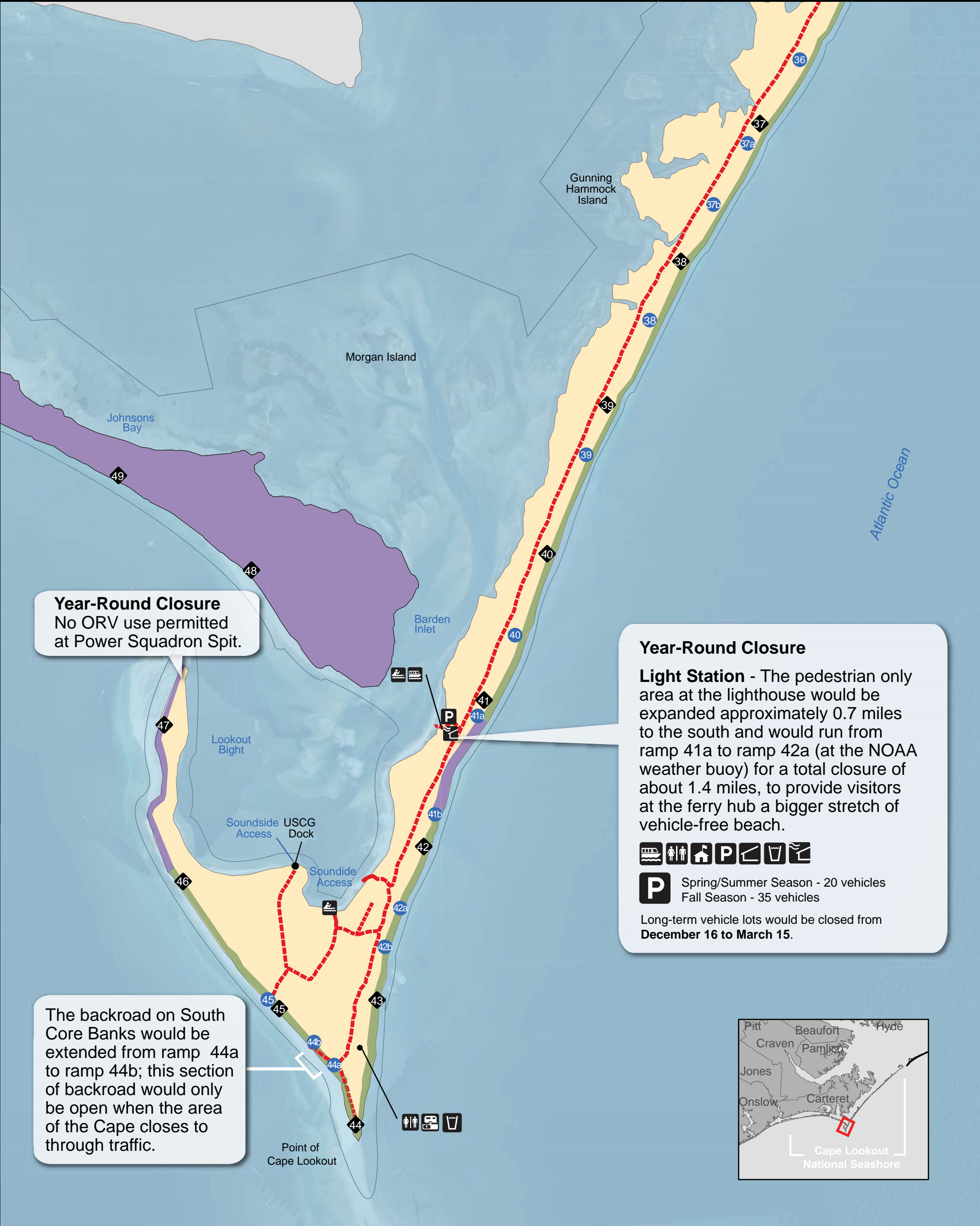
- | | | |
|---|-----------------|-----------------------|
| ORV Route | Passenger Ferry | mile marker |
| ORV Route - Locally Known as the Backroad | Vehicle Ferry | Vehicle ramp Location |
| Pedestrian-only Areas | Parking | Kayak Access |
| Cape Lookout National Seashore Boundary | Shelter | |



* See ORV Plan for open/closed dates; areas open to ORV use are always subject to temporary closures for species management or safety concerns.

Cape Lookout National Seashore North Carolina

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South Core Banks Map 3 of 3

Alternative C

- ORV Route

ORV Route - Locally Known as the Backroad

Pedestrian-only Areas

Cape Lookout National Seashore Boundary
- Passenger Ferry

Vehicle Ferry

Parking

Kayak Access
- mile marker

Vehicle ramp Location

Restrooms

Sanitary Disposal Station

- Ranger Station

Shelter

Drinking Water
- 0

0.5

1

1.5

Miles
- North

↑

Cape Lookout National Seashore North Carolina

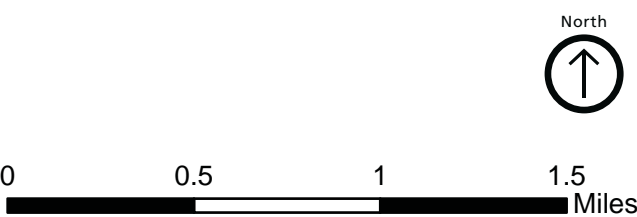
National Park Service
U.S. Department of the Interior



Shackleford Banks Map 1 of 1

Alternative A, B, C, D & E

- | | | |
|---|-----------------|-----------------------|
| ORV Route - Open during ORV Season Only | Passenger Ferry | mile marker |
| ORV Route - Locally Known as the Backroad | Vehicle Ferry | Vehicle ramp Location |
| Pedestrian-only Areas | Parking | Kayak Access |
| Cape Lookout National Seashore Boundary | Shade Shelter | |



Cape Lookout National Seashore North Carolina

National Park Service
U.S. Department of the Interior



Year-Round Pedestrian Area

Portsmouth Village
Ocean beach from the demarcation line at Ocracoke Inlet, west to Portsmouth Village

Portsmouth Flats
No ORV use permitted except the designated route from the ocean beach to the village.

North Core Banks Map 1 of 3

Alternative D

ORV Route - Open during ORV Season Only

ORV Route - Locally Known as the Backroad

Pedestrian-only Areas

Cape Lookout National Seashore Boundary

Passenger Ferry

Vehicle Ferry

Parking

Restrooms

mile marker

Vehicle ramp Location

Kayak Access

Sanitary Disposal Station

Ranger Station

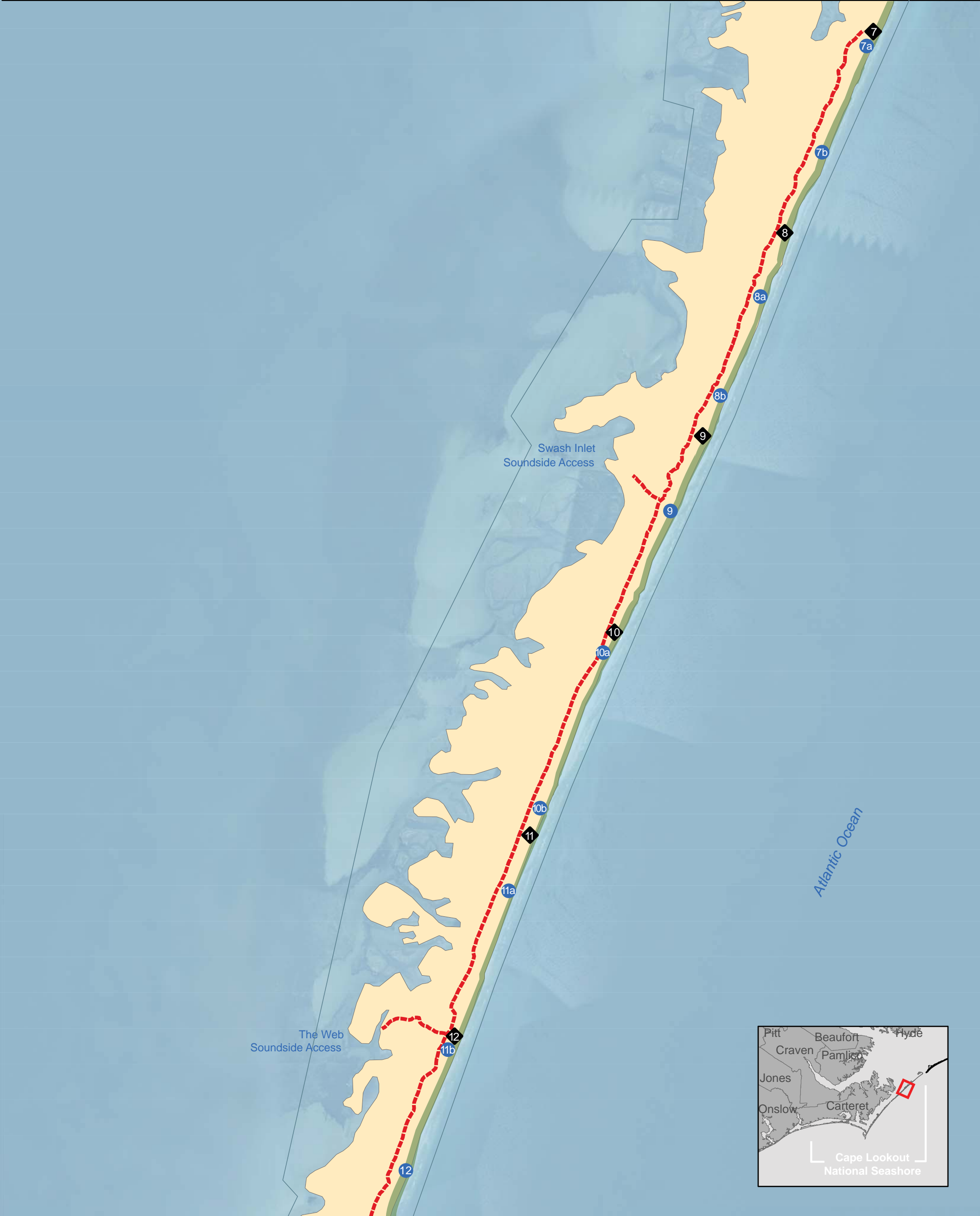
Tidal Flat

0 0.5 1 1.5 Miles

* Areas open to ORV use are always subject to temporary closures for species management or safety concerns.

Cape Lookout National Seashore North Carolina

National Park Service
U.S. Department of the Interior



North Core Banks Map 2 of 3

Alternative D

- ORV Route - Open during ORV Season Only

ORV Route - Locally Known as the Backroad

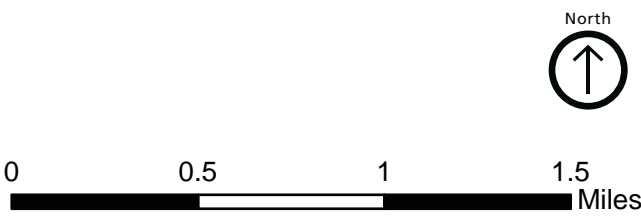
Pedestrian-only Areas

Cape Lookout National Seashore Boundary
- Passenger Ferry

Vehicle Ferry

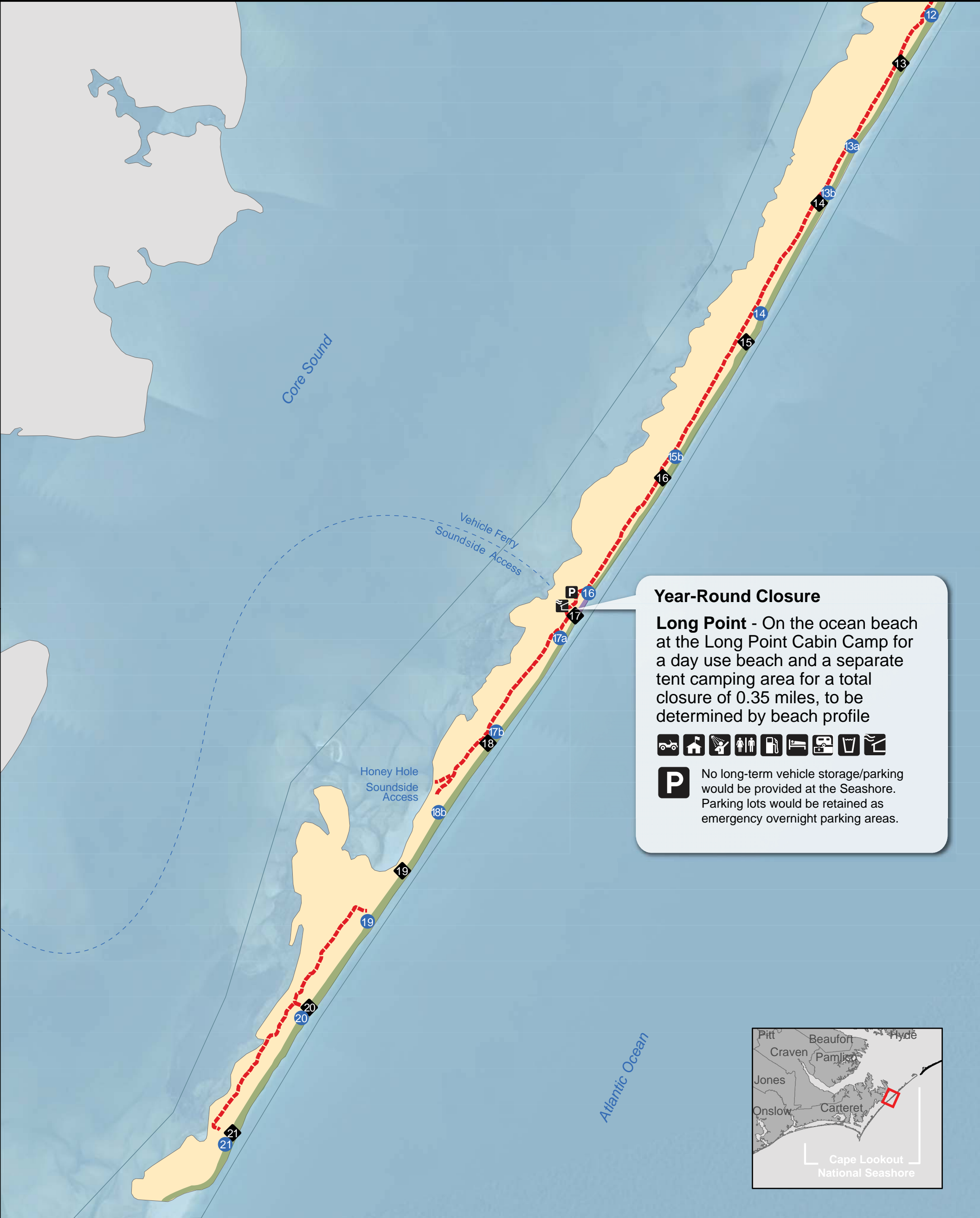
Parking
- mile marker

Vehicle ramp Location



Cape Lookout National Seashore North Carolina

National Park Service
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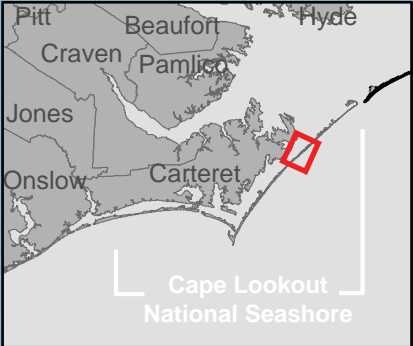


Year-Round Closure

Long Point - On the ocean beach at the Long Point Cabin Camp for a day use beach and a separate tent camping area for a total closure of 0.35 miles, to be determined by beach profile



P No long-term vehicle storage/parking would be provided at the Seashore. Parking lots would be retained as emergency overnight parking areas.



North Core Banks Map 3 of 3

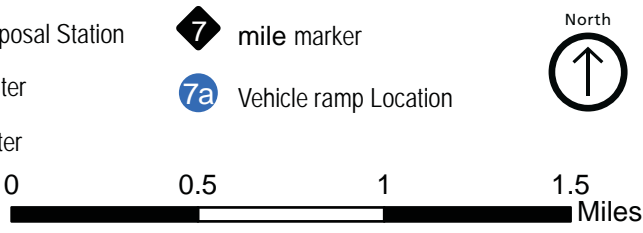
Alternative D

- ORV Route - Open during ORV Season Only
- ORV Route - Locally Known as the Backroad
- Pedestrian-only Areas
- Cape Lookout National Seashore Boundary

- Passenger Ferry
- Vehicle Ferry
- Parking
- Ranger Station
- Showers
- Restrooms
- Gas Station
- Lodging

- Sanitary Disposal Station
- Drinking Water
- Shade Shelter

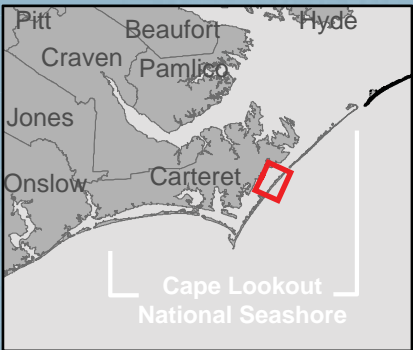
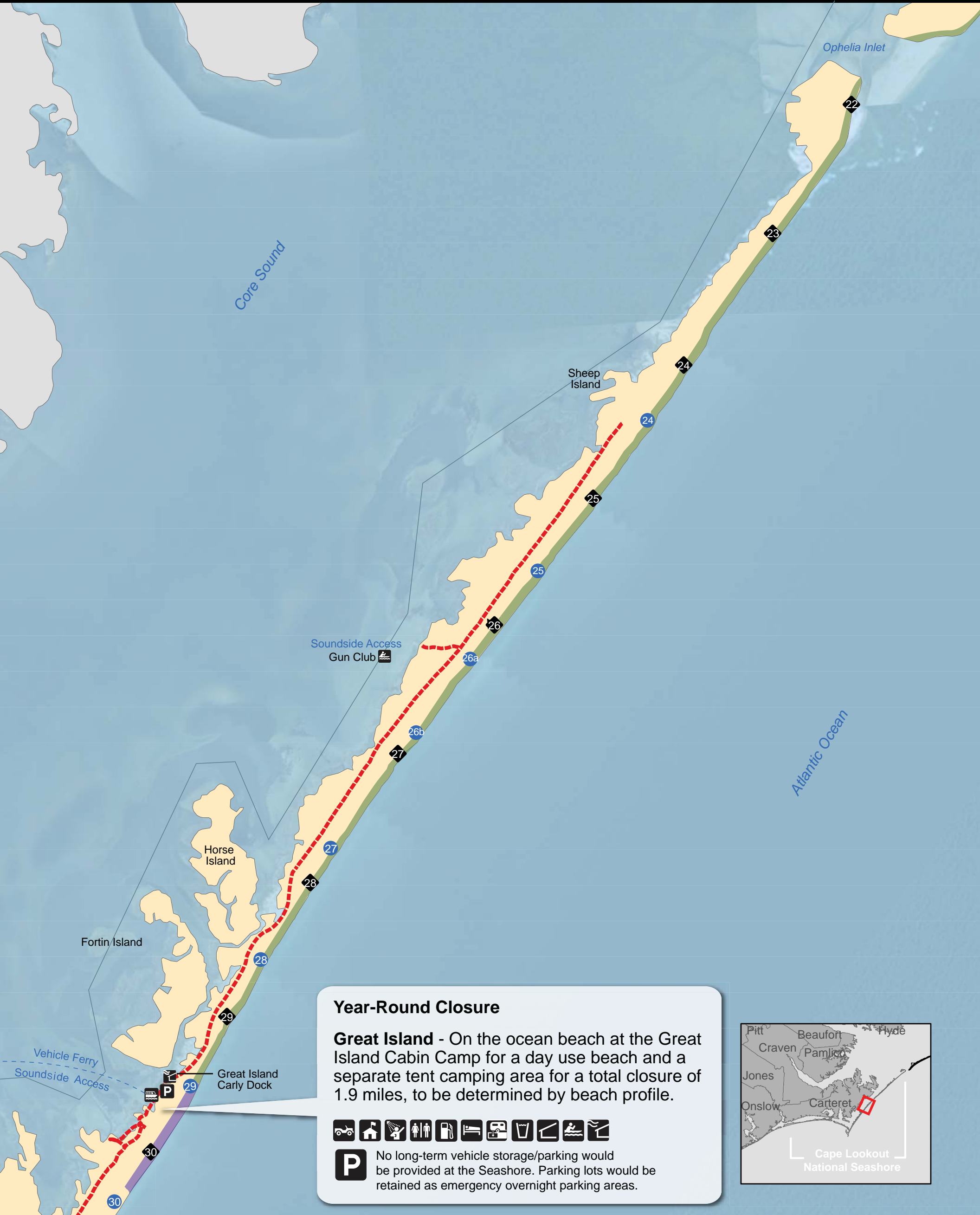
- 7 mile marker
- 7a Vehicle ramp Location



* Areas open to ORV use are always subject to temporary closures for species management or safety concerns.

Cape Lookout National Seashore North Carolina

National Park Service
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South Core Banks Map 1 of 3

Alternative D

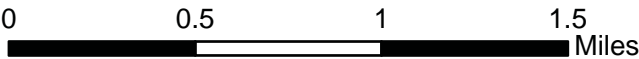
- ORV Route
- ORV Route - Locally Known as the Backroad
- Pedestrian-only Areas
- Cape Lookout National Seashore Boundary

- Passenger Ferry
- Vehicle Ferry
- Parking
- Ranger Station

- Showers
- Restrooms
- Gas Station
- Lodging
- Shade Shelter

- Sanitary Disposal Station
- Drinking Water
- Shelter
- Kayak Access

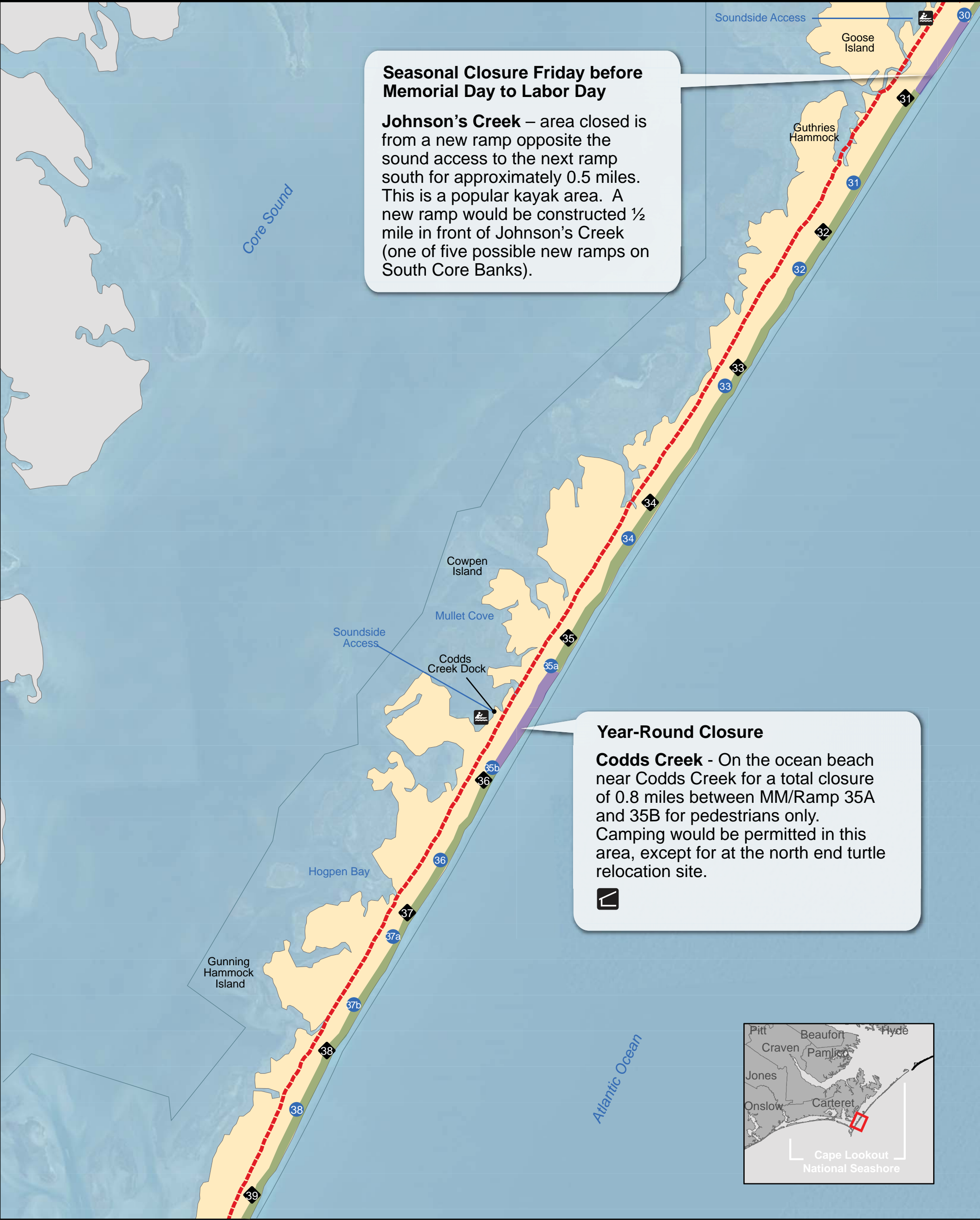
- 7 mile marker
- 7a Vehicleramp Location



* See ORV Plan for open/closed dates; areas open to ORV use are always subject to temporary closures for species management or safety concerns.

Cape Lookout National Seashore North Carolina

National Park Service
U.S. Department of the Interior



South Core Banks Map 2 of 3

Alternative D

- ORV Route

ORV Route - Locally Known as the Backroad

Pedestrian-only Areas

Cape Lookout National Seashore Boundary
- Passenger Ferry

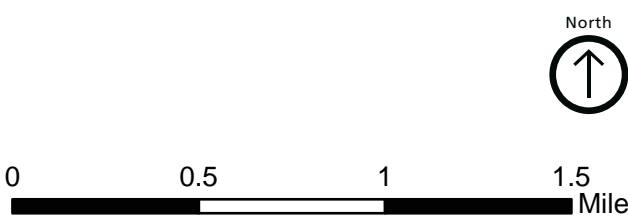
Vehicle Ferry

Parking

Shelter
- mile marker

Vehicle ramp Location

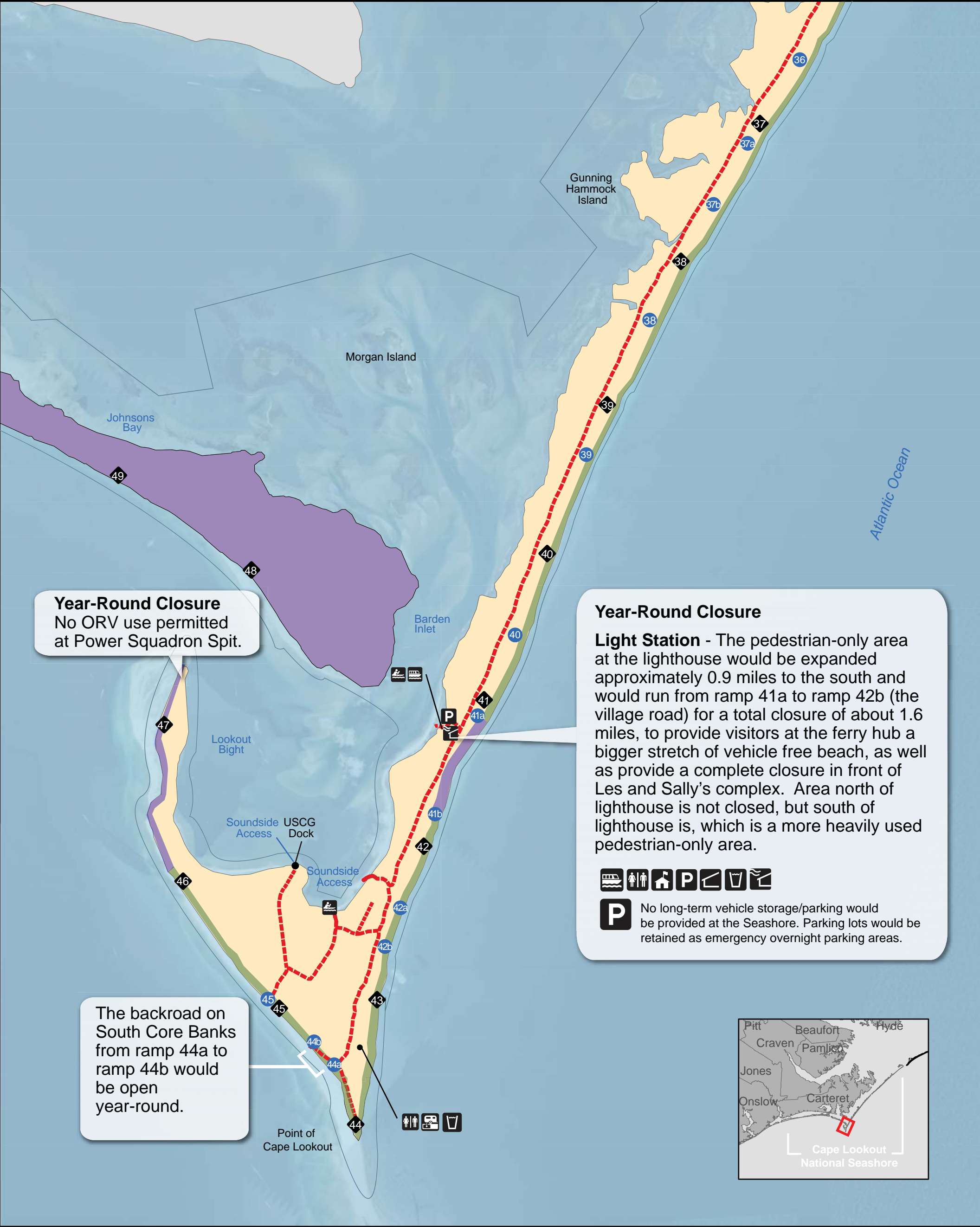
Kayak Access



* See ORV Plan for open/closed dates; areas open to ORV use are always subject to temporary closures for species management or safety concerns.

Cape Lookout National Seashore North Carolina

National Park Service
U.S. Department of the Interior



South Core Banks Map 3 of 3

Alternative D

- ORV Route

ORV Route - Locally Known as the Backroad

Pedestrian-only Areas

Cape Lookout National Seashore Boundary
- Passenger Ferry

Vehicle Ferry

Parking

Kayak Access
- mile marker

Vehicle ramp Location

Restrooms

Sanitary Disposal Station

- Ranger Station

Shelter

Drinking Water
- North

00.511.5

Miles

Cape Lookout National Seashore North Carolina

National Park Service
U.S. Department of the Interior



Shackleford Banks Map 1 of 1

Alternative A, B, C, D & E

- ORV Route - Open during ORV Season Only

ORV Route - Locally Known as the Backroad

Pedestrian-only Areas

Cape Lookout National Seashore Boundary
- Passenger Ferry

Vehicle Ferry

P

Parking

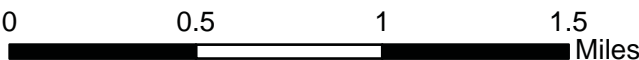
Shade Shelter
- 7

mile marker

7a

Vehicle ramp Location

Kayak Access



* Areas open to ORV use are always subject to temporary closures for species management or safety concerns.

Chapter 3:

Affected Environment

CHAPTER 3: AFFECTED ENVIRONMENT

The “Affected Environment” describes existing conditions for those elements of the natural and cultural environments that are affected by the current management of ORVs and park resources, and which would be affected by the implementation of the actions considered in this Off-road Vehicle Management Plan / Environmental Impact Statement (ORV management plan/EIS). The components addressed in this chapter include federally listed endangered, threatened, or candidate species; state-listed and special-status species; other wildlife and wildlife habitat (with a focus on birds and invertebrate species that could be affected by off-road vehicle (ORV) use or management); soundscapes/acoustic environment; visitor use and experience (including night skies); cultural and historical resources; socioeconomic resources; and Seashore management and operations. Impacts for each of these topics are analyzed in chapter 4.

EFFECTS OF CLIMATE CHANGE ON CAPE LOOKOUT NATIONAL SEASHORE

Climate change poses a direct threat to many of the coastal lands managed by the NPS including Cape Lookout National Seashore, a 56-mile stretch of pristine barrier islands located at the southern end of the North Carolina Outer Banks. Climate change associated impacts that threaten barrier islands include sea level rise and increased frequency and intensity of storm events along the Atlantic Coast of the United States (IPCC 2013). Sea level rise may drastically decrease the area of the Seashore in this low-lying region (Inman and Dolan 1989). As beaches along the coastline erode and are lost, the coastal habitats will become even more important to species. Habitat potentially lost due to sea level rise includes sandy beaches on the eastern side of the Seashore and salt marsh habitat that surrounds the landward boundaries of the islands. Storm events also have the potential to cause substantial land and habitat loss by exacerbating erosion rates and changing hydrologic and sediment dynamics in this inherently unstable region (Burkholder et al. 2004). The paths made by and maintained for ORVs can channelize and direct the storm generated overwash flow, causing damage, or even island breaches. Maintenance of ORV routes is important to minimize such erosion. Furthermore, increased surface water temperatures associated with climate change may increase the frequency and severity of hypoxic events because warmer water has a lower holding capacity for dissolved oxygen than colder water (Diaz and Rosenberg 2008). This may be of particular concern in the calm shallow waters to the landward side of the islands and may compound other environmental risks in the area since hypoxia is currently a well-documented problem in Pamlico Sound (Stanley and Nixon 1992; Paerl et al. 2001; Lin et al. 2007). Changes to groundwater could also occur, and could include salt water intrusion, higher water tables, and changes in soil moisture. According to the Coastal Vulnerability Index established by the USGS, the Seashore meets several criteria which place it toward the more vulnerable end of the climate change risk spectrum including low coastal slope and a high rate of shoreline change (Inman and Dolan 1989; USGS 2001).

FEDERALLY LISTED ENDANGERED, THREATENED, OR CANDIDATE SPECIES

This section addresses species present at the Seashore that are listed by U.S. Fish and Wildlife Service (USFWS) as endangered, threatened, or candidate. In some cases, the species may also be listed by the state of North Carolina. Federally listed species at the Seashore include two birds: piping plover (threatened) and red knot (candidate); five sea turtles: loggerhead (threatened – Northwest Atlantic Ocean distinct population segments (DPS), leatherback (endangered), Kemp’s Ridely (endangered), hawksbill (endangered), and green (threatened); and one plant: seabeach amaranth (threatened).

Species listed only by the state, and which are not federally listed, are discussed in the “State-listed and Special-status Species” section.

PIPING PLOVER

The piping plover (*Charadrius melodus*) is a small, highly camouflaged, sand-colored shorebird endemic to North America. The piping plover is 6 to 7 inches long and weighs 1.5 to 2.2 ounces. The USFWS recognizes three distinct piping plover population segments: (1) the Atlantic Coast (from the Maritime Provinces of Canada to the Outer Banks of North Carolina); (2) the Great Lakes (along Lake Superior and Lake Michigan); and (3) the Great Plains (from southern, prairie Canada to Nebraska). Wintering populations are found on the Atlantic Coast, from North Carolina to Florida, on the Gulf Coast from Florida to Mexico, and in the Caribbean with the greatest number of wintering birds found in Texas. Fewer than 3,000 breeding pairs of piping plovers were detected in the United States and Canada in 2001, although the most recent breeding census estimated breeding pairs in excess of 3,500 (Elliott-Smith, Haig, and Powers 2009). Piping plovers were common along the Atlantic Coast during much of the 19th century, but nearly disappeared due to excessive hunting for decorative feathers. Following passage of the Migratory Bird Treaty Act (MBTA) in 1918, plover numbers recovered to a 20th century peak during the 1940s. Increased development and beach recreation after World War II caused a population decline that led to federal protection for the plover (USFWS 2007b). Habitat loss caused by human development and recreation, and low reproductive rates caused by disturbance and predation, were considered to be the primary causes of the decline (Elliott-Smith and Haig 2004). The Atlantic Coast population was federally listed in 1986 as threatened (50 FR 50726-50734). At the time of listing, there were approximately 790 Atlantic Coast pairs, and the species was in decline. Therefore, a recovery target of 2,000 pairs was established in the 1996 Revised Recovery Plan for the Atlantic Coast population (USFWS 1996a). Disturbance and predation were intensively managed after the listing, and the Atlantic Coast population rose to 1,890 pairs by 2007 (USFWS 2007c), but was still short of the recovery goal of 2,000 pairs (USFWS 1996a; Hecht pers. comm. 2008).

The population for the Atlantic Coast Southern Region (or Recovery Unit), which comprises the states of Delaware, Maryland, Virginia, and North Carolina, was estimated at 333 pairs in 2007, which was the highest since 1986, but still short of the regional goal of 400 pairs (table 7 and figure 8). North Carolina experienced more than a 50 percent decline in breeding pairs from 1989 (55 pairs) to 2004 (20 pairs) (USFWS 2004a) for reasons discussed in the “Risk Factors” section later in this chapter. However, the number of breeding pairs was estimated at 64 pairs in 2008, which represents the highest number recorded in North Carolina in the years that complete surveys have been conducted (1989–2008) (NCWRC 2008a). Preliminary estimates for the 2012 season indicated a total of 70 pairs in the state (USFWS 2013a).

Piping Plover in North Carolina

North Carolina is currently the only state on the Atlantic Coast that hosts piping plovers during all phases of their annual cycle, including the establishment and holding of territories, courtship and copulation, nest scraping and nest building, egg laying and incubation, chick rearing and fledging, and migration and wintering (Cohen 2005a). The first published account of breeding piping plovers in North Carolina is from 1901 on Pearl Island (Golder 1985). The piping plover continue to breed at the extreme northern (Newfoundland’s southern coast) and southern ends (South Carolina) of their range and the extent of the current range does not appear to differ drastically from the historic range. However, piping plovers appear to be absent or greatly reduced in numbers at some beaches where they were historically found. The sparsity of nesting pairs on some beaches in the southern portion of the piping plover’s Atlantic Coast range is of concern. The Seashore is at the southern end of the Atlantic Coast range of piping plover (USFWS 2000).

TABLE 7: SOUTHERN REGION (INCLUDING NORTH CAROLINA) PIPING PLOVER POPULATION TRENDS, NUMBER OF BREEDING PAIRS, 1986–2012

Year	Delaware	Maryland	Virginia	North Carolina	South Carolina	Southern Region
1986	8	17	100	30 ^a	3	158
1987	7	23	100	30 ^b	—	160
1988	3	25	103	40	—	171
1989	3	20	121	55 ^a	—	199
1990	6	14	125	55	1	201
1991	5	17	131	40	1	194
1992	2	24	97	49	—	172
1993	2	19	106	53	1	181
1994	4	32	96	54	—	186
1995	5	44	118	50	—	217
1996	6	61	87	35	0	189
1997	4	60	88	52	—	204
1998	6	56	95	46	—	203
1999	4	58	89	31	—	182
2000	3	60	96	24	—	183
2001	6	60	119	23	0	208
2002	6	60	120	23	—	209
2003	6	59	114	24	—	203
2004 ^c	7	66	152	20	—	245
2005 ^d	8	63	192	37	—	300
2006 ^e	9	64	202	46	—	321
2007 ^f	9	64	199	61	—	333
2008 ^g	10	49	208	64	—	331
2009 ^h	10	45	193	54	—	302
2010 ⁱ	9	44	192	61	—	306
2011 ^j	8	36	188	62	—	294
2012 ^k	7	41	259	70	—	377

Source of 1986–2001 data is USFWS 2002. Source of 2002–2003 data is USFWS 2004b.

^a The recovery team believes that the apparent 1986–1989 increase in the North Carolina population was because of an intensified survey effort.

^b No actual surveys were made in 1987; estimate is that from 1986.

^c USFWS 2004c. Figures are preliminary estimates.

^d USFWS 2005a.

^e USFWS 2006b.

^f USFWS 2007c.

^g USFWS 2008a.

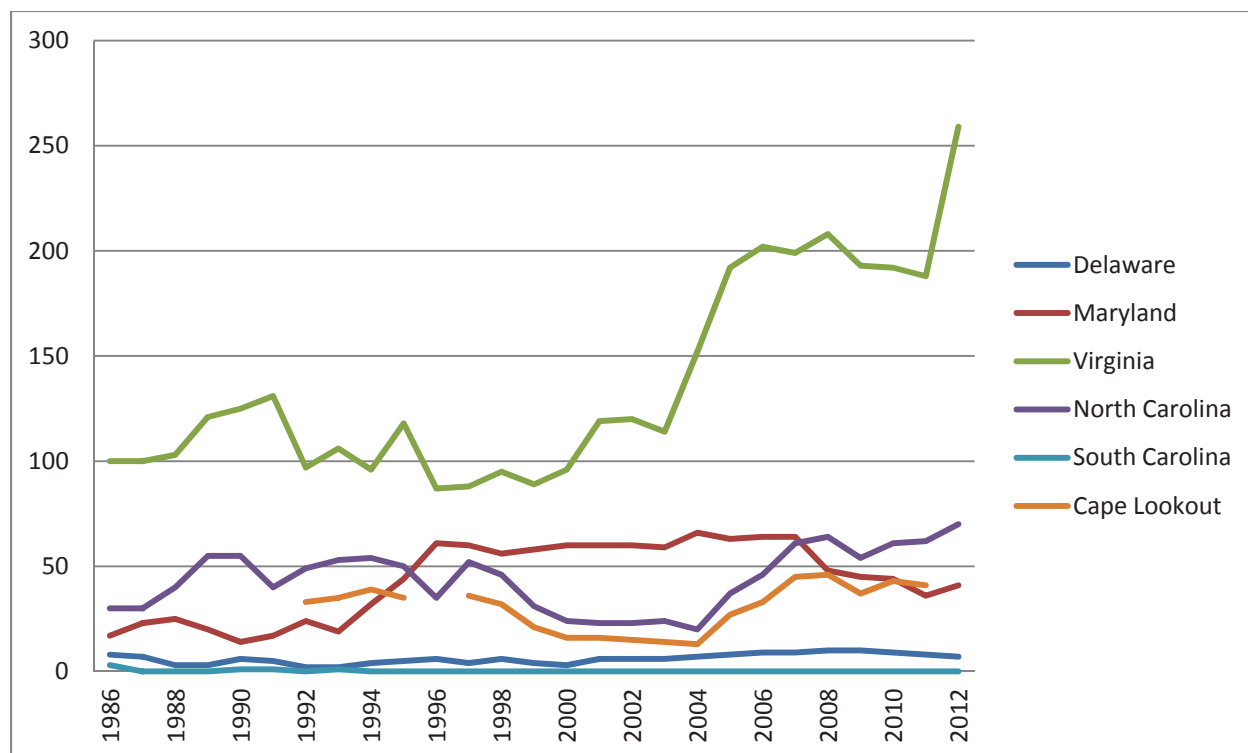
^h USFWS 2009a.

ⁱ USFWS 2011.

^j USFWS 2012a.

^k USFWS 2013

— = No data available.

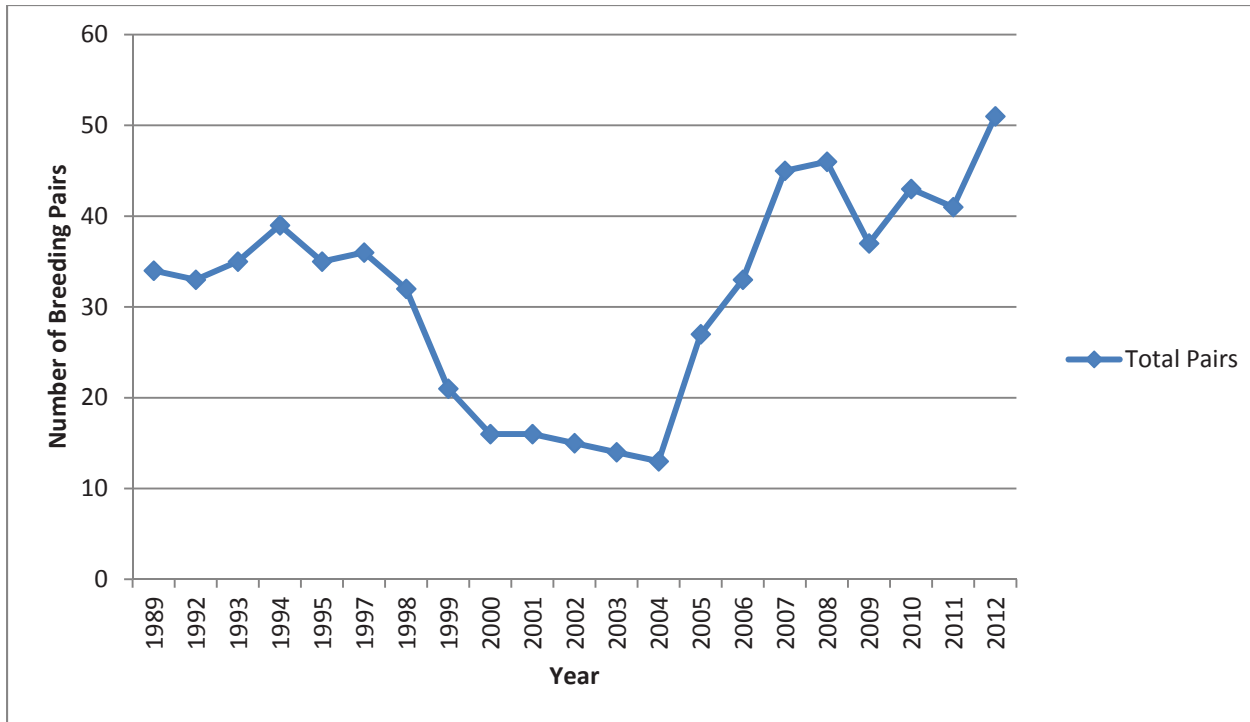


Source: References are the same as the references show in table 7, plus NPS 2013l.

Note: Data is missing for Cape Lookout National Seashore for the years 1986–1988, 1990, 1991, and 1996.

FIGURE 8: SOUTHERN REGION STATES PIPING PLOVER POPULATION TRENDS, NUMBER OF BREEDING PAIRS, 1986–2012

Cape Lookout National Seashore is a significant nesting area, containing 70 percent of the nesting pairs in the state of North Carolina. The Seashore is also an important wintering and migratory site (NPS 2009a). Plovers from the endangered Great Lakes population have been observed in fall and spring migration and during the wintering period (Cohen 2005a). In 2008, the greatest concentration of piping plover nests at Cape Lookout National Seashore was found around New Drum Inlet, which is now considered the most important site in North Carolina for the survival of this species (NPS 2009a). At the Seashore, a baseline study for monitoring piping plovers began in 1989. In that year, 34 nesting pairs were observed and 25 chicks were confirmed to have fledged. Thirty-three pairs were counted in 1992, and 35 pairs in 1993. The piping plover population increased to 39 pairs at the Seashore in 1994, and subsequently varied between 32 and 36 pairs through 1998, after which a steady decline began (figure 9). The population at the Seashore reached a low of 13 breeding pairs in 2004, with only 14 breeding pairs reported the previous year (NPS 2005a). The population increased to 27 pairs in 2005, 33 pairs in 2006, 45 pairs in 2007, and 46 pairs by 2008 before dropping to 36 pairs in 2009 (NPS 2012t). There were 43 pairs reported in 2010, 41 pairs in 2011, and 51 pairs in 2012 (NPS 2012t).

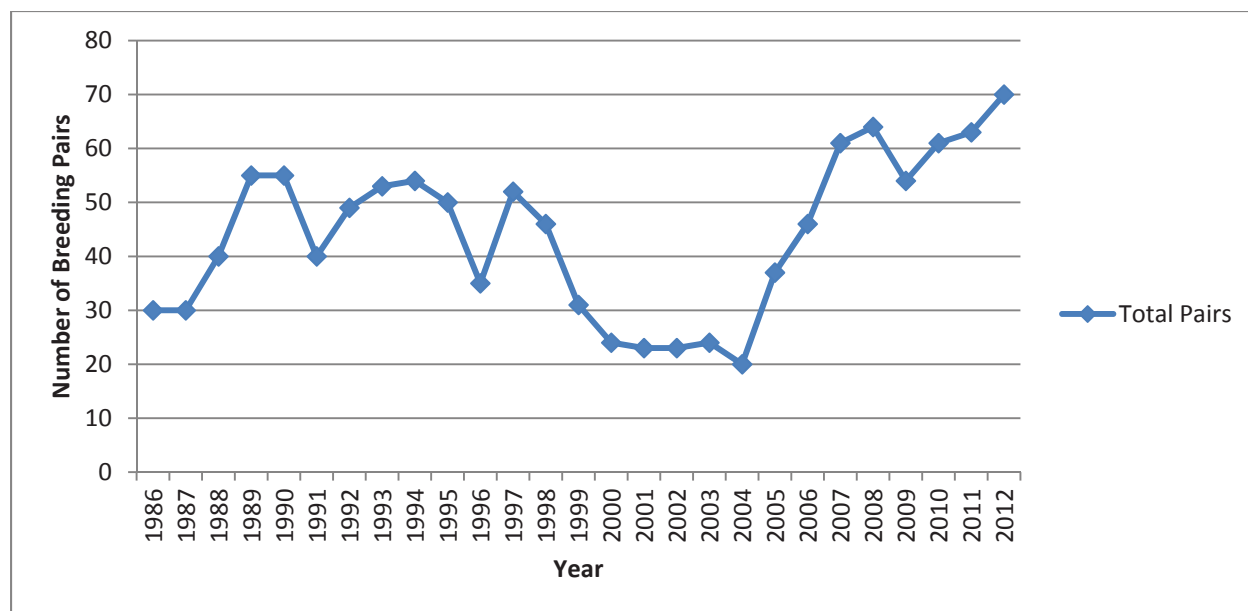


Source: 2012 Piping Plover Monitoring Report (NPS 2012t).

Note: Data missing for 1990, 1991, and 1996.

FIGURE 9: NUMBER OF PIPING PLOVER BREEDING PAIRS, CAPE LOOKOUT NATIONAL SEASHORE, 1989–2012

North Carolina Wildlife Resources Commission (NCWRC) staff conducted a piping plover breeding census along the coast of North Carolina during the June 1 through June 9, 2012 census window. The census included all suitable habitat on ocean and inlet beaches with the exception of Browns Island, which lies within a military live-fire training range. Sixty-four pairs and three individual birds were counted during the census (Schweitzer and Abraham 2012)). The end-of-season best estimate for 2012, which includes pairs discovered after the census, was 70 pairs in the State of North Carolina (Schweitzer and Abraham 2012). The highest number previously recorded in North Carolina in the years that complete surveys have been conducted (1989–2012) was in 2008, when 64 breeding pairs were estimated (figure 10). Forty chicks were fledged in 2012 and the estimated productivity was 0.58 chicks per pair, which is well below the Recovery Plan goal of 1.5 chicks per pair per year (Schweitzer and Abraham 2012). Statewide, the distribution of piping plovers was similar to previous years, with the majority of nesting pairs found at Cape Lookout National Seashore (NCWRC 2008a).



Source: Schweitzer and Abraham 2012.

Note: Data reflect total season estimates, which includes birds found after the census window had closed.

FIGURE 10: NUMBER OF PIPING PLOVER BREEDING PAIRS IN NORTH CAROLINA, 1986–2012 HABITAT DESCRIPTION

On the Atlantic Coast, piping plovers nest in sand, gravel, or cobble substrates in backshore, dune, interdune blowout, overwash fan, and barrier flat zones of open or sparsely vegetated beaches. Nest sites may have little or no slope (Cairns 1982; Burger 1987) although nesting does occur on lower elevation dunes (Cairns 1982). On wide beaches, piping plovers nest in the open to maintain a wide field of view, but on narrower beaches nests can be established under clumps of vegetation (Cairns 1982; USFWS 1996a). Where beaches are wide, piping plovers tend to nest far from the tide line to reduce risk of nest overwash, but this can place nests closer to vegetated dunes where risk of predation is high (Burger 1987). Piping plovers have also been observed nesting within least tern colonies, which could provide an added defense against predators due to antipredator behavior of least terns (Burger 1987).

In the winter and during migration, piping plovers tend to be found in areas with wide beaches and inlet habitats, foraging in moist, substrate habitat that includes both low- and high-wave-energy intertidal zones, mud flats, moist sand flats, ephemeral pools, shores, and brackish ponds (Cohen 2005a; Elliott-Smith and Haig 2004; Nicholls and Baldassarre 1990b; Wilkinson and Spinks 1994). During winter distribution surveys on the Atlantic Coast from 1986 to 1987, piping plovers were almost always found associated with other species of shorebirds, such as sanderlings (*Calidris alba*), least sandpipers (*C. minutilla*), or western sandpipers (*C. mauri*), in addition to other piping plovers (Nicholls and Baldassarre 1990a).

Critical Habitat Designation

Critical habitat identifies specific areas that are essential to the conservation of a listed species or that contain physical and biological features that are essential to the species and that may require special management considerations or protection. Section 7 of the Endangered Species Act (ESA) requires federal agencies to ensure that actions they authorize or carry out are not likely to destroy or adversely modify designated critical habitat. Activities that may destroy or adversely modify critical habitat include

those that alter the primary constituent elements (PCEs) to an extent that the value of critical habitat for both the survival and recovery of the species is appreciably reduced (65 FR 41793).

The USFWS first designated critical habitat for the wintering population of the piping plover in 2001 along the coasts of North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, and Texas (66 FR 36038). A total of 142 areas along these coasts were designated as critical habitat for wintering birds, as defined by the ESA. The original designation of critical habitat included three coastal areas (named Units NC-6, NC-7, and NC-8), totaling approximately 11,006 acres (4,455 hectares), entirely within the Seashore (66 FR 36067). A rule to revise designated critical habitat for the wintering population of the piping plover in North Carolina was proposed in 2006 (71 FR 33703). The final rule for the revised critical habitat designation became effective on November 20, 2008 (73 FR 62816), which described four coastal areas (named Units NC-1, NC-2, NC-4, and NC-5), totaling approximately 1,827 acres (739.4 hectares), as critical habitat for the wintering population of the piping plover. The Units (NC-6, NC-7, and NC-8) within the Seashore were not affected by the 2008 final rule for the revised critical habitat designation. Critical habitat designations are shown in figures 11 and 12.

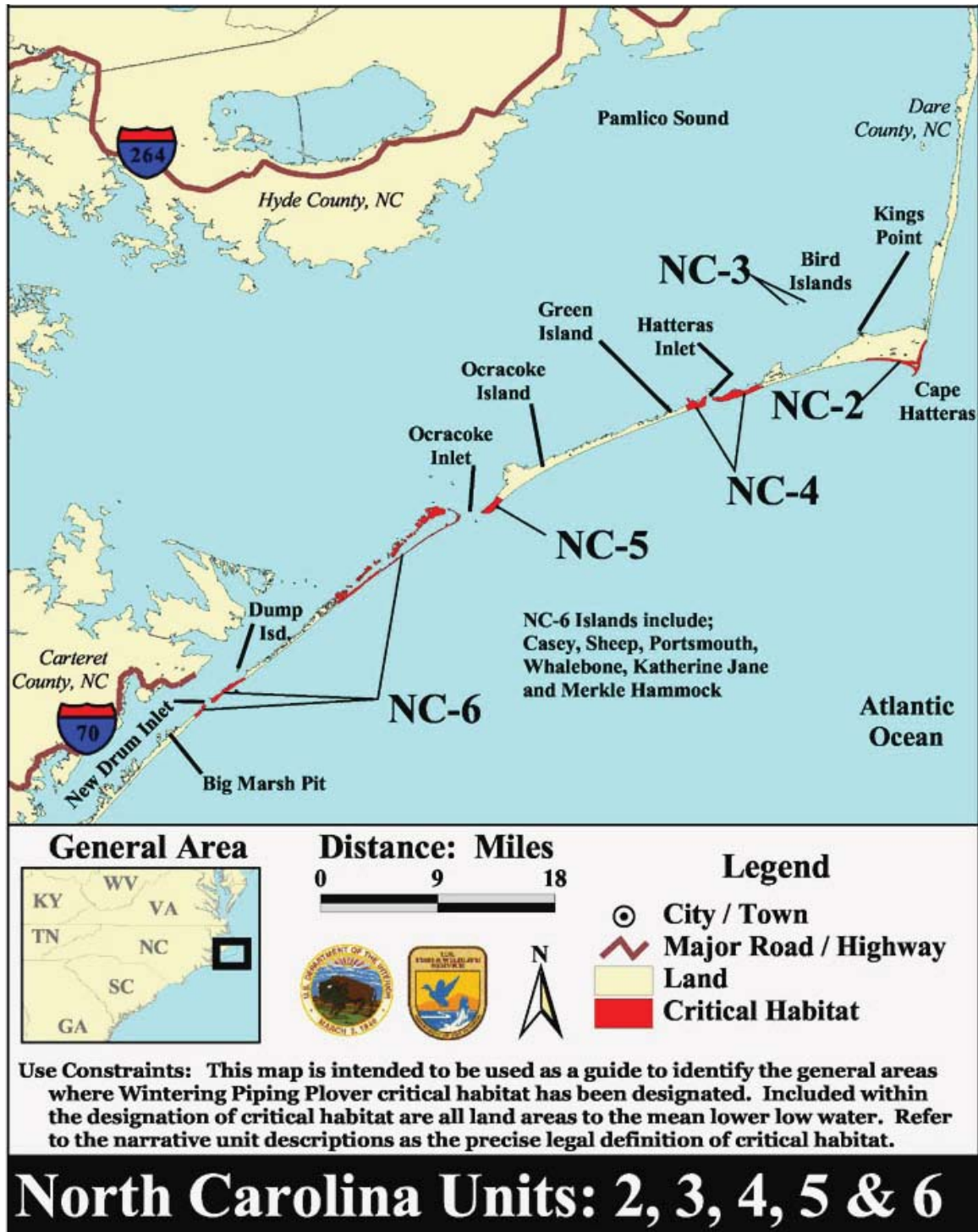
The PCEs for the wintering population of the piping plover are the habitat components that support foraging, roosting, and sheltering and the physical features necessary for maintaining the natural processes that support these habitat components. Specifically, the PCEs that are most relevant to the Seashore are as follows:

1. Intertidal sand beaches (including sand flats) or mud flats (between the mean lower low water (MLLW) line and annual high tide) with no or very sparse emergent vegetation for feeding. In some cases, these flats may be covered or partially covered by a mat of blue-green algae.
2. Unvegetated or sparsely vegetated sand, mud, or algal flats above annual high tide for roosting. Such sites may have debris or detritus and may have micro-topographic relief (less than 20 inches (50 centimeters) above substrate surface) offering refuge from high winds and cold weather.
3. Spits, especially sand, running into water for foraging and roosting.
4. Unvegetated washover areas with little or no topographic relief for feeding and roosting. Washover areas are formed and maintained by the action of hurricanes, storm surges, or other extreme wave actions.

Critical habitat does not include manmade structures (such as buildings, aqueducts, runways, roads, and other paved areas) and the land on which they are located existing within the legal boundaries as of November 20, 2008 (50 CR 17.95 b (1)(2)).

The three units of designated critical habitat that include acreage within the Seashore are described below (66 FR 36067):

NC-6: This unit includes all land MLLW on Atlantic Ocean to MLLW on Pamlico Sound, from Ocracoke Inlet extending west to the western end of Pilonary Islands. This unit includes the islands of Casey, Sheep, Evergreen, Portsmouth, Whalebone, Kathryn-Jane Flats, and Merkle Hammock. This unit also extends west from the eastern side of Old Drum Inlet to 1.6 kilometers (1.0 miles) west to New Drum Inlet and includes all lands from the MLLW on Atlantic Ocean to MLLW on Core Sound.



Source: USFWS 2001.

Note: Only NC-6 is located within Cape Lookout National Seashore.

FIGURE 11: CRITICAL HABITAT DESIGNATIONS FOR PIPING PLOVER IN THE NORTH PORTION OF CAPE LOOKOUT NATIONAL SEASHORE



Source: USFWS 2001.

Note: Only NC-7 and NC-8 are located within Cape Lookout National Seashore.

FIGURE 12: CRITICAL HABITAT DESIGNATIONS FOR PIPING PLOVER IN THE SOUTH PORTION OF CAPE LOOKOUT NATIONAL SEASHORE

NC-7: This unit extends south from Cape Lookout Lighthouse, along Cape Lookout, to the point of Cape Lookout and northwest to the northwestern peninsula. All lands from MLLW on the Atlantic Ocean, Onslow Bay, and Lookout Bight up to where densely vegetated habitat, not used by the piping plover, begins and the constituent elements no longer occur are included.

NC-8: This unit is in two parts: (1) the eastern end of Shackleford Banks from MLLW of Barden Inlet extending west 1.4 miles (2.4 kilometers), including Diamond City Hills, Great Marsh Island, and Blinds Hammock; and (2) the western end of Shackleford Banks from MLLW extending east 2.0 miles (3.2 kilometers) from Beaufort Inlet. The unit includes all land from MLLW to where densely vegetated habitat, not used by the piping plover, begins and where the constituent elements no longer occur and any emergent sandbars within Beaufort Inlet. This unit is bordered by Onslow Bay, Shackleford Slue, and Back Sound.

Diet

Piping plovers feed primarily on freshwater, marine, terrestrial, and benthic invertebrates (Elliott-Smith and Haig 2004) such as marine worms, fly larvae, beetles, crustaceans or mollusks (USFWS 1996a). Adults forage both day and night (Staine and Burger 1994), but young chicks are brooded during the night and therefore feed by day (Wolcott and Wolcott 1999). During territory establishment, foraging adults exhibit a preference for a moist substrate habitat that particularly includes mud flats, sand flats, ephemeral pools, and shores of brackish ponds and excludes the high-wave-energy intertidal zone (Cohen 2005a). Broods forage primarily on damp sand flats or moist substrate habitat, where their prey abundance is much higher than in other habitats (Kuklinski, Houghton, and Fraser 1996).

Chicks with access to moist substrate habitat survived better than chicks without such access in Virginia (Loefering and Fraser 1995) and Rhode Island (Goldin and Regosin 1998). A study in New York in 1992 and 1993 found that piping plover broods had higher foraging rates in areas with ephemeral pools and tidal flats, which suggested that these habitats were superior. This study also documented higher incidences of arthropods in the moist substrate habitat, which could explain the increased plovers numbers and survival rates in these habitat types. Management implications of this study include conserving a variety of foraging habitat (Elias, Fraser, and Buckley 2000). Burger (1994) found that when broods had access to a diversity of foraging habitat zones, the impact of human disturbance was reduced because chicks had opportunities to escape disturbances and still forage.

Breeding Biology

On the Atlantic Coast, breeding territory establishment and courtship generally begin in late March, the first nests are initiated in late April, and the brood-rearing period extends from late May through mid-August (Cohen 2005b). On beaches with more birds in the northern end of the Atlantic Coast breeding range, most pairs establish breeding territory within a day or two of their arrival in early spring, whereas pairs on sites with fewer birds can take several days or weeks longer to become established (Elliott-Smith and Haig 2004).

Piping plovers are primarily monogamous during the breeding season but often change mates between seasons. The nest is built by the male and consists of a shallow scrape in sandy substrate that may or may not be lined with pebbles and shell fragments.

The normal clutch size is four (USFWS 2007b), and the average duration for egg laying is six days (Elliott-Smith and Haig 2004). Replacement of lost or destroyed eggs has not been reported. If one or more eggs are lost, the pair continues to incubate the remaining eggs. Incubation is shared by males and

females and typically commences the day of clutch completion, but sometimes occurs when the next-to-last egg is laid (Elliott-Smith and Haig 2004).

The length of incubation ranges from 25 to 29 days, and a pair will re-nest multiple times if successive clutches are destroyed, but re-nesting after the chicks hatch is rare (Elliott-Smith and Haig 2004). Chicks leave the nest scrape within a few hours of hatching, except when a nest hatches at night, and they never return (Wolcott and Wolcott 1999). Broods may move hundreds of meters away from the nest site during the first week after hatching (USFWS 1996a). Chicks are vulnerable soon after hatching and survival rates are lower if the brood is forced to move. Members of a breeding pair share brood-rearing duties, though some females desert broods within 5 to 17 days (Elliott-Smith and Haig 2004). Although chicks follow adults to a foraging habitat, chicks forage for themselves. Fledging time ranges from 25 to 35 days (USFWS 1996a), and most adults and young depart the breeding grounds between mid-July and early September (Cohen 2005a).

Breeding Chronology and Performance at Cape Lookout National Seashore

Locally breeding piping plovers arrive at the Seashore in mid-March, begin courting and pairing in April, and begin to scrape or build nests by the third week of April (USFWS 1994; Patterson, Fraser, and Roggenbuck 1990). Ocracoke Inlet, Portsmouth Flats, Kathryn-Jane Flats, Old Drum Inlet, New Drum Inlet (mile marker 21 to 22), Ophelia Island (mile marker 22 to 23), Plover Inlet (mile marker 23 to 24), the point of Cape Lookout, Power Squadron Spit, and Shackleford Banks all contain potential nesting habitat. The *Cape Lookout National Seashore Interim Protected Species Management Plan / Environmental Assessment*, March 2006, developed for the Seashore provides guidance for monitoring and management (NPS 2006a). Seashore personnel generally begin monitoring for piping plover arrival and pre-nesting behavior by early April. In 2012, bird sanctuary signs were used to close all known piping plover nesting habitat to pedestrian and vehicular entry by April 1. Nesting areas were surveyed daily for territorial pairs and nests. Potential habitat outside posted areas was monitored and posted as necessary with a minimum 150-foot buffer distance from scrapes and nests. Once a nest was located, nests were monitored daily until they hatched or were lost. All known nests were protected by predator exclosures if the topography of the location was suitable and monitoring was sufficient. After hatching, broods were monitored daily until the chicks fledged or were lost. Ocean beach foraging areas were closed to vehicle traffic while the chicks were present (NPS 2009a, 2012t). Monitoring staff typically document brood status, behavior, individual bird and/or brood movements, human disturbance, predator interactions, or other significant environmental events (NPS 2005a).

In 2012, Portsmouth Flats had the highest concentration of piping plover nests (25) at the Seashore, followed by New Drum Inlet with 14 nests (NPS 2012t). The natural inlet closing process at Old Drum and New Drum Inlets in March 2009 has created good nesting habitat at those sites, which is reflected in the high number of nests (9 and 14 nests, respectively) observed at those locations in 2012 (NPS 2011a, 2012t). The closing of Old Drum Inlet allowed for increased monitoring, from once weekly to daily, of the New Drum Flats and Ophelia Island sites (NPS 2009a).

Table 8 shows the number of breeding pairs of piping plovers at the ten known nesting sites from 1989 to 2012. Table 9 provides data on piping plover nesting, and hatching and fledging success at the Seashore from 1989 through 2012. The highest number of breeding pairs between 1989 and 2012 was identified in 2012 (51 nesting pairs) (NPS 2012t).

TABLE 8: NUMBER OF PIPING PLOVER BREEDING PAIRS BY SITE, CAPE LOOKOUT NATIONAL SEASHORE, 1989–2012

Location	1989	1992	1993	1994	1995	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Ocracoke Inlet	0	2	0	2	2	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	1
Portsmouth Flats	14	8	9	7	8	17	15	9	11	9	8	6	4	6	8	14	14	12	13	12	19
Kathryn-Jane Flats	7	11	9	12	11	10	8	2	1	1	2	1	1	2	1	3	0	1	0	0	0
Old Drum Inlet	3	2	1	1	2	1	1	0	0	0	0	1	0	0	0	0	2	3	6	8	8
New Drum Inlet (North Core Banks/ Middle Core Banks)	4	5	9	10	6	3	2	3	1	2	2	2	2	3	3	5	6	5	8	8	10
New Drum Inlet (South Core Banks)/ Ophelia Island	3	3	4	5	4	2	3	3	2	3	2	2	2	2	2	2	2	2	2	2	5
Plover Inlet (Mile 23 to 24)	0	0	0	0	0	1	1	1	1	1	1	1	4	8	15	17	18	11	11	8	8
The point of Cape Lookout	0	0	0	0	0	0	0	1	0	0	0	0	0	4	3	2	3	2	2	1	0
Power Squadron Spit	3	2	3	2	2	1	2	1	0	0	0	1	0	1	1	2	1	1	1	1	0
Shackleford Banks	—	—	—	—	—	—	—	—	—	—	—	—	—	1	0	0	0	0	0	0	0
Total	34	33	35	39	35	36	32	21	16	16	15	14	13	27	33	45	46	37	43	41	51

Source: Piping Plover Monitoring at Cape Lookout National Seashore 2012 Summary Report (NPS 2012t).

Note: Data not available for all locations in 1990, 1991, and 1996.

—= No data available.

TABLE 9: HATCHING AND FLEDGING SUCCESS AT CAPE LOOKOUT NATIONAL SEASHORE, 1989–2012

Year	# Nests	# Nesting Pairs	# Eggs	Nests Hatched		Eggs Hatched		Chicks Fledged		Fledge Rate (chicks/pair)
				#	%	#	% ^a	#	%	
1989	34	34	—	—	—	—	—	25	—	0.74
1992	33	33	—	—	—	—	—	7 (North Core Banks only)	—	0.21
1993	35	35	—	—	—	—	—	26	—	0.74
1994	39	39	—	—	—	—	—	9	—	0.23
1995	35	35	—	—	—	—	—	15	—	0.43
1997	41	36	—	21	51.2	—	—	7	—	0.19
1998	39	32	—	—	—	—	—	11	—	0.34
1999	22	21	66	9	40.9	23	34.8	2	8.7	0.10
2000	18	16	65	13 ^d	72.2	43 ^a	66.2	8 ^a	18.6	0.50
2001	19	16	64	8 ^e	42.1	24 ^e	37.5	5 ^a	20.8	0.31
2002	20	15	65	13	65.0	43	66.2	4	9.3	0.27
2003	15	14	55	7 ^a	46.7	23 ^a	41.8	6	26.0	0.43
2004	13 ^c	13	44	11 ^c	84.6	37 ^e	84.1	12 ^g	32.4	0.92
2005	31	27	105	24	77.4	69	65.7	23	33.3	0.85
2006	37	33	128 ^b	29 ^d	78.4	90 ^b	70.3	29 ^h	32.2	0.88
2007	58	45	115 ^{ai}	29 ^d	50.0	80 ⁱ	70.0	11 ^g	13.8	0.24
2008	57	46	177 ^a	29	50.9	87 ^a	49.2	9	10.3	0.20
2009	45	37	145	24	53.3	83	57.2	30	36.1	0.81
2010	58	43	204	34	58.6	98	48.0	31	31.6	0.72
2011	48	41	155	35	72.9	102	65.8	37	36.3	0.90
2012	66	51	202	36	54.5	87	43.0	29	33.3 ^j	0.57

Sources: 1997–2012 Piping Plover Monitoring Reports (NPS 1997a, 1998b, 1999a, 2000c, 2001b, 2002b, 2003a, 2004c, 2005a, 2006f, 2007i, 2008c, 2009a, 2010b, 2011a, 2012t).

^a Of all known.

^b Assumes 3 eggs from a brood whose nest were not found.

^c Includes 1 nest not found.

^d Includes those presumed hatched.

^e Assumes 1 egg from a nest with hatch date unknown.

^f Includes 2 fledged chicks from a brood whose nest was not found.

^g Includes 1 fledged chick from a brood whose nest was not found.

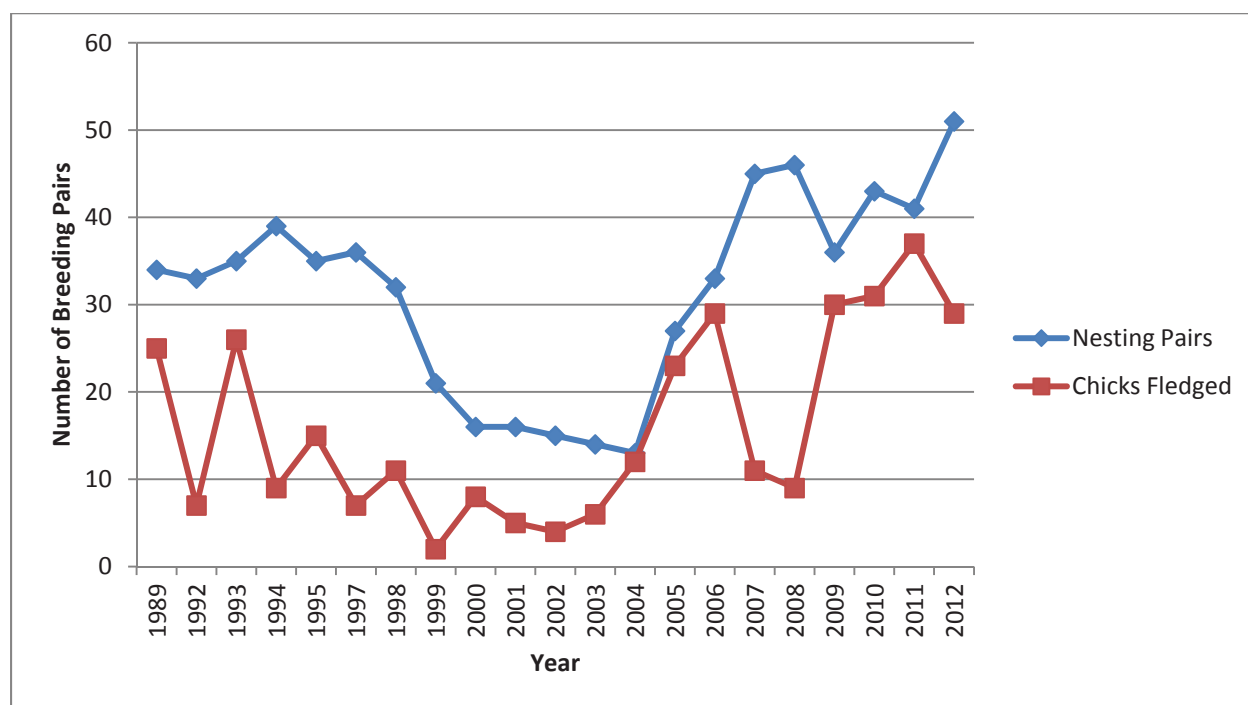
^h Includes 4 fledged chicks from broods whose nests were not found.

ⁱ Assumes 1 egg from a brood whose nest was not found.

^j Includes 12 fledged chicks whose nests were not found.

Fledge rate (or reproductive rate) is defined as the number of chicks that survive until fledging age per breeding pair. Since 1989, fledge rates at the Seashore have ranged from 0.10 to 0.92 chicks per pair, with an average rate from 1989 to 2012 of 0.50 chicks per breeding pair. During 2012, a total of 51 pairs fledged 29 chicks (a rate of 0.57 chicks per pair) (NPS 2012t). However, a rate of 1.25 fledged chicks per breeding pair annually would be needed to sustain the population (USFWS 1996a). The recovery goal set by the USFWS for the Atlantic Coast population of piping plover is 1.50 fledged chicks per breeding pair. Hence, the actual fledge rate at the Seashore has averaged less than half the recovery goal since 1989.

There is a noticeable decline in the local breeding population (figure 13) from 1998 to 2004. The cause of high chick mortality continues to be unknown, but is likely caused by predation, habitat disturbance, and starvation due to poor foraging habitat (NPS 2003a; Patterson, Fraser, and Roggenbuck 1990). However, the general increase in the number of breeding pairs since 2004 is encouraging. Although the fledge rate in 2009 was slightly lower than in 2004, the fledge rate for piping plovers at the Seashore increased 350 percent from 2008 to 2011, but declined in 2012. Also of note is the substantial increase in the number of chicks fledged from 2008 to 2009 compared to 2007 and 2008.



Source: Piping Plover Monitoring at Cape Lookout National Seashore 2012 Summary Report (NPS 2012t).

NOTE: Data not available for 1990, 1991, and 1996.

FIGURE 13: NUMBER OF BREEDING PAIRS AND FLEDGED CHICKS AT CAPE LOOKOUT NATIONAL SEASHORE, 1989–2012

Hatching and Fledging Success at Primary Nesting Sites

Tables 10 through table 19 summarize hatching and fledging success at each of the individual primary breeding sites from the late 1990s (with the exception of Shackleford Banks) through 2011. Average fledge rates across the ten breeding sites ranged from zero at Ocracoke Inlet and Shackleford Banks to 0.77 at Plover Inlet, and each site has a fledge rate below the 1.50 goal set by the 1996 revised recovery plan. However, there were ten instances of years when one or more sites did meet or exceed this goal,

indicating that despite low Seashore-wide recruitment, some primary nesting sites performed at or above this expectation in some years.

TABLE 10: PIPING PLOVER HATCHING AND FLEDGING SUCCESS AT OCRACOKE INLET, 1997–2012

Year	# Nests	# Eggs	Nests Hatched		Eggs Hatched		Chicks Fledged		Fledge Rate (chicks/pair)
			#	%	#	%	#	%	
1997	1	0	0	0.0	0	0.0	0	0.0	0.00
1998	0	0	0	0.0	0	0.0	0	0.0	0.00
1999	0	0	0	0.0	0	0.0	0	0.0	0.00
2000	0	0	0	0.0	0	0.0	0	0.0	0.00
2001	0	0	0	0.0	0	0.0	0	0.0	0.00
2002	0	0	0	0.0	0	0.0	0	0.0	0.00
2003	0	0	0	0.0	0	0.0	0	0.0	0.00
2004	0	0	0	0.0	0	0.0	0	0.0	0.00
2005	0	0	0	0.0	0	0.0	0	0.0	0.00
2006	0	0	0	0.0	0	0.0	0	0.0	0.00
2007	0	0	0	0.0	0	0.0	0	0.0	0.00
2008	0	0	0	0.0	0	0.0	0	0.0	0.00
2009	0	0	0	0.0	0	0.0	0	0.0	0.00
2010	0	0	0	0.0	0	0.0	0	0.0	0.00
2011	1	4	1	100.0	1	25.0	0	0.0	0.00
2012	2	6	1	100.0	1	50.0	0	0	0.00

Source: NPS 1997a, 1998b, 1999a, 2000c, 2001b, 2002b, 2003a, 2004c, 2005a, 2006f, 2007i, 2008c, 2009a, 2010b, 2011a; 2012t; Altman pers. comm. 2013a.

Average Fledge Rate at Ocracoke Inlet = 0.00.

TABLE 11: PIPING PLOVER HATCHING AND FLEDGING SUCCESS AT PORTSMOUTH FLATS, 1997–2012

Year	# Nests	# Eggs	Nests Hatched		Eggs Hatched		Chicks Fledged		Fledge Rate (Chicks/pair)
			#	%	#	%	#	%	
1997	19	59	8	42.1	22	37.3	2	10.0	0.12
1998	16	33	7	44.0	18	55.0	7	39.0	0.47
1999	10	31	5	50.0	14	45.2	1	7.1	0.11
2000	13	47	8	62.0	25	53.2	1	4.0	0.09
2001	11	35	3	27.3	11	31.4	0	0.0	0.00
2002	12	36	7	58.3	21	58.3	0	0.0	0.00
2003	8	27	2	25.0	4	15.0	0	0.0	0.00
2004	4	13	2	50.0	8	62.0	1	13.0	0.25
2005	7	27	4	57.1	13	48.1	4	31.0	0.67
2006	8	25 ^a	6	75.0	17	68.0	5	29.4	0.63
2007	20	54	7	35.0	17	31.5	4	23.5	0.30
2008	16	51	7	43.8	21	41.2	1	4.8	0.07
2009	15	42	7	46.7	21	50.0	14	66.7	1.17
2010	15	55	12	80.0	39	71.0	10	25.6	0.77
2011	14	50 ^b	12	86.0	36	72.0	13	36.1	1.08
2012	25	77	10	40	33	43	2	6.1	0.11

Sources: NPS 1997a, 1998b, 1999a, 2000c, 2001b, 2002b, 2003a, 2004c, 2005a, 2006f, 2007i, 2008c, 2009a, 2010b, 2011a; 2012t; Altman pers. comm. 2013a.

Average Fledge Rate at Portsmouth Flats = 0.37.

^a Assumes 1 egg from brood whose nest was not found.

^b Assumes 2 eggs from a two nests with unknown clutch sizes.

TABLE 12: PIPING PLOVER HATCHING AND FLEDGING SUCCESS AT KATHRYN-JANE FLATS, 1997–2012

Year	# Nests	# Eggs	Nests Hatched		Eggs Hatched		Chicks Fledged		Fledge Rate (chicks/pair)
			#	%	#	%	#	%	
1997	9	34	8	80.0	23	68.0	3	13.0	0.30
1998	12	21	5	42.0	9	43.0	3	33.3	0.40
1999	1	3	0	0.0	0	0.0	0	0.0	0.00
2000	1	4	1	100.0	3	75.0	3	100.0	3.00
2001	2	6	1	50.0	2	33.3	2	100.0	2.00
2002	2	7	2	100.0	7	100.0	2	29.0	1.00
2003	2	8	1	50.0	4	50.0	0	0.0	0.00
2004	1	4	1	100.0	4	100.0	2	50.0	2.00
2005	3	7	2	66.7	6	85.7	1	16.7	0.50
2006	1	3	1	100.0	3	100.0	1	33.3	1.00
2007	4	10*	2	50.0	7	70.0	0	0.0	0.00
2008	0	0	0	0	0	0.0	0	0.0	0.00
2009	1	2	0	0.0	0	0.0	0	0.0	0.00
2010	0	0	0	0.0	0	0.0	0	0.0	0.00
2011	0	0	0	0.0	0	0.0	0	0.0	0.00
2012	0	0	0	0	0	0	0	0	0.00

Sources: NPS 1997a, 1998b, 1999a, 2000c, 2001b, 2002b, 2003a, 2004c, 2005a, 2006f, 2007i, 2008c, 2009a, 2010b, 2011a, 2012t; Altman pers.comm. 2013a.

Average Fledge Rate at Kathryn-Jane Flats = 0.64.

*Clutch size unknown for one nest.

TABLE 13: PIPING PLOVER HATCHING AND FLEDGING SUCCESS AT OLD DRUM INLET, 1997–2012

Year	# Nests	# Eggs	Nests Hatched		Eggs Hatched		Chicks Fledged		Fledge Rate (chicks/pair)
			#	%	#	%	#	%	
1997	2	7	1	50.0	4	57.1	1	25.0	1.00
1998	1	3	0	0.0	0	0.0	0	0.0	0.00
1999	0	0	0	0.0	0	0.0	0	0.0	0.00
2000	0	0	0	0.0	0	0.0	0	0.0	0.00
2001	0	0	0	0.0	0	0.0	0	0.0	0.00
2002	0	0	0	0.0	0	0.0	0	0.0	0.00
2003	0	0	0	0.0	0	0.0	0	0.0	0.00
2004	0	0	0	0.0	0	0.0	0	0.0	0.00
2005	0	0	0	0.0	0	0.0	0	0.0	0.00
2006	0	0	0	0.0	0	0.0	0	0.0	0.00
2007	0	0	0	0.0	0	0.0	0	0.0	0.00
2008	1	4	1	100.0	3	75.0	1	33.3	0.50
2009	5	18	3	60.0	9	50.0	1	11.1	0.33
2010	10	33	5	50.0	9	27.3	1	11.1	0.17
2011	9	32	7	77.8	23	72.0	11	47.8	1.38
2012	9	30	3	33.3	8	44.0	6	75.0	0.75

Sources: NPS 1997a, 1998b, 1999a, 2000c, 2001b, 2002b, 2003a, 2004c, 2005a, 2006f, 2007i, 2008c, 2009a, 2010b, 2011a, 2012t; Altman pers. comm. 2013a.

Average Fledge Rate at Old Drum Inlet = 0.26.

TABLE 14: PIPING PLOVER HATCHING AND FLEDGING SUCCESS AT NEW DRUM INLET (NORTH CORE BANKS), 1997–2012

Year	# Nests	# Eggs	Nests Hatched		Eggs Hatched		Chicks Fledged		Fledge Rate (chicks/pair)
			#	%	#	%	#	%	
1997	4	10	2	50.0	6	60.0	0	0.0	0.00
1998	3	at least 7	2	67.0	at least 3	43.0	0	0.0	0.00
1999	2	8	0	0.0	0	0.0	0	0.0	0.00
2000	1	3	1	100.0	–	–	–	–	–
2001	2	8	1	50.0	1 ^a	12.5	–	–	–
2002	2	7	1	50.0	3	43.0	1	3.33	0.50
2003	2	8	1	50.0	4	50.0	1	25.0	0.50
2004	2	5 ^b	2	100.0	5 ^b	100.0	2	40.0	1.00
2005	3	10	3	100.0	7	70.0	0	0.0	0.00
2006	4	13	3	75.0	8	61.5	1	12.5	0.33
2007	5	17	3	60.0	8	47.0	0	0.0	0.00
2008	8	20	4	50.0	13	65.0	0	0.0	0.00
2009	5	19	4	80.0	15	79.0	5	33.3	1.00
2010	9	36	7	77.8	21	58.3	13	62.0	1.63
2011	9	30	7	77.8	24	80.0	9	37.5	1.13
2012	14	39	10	71.4	21	53.8	10	71	1.0

Sources: NPS 1997a, 1998b, 1999a, 2000c, 2001b, 2002b, 2003a, 2004c, 2005a, 2006f, 2007i, 2008c, 2009a, 2010b, 2011a; 2012t; Altman pers. comm. 2013a.

Average Fledge Rate at New Drum Inlet = 0.50. This excludes 2 years with unknown fledge rates.

^a Assumes 1 egg hatched.

^b Assumes 1 egg from brood whose nest was not found.

– = Data not available.

TABLE 15: PIPING PLOVER HATCHING AND FLEDGING SUCCESS AT OPHELIA ISLAND, 1997–2012

Year	# Nests	# Eggs	Nests Hatched		Eggs Hatched		Chicks Fledged		Fledge Rate (chicks/pair)
			#	%	#	%	#	%	
1997	4	—	3	—	—	—	1	—	0.50
1998	4	15	3	75.0	12	80.0	0	0.0	0.00
1999	5	12	1	20.0	2	17.0	1	50.0	0.33
2000	2	7	2	100.0	7	100.0	1	14.3	0.50
2001	3	11	3	100.0	10	91.0	3	30.0	1.00
2002	3	12	3	100.0	12	100.0	1	8.3	0.50
2003	2	8	2	100.0	7	88.0	3	43.0	1.50
2004	2	8	2	100.0	8	100.0	1	12.5	0.50
2005	2	5	1	50.0	2	40.0	1	50.0	0.50
2006	3	12	2	66.7	7	58.3	4	57.1	2.00
2007	2	5 ^a	2	100.0	3	60.0 ^a	1	33.3	0.50
2008	3	6 ^b	1	33.3	1 ^b	16.7	0	0.0	0.00
2009	1	3 ^c	1	100.0	3	100.0 ^c	1	33.3	0.50
2010	3	7	3	100.0	4	57.1	3	75.0	1.50
2011	2	6	2	100.0	3	50.0	2	66.7	1.00
2012	6	19	3	50.0	8	50.0	4	50.0	0.80

Sources: NPS 1997a, 1998b, 1999a, 2000c, 2001b, 2002b, 2003a, 2004c, 2005a, 2006f, 2007i, 2008c, 2009a, 2010b, 2011a; 2012t; Altman pers. comm. 2013a.

Average Fledge Rate at Ophelia Island = 0.73.

^a Assumes 2 eggs for clutch size from brood whose nest was not found.

^b Clutch size unknown for one nest, but one chick was found.

^c Assumes 3 eggs for clutch size from brood whose nest was missed.

— = Data not available.

TABLE 16: PIPING PLOVER HATCHING AND FLEDGING SUCCESS AT PLOVER INLET, 1997–2012

Year	# Nests	# Eggs	Nests Hatched		Eggs Hatched		Chicks Fledged		Fledge Rate (chicks/pair)
			#	%	#	%	#	%	
1997	1	—	0	0.0	0	0.0	0	0.0	0.00
1998	1	3	1	100.0	3	100.0	1	33.3	1.00
1999	1	3	1	100.0	3	100.0	0	0.0	0.00
2000	1	4	1	100.0	4	100.0	3	75.0	3.00
2001	1	4	0	0.0	0	0.0	0	0.0	0.00
2002	1	3	0	0.0	0	0.0	0	0.0	0.00
2003	1	4	1	100.0	4	100.0	1	25.0	1.00
2004	4	15	4	100.0	12	80.0	6	50.0	1.50
2005	10	37	8	80.0	24	65.0	15	62.5	1.88
2006	17	65 ^a	14	82.4	48 ^a	74.0	17	35.4	1.13
2007	24	79	13	54.2	41	52.0	5	12.2	0.30
2008	23	76 ^{b, c}	14	61.0	39	51.3	7	18.0	0.40
2009	14	49	7	50.0	35	71.4	9	25.7	0.82
2010	17	58	4	23.5	15	26.0	3	20.0	0.27
2011	10	31	5	50.0	13	42.0	2	15.4	0.25
2012	10	35	8	80.0	25	80.0	7	28.0	0.88

Sources: NPS 1997a, 1998b, 1999a, 2000c, 2001b, 2002b, 2003a, 2004c, 2005a, 2006f, 2007i, 2008c, 2009a, 2010b, 2011a; 2012t; Altman pers. comm. 2013a.

Average Fledge Rate at Plover Inlet = 0.78

^a Assumes 4 eggs from brood whose nest was not found.

^b Assumes 1 egg from a nest with unknown clutch size.

^c Assumes 2 eggs from a nest with unknown clutch size.

— = Data not available.

TABLE 17: PIPING PLOVER HATCHING AND FLEDGING SUCCESS AT THE POINT OF CAPE LOOKOUT, 1999–2012

Year	# Nests	# Eggs	Nests Hatched		Eggs Hatched		Chicks Fledged		Fledge Rate (chicks/pair)
			#	%	#	%	#	%	
1999	1	3	1	100.0	1	33.3	0	0.0	0.00
2000	0	0	0	0.0	0	0.0	0	0.0	0.00
2001	0	0	0	0.0	0	0.0	0	0.0	0.00
2002	0	0	0	0.0	0	0.0	0	0.0	0.00
2003	0	0	0	0.0	0	0.0	0	0.0	0.00
2004	0	0	0	0.0	0	0.0	0	0.0	0.00
2005	4	13	4	100.0	11	85.0	2	18.2	0.50
2006	3	9	2	67.0	6	67.0	0	0.0	0.00
2007	2	7	2	100.0	4	57.1	1	25.0	0.50
2008	5	17	3	60.0	9	53.0	0	0.0	0.00
2009	2	8	2	100.0	8	100.0	0	0.0	0.00
2010	3	12	2	67.0	8	66.7	1	12.5	0.50
2011	1	4	1	100.0	2	50.0	0	0.0	0.00
2012	0	0	0	0	0	0	0	0	0

Sources: NPS 1999a, 2000c, 2001b, 2002b, 2003a, 2004c, 2005a, 2006f, 2007i, 2008c, 2009a, 2010b, 2011a; 2012t.

Average Fledge Rate at the point of Cape Lookout = 0.11.

TABLE 18: PIPING PLOVER HATCHING AND FLEDGING SUCCESS AT POWER SQUADRON SPIT, 1997–2012

Year	# Nests	# Eggs	Nests Hatched		Eggs Hatched		Chicks Fledged		Fledge Rate (chicks/pair)
			#	%	#	%	#	%	
1997	0	0	0	0.0	0	0.0	0	0.0	0.00
1998	2	7	2	100.0	3	43.0	0	0.0	0.00
1999	2	6	1	50.0	3	50.0	0	0.0	0.00
2000	0	0	0	0.0	0	0.0	0	0.0	0.00
2001	0	0	0	0.0	0	0.0	0	0.0	0.00
2002	0	0	0	0.0	0	0.0	0	0.0	0.00
2003	0	0	0	0.0	0	0.0	0	0.0	0.00
2004	0	0	0	0.0	0	0.0	0	0.0	0.00
2005	1	3	1	100.0	3	100.0	0	0.0	0.00
2006	1	3	1	100.0	3	100.0	1	33.3	1.00
2007	1	2	0	0.0	0	0.0	0	0.0	0.00
2008	1	3	1	100.0	2	66.7	0	0.0	0.00
2009	2	7	0	0.0	0	0.0	0	0.0	0.00
2010	1	3	1	100.0	2	66.7	0	0.0	0.00
2011	2	4	0	0.0	0	0.0	0	0.0	0.00
2012	0	0	0	0	0	0	0	0	0

Sources: NPS 1997a, 1998b, 1999a, 2000c, 2001b, 2002b, 2003a, 2004c, 2005a, 2006f, 2007i, 2008c, 2009a, 2010b, 2011a; 2012t.

Average Fledge Rate at Power Squadron Spit = 0.06.

TABLE 19: PIPING PLOVER HATCHING AND FLEDGING SUCCESS AT SHACKLEFORD BANKS, 2005–2012

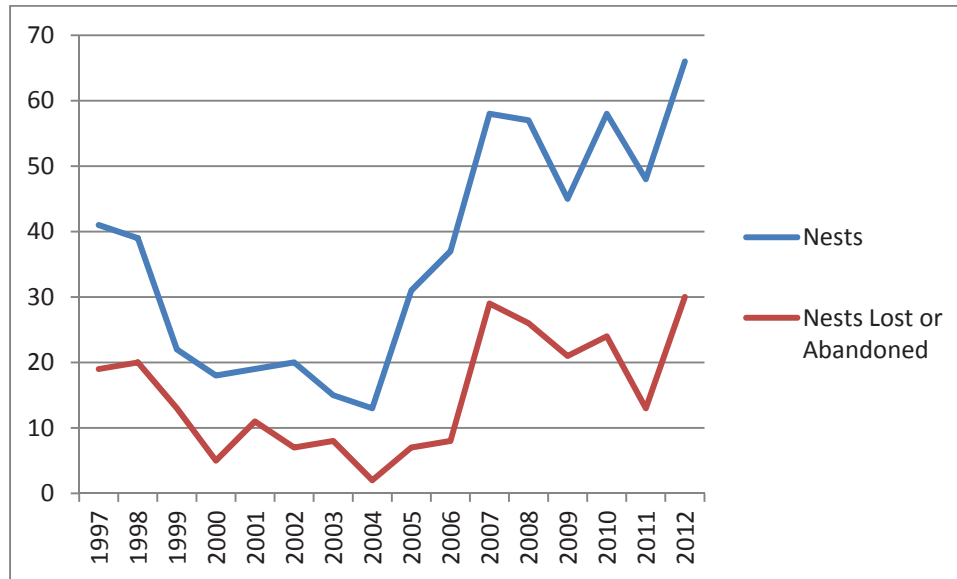
Year	# Nests	# Eggs	Nests Hatched		Eggs Hatched		Chicks Fledged		Fledge Rate (chicks/pair)
			#	%	#	%	#	%	
2005	1	3	1	100.0	3	100.0	0	0.0	0.00
2006	0	0	0	0.0	0	0.0	0	0.0	0.00
2007	0	0	0	0.0	0	0.0	0	0.0	0.00
2008	0	0	0	0.0	0	0.0	0	0.0	0.00
2009	0	0	0	0.0	0	0.0	0	0.0	0.00
2010	0	0	0	0.0	0	0.0	0	0.0	0.00
2011	0	0	0	0.0	0	0.0	0	0.0	0.00
2012	0	0	0	0	0	0	0	0	0.00

Sources: NPS 2005a, 2006f, 2007i, 2008c, 2009a, 2010f, 2011a, 2012t.

Average Fledge Rate at Shackleford Banks = 0.00.

Nest Loss/Abandonment

Nest loss and abandonment has had a severe impact on piping plover reproduction at the Seashore. In the 14 seasons from 1997 to 2012, 41.4 percent of nests (of 587 discovered) were lost or abandoned (figure 14). Factors contributing to nest loss and abandonment include weather, predation, and human disturbance, which are discussed in detail under the “Risk Factors” section later on in this chapter.



Sources: NPS 1997a, 1998b, 1999a, 2000c, 2001b, 2002b, 2003a, 2004c, 2005a, 2006f, 2007i, 2008c, 2009a 2010b, 2011a; 2012t.

FIGURE 14: PIPING PLOVER NEST LOST / ABANDONMENT AT CAPE LOOKOUT NATIONAL SEASHORE, 1997–2012

Nonbreeding Population

In addition to supporting a local breeding population, the Seashore also hosts migrating and overwintering piping plovers from all three of the North American breeding populations (the threatened Atlantic Coast and Great Plains populations and the endangered Great Lakes population). The Seashore is an important migration stopover and wintering area for the piping plover along the Atlantic Coast (NPS 2007i; NPCA 2003). In past years, the area from south of Old Drum Inlet to the north side of Ophelia Inlet was an important migratory stop for piping plovers (NPS 2006f). The 3 mile by 1.5-mile expanse of sand and mud at Portsmouth Flats also provides an ideal migratory stop for this species (National Audubon Society 2009). Fall migrants begin arriving at the Seashore in July, peak in August and September, and most leave wintering grounds by November with some departing as late as February (table 20) (USFWS 2008b; Dinsmore, Collazo, and Walters 1998). The distribution and abundance of nonbreeding populations at the Seashore are not documented as well as the local breeding population. Documenting and protecting nonbreeding piping plovers and their habitats are priorities articulated in the recovery plans for all three North American breeding populations (USFWS 1988, 1996a, 2003a). As previously stated, critical habitat for the wintering piping plover population is designated within the Seashore on the south and north ends of both South Core Banks and North Core Banks, and on the east and west ends of Shackleford Banks (NPS 2006d).

Wintering piping plovers on the Atlantic Coast select wide beaches in the vicinity of inlets that are associated with a high percentage of moist substrate habitat (Nicholls and Baldassarre 1990a; Wilkinson and Spinks 1994). Because tidal regimes and fall and winter storm patterns often cause piping plovers to

move among habitat patches, a diversity of habitat patches may be important to wintering populations (Burger 1994; Nicholls and Baldassarre 1990b).

From 2000 to 2012, the greatest number of nonbreeding piping plovers at the Seashore occurred during the fall migration, which begins in July and peaks between August and September. The fall migration counts were highest overall at North Core Banks, followed by South Core Banks, and then Shackleford Banks (table 20). In 2009, on North Core Banks 83 nonnesting piping plovers were counted in August, and 144 in September. These counts represent the highest numbers recorded in the Seashore since counts began in 2000. In addition, 16 banded piping plovers from the endangered Great Lakes population were seen again in 2009 (NPS 2009a). In 2012, on North Core Banks 82 nonnesting piping plovers were counted in August, and 112 in September (NPS 2012t).

TABLE 20: SELECT MONTHLY MEAN AND MAXIMUM NONBREEDING BIRDS SEEN DURING DAILY SURVEY DURING FALL, WINTER, AND SPRING, SELECTED SITES AT CAPE LOOKOUT NATIONAL SEASHORE, 2000–2012

	Month	North Core Banks	South Core Banks	Shackleford Banks	All Sites
Mean*	August	56	24	6	86
	September	56	17	9	80
	October	24	10	13	47
	November	13	7	12	32
	December ^b	9	8	12	29
	January ^c	9	6	12	27
	February ^d	4 ^c	5	11	20
	March ^d	16 ^e	8	15 ^f	37
Maximum	August	125	46	17	152
	September	144	33 ^a	20 ^a	187
	October	40	26	22	63
	November	27	19	22	47
	December ^b	18	20	29	63
	January ^c	26	18	27	45
	February ^d	15 ^c	15	24	46
	March ^d	43 ^e	21	29	69

Sources: NPS 2000c, 2001b, 2002b, 2003a, 2004c, 2005a, 2006f, 2007i, 2008c, 2009a, 2010b, 2011a, 2012t.

*Value rounded to nearest whole number.

^a 2003 estimate is unknown.

^b Limited to 2005, 2007, 2008, and 2009 data.

^c Excluding data from 2000 and 2007.

^d Excluding data from 2007.

^e 2001 estimate is unknown.

^f 2012 estimate is unknown.

The first banded winter residents usually appear in August; however, other wintering birds may arrive in July. The size of the resident wintering population on the Atlantic Coast is not precisely known, but as of 2005 was estimated to be on the order of 20–35 birds (Cohen 2005a). Between 2002 and 2004, the highest counts of wintering birds in the park were on the northern end of North Core Banks, with a regularly high number of piping plovers from Ocracoke Inlet to Mile 3 (NPS 2002b, 2003a, 2004c).

NPS staff documented piping plover use of the Seashore throughout 2007. Migratory birds peaked in August with a high count of 55 on August 21, 2007, at Ocracoke Inlet (table 21). To investigate the movement of birds through this area, counts were made twice a week with a total of ten surveys conducted from August through September. On average, 37 birds were counted in the area south of Ocracoke Inlet. During high tide, the number of birds found on the North Core Banks side was lowest (table 21) (NPS 2007i).

TABLE 21: COUNTS OF PIPING PLOVER NEAR OCRACOCKE INLET DURING FALL MIGRATION, 2007

Date	Number of Piping Plovers	Tide
August 15, 2007	43	Mid+
August 19, 2007	22	Mid+
August 21, 2007	55	Low
August 28, 2007	51	Low+
September 4, 2007	40	Low+
September 7, 2007	29	Low
September 11, 2007	49	Low
September 15, 2007	25	High
September 21, 2007	27	Low
September 25, 2007	15	Low

Source: NPS 2007i.

The importance of protecting nonbreeding piping plovers was demonstrated in a research program by the Canadian Wildlife Service between 1998 and 2003, which primarily tracked migration patterns and survival rates of the Eastern Canada population of piping plovers. Individuals from this population were identified migrating and wintering at points along the east coast of the United States, including North Carolina (Amirault et al. 2006). The analysis of this research identified adult survival as the single most important factor influencing the population trends of this piping plover population and that expanding protection of nonbreeding habitat was an important factor in the recovery of the species (Amirault et al. 2006).

Risk Factors

Small populations such as the Atlantic Coast piping plover populations face a heightened risk of extinction compared to large populations because they are more vulnerable to the following: (1) random environmental variations, such as storms; (2) reduction in genetic variations that limit a species' ability to adapt to local conditions; (3) sudden, random drops in birth and death rates; and (4) an impaired ability to find suitable mates (Lande 1988).

Given the vulnerability of the small piping plover populations in North America to random events, the persistence of the populations will depend increasingly on controlling sources of mortality to adults, eggs, and chicks throughout their range. Predators, human disturbance, and limited or blocked access to foraging habitat have been identified in past research as contributing to impaired reproductive success for plovers using the Seashore (Coutu et al. 1990; Kuklinski, Houghton, and Fraser 1996). Thus, providing a disturbance-free environment early in the season may help piping plovers to establish territories and attract mates (Cohen 2005b).

The greatest concerns related to wintering and migrating birds are habitat loss and degradation from development and beach stabilization and chronic human disturbance. In the past, surveys for migrating and wintering piping plovers along North Carolina's coast were conducted sporadically and numbers were not well documented. Since then the state has made great strides with respect to nonbreeding piping plover monitoring, but there is still much unknown regarding the nonbreeding birds in the state and the threats that they face (Cameron et al. 2005). It is known, however, that piping plover foraging and roosting habitats at the Seashore are used by pedestrians and ORVs outside of the breeding season. Where such activity is allowed, studies conducted at several beaches in Massachusetts and New York have shown that there is the potential for piping plovers to be run over by ORVs and killed (Melvin et al. 1994) or taken by domestic pets. Studies along the Atlantic and gulf coasts have shown that the density of wintering plovers is higher in areas with limited human presence or disturbance (Cohen et al. 2008; Nicholls and Baldassarre 1990b). Furthermore, disturbance to roosting and foraging birds by ORVs, unleashed pets, and pedestrians may reduce foraging efficiency or alter habitat use, thereby increasing the risk of nutritional or thermal stress (Zonick 2000).

Weather and Tides—Eleven named hurricanes affected the Seashore between 1993 and 2012 (NOAA 2012). Hurricane Isabel, which hit the coast in September 2003, resulted in renewed piping plover habitat on portions of the Seashore and may have resulted in a reduction in predator populations (NCWRC 2008a). In the years immediately following the storm, piping plover numbers and productivity increased. However, there have been no significant storms since that time, and much of the created habitat is now deteriorating due to revegetation (NCWRC 2008a). In May of 2005 a Nor'easter flooded nesting areas causing ephemeral pools at the point of Cape Lookout and Power Squadron Spit on South Core Banks, and Mile 49.8 on Shackleford Banks. The storm created sites attractive to nesting plovers, and for the first time in many years piping plovers nested at these areas. Piping plover numbers more than doubled and productivity increased in response to the changes (NPS 2005a). There were no significant weather events such as hurricanes or tropical storms during the 2006 breeding season. In 2007, the New Drum Inlet area yielded poor habitat quality due to revegetation after Hurricane Isabel in 2003. A total of 28 nests at Cape Lookout were either lost to weather, predation, or abandonment during the 2007 breeding season. Nests 1 and 2 at North Core Banks and five nests at South Core Banks were lost to a storm at the beginning of May. Tropical Storm Barry caused the loss of Nest 4 at Middle Core Banks on June 7. Two other nests (Nests 23 and 26) were lost at South Core Banks due to a swell and tide on June 16 (NPS 2007i). In 2008, no nesting occurred at Kathryn-Jane Flats due to heavy revegetation. Up to that year, this area supported piping plover nesting pairs since monitoring began in 1989. A total of 20 nests were either lost to weather, predation, or abandonment during the 2008 breeding season (NPS 2008c). In 2009, the heavily revegetated Kathryn-Jane Flats attracted one nesting pair. There were ten weather related nest losses, which accounted for 48 percent of total losses in the Seashore. These weather losses were primarily related to strong winds in May that buried nests in sand or flooded nests (NPS 2009a). In late August 2011, after the breeding season had finished, Hurricane Irene reopened Old Drum and New Drum Inlets, cutting channels and causing severe erosion at piping plover nesting sites. After that event, much of the 2011 nesting sites were currently exposed only at low tides. On the north end of South Core Banks, erosion from Hurricane Irene removed 0.3 mile of island off the north tip making Ophelia Inlet much wider. That section supported 4 pairs in the breeding season before the storm. The remaining nesting habitat is much improved after the storm. The storm surge and overwash removed most of the vegetation, created big sand flats, created ponds and mudflats. This high quality nesting habitat from Old Drum to Plover Inlet contained 63 percent (26 pairs) of the nesting pairs in 2011 and 61 percent (31 pairs) of the nesting pairs in 2012 (NPS 2011a, NPS 2012t). Hurricane Sandy in late 2012 also scoured the habitat and maintained good conditions for nesting. This high quality nesting habitat from Old Drum to Plover Inlet contained 71 percent (32 pairs) of the nesting pairs in 2013 (NPS 2013l). Hurricanes and other ocean storms can lead to unusually high tides, and subsequent flooding can overwash piping plover nests (Cohen 2005a). In May 2008, Nests 7, 10, and 12 were lost to storm tides at South Core Banks (NPS 2008c). In 2009, five nests were flooded by high tides in North Core and South Core Banks (NPS 2009a).

Some piping plovers that nest too close to mean high tide may lose their nests on normal high tides (Cohen 2005a). Storms can also result in widespread mortality of chicks (Houghton 2005). Besides these direct effects of storms on piping plover nests, flooding from extreme high tides or storm surges may alter habitat enough to render it unsuitable for nesting. This may lead to the abandonment of habitat within or between breeding seasons (Haig and Oring 1988). In 2012, 10 nest losses were attributed to storms (NPS 2012t).

Predation—Predation, especially by mammalian predators, continues to be a major factor affecting the reproductive success of the piping plover (Elliott-Smith and Haig 2004). Predators of eggs, chicks, and/or adults include such predators as mink (*Mustela vison*), gray fox (*Urocyon cinereoargenteus*), red fox (*Vulpes vulpes*), coyote (*Canus latrans*), opossum (*Didelphus virginiana*), raccoon (*Procyon lotor*), domestic dogs (*Canis lupus familiaris*), feral and domestic cats (*Felis catus*), crows (*Corvus brachyrhynchos*), gulls (*Larus* spp.), and birds of prey (Murphy et al. 2003; Patterson, Fraser, and Roggenbuck 1990; NPS 2007i). The impact of predation has been postulated to be greater on beaches with high human use, because the presence of pets and trash (which may attract wild predators) is correlated with the presence of humans (USFWS 1996a). In addition to causing direct mortality, predators in piping plover habitat can also lead to piping plovers' abandoning territories within and between breeding seasons (Cohen 2005b). Table 22 details recorded predation since 2005.

TABLE 22: PIPING PLOVER PREDATION, 2005–2012

Year	Noted Signs of Predation
2005	One chick was killed by a gull-billed tern (<i>Gelochelidon nilotica</i>) at Kathryn-Jane Flats. One nest site at Portsmouth Flats was abandoned with cat tracks found around the nest enclosure (NPS 2005a).
2006	Predator closures were relatively effective. Four nests lost to ghost crab (<i>Ocypode quadrata</i>) predation and two others thought to have been lost to predation (predator unknown) (NPS 2006f).
2007	Mink was documented on South Core Banks, a new predator in this area. Red fox was documented on North Core Banks, a new predator in this area. Feral cat tracks were also observed at North Core Banks, and the presence of a bobcat (<i>Lynx rufus</i>) and coyote were also reported in that area (NPS 2007i).
2008	Two plover nests lost at Ophelia Island and one nest at Middle Core Banks by raccoon predation. Another two nests at South Core Banks were lost with raccoon tracks located nearby (NPS 2008c). Ghost crabs, mink, grackles (<i>Quiscalus</i> spp.), and feral cats also documented within many of the piping plover breeding territories (NPS 2008c).
2009	80% of the nests in the Seashore were protected by exclosures. Of the nine nests that were not protected, two were lost to raccoon predation (NPS 2009a).
2010	Evidence of mink predation observed on eight nests at Plover Inlet (mile marker 23 to 24) on South Core Banks. Raccoon took one nest on North Core Banks (NPS 2010b).
2011	71% of the nests in the Seashore were protected by exclosures. Of the 14 nests that were not protected by exclosures in 2011, two were lost to raccoon predation and one was lost to mink predation (NPS 2011a).
2012	40% of the nests in the Seashore were protected by exclosures. Of the 39 nests that were not protected by exclosures in 2012, four were lost to raccoon predation and three were lost to ghost crab predation, with 11 lost for unknown reasons (NPS 2012t).

In an effort to reduce depredation of piping plover eggs and chicks, 44 raccoons and two feral cats were relocated from Portsmouth Flats, Kathryn-Jane Flats, and New Drum Inlet in 2002 (NPS 2002b). In the spring of 2007, a study began at South Core Banks regarding predator/raccoon population (NPS 2007i). In December 2008, 83 raccoons were removed from South Core Banks as an experimental removal effort. In an attempt to remove 50 percent of the raccoon population by April, another removal effort took place in the spring of 2009 (NPS 2008a; NPS 2009a).

Ghost crabs have occasionally been implicated in the loss of nests (Watts and Bradshaw 1995) and chicks (Loefering, Fraser, and Loefering 1995). Research on ghost crabs conducted in the lab and at a breeding site at Assateague Island in Virginia suggests that crab predation is generally uncommon. However, this study indicated that the presence of ghost crabs could have more of an indirect effect on plover survival. For example, adult plovers may shepherd their broods away from the foreshore, where the best forage normally exists, due to the abundance of ghost crabs at that location (Wolcott and Wolcott 1999). Poor forage was found to be a more likely contributor to chick mortality than predation by ghost crabs (Wolcott and Wolcott 1999). However, anecdotal records indicate that ghost crabs may be more of a problem in North Carolina than at sites farther north (Cohen 2005a). Between 1997 and 2005, at least 20 protected nests lost eggs to ghost crabs (NPS 2005a). During the 2008 season, approximately eight nests were lost to ghost crab predation, six of which were protected by predator exclosures (NPS 2008c). In 2009, one of the 36 nests that were protected by exclosures was lost to ghost crab predation. Of the nine that were not protected, two were lost to ghost crab predation (NPS 2009a). In 2010, a total of three nests were lost to ghost crab predation; one of the three nests lost was protected by a predator exclosure (NPS 2010b). In 2011, predator exclosures were not used on 14 nests; of these 3 were lost to ghost crabs (NPS 2011a). In 2012, predator exclosures were not used on 39 of the 66 nests; four nests were lost to raccoons, three were lost to ghost crabs, and 11 were lost for unknown reasons (NPS 2012t).

Human Activity—Human disturbance, both direct and indirect, can adversely affect piping plovers at the Seashore. Research has shown that plover behavior is altered by the presence of humans, which ultimately results in chicks exhibiting less time feeding, brooding, and conserving energy; adults also spend less time foraging and conserving energy (Burger 1991, 1994). Plovers that are subject to disturbance from human presence spend less than 50 percent of their foraging time searching for prey and feeding, where undisturbed plovers can spend up to 90 percent of that time feeding (Burger 1994). These human-caused behavioral changes resulted in depleted energy reserves, which could leave chicks more susceptible to predation or other stresses (Flemming et al. 1988; Loefering and Fraser 1995). At other sites, it was documented that fledging success did not differ between areas with and without recreational ORV use (Patterson, Fraser, and Roggenbuck 1991) although pedestrians caused a decrease in brood-foraging behavior in New Jersey (Burger 1994).

Studies in areas outside of the Seashore have shown that pedestrian and nonmotorized recreational activities can be a source of both direct mortality and harassment of piping plovers. Potential pedestrians on the beach include those individuals driving and subsequently parking on the beach, those originating from off-beach parking areas (hotels, motels, commercial facilities, beachside parks, etc.), and those from beachfront and nearby residences. Vehicle impacts can extend to remote stretches of beach where human disturbance would be very slight if access were limited to pedestrians only (USFWS 1996a).

Even with resource closures in place, protected species are still at risk. Park visitors do not always adhere to posted closures for bird nesting, and many violations occur every year at the Seashore. Law enforcement rangers issued eight citations for pedestrian in bird areas and nine citations for vehicles in bird areas in 2012. In addition, 35 dog off leash citations, 12 written warnings, and 118 verbal warnings were issued in 2012 (NPS 2012t).

Research in areas outside of the Seashore show that disturbance from vehicles, pedestrians, and pets can cause incubating birds to be flushed from their nests. Flushing can affect plover behavior and viability in a number of ways. Flushing of incubating plovers from nests can expose eggs to avian predators or excessive temperatures. Repeated exposure of eggs to direct sunlight on hot days can cause overheating, which could kill avian embryos (Bergstrom 1989). In Texas, piping plovers avoided foraging on sand flats close to areas of high human use (Drake et al. 2001). Zonick (2000) found that the number of piping plovers was lower on disturbed bayside flats than on undisturbed flats, and piping plovers experienced lower foraging efficiency when disturbed. Other unpublished data support the assertion that winter habitat selection is negatively correlated with human activities and development (Houghton 2005). In New York, the response of incubating adults to the presence of humans near the nest was found to be highly variable, and average nest success was unrelated to the number of disturbance sources observed within 328 feet (100 meters) of nests (Houghton 2005). Other studies in other areas on the effect of human disturbance on incubating piping plovers documented highly variable flushing distances ranging anywhere between 66 to 656 feet (20 and 200 meters) (USFWS 1996a). However, piping plovers may be more sensitive to disturbance in the Atlantic Coast southern recovery unit, as evidenced by longer flush distances in response to disturbance sources at Assateague Island National Seashore (Loefering 1992). The study on Assateague Island found that on average, incubating plovers flushed from their nests at a distance of 256 feet (78 meters), although some birds flushed when researchers were as far away as 571 feet (174 meters), indicating a much larger flushing distance than was documented by other studies.

Unleashed pets have the potential to flush piping plovers, and these flushing events may be more prolonged than those associated with pedestrians or pedestrians with dogs on leash. For example, a study conducted on Cape Cod, Massachusetts, found that the average distance at which piping plovers were disturbed by pets was 151 feet (46 meters), compared with 75 feet (23 meters) for pedestrians. Birds flushed by pets moved farther (average of 187 feet [57 meters]) than plovers reacting to pedestrians (average of 82 feet [25 meters]). Duration of observed disturbance behaviors stimulated by pets was significantly greater than that caused by pedestrians (USFWS 1996a).

Although there have been no records of piping plovers being run over by vehicles at the Seashore, vehicles have been documented running over nests and chicks on Assateague Island in Virginia and Maryland (Patterson, Fraser, and Roggenbuck 1991). In Massachusetts and New York, biologists found that 18 chicks and 2 adults were killed by vehicles between 1989 and 1993, even on beaches with only five to ten vehicle passes per day (Melvin et al. 1994). Piping plover chicks often move from the foredune area to forage along the wrack line and intertidal zone, which places them in the paths of vehicles. Chicks can end up in or near tire ruts, and sometimes have difficulty crossing or climbing out of them. The normal response of plover chicks to disturbance could increase their vulnerability to vehicles. Chicks sometimes stand motionless or crouch as vehicles approach, and their lack of rapid movement could lead to mortality (USFWS 1996a).

ORV use may also affect the beach through sand displacement and compaction, which may lead to steeper dune profiles (Anders and Leatherman 1987). This, in turn, may prove less suitable for piping plover nesting. Degradation of the wrack line is possible from as little as one vehicle pass (Leatherman and Godfrey 1979), which may negatively impact reproductive success because of loss of important habitat used for foraging plovers. Also, the wrack line is habitat for many beach invertebrates, which are a staple of the plover diet.

Beach and dune renourishment projects can alter the profile of beaches, causing increased erosion and habitat loss (Patterson, Fraser, and Roggenbuck 1990). Following a devastating storm in 1962 that caused severe damage to the east coast, the U.S. Army Corps of Engineers undertook the first congressionally authorized beach nourishment project from Florida to New England. By the late 1980s over 400 miles of U.S. coast had undergone beach nourishment projects. As sea level rises and beaches along the east coast

continue to erode, the frequency of beach nourishment projects is expected to increase in the future (ASMFC 2002). A recent study theorized that beach nourishment projects may negatively impact plover habitat because the resulting dredge spoil is often fine-grained, reducing the availability of pebbles and cobbles, which are a preferred substrate for nesting plovers (Cohen, Wunker, and Fraser 2008). Furthermore, beach stabilization prevents normal storm processes, such as overwash fan formation, thereby leading to long-term loss of moist substrate habitat and to accelerated vegetative succession in potential nesting habitat (Dolan, Godfrey, and Odum 1973). Construction of artificial structures on beaches eliminates breeding territories and may result in an increased level of human disturbance of and predation on remaining pairs (Houghton 2005).

Research, surveying, and even protective management activities can sometimes expose piping plovers to a risk of disturbance at breeding sites. For example, adult birds may be more vulnerable to predation within exclosures (Murphy et al. 2003) depending on the local predator pool and the type of exclosure used. Adults may also abandon exclosed nests more frequently (Elliott-Smith and Haig 2004).

RED KNOT

The red knot is a shorebird that breeds in the Canadian Arctic and is known to visit the eastern seaboard of the United States as a migrant and an occasional winter resident (Harrington 2001). Five subspecies are currently recognized (*Calidris canutus canutus*, *C.c. rufa*, *C.c. islandica*, *C.c. rogersi*, and *C.c. roselaari*) (Harrington 2001). Two of these (*C.c. rufa* and *C.c. roselaari*) are found in the United States but only during migration and in the winter. Southward migration of *C.c. rufa* and *C.c. roselaari* begins in mid-July, with staging occurring along the U.S. Atlantic coasts (Harrington 2001). Only those aspects of the red knot's life pertinent to its management and conservation in North Carolina, the Outer Banks, and the Seashore, are addressed in this section. The red knot is not listed as threatened or endangered by the USFWS, but is a federal candidate species. The red knot does not have special-status in North Carolina.

Emergency Endangered Listing and Taxonomy

On August 1, 2005, in response to the 80 percent decline in red knot population over the past 10 years, leading conservation groups filed an emergency petition asking the USFWS to list the red knot as an endangered species under the ESA. The listing request came from an alliance of wildlife groups, including Defenders of Wildlife, New Jersey Audubon Society, American Bird Conservancy, the National Audubon Society, Delaware Audubon Society, Citizens Campaign for the Environment, Audubon New York, Audubon Maryland-DC, and the Virginia Audubon Council. On September 12, 2006, the USFWS announced that it had designated the red knot as a candidate for ESA protection. On February 27, 2008, conservation groups again petitioned the Department of the Interior to list as endangered the *rufa* subspecies of the red knot, and a broader taxon comprising both the *rufa* subspecies and the *roselaari* subspecies (*Calidris canutus roselaari*). As of September 2013, the red knot was proposed for listing under the ESA (USFWS 2013b).

Another indication of conservation concern for the red knot is the fact that in August of 2004, the U.S. Shorebird Conservation Plan (USFWS 2004a) published its list of United States and Canadian shorebird populations that are considered highly imperiled or of high conservation concern. The Canadian Arctic-Atlantic Coast Population of the red knot was one of eight taxus classified as "highly imperiled." In 2008, the USFWS determined that the ranking for the red knot should be raised from 6 to 3. The species' listing priority dictates the relative order in which proposed listing rules are prepared, with the species at greatest risk (listing priority 1 through 3) being proposed first (USFWS 2007d).

Red Knot in North Carolina and Cape Lookout National Seashore

At Cape Lookout National Seashore in 2012, the majority of birds were located on North Core Banks with an average of 276 birds per count. South Core Banks averaged 130. The Seashore is an important stopover site for the red knot, particularly during springtime. Historically red knot abundance has been higher on North Core Banks (table 23) (NPS 2009b).

TABLE 23: RED KNOT RELATIVE ABUNDANCE ON NORTH CORE BANKS, 1992–2012

Year	Date	Peak Count	Abundance
1992–1993	–	–	34
2006	May 5	618	20
2007	May 15	718	23
2008	April 15	1287	42
2009	May 25	525	14
2010	May 15	927	26
2011	May 15	1012	28
2012	April 25	1370	46

Source: NPS 2012u.

– = Data not available.

Note: The length of North Core Banks varies every year, based on inlets opening and closing.

Description

The red knot is characteristically found along the east coast of the United States, with its greatest population staging on Delaware Bay (Tsipoura and Burger 1999) during migration from the breeding ground in the Canadian Arctic to the Tierra del Fuego region of Chile and Argentina in South America. This subspecies is the subject of the emergency petition described previously.

Males in breeding plumage have a dark red or salmon breast, throat, and flanks, with a white belly. Their crowns and backs are flecked with gray and salmon (Harrington 1996, 2001; Paulson 1993). Female coloration is similar to that of males, but is typically less intense. Nonbreeding plumage is plain gray on the head and back, with light fringes of gray and white along the wings, giving an appearance of a white line running the length of the wing when in flight. The breast is white, mottled with gray, and the belly is dull white. For both male and female, the bill is black (year-round), and the legs are dark gray to black (Harrington 1996, 2001). The average weight of the red knot is 5 ounces (which varies considerably through the year), with a body length between 9 to 10 inches.

Range and Migration

Red knots are found in the Arctic regions of Canada during the breeding season, which is mid-June through mid-August. They winter from November through mid-February primarily in two separate areas in South America – the Tierra del Fuego in Chile and Argentina and in Maranhao, northern Brazil (American Bird Conservancy 2005). Additionally, smaller numbers of red knots winter further northwest in French Guiana and in the coastal, southeastern United States, including North Carolina, the Outer Banks, and the Seashore.

Red knots have one of the longest migration routes of any shorebird. Those individuals that overwinter in southern South America embark on their northern migration in February, with peak numbers leaving Argentina and southern Chile in mid-March through mid-April (Harrington 1996, 2001). The first stopover is along the coast of southern Brazil (Vooren and Chiaradia 1990). Their final stopover is the Delaware Bay. Their southward migration from the Canadian Arctic begins in mid-July. They arrive in South America along the coast of the Guianas in mid to late August (Spaans 1978). From the Guianas, red knots continue to move southward along the Atlantic coastline of South America, and the greater part of the population will continue on to Tierra del Fuego to overwinter (Morrison, Ross, and Niles 2004).

These long-distance migrations can only occur when the birds have access to productive refueling stops, particularly on their northern migrations, which involve fewer stops than the southern migrations. For red knots on the eastern seaboard of the United States, Delaware Bay is the most crucial spring stopover because it is the primary final stop at which the birds can refuel in preparation for their nonstop leg to the Arctic. When they arrive at their final destination, weather conditions can be harsh, and food is scarce. Their fat reserves from the Delaware Bay must sustain them not only during their 1,488-mile (2,400-kilometer) final flight, but also upon arrival in the Arctic until food resources become more plentiful (Baker et al. 2004).

Nonbreeding and Migratory Habitat

Harrington (1996, 2001) describes how, during the winter, the red knot frequents intertidal habitats, notable along ocean coasts and large bays. Both areas usually display high waves or strong currents while supplying a sandy habitat. These areas are selectively chosen in South America, with the most abundant population on the island of Tierra del Fuego in Argentina and Chile (Morrison and Ross 1989).

During migration, the red knot principally uses marine habitats in both North and South America. Coastal habitats along the mouths of bays and estuaries are preferred, providing sandy beaches to forage (Harrington 1996, 2001). High wave energy is associated with these areas (Harrington 2001; Vooren and Chiaradia 1990; Blanco, Goi, and Pugnali 1992). Red knots are also known to use tidal flats in more sheltered bays or lagoons in search of benthic invertebrates or horseshoe crab eggs (Harrington 1996, 2001; Tspoura and Burger 1999). Delaware Bay hosts the largest number of spawning horseshoe crabs in the United States, a primary food source for the red knot. At Delaware Bay, red knots feed and gain weight needed for winter migration. The increasing human harvest of the horseshoe crab has reduced this food source for red knots, and this dearth is believed to be contributing to the red knot's failure to reach its needed threshold departure weight of 6.3 to 7.0 ounces. Hence, there has been a systematic reduction in the body weight of red knots leaving Delaware Bay for the Arctic, which negatively impacts their ability to survive and breed (Baker et al. 2004).

Risk Factors

Red knots are highly vulnerable to degradation of the resources on which they depend to accomplish their migrations. Morrison, Ross, and Niles (2004) has identified four factors that cause this vulnerability: (1) a tendency to concentrate in a limited number of locations during migration and on the wintering grounds so that deleterious changes can affect a large proportion of the population at once; (2) a limited reproductive output, subject to vagaries of weather and predator cycles in the Arctic, which, in conjunction with a long lifespan, suggests slow recovery from population declines; (3) a migration schedule closely timed to seasonally abundant food resources, such as horseshoe crab eggs during spring migration in Delaware Bay (Tspoura and Burger 1999), suggesting that there may be limited flexibility in migration routes or schedules; and (4) occupation and use of coastal wetland habitats that are affected by a wide variety of human activities and developments (Bildstein et al. 1991).

Research by Baker et al. (2004) indicated that if red knot populations continued at the 2004 rate of decline populations would approach extremely low numbers by 2010, and the probability of near-term extinction would be correspondingly higher than it was in 2004. Research by Niles et al. (2005) supports this extinction trajectory. The evidence strongly suggests that the decline of the red knot closely corresponded to the massive increase in the harvesting of the horseshoe crab on the Delaware Bay during the decade preceding 2004.

SEA TURTLES

Sea turtles are large marine reptiles found in subtropical, tropical, and temperate oceans as well as subarctic areas. They spend the majority of their time in ocean waters, with females only coming ashore to nest on sandy beaches. Five of the seven sea turtle species existing in the world today occur in the coastal waters of North Carolina and Cape Lookout National Seashore, and all are listed as either federally threatened or endangered. The species are the loggerhead sea turtle (*Caretta caretta*), the green sea turtle (*Chelonia mydas*), the leatherback sea turtle (*Dermochelys coriacea*), the hawksbill sea turtle (*Eretmochelys imbricata*), and the Kemp's ridley sea turtle (*Lepidochelys kempii*). All but the hawksbill and Kemp's ridley are known to regularly nest at the Seashore. The only occurrences of hawksbill sea turtles at the Seashore were a single dead stranding in 2003 and two dead strandings in 2005 (NPS 2004d, 2006g). Occurrences of Kemp's ridley turtles at the Seashore are mostly from strandings; however, in 2003 and 2012 a single nest was documented each year (NPS 2004d, 2012n).

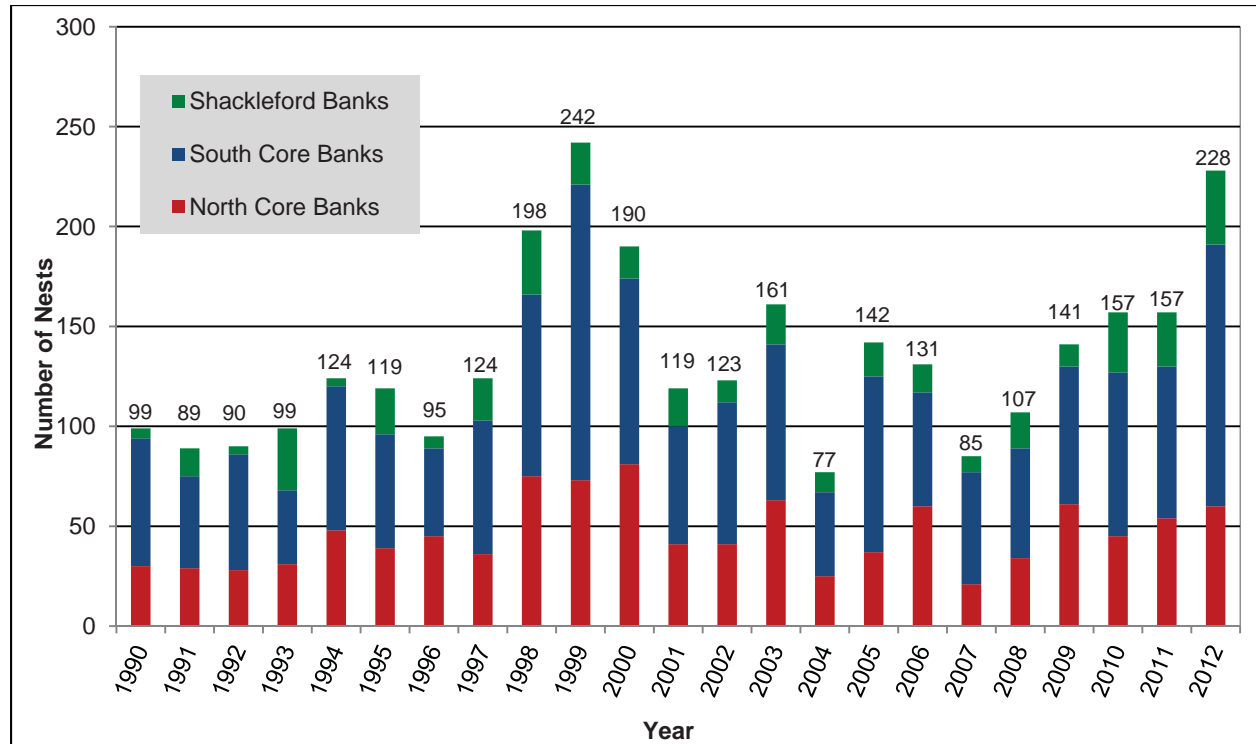
In 1978, the loggerhead turtle was federally listed as threatened throughout its range (FR 2011). In 2010 the National Marine Fisheries Service and the USFWS determined that the loggerhead sea turtle is composed of nine DPS: North Pacific Ocean DPS, South Pacific Ocean DPS, North Indian Ocean DPS, Southeast Indo-Pacific Ocean DPS, Southwest Indian Ocean DPS, Northwest Atlantic Ocean DPS, Northeast Atlantic Ocean DPS, Mediterranean Sea DPS, and the South Atlantic Ocean DPS, and proposed to list them under the Endangered Species Act (FR 2011). In September 2011, the National Marine Fisheries Service and the USFWS listed the North Pacific DPS, South Pacific Ocean DPS, North Indian Ocean DPS, Northeast Atlantic Ocean DPS, and the Mediterranean Sea DPS as endangered, and listed the Southeast Indo-Pacific Ocean DPS, Southwest Indian Ocean, Northwest Atlantic Ocean DPS, and South Atlantic Ocean DPS as threatened (FR 2011). The population of loggerhead sea turtles nesting at Cape Lookout National Seashore is a part of the Northwest Atlantic Ocean DPS, and therefore is listed as threatened. Additionally, in March 2013, the USFWS proposed designating 739.3 miles of loggerhead sea turtle nesting beaches located in the coastal counties of North Carolina, South Carolina, Georgia, Florida, Alabama, and Mississippi as critical habitat; however, the beaches of Cape Lookout National Seashore are not included in this proposed designation (FR 2013a). In 1978, the green turtle was federally listed as threatened, except for the breeding populations in Florida and on the Pacific coast of Mexico, which were listed as endangered (NMFS and USFWS 1991). The leatherback was listed as federally endangered in 1970 (NMFS and USFWS 1992). The green sea turtle and the loggerhead sea turtle are listed as threatened, and the leatherback sea turtle is listed as endangered by the State of North Carolina (NCWRC 2014).

The Seashore began monitoring sea turtles in 1976, and since 1984 the Seashore has conducted daytime monitoring to document strandings, protect nest sites, relocate nests in danger of being flooded, and protect hatchlings. Monitoring procedures changed significantly in 1990 when the Seashore began following the USFWS Index Nesting Beach Program monitoring procedures (NPS 2012n); therefore, only nesting data from 1990 to 2012 is presented in this plan/EIS.

Since 1990, the number of sea turtle nests at the Seashore has averaged 135 nests, ranging from a low of 77 in 2004 to a peak of 242 in 1999 (figure 15). Within the Seashore, the greatest annual number of sea turtle nests are at South Core Banks, approximately 53 percent of the total nests (figure 15), with the

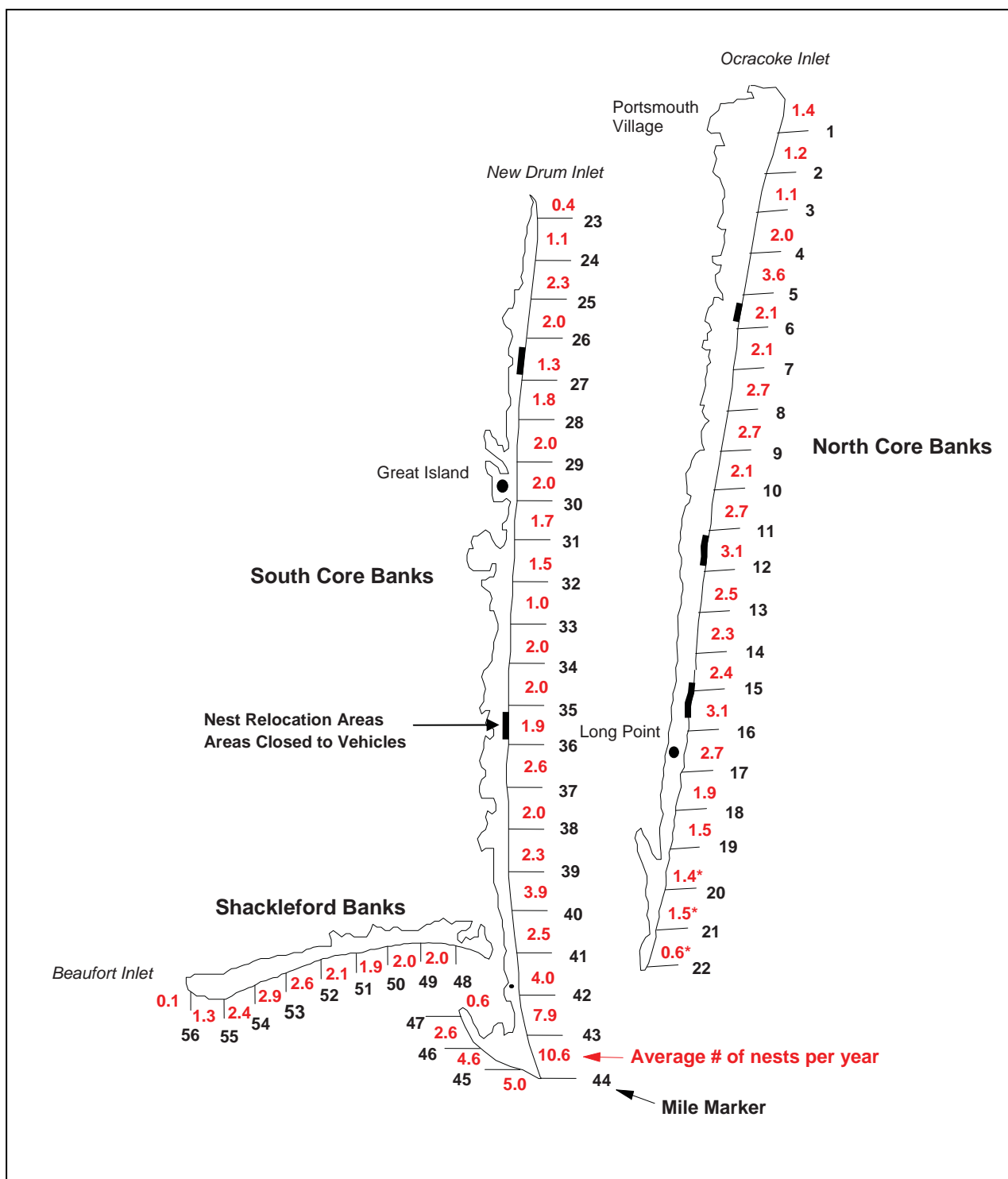
greatest concentration south of the lighthouse between mile markers 42 and 44 (figure 16).

Approximately 34 percent of the sea turtle nests are at North Core Banks. Approximately 13 percent of the sea turtle nests are at Shackleford Banks. Mile markers 19 to 22 on North Core Banks were not monitored from 2000 to 2008; however, with the natural closing of Old Drum Inlet in March 2009, these areas were once again monitored in 2009 and 2010 (NPS 2010c, 2010h). Although Hurricane Irene re-opened Old Drum Inlet in 2011, isolating Middle Core Banks again, monitoring between mile markers 19 and 22 continued in 2011 and 2012 (NPS 2011c, 2012n).



Source: NPS 2012n.

FIGURE 15: NUMBER OF SEA TURTLE NESTS AT CAPE LOOKOUT NATIONAL SEASHORE, 1990–2012



Sources: Altman pers. comm. 2010a; NPS 1991, 1992, 1993b, 1994, 1995, 1996, 1997b, 1998c, 1999b, 2000d, 2001c, 2002c, 2003b, 2004d, 2005b, 2006g, 2007j, 2008d, 2009c, 2010c, 2010h, 2011c, 2012n.

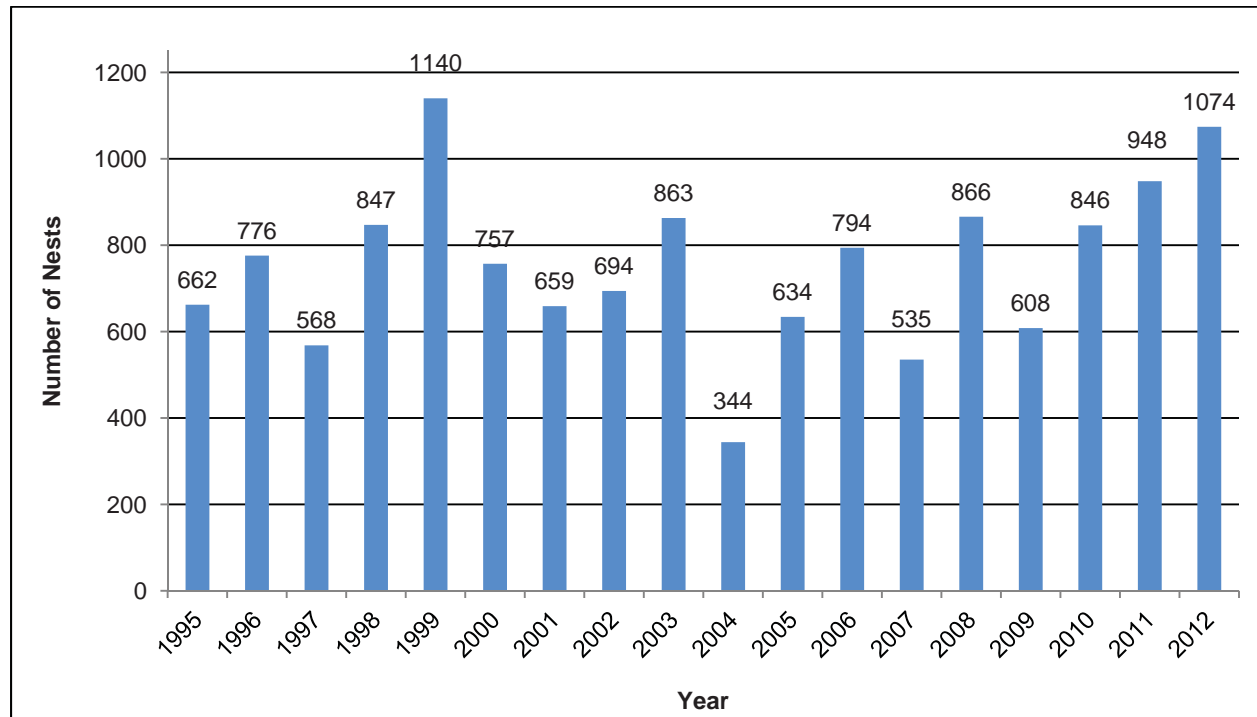
Note: Nest data by mile marker is from 1990 through 2012. North Core Banks mile sections 19–22 were not monitored between 2000 and 2008.

FIGURE 16: AVERAGE NUMBER OF SEA TURTLE NESTS BETWEEN MILE MARKERS

Of the four species known to have nested at the Seashore, the loggerhead is by far the most numerous, comprising approximately 98 percent of the known nests between 1990 and 2012 (Cordes pers. comm. 2005a; NPS 2006g, 2007j, 2008d, 2009c, 2010c, 2010h, 2011c, 2012n). Green and leatherback sea turtles breed primarily in the tropics and are rare nesters at higher latitudes, only nesting sporadically at Cape Lookout National Seashore. For the Kemp's ridley sea turtle, nesting is essentially restricted to beaches along the western Gulf of Mexico (NMFS, USFWS, and SEMARNAT 2011).

LOGGERHEAD TURTLE

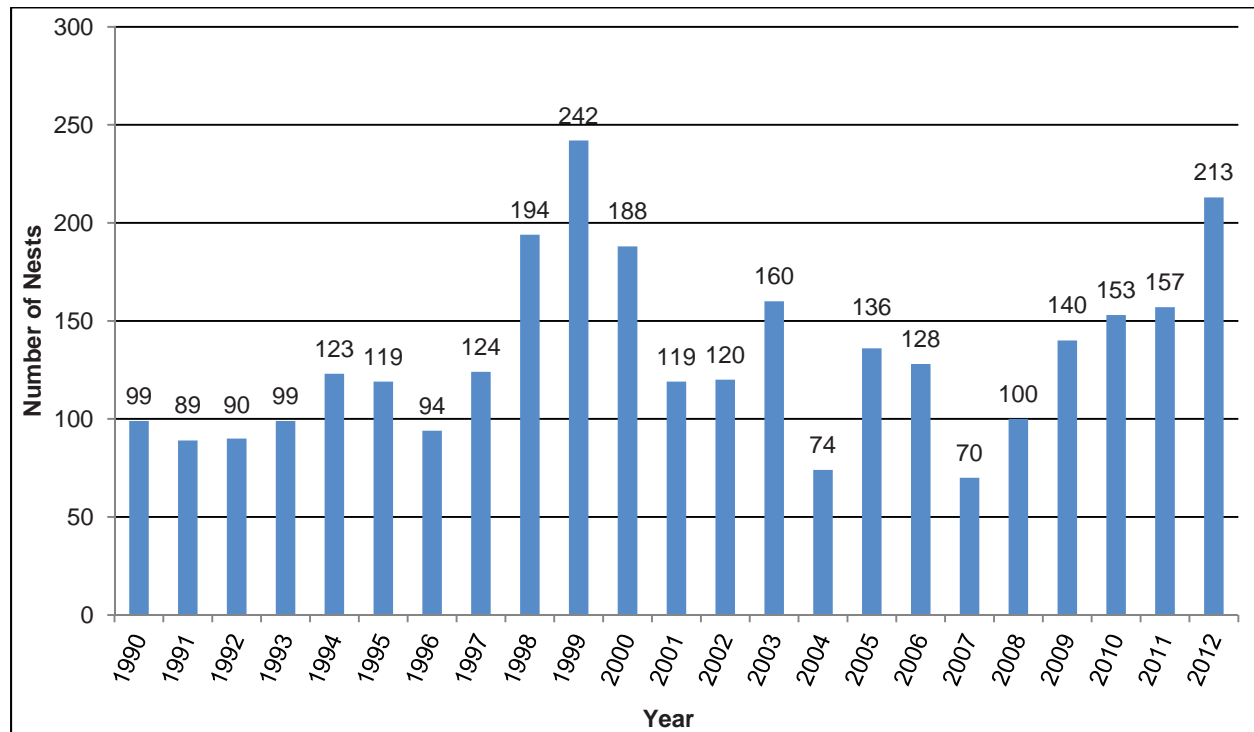
The loggerhead sea turtle occurs throughout the temperate and tropical regions of the Atlantic, Pacific, and Indian oceans. However, the two largest nesting rookeries are along the western rims of the Atlantic and Indian oceans. Within the United States, the loggerhead turtle nests from Texas to Virginia, with the primary nesting concentrations found on the coastal islands of North Carolina, South Carolina, and Georgia, and on the Atlantic and Gulf coasts of Florida (NMFS and USFWS 2008). Over the last two decades, the total estimated nesting in the United States has fluctuated between 47,000 and 90,000 nests per year, with about 80 percent of the loggerhead nesting activity in the southeast United States occurring in six counties in the state of Florida (USFWS 2012b). Within the northern recovery unit (Florida/Georgia border to southern Virginia) of the North Atlantic Ocean DPS, as defined in the loggerhead recovery plan, studies of annual nest totals indicate an apparent decline in the loggerhead sea turtle population (Ehrhart, Bagley, and Redfoot 2003). Since standardized surveying began in North Carolina in the mid-1990s, the number of loggerhead nests per season has averaged 756 nests from 1995 through 2012 (figure 17) (Godfrey pers. comm. 2005a, 2008, 2010; Muiznieks pers. comm. 2009; Seaturtle.org 2011, 2012).



Sources: Godfrey pers. comm. 2005a, 2008, 2010; Muiznieks pers. comm. 2009; Seaturtle.org 2011, 2012.

FIGURE 17: NUMBER OF LOGGERHEAD TURTLE NESTS IN NORTH CAROLINA, 1995–2012

At Cape Lookout National Seashore, the average number of loggerhead nests between 1990 and 2012 was 132, with the lowest number of nests in 2007 and the highest number of nests in 1999 (figure 18).



Sources: Cordes pers. comm. 2005a; NPS 2007j, 2008d, 2009c, 2010c, 2010h, 2011c, 2012n.

FIGURE 18: NUMBER OF LOGGERHEAD TURTLE NESTS AT THE SEASHORE, 1990–2012

Loggerhead turtles spend the majority of their life history at sea. Only mature females come ashore to nest every 2 to 3 years, on average (Schroeder, Foley, and Bagley 2003). The first turtle nests generally begin to appear at the Seashore in mid-May, and the last nests are deposited in late August. Typical nesting areas for loggerheads tend to be sandy, wide, open beaches, backed by low dunes (Miller, Limpus, and Godfrey 2003). Some factors that determine nest selection include beach slope, temperature, distance to the ocean, sand type, and moisture, though results were occasionally contradictory (Miller, Limpus, and Godfrey 2003). The beaches at Cape Lookout National Seashore are typical of the preferred nesting habitat for sea turtles, consisting of a moderate dune system, wide gently sloped beaches with little or no vegetation, beaches that are not re-nourished, and sand that is the appropriate size and texture for nesting habitat.

Although the process of nest-site selection is not well understood, a successful nest must be laid in a low salinity, high humidity, well-ventilated substrate that is not prone to flooding or burying because of tides and storms, and where temperatures are optimal for development (Miller, Limpus, and Godfrey 2003). At the Seashore, between 1990 and 2012, on average 47 percent of the nests found (all turtle species included) were relocated from their original location by NPS staff, though in recent years those numbers have decreased (NPS 2012n). Since 2005, on average 27 percent of the nests annually were relocated. Most nests that were relocated would have been lost to flooding had they not been moved. The emergence success rate of relocated versus nonrelocated nests during that same period (1990–2012) was the same; averaging 65 percent emergence success (NPS 2012n).

Loggerheads are nocturnal nesters. Females emerge from the ocean and crawl toward the dune line until they encounter a suitable nest site. The female clears away surface debris with her front flippers, creating

a “body pit,” and then excavates a flask-shaped nest cavity with her hind flippers. Loggerheads throughout the southeastern United States lay an average of 100 to 126 eggs per nest (NMFS and USFWS 2008). After laying her eggs, the female covers the nest with sand, using all four flippers. Once the nest-covering phase is complete, the female crawls back to the sea.

Individual females may nest one to seven times per nesting season, at an average interval of 14 days (NMFS and USFWS 2008). The nest incubation period (from laying to hatching) depends on temperature, and ranges on average from 49 to 68 days in North Carolina with an average of about 55 days (USFWS n.d.b). The sex ratio of hatchlings also depends on temperature during incubation. An incubation temperature of approximately 84.2°F (29.0°C) produces an equal number of male and female hatchlings, while cooler incubation temperatures produce more males, and warmer incubation temperatures produce more females (Carthy, Foley, and Matsuzawa 2003). For this reason, the northern part of the U.S. Atlantic population, which includes North Carolina, apparently provides a disproportionate number of males to the larger population (Mrosovsky 1988; Hanson, Wibbels, and Martin 1998).

Hatchling emergence occurs almost exclusively at night (Mrosovsky 1968; Witherington, Bjørndal, and McCabe 1990) and may occur over several nights. Upon emerging from the nest, hatchlings primarily use light cues to find and move towards the sea (Witherington and Martin 1996). Once in the water, they swim incessantly out to sea to offshore habitats where they will spend the next phase of their life history.

Green Turtle

The green turtle is a circum-global species in tropical and subtropical waters. The major green turtle nesting colonies in the Atlantic Ocean occur on Ascension Island, Aves Island, Costa Rica, and Surinam (NMFS and USFWS 1991). Nesting in the United States occurs in small numbers in the U.S. Virgin Islands and on Puerto Rico, and in larger numbers along the east coast of Florida, particularly in Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties. North Carolina is near the northern limits of its nesting area.

Nesting habits for the green turtle are similar to the loggerhead turtle, with slight differences. Average clutch sizes range from 110 to 115 eggs, though this varies by population, and only occasionally do females produce clutches in successive years. Usually 2, 3, 4, or more years pass between breeding seasons (NMFS and USFWS 1991).

Green turtles nest sporadically at Cape Lookout National Seashore with a total of 44 nests since 1990. A peak of 10 nests was documented in 2012 with the nesting intervals suggesting at least two nesting females (NPS 2012n).

Leatherback Turtle

Leatherback nesting grounds are distributed circum-globally, with the largest known nesting area occurring on the Pacific Coast of southern Mexico. Nesting in the United States occurs primarily in Puerto Rico, the U.S. Virgin Islands, and southeastern Florida. Until 2009, Cape Hatteras National Seashore was the northernmost nesting location on record for this species (Rabon et al. 2003). However, in 2009 a leatherback nested in Kill Devil Hills, North Carolina, which currently represents the northernmost nest ever found from this species (Godfrey pers. comm. 2012).

Leatherback nesting habits are similar to the loggerhead turtle, though they tend to begin and end nesting earlier in the year than the loggerhead turtle (NMFS and USFWS 1992). Leatherbacks are thought to migrate to their nesting beach about every 2 to 3 years (NMFS and USFWS 1992; Miller 1997). Clutch sizes average 116 eggs, and the incubation period averages 55 to 75 days. It is also reported that

leatherback turtles nest an average of five to seven times per year, with an average interval of nine to ten days between nesting (NMFS and USFWS 1992).

Leatherback nesting at Cape Lookout National Seashore is rare, documented in only 5 years since 1990 with a total of 20 nests recorded. In 2000, the first nest since 1966 was found at the Seashore (NPS 2001c). Three confirmed nests in 2004, five nests in 2005, seven nests in 2007, and four nests in 2012 have also been documented, but given the nesting intervals (ranging from 6 to 13 days), it is likely that during each year nests were laid by only one female (NPS 2005b, 2006g, 2008d, 2012n). However, it is known that more than one individual leatherback has nested in North Carolina. In 2004 a leatherback turtle nest was found at Cape Hatteras National Seashore the same night that one was found at Cape Lookout National Seashore (NPS 2005b).

Potential Threats

Threats to the loggerhead turtle on nesting grounds, as outlined in the recovery plan (NMFS and USFWS 2008), are representative of those also faced by green and leatherback turtles. The following general discussion about threats to sea turtles on their nesting grounds is taken from the 2008 revised recovery plan for loggerhead turtles, which has been updated with more recent research on potential threats to these species that, in some cases, was not available at the time of the 1991 recovery plan. A more detailed discussion about the specific threats that occur at Cape Lookout National Seashore follows after the general discussion of threats.

Human Presence—The greatest threat posed by humans on the beach at night is disturbance of female turtles before they have finished nesting. From the time a female exits the surf until she has begun covering her nest, she is highly vulnerable to disturbance, especially prior to and during the early stages of egg laying. Females that abort a nesting attempt may attempt to nest again at or near the same location or select a new site later that night or the following night. However, repeated interruption of nesting attempts may cause a turtle to construct her nest in a sub-optimum incubation environment, postpone nesting for several days, prompt movement many kilometers from the original chosen nesting site, or result in the shedding of eggs at sea. Direct harassment (which involves harassing or watching turtles nest) may also cause adult turtles to reduce the time spent covering the nest. Visitors using flashlights or lanterns or lighting campfires on the beach at night during the nesting season may deter nesting females from coming ashore and may disorient hatchlings. In addition, heavy pedestrian traffic may compact sand over unmarked nests, although the effect of this compaction has not been determined and may be negligible. Depending on the nesting substrate, pedestrian traffic over nests near the time of emergence can cause nests to collapse and result in hatchling mortality. A study in Japan found loggerhead nests laid in beach areas with pedestrian access had higher rates of dead pipped hatchlings than nests laid in restricted beach zones (NMFS and USFWS 2008).

Recreational Beach Equipment—Generally, the use and storage of lounge chairs, cabanas, umbrellas, catamarans, and other types of recreational equipment on the beach can hamper or deter nesting by adult females and trap or impede hatchlings during their nest to sea migration, although this potential threat is not prevalent at the Seashore. The documentation of nonnesting emergences (also referred to as false crawls) at these obstacles is becoming increasingly common as more recreational beach equipment is left on beaches at night. Nesting turtles have been documented being deterred by wooden lounge chairs that prevented access to the upper beach. Additionally, there are documented reports of nesting females being trapped under heavy wooden lounge chairs and cabanas, eggs being destroyed by equipment (e.g., beach umbrellas penetrating the egg chamber), and hatchlings being hampered during emergence by equipment inadvertently placed on top of the nest (NMFS and USFWS 2008).

Beach Vehicular Driving—Operating privately owned vehicles on nesting beaches for recreational purposes or beach access is allowed on certain beaches in northeast Florida, northwest Florida, Georgia, North Carolina, Virginia, and Texas. Operating vehicles to conduct scientific research and management is generally allowed throughout the loggerhead’s nesting range. The presence of vehicles on the beach has the potential to negatively impact sea turtles by running over nesting females, hatchlings, stranded turtles that have washed ashore, and nests. In addition, the ruts left by vehicles in the sand may prevent or impede hatchlings from reaching the ocean following emergence from the nest. Hatchlings impeded by vehicle ruts are at greater risk of death from predation, fatigue, desiccation, and being crushed by additional vehicle traffic. Vehicle lights and vehicle movement on the beach after dark can deter females from nesting and disorient hatchlings. Sand compaction due to vehicles on the beach may hinder nest construction and hatchling emergence from nests. Driving directly above incubating egg clutches can cause sand compaction, which may decrease hatching success and directly kill pre-emergent hatchlings. Additionally, vehicle traffic on nesting beaches may contribute to erosion, especially during high tides or on narrow beaches where driving is concentrated on the high beach and foredune (NMFS and USFWS 2008).

Research and Conservation Management Activities—Research and conservation management activities (e.g., nesting surveys, tagging of nesting females, nest manipulation) are tools to advance the recovery of the loggerhead; however, they have the potential to adversely affect nesting females, hatchlings, and developing embryos if not properly conducted. Research and conservation management activities should be carefully evaluated to determine their potential risks and conservation benefits. The states, in cooperation with the USFWS, have established permitting programs to ensure that proposed research and conservation activities are necessary for recovery, carried out by appropriately trained persons, nonduplicative, the least manipulative possible, and carried out in such a way to minimize chances of mortality. A low level of lethal take is authorized annually for research and conservation purposes. Under conditions where the conservation benefits (e.g., embryo survivorship, hatchling survivorship, conservation knowledge gained) are forecast to substantially outweigh the potential conservation risks, certain activities can be considered beneficial to loggerhead recovery. Most research and conservation management activities are likely to have minimal effects on nesting turtles, hatchlings, and developing embryos when conducted in accordance with established protocols designed to minimize disturbance and risk. On many beaches, surveyors use small 4-wheeled all-terrain vehicles (ATVs) with low-pressure (<5 pounds per square inch (psi)) tires that minimally impact nesting habitat. In addition, almost all surveys to count nests are conducted after sunrise when encounters with nesting turtles and emergent hatchlings are unlikely. Research activities, such as flipper and passive integrated transponder tagging, blood sampling, skin sampling, satellite and radio transmitter attachment, and hatchling orientation surveys, have a minimal affect on individual turtles when conducted according to established guidelines (e.g., Florida Fish and Wildlife Conservation Commission Marine Turtle Conservation Guidelines). Potential benefits from this research include important insight into population structure, species health, habitat use, and other important aspects of loggerhead biology and ecology. Nest relocation is a management technique for protecting nests predicted to be destroyed by environmental factors, such as erosion or repeated tidal inundation, or permitted human activities, such as beach nourishment during the nesting season. However, the unnecessary relocation of nests may result in negative impacts to eggs and hatchlings. Historically, the relocation of sea turtle nests to higher beach elevations or into hatcheries was a regularly recommended conservation management activity throughout the southeast United States. However, advances in our knowledge of the incubation environment have provided important information to guide nest management practices. Nests located where there are threats from beachfront lighting, foot traffic, and mammalian predators can be effectively managed by addressing the threat directly or by protecting the nest in situ rather than by moving the nest. In situ protection, which addresses the root causes of egg and hatchling mortality, is in keeping with Frazer’s (1992) (as cited in NMFS and USFWS 2008) call to move away from “halfway technology.” Increased understanding of the potential adverse effects associated with nest relocation, restraint of hatchlings, and concentrated

hatchling releases has resulted in less manipulative management strategies to protect nests and hatchlings. In Florida, the Florida Fish and Wildlife Conservation Commission's sea turtle conservation guidelines consider nest relocation to be a management technique of last resort. At training workshops, nest monitors are advised to relocate nests only if they are certain that the nest will otherwise be lost, and if this certainty is based on extensive experience at the specific beach. Recovery action 6111 describes development of protocols by which managers could identify threatened nests with greater precision, thereby minimizing the number of nests that are relocated (NMFS and USFWS 2008).

Beach Erosion and Accretion—Natural beach erosion events may influence the quality of nesting habitat. Nesting females may deposit eggs at the base of an escarpment formed during an erosion event where they are more susceptible to repeated tidal inundation. Erosion, frequent or prolonged tidal inundation, and accretion can negatively affect incubating egg clutches. Short-term erosion events (e.g., atmospheric fronts, nor'easters, tropical storms, and hurricanes) are common phenomena throughout the loggerhead nesting range and may vary considerably from year to year. Sea turtles have evolved a strategy to offset these natural events by laying large numbers of eggs and by distributing their nests both spatially and temporally. Thus, the total annual hatchling production is never fully affected by storm-generated beach erosion and inundation, although local effects may be high. For example, storm-induced mortality in the Dry Tortugas Recovery Unit has been high during years of high tropical storm activity and may limit recovery. However, in general, human activities along coastlines can accelerate erosion rates, interrupt natural shoreline migration, and reduce both the quantity and quality of available nesting habitat. During erosion events, some nests may be uncovered or completely washed away. Nests that are not washed away may suffer reduced reproductive success as the result of frequent or prolonged tidal inundation. Eggs saturated with seawater are susceptible to embryonic mortality. However, in spite of the potential for reduced hatching success, loggerhead eggs can successfully survive periodic tidal inundation. Studies have shown that although frequent or prolonged tidal inundation resulted in fewer emergent hatchlings, occasional overwash of nests appeared to have minimal effect on reproductive success. Accretion of sand above incubating nests may also result in egg and hatchling mortality (NMFS and USFWS 2008).

Light Pollution—Nesting and hatchling sea turtles are adversely affected by the presence of artificial lighting on or near the beach. Experimental studies have shown that artificial lighting deters adult female turtles from emerging from the ocean to nest. A 1986 study noted that loggerheads aborted nesting attempts at a greater frequency in lighted areas. Because adult females rely on visual brightness cues to find their way back to the ocean after nesting, those turtles that nest on lighted beaches may become disoriented (unable to maintain constant directional movement) or misoriented (able to maintain constant directional movement but in the wrong direction) by artificial lighting and have difficulty finding their way back to the ocean. In some cases, misdirected nesting females have crawled onto coastal highways and have been struck and killed by vehicles. Hatchlings exhibit a robust sea-finding behavior guided by visual cues, and direct and timely migration from the nest to sea is critical to their survivorship. Although the mechanism involved in sea-finding is complex, involving cues from both brightness and shape, it is clear that strong brightness stimuli can override other competing cues. Hatchlings have a tendency to orient toward the brightest direction as integrated over a broad horizontal area. On natural undeveloped beaches, the brightest direction is commonly away from elevated shapes (e.g., dune, vegetation, etc.) and their silhouettes and toward the broad open horizon of the sea. On developed beaches, the brightest direction is often away from the ocean and toward lighted structures. Hatchlings unable to find the ocean, or delayed in reaching it, are likely to incur high mortality from dehydration, exhaustion, or predation. Hatchlings lured into lighted parking lots or toward streetlights are often crushed by passing vehicles. Uncommonly intense artificial lighting can draw hatchlings back out of the surf. Although the attributes that can make a light source harmful to sea turtles are complex, a simple rule has proven useful in identifying lights that pose potential problems for sea turtles. Researchers propose that artificial light sources are "likely to cause problems for sea turtles if light from the source can be seen by an observer

standing anywhere on the beach.” This visible light can come directly from any glowing portion of a luminaire, including the lamp, globe, or reflector, or indirectly by reflection from buildings or trees that are visible from the beach. Bright or numerous light sources, especially those directed upward, will illuminate sea mist and low clouds, creating a distinct sky glow visible from the beach. Field research suggests hatchling orientation can be disrupted by the sky glow from heavily lighted coastal areas even when no direct lighting is visible. The ephemeral nature of evidence from hatchling disorientation and mortality makes it difficult to accurately assess how many hatchlings are misdirected and killed by artificial lighting. Reports of hatchling disorientation events in Florida describe several hundred nests each year and are likely to involve tens of thousands of hatchlings. However, this number calculated from disorientation reports is likely a vast underestimate. Independent of these reports, researchers surveyed hatchling orientation at nests located at 23 representative beaches in six counties around Florida in 1993 and 1994 and found that, by county, approximately 10 to 30 percent of nests showed evidence of hatchlings disoriented by lighting. From this survey and from measures of hatchling production, the number of hatchlings disoriented by lighting in Florida is calculated in the range of hundreds of thousands per year (NMFS and USFWS 2008).

Cape Lookout National Seashore is ranked, along with Cape Hatteras National Seashore, as the 9th best national park system unit to view the night sky by the NPS Night Sky Program. The lack of artificial light at the Seashore makes the stars, planets, and moon particularly more visible during clear nights, which influences humans and many other species of animals. Additionally, the phosphorescence of waves on dark nights helps sea turtle hatchlings orient to the ocean. The NPS does not use artificial lighting in areas such as sea turtle nesting locations where the presence of the artificial lighting could disrupt a park’s dark-dependent natural resource components (NPS 2006d).

Beach Debris—Hatchlings often must navigate through a variety of obstacles before reaching the ocean. These include natural and human-made debris. Debris on the beach may interfere with a hatchling’s progress toward the ocean. Research has shown that travel times of hatchlings from the nest to the water may be extended when traversing areas of heavy foot traffic or vehicular ruts; the same is true of debris on the beach. Hatchlings may be upended and spend both time and energy in righting themselves. Some beach debris may have the potential to trap hatchlings and prevent them from successfully reaching the ocean. In addition, debris over the tops of nests may impede or prevent hatchling emergence (NMFS and USFWS 2008).

Natural Catastrophes—Periodic, short-term weather-related erosion events (e.g., atmospheric fronts, nor’easters, tropical storms, and hurricanes) are common phenomena throughout the loggerhead nesting range and may vary considerably from year to year. It was reported that 24.5 percent of all loggerhead nests laid on Deerfield Beach, Florida, in 1992 were lost or destroyed by Hurricane Andrew as a result of storm surge (NMFS and USFWS 2008). Similarly, Martin (1996) reported a 22.7 percent loss of total loggerhead nest production on the southern portion of Hutchinson Island, Florida, during the passage of Hurricane Erin in 1995. Ehrhart and Witherington (1987) reported a 19 percent loss of loggerhead nests at Melbourne Beach, Florida, after a 5-day nor’easter in 1985. In Georgia, 16 percent of loggerhead nests were lost to tropical storm systems in 2001; nest loss was particularly high on Sapelo (54 percent) and Little Cumberland Islands (28 percent). On Fisher Island in Florida, it was reported that hatchling emerging success decreased significantly following Hurricane Andrew in 1992 (NMFS and USFWS 2008). They found that hatchlings were unable to emerge from nests where sand had accreted in large quantities and that these hatchlings probably died from asphyxiation or exhaustion while struggling to emerge from the nests. Sea turtles have evolved a strategy to offset these natural events by laying large numbers of eggs and by distributing their nests both spatially and temporally.

Threat Occurrences at Cape Lookout National Seashore

The following data and discussions are from the Seashore's annual sea turtle reports, 1990 to 2011, and include all turtle species (Altman pers. comm. 2012b; NPS 1991, 1992, 1993b, 1994, 1995, 1996, 1997b, 1998c, 1999b, 2000d, 2001c, 2002c, 2003b, 2004d, 2005b, 2006g, 2007j, 2008d, 2009c, 2010c, 2010h, 2011c, 2012n).

The majority of turtle nest losses at Cape Lookout National Seashore from 1990 to 2012 were weather-related, particularly from hurricanes and other storms. During this timeframe, an average of 27 nests were lost annually due to flooding from storms (either washed away or failed to hatch due to flooding), ranging from a low of 1 nest lost in 1990 to a peak of 90 nests in 1999. In general, the years that experienced the greatest nest loss corresponded with the years that the Seashore experienced impacts from tropical storms. For example, Hurricane Ophelia and several other storms had a great impact on the 2005 nesting season. A total of 81 nests were flooded in 2005 with 54 of those nests either washing away or failing to hatch due to flooding. In 2009 and 2010 Hurricanes Bill and Earl both made landfall near Cape Lookout. During these two years the number of nests washed away or flooded was also high, with 42 and 65 nests lost respectively. In 2011, a total of 66 nests were lost to erosion or flooding with Hurricane Irene alone responsible for destroying 58 of those nests (NPS 2011c). However, in 2007 when the Seashore experienced no major storms during the sea turtle nesting season, only 19 nests were flooded with 9 either washing away or failing to hatch.

Other natural threats to sea turtle nests at the Seashore include predation by ghost crabs and raccoons. From 1990 to 2012, raccoons depredated an average of eight nests, ranging from zero nests in 2004, 2009, and 2010 to 28 nests in 2000. Protecting nests with wire cages has minimized the amount of egg loss to raccoons; however, on rare occasion a hatchling can get caught in the screening. Ghost crabs depredated an average of seven nests annually from 1990 to 2012, though the total number of eggs lost is not known. Roots from plants have also destroyed eggs or trapped hatchlings. On average four nests are impacted by root invasion each year.

Many, but not all ORV users respect sea turtle nest protection areas. ORV violations of nest protection areas threaten the survival of hatchlings by leaving ruts that impede hatchlings on their way to the ocean or by resulting in vehicles driving over hatchlings. At night, vehicle lights can also disorient hatchlings. Between 2000 and 2012, an average of 29 documented violations occurred each year, ranging from a peak of 84 in 2007 to a low of 2 in 2011. Most, but not all of these ORV violations occurred when ORVs drove in front of nests between posts and the ocean at low tides. Other violations include pulling up posts and rope and driving through the closure. In 2006, an ORV closure violation resulted in the ORV running over a sea turtle hatchling.

Light pollution is occasionally a problem at the Seashore as well. Since 1990, hatchlings from 32 different nests have been documented as being disoriented by artificial light and crawling inland away from the ocean, though in a few of these instances confusion by the local topography could not be ruled out. Some instances of disorientation were in the vicinity of the lighthouse and Great Island cabins while others were in areas that may have been influenced by the glow of lights from the mainland. Camp lights can also pose a problem, and in 2012, visitors camping outside of a closure reported three hatchlings crawling toward their camp light, which they promptly turned off and helped the hatchlings to the ocean. Hatchlings from another seven nests also crawled inland away from the ocean; however, the nests were located in areas relatively free from artificial light and may have been confused by the local topography instead of lights. In 2011 there were several other incidences where hatchlings appeared to be disoriented while crawling outside of the closure areas, but no causes were attributed to this by NPS staff. In 2005, a light barricade successfully protected a nest directly in front of the Long Point cabin area from being impacted by the cabin lights.

False crawls can be detrimental to sea turtles and can be caused by, among other things, suboptimal sand conditions; encounters with roots, debris, or rocks while digging a nest; encounters with obstacles while crawling up a beach; disturbance from lights, noise, or other unusual activities; or other reasons that are not known. Under normal, undisturbed conditions, there is generally a one to one ratio between the number of false crawls and the number of nests in a given area (i.e., 50 percent of all nesting activity is false crawls) (Godfrey pers. comm. 2005b). From 1990 through 2012 the ratio of false crawls to nests at the Seashore was 0.97 to 1 (i.e., on average 49 percent of all turtle activity at the Seashore each year were false crawls) with individual years ranging from 0.56 to 1 (36 percent) in 1997 to as high as 1.60 to 1 (62 percent) in 1991 and 1.58 to 1 (61 percent) in 2004.

SEABEACH AMARANTH

Seabeach amaranth (*Amaranthus pumilus*) is an annual plant, native to barrier island beaches along the U.S. Atlantic Coast, including those within the Cape Lookout National Seashore. Historically, seabeach amaranth was found in nine states, from Massachusetts to South Carolina. It was federally listed as threatened by the USFWS in 1993 because of its vulnerability to human and natural impacts and the fact that it had been eliminated from two-thirds of its historic range (USFWS 1996b). Since its listing, seabeach amaranth has reappeared in several states and is currently found in New York, New Jersey, Delaware, Maryland, Virginia, North Carolina, and South Carolina. Despite its reappearance in several states, the plant remains highly vulnerable to the threats that caused its listing, and in some states, populations continue to decline (USFWS 2003b). This species is also listed as threatened by the state of North Carolina (NCNHP 2008).

Seabeach amaranth is a low-growing annual, with stems that trail along the ground but do not root. The stems are reddish in color, fleshy, grow to 4 to 24 inches in length, and have round, fleshy, dark-green leaves (0.4 to 0.6 inches long) clustered near the tips. Plants must recruit annually from seed banks, either in place or from other source populations dispersed by wind, water, or from sediments distributed by anthropogenic (human) factors, for example, beach re-nourishment (Jolls, Sellars, and Wigent 2004). Seeds must be scarified (the seed coat broken by nicking or abrasion) or cold stratified (chilling for weeks) before germination can occur (Marion n.d.). Germination takes place from April through July, initially forming a small sprig that soon begins to branch into a clump. Seedlings are usually visibly detectable beginning in June (Lyons pers. comm. 2005). Plants are typically 10 to 12 inches in diameter, consisting of 5 to 20 branches, though occasionally a clump may get as large 3 feet or more across, with over one hundred branches (FR 1993).

Flowering begins when plants are of sufficient size, often beginning in June, but more typically beginning in July, and continuing until the plants die in late fall or early winter. The species is a prolific seed producer, with seed production beginning in July or August and reaching a peak usually in September. Seed production continues until the plant dies. The seeds are relatively large (0.1 inch), believed to be viable for long periods of time (decades), and are contained in indehiscent utricles (a fruit pouch that does not split open spontaneously at maturity to release its seed). Though the utricles are normally indehiscent, it is not unusual to see them splitting open, either before or after their detachment from the plant. Splitting or fragmentation of the utricle occurs under conditions of agitation (by wind), abrasion (by sand), or simple loss of integrity over time (USFWS 1996b).

Seed dispersal may occur by wind or water, though naked seeds do not disperse nearly as far from the parent plants as seeds retained in utricles. Seeds may also be dispersed by human activities, such as beach replenishment programs. Many utricles remain attached to the plant and are never dispersed, allowing seeds and fruit to pile up around the bases of the parent plants. This primarily occurs at the end of the growing season, when the plant dies (USFWS 1996b).

Seabeach amaranth occupies a fairly narrow and precarious habitat niche based on elevation, bounded by its relative intolerance of flooding in lower beach settings and competition with other plants in upper beach and dune settings. It is found on sandy ocean beaches, where its primary habitat consists of overwash flats at accreting ends of islands and the sparsely vegetated zone between the high-tide line and the toe of the primary dune on noneroding beaches. It is intolerant of competition and does not occur on well-vegetated sites. It is also intolerant of even occasional flooding or overwash. Its placement within upper beach and overwash area habitats is severely limiting because these areas are often absent on barrier islands that are experiencing beach erosion. Historically, in both Cape Lookout National Seashore and Cape Hatteras National Seashore, surveys have found very few seabeach amaranth plants on east- and northeast-facing beaches, which experience the greatest erosion rates. South-facing beaches have lower erosion rates and likely provide better habitat for seabeach amaranth. Populations are occasionally found in other habitats, including back dunes, soundside beaches, blowouts in foredunes, and beach-replenishment areas, but these populations tend to be small and temporary (USFWS 1996b). In general, to survive, this species needs extensive areas of barrier island beaches and inlets, functioning in a relatively natural and dynamic manner, to allow it to move around in the landscape as a fugitive species, occupying suitable habitat as it becomes available (FR 1993).

According to survey data compiled by USFWS, the number of plants in North Carolina between 2000 and 2005 ranged from 202 to 21,966 (Suiter pers. comm. 2005), only a fraction of the approximately 40,000 plants reported in the late 1980s and 1995. The number of plants at Cape Lookout National Seashore has also been extremely variable since 1993 (table 24). This variability is indicative of its fugitive nature, and is likely due in a large part to habitat changes and the impact of hurricanes, for often in years following major storms (1996, 1999, 2000, 2004, and 2006) few plants were found within the Seashore. Presumably, plants were either killed before they set seed, or the seeds were buried or washed away. For example, on August 27, 2011, Hurricane Irene destroyed the 19 plants documented that year and scoured the beaches (NPS 2011d). However, following a growing season without major storm impacts, seven plants were found on Shackleford Banks.

At the Seashore most of the plants are found on the south facing beaches of Shackleford Banks and the area between the point of Cape Lookout and Power Squadron Spit where there is little beach erosion. In the early 1990s there was a large population on the south side of New Drum Inlet; however, the seed bank in that area was lost in Hurricane Gordon in 1994 and the plant has yet to recover there. 2008 was the first year since 1999 that no plants were found on South Core Banks. Although plants are not necessarily evident every year, they do survive in the seed bank; therefore, populations of seabeach amaranth may still be present even though plants are not visible for several years (USFWS 2007e).

The predominant threat to seabeach amaranth is the destruction or alteration of suitable habitat, primarily because of beach stabilization efforts and storm-related erosion (FR 1993). Other important threats to the plant include some forms of “soft” beach stabilization, such as sand fencing; vehicular traffic, which can easily break or crush the fleshy plant and bury seeds below depths from which they can germinate; and predation by webworms (caterpillars of small moths) (FR 1993). Webworms feed on the leaves of the plant and can defoliate the plants to the point of either killing them or at least reducing their seed production. Some webworm predation of seabeach amaranth was observed in the Seashore in 2008, 2009, and 2010 (NPS 2008e, 2009d, 2010d). Beach vitex (*Vitex rotundifolia*) is another threat to seabeach amaranth because it is an aggressive, invasive, woody plant that can occupy habitat similar to seabeach amaranth and outcompete it (ISSG 2009). To date, no beach vitex has been found at the Seashore (Altman pers. comm. 2010b, 2012a).

TABLE 24: ANNUAL COUNTS OF NATURALLY OCCURRING PLANTS OF SEABEACH AMARANTH AT CAPE LOOKOUT NATIONAL SEASHORE

Year	North Core Banks	South Core Banks	Shackleford Banks	Cape Lookout National Seashore Total
1993	82	1,208	975	2,265
1994	63	641	948	1,652
1995	30	45	1,155	1,230
1996	1	0	3	4
1997	2	0	51	53
1998	121	4	369	494
1999	2	0	9	11
2000	0	4	13	17
2001	8	43	126	177
2002	2	69	261	332
2003	1	205	1,354	1,560
2004	1	78	58	137
2005	0	284	669	953
2006	0	33	30	63
2007	0	2	125	127
2008	0	0	76	76
2009	0	1	100	101
2010	0	6	28	34
2011	0	1	18	19
2012	0	0	7	7

Source: NPS 2012o.

STATE-LISTED AND SPECIAL-STATUS SPECIES

This section addresses the habitat, diet, reproduction, population trends, and impacts of several species of shorebirds that are listed or recognized as special-status species by the state of North Carolina but are not federally listed as endangered or threatened. These species breed on Cape Lookout as well as in other areas of North Carolina. Species described include the American oystercatcher (*Haematopus palliatus*), Wilson's plover (*Charadrius wilsonia*), and colonial waterbirds which include gull-billed tern (*Gelochelidon nilotica*), common tern (*Sterna hirundo*), least tern (*Sternula antillarum*), and black skimmer (*Rynchops niger*).

AMERICAN OYSTERCATCHER

The American oystercatcher is a large (16–18 inches long, 14–24 ounces) and conspicuous shorebird with long pink legs and a long, bright reddish-orange bill. The upper body is covered with black feathers that contrast with white feathers on the breast and sides. The sexes are similar in appearance although females are slightly larger than males.

Oystercatchers are restricted to marine environments, where they inhabit coastal salt marshes and sandy beaches along the Atlantic seaboard. Here they primarily feed on bivalve mollusks (Nol and Humphrey 1994; Meyers 2005). They form pair bonds in February and early March. Courtship takes place in salt marshes and on dunes, beaches, dredge spoils, and oyster bars. They breed from March through August along the Atlantic coast, from Massachusetts to Florida, in relatively high, open sandy areas with sparse to no vegetation (Nol and Humphrey 1994; Meyers 2005).

American Oystercatchers in North Carolina

In 2011, the North Carolina coast supported 192 breeding pairs of American oystercatchers, of which 33 percent lived within Cape Lookout (Simons and Stocking 2011). Reproductive success in the North Carolina coast has been low: out of 311 nests, less than half (40.8 percent) produced a successfully hatched egg in 2011 (Simons and Stocking 2011). Oystercatcher breeding success overall in North Carolina has been extremely low over the past decade. Davis et al. (2001) found that on average only one egg in 32 hatches. In response to low reproductive rates, the NCWRC and the Southeastern Shorebird Conservation Plan proposed the American oystercatcher for listing as a state-listed species of special concern in 2005 (Meyers 2005). On May 1, 2008, the American oystercatcher was designated as a species of special concern in North Carolina (Pipkin pers. comm. 2009).

Habitat Description

In North Carolina, American oystercatcher nesting habitat is comprised of sand sites characterized by more open substrate with less vegetation, away from water (70–159 feet [21–48.5 meters]), and slightly elevated to achieve at least an 180° view (Lauro and Burger 1989; Zarudsky 1985; Shields and Parnell 1990). Vegetation, which can include smooth cordgrass (*Spartina alterniflora*), salt meadow cordgrass (*S. patens*), marsh elder (*Iva frutescens*), and salt marsh elder (*Baccharis halimifolia*), is variable, with vegetation cover on average from 23 to 50 percent around nest sites (Lauro and Burger 1989). Oystercatcher foraging habitats include oyster and mussel bars, intertidal sand and mud flats. Winter and summer foraging habitats are similar (Nol and Humphrey 1994).

Diet

The elongated and laterally compressed bill of the oystercatcher is well-suited to allow the opening and preying upon marine bivalves (class *Bivalvia*), including oysters (family *Ostreidae*), soft-shell clams (*Mya arenaria*), razor clams (*Ensis directus*), stout razor clams (*Tagelus plebeius*), and ribbed mussels (*Modiolus demissus*). Oystercatchers also consume marine worms (phylum *Platyhelminthes*), mole crabs (*Emerita talpoida*), sandworms (*Nereis virens*), limpets (order *Patellogastropoda*), jellyfish (phylum *Cnidaria*), sea urchins and starfish (phylum *Echinoderma*), and crabs (order *Decapoda*) (Bent 1929; Johnsgard 1981; Nol 1989; Nol and Humphrey 1994).

Breeding Biology

The major stages of the oystercatcher nesting cycle includes: establishment and holding of nesting territories, courtship and copulation, nest scraping and nest building, egg laying and incubation, chick rearing and fledging. Breeding pairs of oystercatchers begins in late February and early March by establishing and holding a nesting territory and then scraping multiple shallow depressions into the sand. Eventually they choose one scrape and build a nest (Nol and Humphrey 1994; McGowan et al. 2005). Nests are 1.5 to 2.5 inches (3.8 to 6.4 centimeters) deep and 7.0 to 8.0 inches (17.8 to 20 centimeters) across and can contain shell fragments, dead plants, small stones, and beach debris (Baicich and Harrison 1997). In North Carolina, nests are rarely more than 70 to 105 feet (21 to 32 meters) from the water (Lauro and Berger 1989) and are often on an elevated mound, which serves as a lookout for the bird

(Baicich and Harrison 1997). Oystercatchers are monogamous and may mate for life (Palmer 1967 *in* Nol and Humphrey 1994). They can nest in proximity to colonial waterbirds, including, but not limited to, common tern, least tern, and black skimmer.

Both sexes incubate three eggs for 24 to 28 days, and incubation may begin after the second egg is laid (Nol and Humphrey 1994) or after the last egg is laid (Baicich and Harrison 1997). Oystercatchers will re-nest if eggs or nestlings are lost early in the season. Both adults brood nestlings less than seven days old. Nestlings will crouch motionless when alarmed, making them difficult to see. Nestlings remain in the nest for one to two days and then move with adults within their nesting territory or into nearby foraging areas, which can be 150 to 600 feet (46 to 183 meters) away, depending on the habitat. Chicks fledge in about 35 days, but fledglings rely on adults almost entirely until 60 days old (Palmer 1967 *in* Nol and Humphrey 1994).

Breeding Performance at Cape Lookout National Seashore

American oystercatchers are common nesters throughout Cape Lookout National Seashore, primarily on the ocean beach of the North Core, Middle Core, South Core, and Shackleford Banks. However, they have experienced very low reproductive success in each year (with the exception of 1996) since surveying began in 1995 with an average of only 24 percent of all nests producing hatchlings and very low numbers of chicks fledging (table 25). In 2004, just over 50 percent of nests hatched for the first time since surveying began. Fledging success was also the highest ever recorded at the Seashore in 2004; at least 88 chicks hatched with 45 (51 percent) surviving to fledge (NPS 2006e). In 2012, 31 percent of nests hatched with 42 chicks surviving to fledge (table 25).

Nonbreeding and Wintering

In September, oystercatchers in the northeastern United States migrate to their wintering grounds, which are located from Virginia south along the Atlantic and Gulf coasts. Oystercatchers in North Carolina and in other southern states appear to be nonmigratory (Meyers 2005). Hence, in the winter, these southern coastal beaches can support large, mixed flocks of migrant and resident oystercatchers (Post and Gauthreaux 1989).

Winter and migratory habitat appear to be similar to breeding habitat though there is inadequate data in North Carolina regarding what constitutes preferred habitat in the winter, especially for birds in migration. Limited observation indicate that winter birds roost in open ground without vegetation in areas near foraging habitat (Nol and Humphrey 1994).

Risk Factors

Threats to nesting American oystercatchers are numerous and interrelated, but more than 47 percent of nest losses are from undetermined causes, which does not allow managers to correct the problem (NPS 2011e). Due to their choice of nesting habitat, oystercatchers are particularly vulnerable to disturbance by Seashore visitors and ORVs. Major causes of nest failures during 2012 were from unknown causes (47.8 percent), predation (37.7 percent), nest abandonment (8.7 percent), and weather (4.3 percent). Human disturbance accounted for only 1.4 percent of nest losses. The *American Oystercatcher* (*Haematopus palliatus*) *Monitoring at Cape Lookout National Seashore, 2012 Summary Report* (NPS 2012p) identified mammalian predators, particularly raccoons, as the primary cause of known nest loss.

TABLE 25: SUMMARY OF OYSTERCATCHER REPRODUCTIVE SUCCESS DATA AT CAPE LOOKOUT NATIONAL SEASHORE

Year	Island	Number of Nests	Nests Hatched		Number of Chicks Fledged
			#	%	
1995	South Core Banks	36	10	28	7
1997	South Core Banks	34	4	12	2
1998	North and South Core Banks	98	12	12	6
1999	North and South Core Banks	114	16	14	6
2000	North and South Core Banks	75	25	33	9
2001	North and South Core Banks	109	19	17	1
2002	North and South Core Banks	90	10	11	6
2003	North and South Core Banks	106	17	16	8
2004	Cape Lookout National Seashore	68	37	54	45
2005	Cape Lookout National Seashore	65	26	40	18
2006	Cape Lookout National Seashore	69	23	33	25
2007	Cape Lookout National Seashore	99	21	21	31
2008	Cape Lookout National Seashore	91	17	19	15
2009	Cape Lookout National Seashore	83	20	24	21
2010	Cape Lookout National Seashore	113	27	24	33
2011	Cape Lookout National Seashore	114	29	25	37
2012	Cape Lookout National Seashore	99	31	31	42
All		1,463	344	24	312

Sources: NPS 2006e, 2009e, 2010e, 2011e.

Note: Data from 1996 is not available.

Human Activity—Current threats to the American oystercatcher throughout its breeding in wintering range are human disturbance, increasing predators (thought to be largely linked to human activity), and development of coastal areas (Bent 1929; Tomkins 1954; Nol and Humphrey 1994). Oystercatchers need large, undisturbed beach areas for successful nesting. Research has shown that disturbance by pedestrians, kayakers, vehicles, and unleashed pets can cause the abandonment of nest habitat as well as direct loss of eggs and chicks (Cohen et al. 2010; Sabine, Schweitzer, and Meyers 2006; Sabine et al. 2008; Toland 1999; Hodgson, Paul, and Rachal 2008; Meyers 2005). Studies of the effects of humans and vehicles on American oystercatchers have indicated lower nest survival and higher chick mortality in places with higher levels of disturbance (McGowan 2004; Sabine 2005; Simons and Schulte 2008).

Studies in Europe on the European oystercatcher (*Haematopus ostralegus*), in the same genus as the American oystercatcher and closely related, have shown reduced foraging efficiency and lower rates of chick feeding in disturbed versus undisturbed habitats (Verhulst, Oosterbeek, and Ens 2001). In the winter, disturbance caused European oystercatchers to reduce foraging, although the behavioral response of avoidance lessened as the winter progressed (Stillman and Goss-Custard 2002). A study at Cape Lookout National Seashore documented lower nesting success for oystercatchers in areas where human disturbance was higher and also noted that oystercatchers avoided nesting in areas with high levels of

human activity (Davis et al. 1999). Another study in North Carolina found evidence that oystercatcher nests that were frequently disturbed by beach vehicles (causing the adults to leave the nest more than three times per hour) had a lower survivability rate, which the authors attributed to nest predation (McGowan and Simons 2006).

In addition to direct impacts or mortality, reasons for lower reproductive success in areas of high disturbance may include reduced time spent foraging (Sabine et al. 2008; Verhulst, Oosterbeek, and Ens 2001; Stillman and Goss-Custard 2002), thermal stress to eggs caused by a lack of incubation when reacting to disturbance (Sabine, Schweitzer, and Meyers 2006; Verhulst, Oosterbeek, and Ens 2001), and expenditure of energy reserves during flushing or defensive displays (Toland 1999; Nudds and Bryant 2000; Stillman and Goss-Custard 2002). Studies at Cumberland Island National Seashore in Georgia found that foraging behavior was lower in the presence of vehicular activity, which could alter chick provisioning and ultimately affect chick survival. Researchers recommended prohibiting beach driving in oystercatcher territories when chicks are present (Sabine 2005). Research on flush responses of oystercatchers to human disturbance indicates that protection of this species requires a buffer distance of up to 656 feet from nesting areas (Cohen et al. 2010).

Recreational activities such as kayaking, camping, and fishing have been known to directly impact productivity of the black oystercatcher (*Haematopus bachmani*) through trampling of nests and eggs or indirectly by interfering with foraging and parental care or by causing abandonment (Tessler et al. 2007). Because of similarities in life history of the black and American oystercatcher, it is likely that these recreational activities can have similar impacts on the American oystercatcher as well and similar impacts have been observed at the Seashore (NPS 2011e). Research on flush responses of oystercatchers to human disturbance indicates that protection of this species requires a buffer distance of 600 feet (183 meters) from nesting areas (Meyers 2005; table 26). A 2012 report on the effects of military overflights on American oystercatchers at the Seashore (Simmons and Borneman 2012) concluded that at their peak sound level, military overflights contributed to a 72.5 dBA (A-weighted decibel) sound level, which is comparable to walking along the oceanside of the point of Cape Lookout (see “Soundscapes/Acoustic Environment” in this chapter). Thus, the report concluded that there is no noteworthy evidence that military overflights affect the behavioral responses of American oystercatchers, including low-altitude flyovers (Simmons and Borneman 2012). Furthermore, the same study noted that ORVs, ATVs, and pedestrian traffic disturbed American oystercatchers, and that American oystercatchers moved off of their nests more readily with the passing of an ATV than an ORV. The study found that nests with adults making more trips off the nest had a lower hatch rate. Therefore, this report demonstrates that American oystercatchers display behavioral responses as a result of ORVs and pedestrians (Simmons and Borneman 2012).

TABLE 26: BUFFER DISTANCES RECOMMENDED FOR FORAGING AND NESTING AMERICAN OYSTERCATCHERS IN FLORIDA, GEORGIA, AND MAINE

Buffer	Disturbance Types	Behavior	Region
590–656 feet (180–200 meters)	Pedestrians, ATVs, vehicles, boats, pets	Nesting	Cumberland Island National Seashore, Georgia
100 feet (30 meters)	Development, vegetation removal	Foraging	Maine
250 feet (76 meters)	Development, vegetation removal	Roosting	Maine
338 feet (103 meters)	Personal watercraft	Foraging and loafing	West and east coasts of Florida

Source: Meyers 2005.

Also, in 2012 there were two American oystercatcher chick deaths attributed to ORV collisions at the Seashore (NPS 2011e).

Weather and Tides—Since 1996, 11 hurricanes and tropical storms have come within 65 nautical miles of Cape Lookout (NOAA 2012). Storms and high tides can reduce nesting success. Overwash and other weather related causes accounted for 29 percent of all identified nest failures in a study of 1,172 American oystercatcher nests on six islands at Cape Lookout from 1998 through 2008 (Schulte 2012). However, periodic hurricanes can also benefit oystercatcher nesting success in the long term through habitat generation and predator reduction (Simons and Schulte 2008).

Predation—Predators to American oystercatchers on Cape Lookout National Seashore include feral cats, muskrat, raccoons, gray fox, red fox, striped skunk, opossum, domestic dogs, crows, gulls, birds of prey, and ghost crabs. Oystercatchers may lay another clutch if predators depredate their nests early in the season (Nol and Humphrey 1994).

Predation of oystercatchers is thought to be associated with human activities such as ORV use and pedestrian traffic (McGowan and Simons 2006; Simons and Schulte 2008). McGowan and Simons (2006) hypothesized that human recreation might increase the activity of incubating oystercatchers, thereby leading to increased predation rates. Their research found a clear association between recreation and incubation behavior at Cape Hatteras and Cape Lookout during the 2002 and 2003 breeding seasons (McGowan and Simons 2006). ATV traffic was associated with increased rates of trips parents made back and forth to nests and a decrease in duration of incubation. Recreation types such as truck use and pedestrian traffic showed a weaker association with nesting behaviors. Evidence points to a reduction of nest success, the result of an alternation of incubation behavior due to recreational disturbance. McGowan and Simons (2006) hypothesized that mammalian nest predators, which were the main nest predators during this research (Davis et al. 2001), can better locate disturbed nests because adults leave a scent trail when going back and forth to nests. Humans may also support higher mammalian predator populations. For example, raccoon sightings and signs were greater in areas of increased human activity at Cape Lookout (Davis et al. 2001), and raccoon and bobcat signs appeared to be more abundant around areas of frequent human activity at Cumberland Island National Seashore, Georgia (Sabine, Schweitzer, and Meyers 2006).

COLONIAL WATERBIRDS

Colonial waterbirds at the Seashore include gull-billed terns, common terns, least terns, and black skimmers. Gull-billed terns are considered to be “threatened” in North Carolina by the NCWRC and the National Park Service (NPS) (Erwin 2005). None of these species is federally listed.

Colonial Waterbirds—Descriptions

Gull-billed Tern—The gull-billed tern is a medium-sized (13–15 inches long, weight about 5.6–7.0 ounces) waterbird found widely in Eurasia, the Mediterranean, northern Europe, and the United States. In the United States, it occurs as two subspecies. The Atlantic and Gulf subspecies has been designated *Sterna nilotica aranea* and the Salton Sea in California and south to western Mexico subspecies is known as *Sterna nilotica van rossemi* (Parnell, Erwin, and Molina 1995).

Common Tern—The common tern is a widespread species that can be found across the temperate region of the northern hemisphere. It also occurs in Bermuda and the southern Caribbean region (Nisbet 2002). It is a medium-sized, black-capped tern (12–14 inches long, weight 3.8–5.1 ounces) (Nisbet 2002). In North America, it is distributed along the Atlantic Coast, the St. Lawrence River, and in most of the Great Lakes (Nisbet 2002).

Least Tern—The least tern is the smallest of the black-capped terns in North America. Five types are known in North America, although there are few differences genetically or morphologically among them (Thompson et al. 1997). The least tern weighs, on average, about 1.7 ounces and is 8 to 9 inches long.

Black Skimmer—The black skimmer is the only waterbird on the Atlantic Coast that feeds by skimming the surface of the water with its lower jaw. Males, on average, are larger than females by 35–40 percent. The average weight of females is about 9.3 ounces; males average around 13 ounces. The length of females ranges from 16 to 24 inches; males range from 19 to 24 inches. Both sexes exhibit a high degree of nocturnal behaviors (Gochfeld and Burger 1994).

Colonial Waterbirds in North Carolina—The Outer Banks region of North Carolina supports a large number of colonial waterbirds species that depend upon its extensive sounds and the nearshore waters for feeding and its relatively undisturbed islands for nesting. Most species of colonial waterbirds are in jeopardy in North Carolina (Parnell and Committee 1977) because of a decline in numbers over the past 20 to 30 years (Erwin 2005). Between 1977 and 2007, the number of gull-billed tern nests declined from approximately 268 to only 90, common tern nests from 2,761 to 498, and black skimmer nests from 976 to 555. The number of least tern nests, however, increased from 1,925 to 2,827 (NCWRC 2008b). Numbers of most breeding, colonially nesting shorebirds within North Carolina have declined over the past 20 to 30 years (Cohen et al. 2010; table 27). For example, from 1977 to 2007, colonial waterbird nesting declined 30 percent, from 7,068 to 5,004 nests (table 27). Barrier island beaches provide important habitat for gull-billed terns, common terns, least terns, and black skimmers. Many of these beaches are severely degraded due to coastal development and associated increases in human disturbance and in predation by overabundant species. These factors have most likely contributed to the decline in colonial waterbird numbers in North Carolina (Cameron and Allen 2008).

TABLE 27: NUMBERS OF COLONIAL WATERBIRD NESTS IN NORTH CAROLINA, 1977–2007

Species	1977	1983	1988	1993	1995	1997	1999	2001	2004	2007	Average
Least tern	1,925	1,653	1528	2,188	1,993	882	1,271	1,742	2,408	2,827	1,842
Common tern	2,761	2,247	2,618	2,122	1,699	952	888	1,131	570	498	1,549
Gull-billed tern	268	233	161	155	249	137	154	258	99	90	180
Black skimmer	976	797	743	1,084	819	570	681	594	623	555	744
Total	7,068	5,866	5,983	7,159	5,877	3,408	3,806	4,811	4,528	5,004	N/A

Source: NCWRC 2008b.

N/A = Not applicable.

The reasons for the decline in North Carolina's colonial waterbirds include at least the following: predation from mammals and birds; competition from large gulls, especially herring gulls (*Larus argentatus*); human disturbance; and recreational disturbances (Parnell and Committee 1977, Parnell, Erwin, and Molina 1995; Erwin, Truitt, and Jimenez 2001; Erwin 2005).

Descriptions of Breeding, Foraging, and Migration/Winter Roost Habitats

Gull-billed Tern

Breeding Habitat—Gull-billed terns typically nest among other tern species on open, sandy-shell beaches, on large barrier islands, on dredge-spoil islands, or on overwash fans that are mostly devoid of vegetation. They also nest on elevated-shell ridges (rakes) along the edges of marsh islands that they

share with American oystercatchers and common terns (Erwin et al. 1998; Erwin 2005; Parnell, Erwin, and Molina 1995).

Foraging Habitat—In contrast to other terns, gull-billed terns do not feed primarily on fish but are opportunistic, taking insects on the wing, feeding on a variety of invertebrates, including fiddler crabs (*Uca pugnax*), decapods, marine worms, and clams, as well as small marsh fish (Erwin 2005; Parnell, Erwin, and Molina 1995). Consequently, gull-billed terns can be seen feeding over marshes, creeks, and along ocean and bay beaches, as well as over agricultural fields many miles from their nesting sites (Erwin 2005; Parnell, Erwin, and Molina 1995).

Migration/Winter Roost Habitat—There is little known about the habitat used by migrating gull-billed terns, except that it is generally considered similar to the nesting habitats (i.e., open beach, sand spits) (Erwin 2005). Winter range includes Costa Rica, coastal ponds, lagoons, and Louisiana mud flats, and mainly flooded rice fields (Parnell, Erwin, and Molina 1995).

Common Tern

Breeding Habitat—Common terns typically nest on open, sandy-shell beaches on ocean coastal islands, as well as on inland island sites in freshwater lakes (Nisbet 2002). However, they also nest in salt marshes, either on shell or on wrack, especially where human disturbance along the beaches are significant. They also nest on human-made structures, such as old piers or channel markers (Erwin 1980).

Foraging Habitat—Common terns prey on small fish and shrimp in inlets and along the coast, often within a few miles of their breeding colonies (Nisbet 2002).

Migration/Winter Roost Habitat—There is little information on habitats used by migrating common terns, however, most continue to feed close to the shore. Migration staging areas are known at large sandy spits and bars at a number of North Atlantic sites, with concentrations numbering in the thousands at some places (Nisbet 2002). In the winter, common terns migrate to the Caribbean and South America, both coasts of Africa, coasts and islands of the Indian Ocean, the western Pacific from Japan to the Solomon Islands, New Guinea, and Australia (Nisbet 2002) where they often concentrate in large numbers in coastal lagoons (Nisbet 2002).

Least Tern

Breeding Habitat—Least terns typically select the barest sand-shell covered substrates available on coastal, riverine, or dredge-spoil islands (Thompson et al. 1997). They also nest on rooftops in a number of coastal areas, where pea gravel is used as part of the roofing material (Thompson et al. 1997). On coastal barrier islands, they often select colony sites either adjacent to inlets or in overwash areas that are often interspersed among piping plover nests. Unlike common terns, least terns are typically found in small single species colonies, where their nests are often widely spaced (Thompson et al. 1997). In New Jersey, inter-nest distance ranged from 6 to 216 feet (1.8 to 65.8 meters) at the time of egg-laying, and 3 to 197 feet (1 to 60 meters) at the end of incubation (Burger and Gochfeld 1990).

Foraging Habitat—Least tern foraging habitat is similar to that of common terns, except that least terns seldom feed in large flocks.

Migration/Winter Roost Habitat—Least terns migrate from the Outer Banks in August and September, with migration flocks staging at certain sandy island sites (Thompson et al. 1997). In late July or August, remote sandbars or sandy spits serve as roost sites. Least terns winter in Florida through the Caribbean and into Central and South America (Thompson et al. 1997).

Black Skimmer

Breeding Habitat—Black skimmers prefer to nest on open, sandy substrates on barrier and dredge-spoil islands or at the tips of barrier islands (Gochfeld and Burger 1994). They invariably nest with other tern species along the Atlantic Coast (Erwin 1977, 2005). Black skimmers occasionally nest on wrack or on shell ridges, in salt marshes, and even on rooftops with least terns (Gochfeld and Burger 1994).

Foraging Habitat—Black skimmers feed on small fish, shrimp, and other invertebrates that they capture by skimming the surface with their lower jaws just below the surface of the water. They typically feed very close to their nesting colonies and prefer quiet waters in salt march creeks, lagoons, or protected coves and inlets near barrier islands (Erwin 1977; Gochfeld and Burger 1994).

Migration/Winter Roost Habitat—Black skimmers migrate from the Outer Banks region from September through November, forming very large concentrations on sand spits and sandbars (Gochfeld and Burger 1994). They winter in Florida through the Caribbean and South America (Erwin 2005; Gochfeld and Burger 1994).

Breeding Biology

Gull-billed Tern—The gull-billed tern arrives in North Carolina by mid-May. The mating system is monogamous, and like many other waterbirds, gull-bills probably have long-lasting pair bonds. Nest-site establishment and egg-laying usually occur in mid to late May. The nest consists of a shell-lined scrape in the sand or sometimes on wrack in salt marshes. Clutch sizes vary; two to three brownish-blotched eggs are incubated for 22 to 23 days. Members of a pair share incubation duties, while females take the dominant role. Both parents share brooding duties, and both feed the young, often for an extended period after fledging occurs (birds generally fledge at 26 to 30 days of age). The chicks are highly camouflaged and more mobile (precocial) than either common tern or black skimmer chicks, with which it coexists. The young may leave the immediate area of the nest within a few days if disturbance is high. Pairs may re-nest if a nest is lost early in the season (Erwin 2005).

Common Tern—The common tern arrives in North Carolina in late April through early May and begins nesting most years from mid-May through early June (Nisbet 2002). The mating system is monogamous, and like many other waterbirds, common terns probably have long-lasting pair bonds. Clutch sizes vary, but three, medium-dark brown mottled eggs are normal. The eggs are incubated for 22 to 33 days. Both sexes incubate and feed the brood. As in other terns, feeding of the young occurs post-fledging and can continue into the fall migration. Upon hatching, the young remain near the nest (unless disturbed) for the entire pre-fledging period. Renesting may occur if early nests fail. Fledging ranges from about 25 to 30 days. Common terns appear to serve as a social locus for mixed-species colony formation, possibly because of their aggressively protective nature (Erwin 1979, 2005; Nisbet 2002). Thus, gull-billed terns and black skimmers often nest among common terns (Erwin 2005).

Least Tern—Birds arrive in North Carolina from late March through mid-April. Least terns usually nest in single-species colonies, with nests often spread out. Courtships lasts for two to three weeks in April and May, and egg-laying occurs from late May through June. Clutch sizes range from one to three eggs, with the average of two in North Carolina. Eggs are highly camouflaged, with the background color beige to light olive brown. Members of a pair share incubation duties, but females take the dominant role. Incubation lasts for 21 to 22 days, and the highly mobile young move from the nest within a few days. They are able to fly at about 20 days of age. Post-fledging parental feeding can occur for several weeks away from the colony (Erwin 2005; Thompson et al. 1997).

Black Skimmer—Birds arrive in North Carolina from late April through mid-May, and nest building and egg-laying usually occurs from late May through mid-June (Erwin 1977, 2005; Gochfeld and Burger 1994). Clutch sizes range from two to four eggs (Erwin 1977). Eggs are light buff with black blotches, and are laid and hatch at different times. Both sexes incubate the eggs, brood, and feed the young. Incubation ranges from 22 to 25 days. The young remain near the nest (unless disturbed) for most of the pre fledging period of 28 to 30 days (Erwin 1977). As with other waterbirds, if nests fail early in the season, skimmers will re-nest (sometimes several times). Skimmers are sometimes seen incubating eggs as late as August in the mid-Atlantic region (Burger and Gochfeld 1990). Fledged young are fed by their parents, often right up until migration (Erwin 1977, 2005).

Breeding Performance at Cape Lookout National Seashore

Colonial waterbird breeding at the Seashore occurs between May and August. In many cases, colonial waterbirds use areas already closed to the public for breeding (NPS 2006h).

At Cape Lookout National Seashore, all colonial waterbirds have declined since 1992 and for gull-billed and common terns the decline has been dramatic (tables 28a and 28b) (NPS 2006h).

TABLE 28A: ESTIMATES OF COLONIAL WATERBIRD NESTING (NESTING PAIRS) AT CAPE LOOKOUT NATIONAL SEASHORE FROM SELECTED YEARS, 1992–2004

Species	1992	1993	1995	1997	1998	1999	2001	2004
Gull-billed Tern	59	57	35	2	–	0	0	0
Common Tern	242	582	258	9	41	–	5	28
Least Tern	363	583	236	179	236	131	96	218
Black Skimmer	111	307	185	28	10	–	33	72

TABLE 28B: ESTIMATES OF COLONIAL WATERBIRD PAIRS AT CAPE LOOKOUT NATIONAL SEASHORE FROM SELECTED SITES AND SELECTED YEARS, 2007–2012

Species	2007	2008	2009*				2010			2011		2012		
	NDI	ODF	ODF	NDI	OPH	CLP	ODF	OPH	CLP	BLO*	CLP	NDI	OPH	CLP
Least tern	191	296	101	63	50	143	230-250	40	209	153	127	346	117	18
Black skimmer	169	30	37	83	10	94	3	133	70	3	155	0	49	72
Common tern	71	1	3	11	0	11	1	12	2	1	96	0	17	38
Gull-billed tern	59	3	1	2	0	2	0	10	1	2	7	0	24	0
Royal tern	0	0	0	0	0	0	0	0	0	0	0	0	0	33

Sources: NPS 2007k, 2008f, 2009f, 2010f, 2011f, 2012q; Altman 2013b.

NDI = New Drum Inlet, ODF = Old Drum Flats, OPH = Ophelia Inlet, CP = the point of Cape Lookout, BLO = Blowfish Island.

*Reported as individuals in NPS monitoring report. Divided by 2 per NPS instruction to get pair counts.

A summary of trends for colonial waterbirds at Cape Lookout National Seashore follow.

Least Tern

Apparently Stable—The number of nesting pairs fluctuates (583 nesting pairs in 1994 to 218 pairs in 2004) but the long-term population at Cape Lookout National Seashore seems to be stable. Accurate counts of nesting least terns can be difficult because of the high rates of nest losses. The least tern is a species of “high conservation concern” on the North Carolina Bird Watchlist.

Common Tern

Declining—The number of nesting pairs at the Seashore fell from 582 in 1993 to only 28 in 2004. The common tern is a species of “high conservation concern” on the North Carolina Bird Watchlist.

Gull-billed Tern

Declining—The gull-billed tern is rare at Cape Lookout National Seashore as a nester. The number of nesting pairs in the Seashore fell from more than 50 in 1992 and 1993 to none in 2004. This species is listed as “threatened” by the state of North Carolina.

Black Skimmer

Declining—The number of nesting pairs fell from over 300 in 1993 to 72 in 2004. This species is listed as a state species of concern.

Nonbreeding and Wintering

Gull-billed Tern—Fledged young and adults usually leave North Carolina’s colonies by August, moving north for a short period before turning south for the fall and winter. Little is known of concentration areas during migration or winter, although wintering birds are known in Florida and the Gulf coastal region, from western Florida all the way south to Honduras and to Panama on the west coast. The gull-billed tern occasionally winters along the Atlantic Coast of North America as far north as North Carolina (Parnell, Erwin, and Molina 1995; Erwin 2005).

Common Tern—Fledged young and adults usually leave North Carolina’s colonies in late-July through August. They often move north before staging at sandbars near inlets in September and then heading south. Little information is known about winter range, but they are known from Florida south through the Caribbean to Peru and southern Brazil, where tens of thousands have been recorded in late winter (Nisbet 2002, 21).

Least Tern—Fledged young and adults usually leave North Carolina’s colonies in late July through August after breeding and also move northward into the New York to New England before turning to South America and the Caribbean; however, data is very limited on winter ranges (Thompson et al. 1997). Like other terns, least terns tend to congregate at staging areas along the Gulf Coast in August before departing for the winter (Thompson et al. 1997; Erwin 2005).

Black Skimmer—Fledged young and adults usually leave North Carolina’s colonies by early August and disperse northward before heading south. Large flocks congregate at staging areas, often with terns. Adults may remain with their young during fall migration. Most birds from the mid-Atlantic region winter from southern North Carolina to Florida, the Caribbean, and into Central and South America (Gochfeld and Burger 1994; Erwin 2005).

Risk Factors

Human Activity—Ground-nesting colonial waterbirds are particularly vulnerable to impacts from human activities undertaken by ORVs, pedestrians, photographers, wildlife managers, scientists, and even poachers because of the birds' usually high colony density and co-occurrence with human recreation (Erwin 1980, 2005; Rodgers and Smith 1995; Rodgers and Schwikert 2002). Disturbances affect the animals' ability to feed, rest, and breed by evoking a flush response (Rodgers and Smith 1995; Rodgers and Schwikert 2002). Human activities which have indirect effects include: sonic booms from military operations, aircraft disturbances, the presence of both domestic and feral animals, and the leaving of garbage that subsequently attracts both bird and mammal predators. Even modest disturbances early in the spring, when the birds are first arriving and prospecting for breeding sites, can be highly disruptive to colonial species (Buckley and Buckley 1976). These studies indicate that buffer distances from human disturbances should be approximately 600 feet (183 meters) from nesting areas (Erwin 1989, 2005; Rodgers and Smith 1995).

Weather and Tides—Since 1996, 11 hurricanes and tropical storms have come within 65 nautical miles of Cape Lookout (NOAA 2012). The effects of major hurricanes caused major declines in water quality conditions, as well as in marine life, throughout Pamlico Sound in North Carolina for an extended period (Mallin 2000). Winter storms are known to impact shorebirds. High mortality of many coastal bird species was noticed after a snowstorm swept the entire North Carolina coast in 1989 (USFWS 1996a).

Predation—Predators to colonial waterbirds at the Seashore include: muskrat, gray fox, red fox, striped skunk, opossum, domestic dogs, crows, gulls, birds of prey, and ghost crabs. Raccoons and feral cats have increased in recent years as human populations have grown in coastal regions (Buckley and Buckley 1976; Erwin, Truitt, and Jimenez 2001; Erwin 2005). The result of this predation has been poor reproduction or major redistributions of species (Erwin, Truitt, and Jimenez 2001; Erwin 2005). In addition, gulls are often predators of terns as well as competitors for nesting space (Nisbet 2002). These include: great black-backed gulls (*Larus marinus*), herring gulls (*Larus argentatus*), and the smaller laughing gulls (*Leucophaeus atricilla*). In addition, in certain areas, other bird species may prey on terns and skimmers (or their eggs), such as peregrine falcons (*Falco peregrinus*), great-horned owls (*Bubo virginianus*), fish crows (*Corvus ossifragus*), and others (Erwin 2005).

Environmental Pollutants—A number of chemicals in the environment may be detrimental to the survival and/or reproduction of colonial waterbirds. Environmental contaminants are believed to cause reproductive failure in common terns, one of the more sensitive seabirds to organochlorine chemicals. Problem areas that have been researched in North America are mostly in the U.S. and Canadian Great Lakes region (Nisbet 2002). No evidence of any population-wide wildlife effects of agricultural contaminants has been documented for the Outer Banks region (NPS 2006e).

Foraging Habitat Availability—Unlike foraging habitats of plovers and oystercatchers, the habitats of feeding colonial waterbirds are not contiguous with their breeding areas. Least terns, common terns, and black skimmers usually feed from 0.6 to 6 miles (1 to 10 kilometers) from their nesting colonies in shallow waters (Erwin 1980; Burger and Gochfeld 1990), while gull-billed terns feed on invertebrates primarily in marshes and over upland habitats (Parnell, Erwin, and Molina 1995). Few data are available on trends on either forage fish populations in coastal waters, or on invertebrates to indicate whether there are current threats to foraging habitats (NPS 2006e).

WILSON'S PLOVER

Wilson's plover is a medium-sized, ringed plover of coastal habitats. Its overall length is 6.5 to 7.5 inches, and its weight ranges between 2 to 2.5 ounces. At all times of the year and in all plumages, its bill

is entirely black, large, and heavy; its upperparts are generally grayish to grayish brown, and its underparts are white, with a black-to-brownish breast band; its legs and feet are flesh-colored to pinkish. It is readily distinguished from other, similar, ringed plovers by its larger size; large, heavy, all-black bill; and flesh colored legs (Corbat and Bergstrom 2000; Hayman, Marchant, and Prater 1986). Wilson's plover has no federal protection status in the United States; however, it was classified as a species of conservation concern by the USFWS in 2008. Birds that appear on this list are those that, without additional conservation actions are likely to become candidates for listing under the ESA (USFWS 2008b). Brown et al. (2001) list Wilson's plover as a "species of high concern" in their prioritization of shorebird species according to relative conservation status risk (Brown et al. 2001). Wilson's plover is listed as endangered in Virginia and Maryland, threatened in South Carolina, rare in Georgia, state-protected in Alabama (National Audubon Society 2005), and as a species of special concern in North Carolina (NCAC 10I.0105, Subchapter 101 15A).

Distribution

Breeding—Wilson's plover is distributed locally along the Atlantic Coast, from Virginia south to southern Florida, including the Florida Keys, and from southern Florida west along the Gulf Coast to Veracruz, Mexico, the Yucatán, and Belize (Stevenson and Anderson 1994). Breeding locations are uncertain farther south along the Caribbean coast of Central America.

In South America, Wilson's plover breeds locally along the Atlantic coast, from Colombia south to Brazil, including the islands of Trinidad, Aruba, Bonaire, Margarita, and Curaçao, located off the coast of Venezuela (Meyer de Schauensee and Phelps 1978). In the West Indies, it breeds throughout the Bahamas, the Greater Antilles, the Virgin Islands, the Lesser Antilles, and in the Grenadines (Raffaele et al. 1998).

Along the Pacific Coast, Wilson's plover breeds locally along the west coast of Baja California, and from the Gulf of California south to Nayarit, Mexico (Howell and Webb 1995). Farther south along the Pacific Coast, it breeds from Mexico to Ecuador and Peru (Hilty and Brown 1986).

Wintering—Wintering occurs mainly in northeast and central Florida (Corbat and Bergstrom 2000) as well as in west Louisiana and south Texas throughout the remainder of the breeding range (see above), to northern South America (Hayman, Marchant, and Prater 1986). There is no data pertaining to Wilson's plover nonbreeding or wintering at the Seashore.

Wilson's Plover in North Carolina and Cape Lookout National Seashore

A 2004 survey of the entire coast of North Carolina yielded 232 pairs of Wilson's plover. In 2004, Cape Lookout National Seashore supported 61 nesting pairs and two individuals, which represented 26 percent of North Carolina's population of Wilson's plover (Cameron 2004). The birds were distributed throughout the Seashore, with the greatest concentration at the Power Squadron Spit. Piping plovers and American oystercatchers also use many of their nesting sites (NPS 2006e). In 2012, a total of 85 nesting pairs and 11 individuals were counted throughout the Seashore (NPS 2012r). Table 29 shows the rise and fall of Wilson's plovers at Cape Lookout National Seashore.

TABLE 29: NUMBER OF WILSON'S PLOVER AT THE SEASHORE, 2009–2012

Totals for the Seashore	2007	2008	2009	2010	2011	2012
Total for the Seashore	76 pairs; 3 individuals	90 pairs; 6 individuals	72 pairs; 1 individual	76 pairs; 9 individuals	76 pairs; 3 individuals	85 pairs; 11 individuals

Sources: NPS 2009g, 2010g, 2011g, 2012r.

Population trends and nesting productivity of Wilson's plovers at Cape Lookout National Seashore are unknown. It is likely they face the same threats as other ground nesting species, including flooding and predation. In 1994, 22 of the 29 surveyed nests on North Core Banks were lost to predators (NPS 2006e).

Habitat Description—Wilson's plovers are typically associated with coastal areas of high salinity and sparse vegetation including salt flats, coastal lagoons, sand dunes, foredunes, and overwash areas above the high-tide line (Tomkins 1944; Hayman, Marchant, and Prater 1986; Corbat and Bergstrom 2000). At the Seashore, Wilson's plover breeding sights have only been known to occur within piping plover closures. Hence, all closures, and much of the management of piping plovers, also apply indirectly to Wilson's plover.

Diet—Wilson's plover is a visual feeder of crustaceans, particularly fiddler crabs and some insects (Strauch and Abele 1979; Morrier and McNeil 1991; Thibault and McNeil 1994), which they prey upon at intertidal mud flats, sand flats, ephemeral pools, and shore of brackish ponds. They usually forage at low tide on intertidal mud flats (Strauch and Abele 1979; Thibault and McNeil 1994; Corbat and Bergstrom 2000).

Breeding Biology—Before territories are established from mid-March through early April (Tomkins 1944; Bergstrom 1988), Wilson's plover form pairs, and most breeding territories are established by mid-April. The nest is a scrape in sand that requires little construction (Bergstrom 1982). Egg-laying peaks from late April through late May (Bergstrom 1982). Re-nesting after failure of the first nest continues through the end of June. The estimated time required to complete a clutch of three eggs is four to six days (Bergstrom 1988; Corbat and Bergstrom 2000).

Reproductive Success at Cape Lookout National Seashore—There is no data pertaining to Wilson's plover reproductive success at Cape Lookout National Seashore (NPS 2006e).

Risk Factors—Because Wilson's plovers commonly nest on beaches with wide berms, they are subject to disturbances at their nests and roosts factors including beachgoers, pets, and ORV traffic on beaches. Wilson's plovers leave their nests when disturbed and are extremely reluctant to return when intruders are anywhere near, a practice that exposes eggs to predation and overheating (Corbat and Bergstrom 2000).

OTHER WILDLIFE AND WILDLIFE HABITAT

In addition to the federally and state-listed threatened and endangered species detailed in preceding sections of this chapter, a variety of birds as well as terrestrial and marine animals depend on the barrier island habitats within the Seashore. This section describes those species that inhabit the beach, berm, tidal flats, salt marsh, and sound water ecological zones within the study area, and which are sensitive to human activity and could therefore be affected by ORV management actions.

INVERTEBRATES

The Seashore beach ecosystem is home to a vast quantity of invertebrates, which form a valuable link in the coastal food chain. Many of the protected bird species found within the Seashore, including the piping plover, Wilson's plover, red knot, American oystercatcher, and gull-billed tern, feed on invertebrates in areas that are open to ORV use, such as the intertidal zone and the wrack line. High-energy, intertidal beaches in the southeastern United States generally support approximately 20 to 30 types of invertebrate species (Ruppert and Fox 1988), with the most identifiable being mole crabs, ghost crabs, and coquina clams (*Donax variabilis*). Both mole crabs and coquina clams are a primary prey base for fish, crabs, and shorebirds, and the population density of some predators may actually be dependent on the availability these invertebrate species (Green 2002). Other invertebrates within the Seashore beach ecosystem include

clamworms (*Nereis succinea*), limpets (*Patella vulgata*), which can be found in the intertidal zone, and varieties of jellyfish, sea urchins, and sea stars (class Asteroidea), all of which spend their entire lives in the water.

Ghost crabs are sand-colored, terrestrial animals with square-shaped bodies, which are generally no more than 2 to 3 inches (5 to 7.6 centimeters) wide (Lippson and Lippson 1997). Ghost crabs are a top predator of the beach ecosystem and can be used as an indicator species to analyze the health of the beach ecosystem, due to their prominence and high susceptibility to anthropogenic disturbances (Hobbs, Landry, and Perry 2008). They are primarily nocturnal and create burrows for shelter from heat and desiccation (drying) stress during the warmer afternoon periods. Burrows are usually 2 to 4 feet (0.6 to 1.2 meters) in length and are generally located in an area from the high-tide line landward up to 1,312 feet (400 meters). Ghost crabs emerge from their burrows at night to feed in the intertidal zone, and travel up to 984 feet (300 meters) while foraging (Hobbs, Landry, and Perry 2008). Ghost crabs retreat deep into their burrows during the winter months (Lippson and Lippson 1997).



Credit: George Harrison/USFWS

Ghost Crab

Like ghost crabs, mole crabs are a common inhabitant of the high-energy, exposed beach environment. In contrast to other species of crabs, they do not have claws or pincers. Mole crabs are generally less than 2 inches (5 centimeters) in length and have egg-shaped bodies that allow for rapid digging in wet sand (Ruppert and Fox 1988). Mole crabs are filter feeders that burrow and anchor themselves into the sands within the swash zone, collecting organic matter that they trap within their feeding antennae when water recedes over the buried crabs. Unlike ghost crabs, mole crabs move off the beach to deeper offshore waters during the winter (Lippson and Lippson 1997).

Marine bivalves such as oysters (*Crassostrea virginica*), razor clams, coquina clams, and ribbed mussels (*Geukensia demissa*) also inhabit the Seashore, forming the diet for many birds. Clams characteristically lie buried just beneath the surface of the sand, although they can burrow to greater depths as necessary. Much like the mole crab, coquina clams are filter feeders and migrate up and down the ocean beach in the intertidal area during the spring and summer (Ruppert and Fox 1988). Due to its importance in food webs, the coquina clam is considered an indicator species for the sandy beach oceanfront habitat. It feeds on small particles such as unicellular algae and detritus and in turn, is consumed by fish and birds (SCDNR 2009).

In addition to the intertidal zone, another important habitat for invertebrates is the wrack line. A wrack line is a line of stranded debris along a beach face marking the point of maximum run-up during a previous high tide. The wrack line is often composed of drying seaweed, tidal marsh plant debris, decaying marine animals, shells, and miscellaneous debris washed up and deposited on the beach. The wrack line provides a habitat suitable for many invertebrates such as amphipods, beetles, mites, flies, and spiders. Studies have demonstrated that ORV use in and around the wrack line reduces the density of invertebrates in beach environments.



Intertidal Zone

A three-year study on Cape Cod and Fire Island, New York (Kluft and Ginsberg 2009), found that the shrimp-like crustaceans called amphipods are particularly vulnerable to drying out in immature stages, and use the wrack line as cover. Several species of flies also use the site to lay their eggs, and wolf spiders (family Lycosidae) migrate back and forth from the beach grass to the wrack line to feed on these amphipods. The study observed that higher ORV traffic resulted in dispersal and desiccation of the wrack line, thereby reducing the populations of invertebrates in these areas.

OTHER BIRD SPECIES

Birds are the most visible of all vertebrates within the Seashore because of its location on the Atlantic Flyway, varied habitats, strong winds which drive oceanic birds onto land, and lack of development and human disturbance. The Outer Banks of North Carolina, including the Seashore, provide a critical link in the migratory path of several shorebird species. The barrier island ecosystems at the Seashore provide habitat for large numbers of migratory and nesting bird species, and coastal marshes are critical to overwintering populations of many waterbirds.

Studies have recorded 21 species of shorebirds (table 30) on the Outer Banks of North Carolina, such as whimbrels (*Numenius phaeopus*), willets (*Catoptrophorus semipalmatus*), and sanderlings (*Calidris alba*). These shorebirds are most abundant in May and August. Least terns, common terns, gull-billed terns, black skimmers, piping plovers, Wilson's plovers, willets, and American oystercatchers can all be found nesting on North Carolina beaches (North Carolina Audubon 2008). Several of these species are designated as state-listed and/or federally listed threatened or endangered species and are discussed previously in this chapter. However, nonlisted shorebirds such as willets have similar nesting and foraging habitats as federally and state-listed species. The eastern willet, for instance, breeds in coastal salt marshes and nests on the ground, often in colonies, usually in well-hidden locations in short grass. These birds forage on mud flats or in shallow water, probing or picking up food by sight. Their diet consists of insects, crustaceans, and marine worms, as well as some plant material. Killdeer (*Charadrius vociferus*), whose breeding range also includes North Carolina, often nest in unlined gravel depressions. However, although killdeer are technically in the family of shorebirds, they are unusual in that they often nest and live far from water (Porter 1997).

The American Bird Conservancy recognized Cape Lookout National Seashore as a Globally Important Bird Area in 2001 for its wide variety of birds and the value this barrier island park has for protection of these birds (NPS 2012s). Within the boundaries of the Seashore, approximately 269 bird species have been identified (NPS 2012a). Migratory birds are often found throughout the year on the way to and from their destinations. During the winter months, the common loon (*Gavia immer*), pied-billed grebe (*Podilymbus podiceps*), northern gannet (*Morus bassanus*), tundra swan (*Cygnus columbianus*), as well as Canada geese (*Branta canadensis*), are common sights along the Seashore. During the summer migratory season, several varieties of herons (*Ardea herodias*), Audubon's shearwater (*Puffinus lherminieri*), and the barn swallow (*Hirundo rustica*) populate the Cape Lookout shores. While less frequently sighted, grebes (*Podiceps auritus*), mallard ducks (*Anas platyrhynchos*), hawks (genus *Accipiter*), bald eagles (*Haliaeetus leucocephalus*), peregrine falcons (*Falco peregrinus*), and various species of sandpipers also inhabit the island at one point or another throughout the year. Rarely, birds like the tropical masked booby (*Sula dactylatra*) and the magnificent frigate bird (*Fregata magnificens*) have been seen (NPS 2006b). Common crows (*Corvus brachyrhynchos*) and gulls (*Larus canus*) are present within the Seashore, and the ring-necked pheasant (*Phasianus colchicus*) is also present in shrub thickets on Core Banks (NPS 2001d).

TABLE 30: SHOREBIRDS ON THE OUTER BANKS OF NORTH CAROLINA, 1992–1993

Species	Common Name
<i>Actitis macularia</i>	Spotted sandpiper
<i>Arenaria interpres</i>	Ruddy turnstone
<i>Calidris alba</i>	Sanderling
<i>Calidris alpina</i>	Dunlin
<i>Calidris canutus</i>	Red knot
<i>Calidris fuscicollis</i>	White-rumped sandpiper
<i>Calidris mauri</i>	Western sandpiper
<i>Calidris minutilla</i>	Least sandpiper
<i>Calidris pusilla</i>	Semipalmated sandpiper
<i>Catoptrophorus semipalmatus</i>	Willet
<i>Charadrius melodus</i>	Piping plover
<i>Charadrius semipalmatus</i>	Semipalmated plover
<i>Charadrius vociferous</i>	Killdeer
<i>Charadrius wilsonia</i>	Wilson's plover
<i>Haematopus palliatus</i>	American oystercatcher
<i>Limnodromus griseus</i>	Short-billed dowitcher
<i>Limosa fedoa</i>	Marbled godwit
<i>Numenius phaeopus</i>	Whimbrel
<i>Pluvialis squatarola</i>	Black-bellied plover
<i>Tringa flavipes</i>	Lesser yellowlegs
<i>Tringa melanoleuca</i>	Greater yellowlegs

Source: Dinsmore, Collazo, and Walters 1998.

MAMMALS

Upland mammal species are somewhat limited in number on barrier islands because of the lack of diversity in vegetation and difficulty of access from mainland areas. The only large animals present in the Seashore are the wild horses on Shackleford Banks, and deer and coyotes, which are found throughout the Seashore (NPS 2007h). There are an estimated 107 wild horses on Shackleford Banks. The horse population is generally managed at between 110 and 130 horses, but the birth rate was lower and mortality higher than anticipated in 2011 (NPS 2012b). Federal legislation protects the horses within the Seashore and requires an annual report on the status of the herd. The horses are cooperatively managed by the NPS and the Foundation for Shackleford Horses, Inc., pursuant to the legislation, and a Memorandum of Understanding updated in 2007 (NPS 2008g).

North and South Core Banks support smaller native mammals, including eastern cottontail (*Sylvilagus floridanus*), nutria (*Myocastor coypus*), northern raccoon (*Procyon lotor*), and shrews (*Blarina brevicauda*, *Cryptotis parva*) (NPS 2007h, 2012c). The primary mammalian predators at the Seashore are raccoons and feral cats (NPS 2006a), although sightings of red fox and mink were confirmed in 2007 (NPS 2007j) and coyotes were observed in 2013.

REPTILES AND AMPHIBIANS

Sea turtles are the more common reptile species found in Cape Lookout National Seashore, lizards, snakes, and land turtles can also be found. The most common reptiles (other than sea turtles) in the area include black racer snake (*Coluber constrictor*), six-lined racerunner lizard (*Cnemidophorus sexlineatus*), eastern box turtle (*Terrapene carolina*), rough green snake (*Opheodrys aestivus*), Carolina anole (*Anolis carolinensis*), eastern kingsnake (*Lampropeltis getula*), and copperhead (*Agkistrodon contortrix*) (NPS 2012d). With the exception of the copperhead, all of the species listed above are most active during daylight hours. Reptiles can be found in a variety of habitats at the Seashore, including the sand dunes, grassland, maritime forest, and salt marsh (NPS 2012e). The grasslands are the preferred habitat for six-lined racerunner lizards and black racer snakes (NPS 2012d), while the copperhead is likely common in forested areas (Davidson College n.d.). Similarly, the eastern box turtle typically prefers moist forested areas, but can be found in a wide variety of habitat types (e.g., grasslands) (Davidson College n.d.).

Although salt and brackish water environments dominate the islands, a few fresh water habitats support tree frogs (*Hyla cinerea*) and Fowler's toads (*Bufo fowleri*) (NPS 2012f).

SOUNDSCAPES/ACOUSTIC ENVIRONMENT

According to the NPS, the acoustical environment is comprised of a combination of acoustic resources, including natural, cultural, and historical sounds. A soundscape is defined as the way in which humans perceive this acoustic environment (NPS 2009h). Specifically, the natural soundscape encompasses all of the natural sounds that occur in parks, including the physical capacity for transmitting those natural sounds and the interrelationships among park natural sounds of different frequencies and volumes (NPS 2006d, section 4.9)]. Natural sounds may range from bird and bat calls and insect chirps, to sounds produced by physical processes like wind rushing through leaves on trees, thunder, and rushing and falling water through rivers, creeks and streams within a park. According to the NPS, 72 percent of visitors indicate that a crucial reason for the need to preserve national parks is that parks provide opportunities to experience natural peace and the sound of nature (NPS 2009h). Therefore, the NPS works to preserve, to the greatest extent possible, the acoustic environment and natural soundscapes of parks.

NOISE FUNDAMENTALS

According to the NPS, “although noise has been used as a synonym for sound, it is essentially the negative evaluation of sound by people, is extraneous, or undesired. Humans perceive sound as an auditory sensation created by pressure variations that move through a medium such as water or air and is measured in terms of amplitude and frequency” (NPS 2009h). Sources of noise within national parks are dependent upon the particular park and may include vehicular sources (cars, buses, or other vehicles) used for tours and access to trails and campgrounds, aircraft overflights from planes, helicopters and military jets along with airport development, snowmobiles and watercraft, park operations and energy development (NPS 2009h).

The magnitude of noise is usually described by its sound pressure. Since the range of sound pressure varies greatly, a logarithmic scale is used to relate sound pressures to some common reference level, usually the decibel (dB). Sound pressures described in dBs are called sound pressure levels and are often defined in terms of frequency-weighted scales (A, B, C, or D).

The dBA is commonly used to describe noise levels because it emphasizes the frequency range to which the human ear is most sensitive (1,000–5,000 Hertz) (Caltrans 1998). Sound levels measured using a dBA scale are generally expressed as dBA. Throughout this section, all noise levels are expressed in dBA.

Several examples of sound pressure levels in the dBA scale are listed in table 31, while table 32 presents examples of sound pressure levels measured in national parks.

TABLE 31: EXAMPLES OF COMMON SOUNDS

A-weighted Sound Level (dBA)	Overall Level	Noise Environment
120	Uncomfortably loud (32 times as loud as 70 dBA)	Military jet airplane takeoff at 50 feet
100	Very loud (8 times as loud as 70 dBA)	Jet flyover at 1,000 feet Locomotive pass-by at 100 feet
80	Loud (2 times as loud as 70 dBA)	Propeller plane flyover at 1,000 feet. Diesel truck 40 mph at 50 feet
70	Moderately loud	Freeway at 50 feet from pavement edge at 10:00 a.m. Vacuum cleaner (indoor)
60	Relatively quiet (one-half as loud as 70 dBA)	Air condition unit at 100 feet. Dishwasher at 10 feet (indoor)
50	Quiet (1/4 as loud as 70 dBA)	Large transformers Small private office (indoor)
40	Very quiet (1/8 as loud as 70 dBA)	Birds calls. Lowest limit of urban ambient sound
10	Extremely quiet	Just audible (1/64 as loud as 70 dBA)
0	Threshold of hearing	Quietest sound detectible by a healthy human ear

Source: FICN 1992.

Modified by: The Louis Berger Group, Inc., October 1998.

TABLE 32: SOUND PRESSURE LEVELS MEASURED IN NATIONAL PARKS

Sound	dBA
Threshold of human hearing	0
Haleakala National Park: Volcano crater	10
Canyonlands National Park: Leaves rustling	20
Zion National Park: Crickets (5 meters)	40
Whitman Mission: Conversational speech (5 meters)	60
Yellowstone National Park: Snowcoach (30 meters)	80
Arches National Park: Thunder	100
Yukon-Charley Rivers National Park: Military jet (100 meters above ground level)	120

Source: NPS 2013c.

HUMAN AND WILDLIFE RESPONSE TO CHANGES IN NOISE LEVELS

Noise may have adverse effects on the human population in a variety of ways. Noise may interfere with human activities, such as sleep, speech communication, and tasks requiring concentration or coordination. At a physiological level, noise may also cause annoyance, hearing damage, and other health-related problems. The degree of disturbance on humans from unwanted sound depends essentially on (1) the amount and nature of the intruding noise; and (2) the type of activity occurring where the noise is heard.

In considering the first of these factors, it is important to note that individuals have different sensitivity to noise. Loud noises bother some people more than others, and some patterns of noise also affect a person's perception of whether or not a noise is offensive. With regard to the second factor, individuals tend to judge the annoyance of noise relative to the natural sounds and perceived quiet (i.e., without the intruding noise source) and activities occurring where the noise is heard. For example, if regions of a park are dedicated to enjoying the tranquility and serenity of the natural environment, sounds from motor boating and hunting would be distracting to the visitor experience. However, if these activities are consistent with the purpose of a particular region of the park, these sounds would be considered appropriate. Therefore, noise can be a subjective term, and it is important to characterize the activities essential to the park's purpose (NPS 2000a).

In addition to its effect on humans, studies have shown that intrusive and other human-induced noises can result in adverse physiological and behavioral changes in wildlife communities; however, the severity of impacts is dependent upon the particular species. For example, some sound sources have been associated with increased stress levels (Slabbekoorn 2008), as well as suppression of the immune system in wildlife (Blickley 2012; Jankowski et al. 2010). Additionally, increases in ambient noise levels may interrupt important communication networks for survival and reproduction between insects, birds, and mammals (Barber, Crooks, and Fristrup 2010; Berber et al. 2011). Specifically, wildlife communications may signify mating calls, danger from predators, and territorial claims (NPS 2009h). An increase in ambient noise levels from the presence of intrusive noise sources may also reduce the listening area over which predators can hear their prey, as well as reduce the distance at which prey can begin to hear their predators (California State Lands Commission 2005).

NOISE LEVELS AT CAPE LOOKOUT NATIONAL SEASHORE

Vehicular noise and the recreational uses associated with vehicles are a component of the soundscape at the Seashore. Some potential sources of noise related to ORV use include engine noise, truck noise, and the possibility of loud noise from music/stationary generators which can create a longer duration of noise than other sources. Other sources of noise at the Seashore which contribute to soundscapes include military overflights, personal watercraft and Marine Corps search and rescue helicopters and jets. Table 33 illustrates common sounds at Cape Lookout National Seashore and their associated sound levels.

TABLE 33: SOUND LEVELS AT CAPE LOOKOUT NATIONAL SEASHORE

Decibels	Sound Levels at Various Locations in Cape Lookout National Seashore
130–140	Gun blasts from permitted hunting on designated islands
100	Planes flying overhead near the west end of the Seashore; boat congestion in Barden Inlet on Memorial weekend
90	Standing near a passing ORV on the oceanside of South Core Banks
80	Standing on the beach on a windy day; touring Cape Lookout lighthouse on a busy day
70	Walking along the oceanside of the point of Cape Lookout
60	Sitting on Whale Creek on Shackleford Banks during a weekday
50	Walking along the soundside of the islands at the Seashore
40	Viewing a soundside marsh
30	In a tent on the soundside of North Core Banks after sundown

Source: NPS 2004e.

Note: Decibel levels vary at different distances from the sound source.

Noise levels vary throughout the Seashore, with most noise concentrated on the west end of Shackleford Banks. Noise levels at this location are affected by visitors coming to the island from the nearby population centers of Beaufort, Atlantic Beach, and Morehead City, North Carolina. Human-made noise sources at the Beaufort Inlet area include powerboats, personal watercraft, commercial vessels, background noise from the town of Beaufort, and small aircraft and military aircraft. A 2012 report on the effects of military overflights on American oystercatchers (Simmons and Borneman 2012), concluded that at their peak sound level, military overflights contributed to a 72.5 dBA sound level, which is comparable to walking along the oceanside of the point of Cape Lookout (table 33). Thus, the report concluded that there is no noteworthy evidence that military overflights affect the behavioral responses of American oystercatchers, including low-altitude flyovers (Simmons and Borneman 2012).

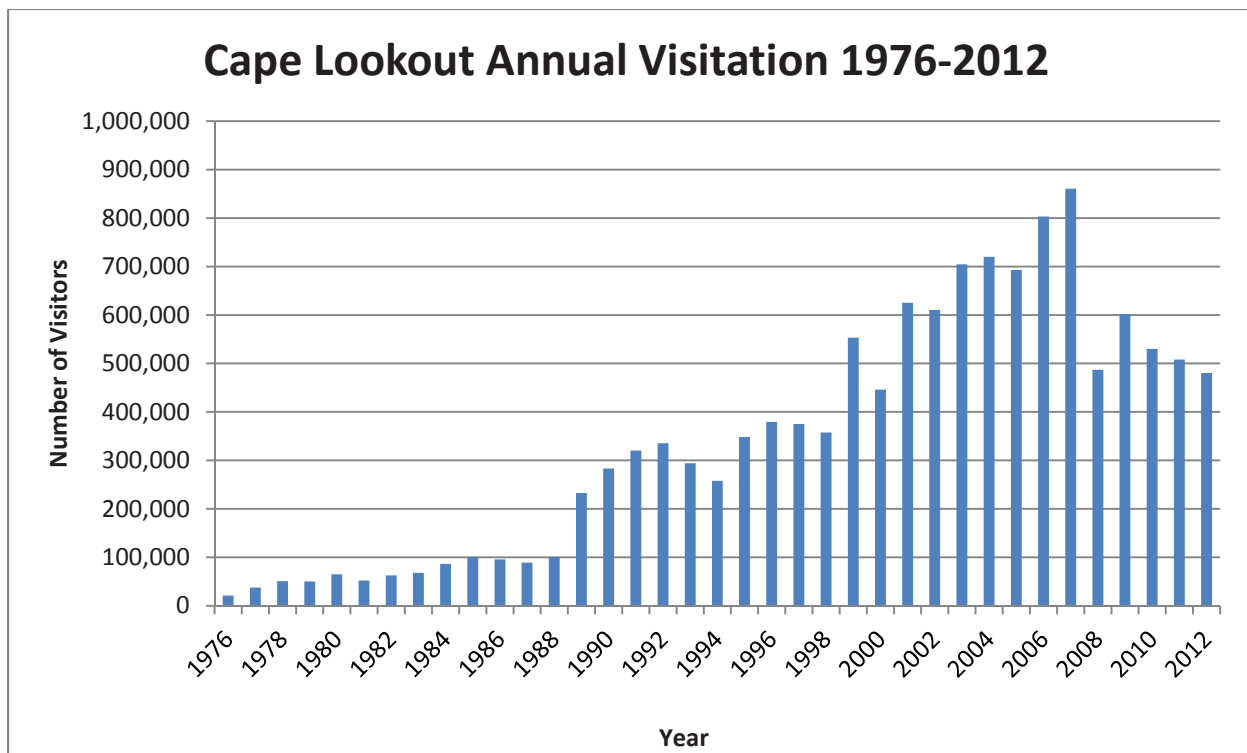
Cape Lookout, another popular visitor area, is accessed via Barden Inlet, which provides the majority of boat access. Noise associated with visitor activities in this area is most notable during weekends. Human-made noise subsides farther north of Cape Lookout and is quietest along North Core Banks, which is the Seashore's farthest point from the mainland.

The Core Sound mainland also exhibits comparably lower noise levels, although Highway 70 parallels the coastline and contributes to noise. The Great Island Ferry Landing and the Cape Lookout Lighthouse passenger ferry landing, both located on South Core Banks, provide several visitor services, and both sites likely exhibit the highest noise levels along the eastern area of Core Sound. The Long Point vehicle ferry landing likely exhibits the highest noise levels on North Core Banks.

Because of the nature of the Seashore environment, the constant, dynamic sounds of wind and surf create a high level of ambient noise. This effect is especially prevalent on the oceanside of all the Seashore's islands. Since few motorboats anchor on the oceanside due to difficulty of anchoring in rough surf, the predominant sound along the oceanside of Shackleford Banks is that of the surf. The Cape Lookout National Seashore: Superintendent's Compendium (NPS 2013d) limits operation of vehicles on the Core Banks to designated routes along the oceanside beach below the primary dune line, marked routes within cabin camp areas (including vehicle ferry camps), marked crossover routes ("ramps") between the ocean beach and the interior back routes, the designated long-term vehicle parking areas, the temporary village bypass open and authorized when the point of Cape Lookout is closed to vehicle traffic, and both South and North Core Banks include a designated vehicle route (back route) that approximately parallels the center of the island and is connected to several other designated routes. Since ORV use is allowed along the oceanside of South and North Core Banks, ORVs contribute to existing noise levels in this area.

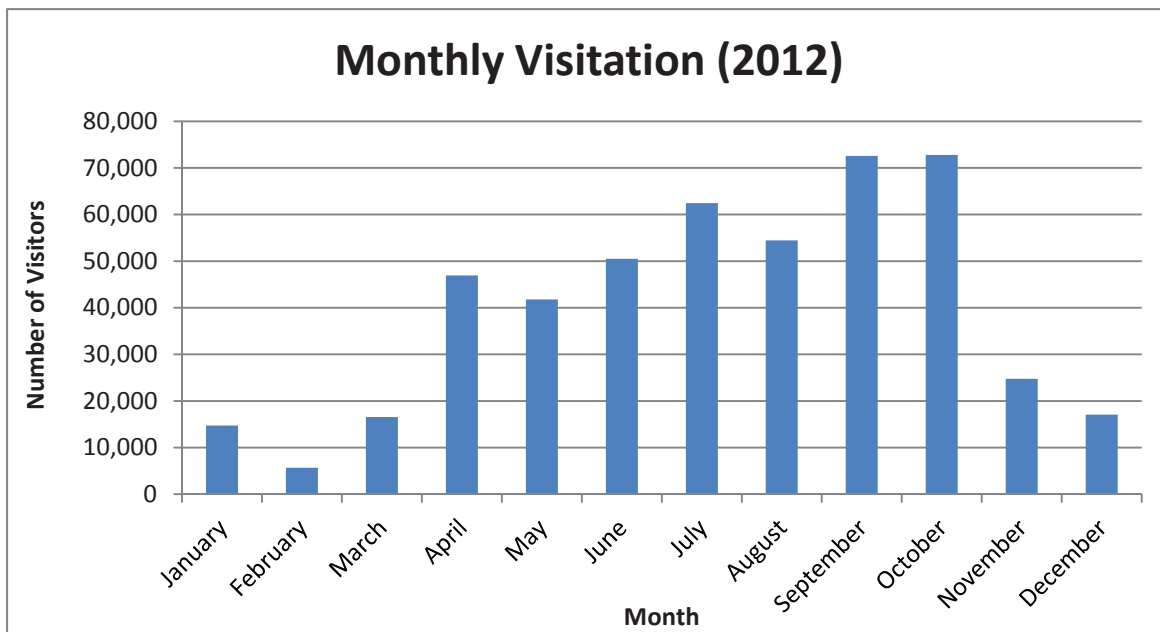
VISITOR USE AND EXPERIENCE

As seen in figure 19, visitation at Cape Lookout National Seashore has grown over the years, increasing from roughly 21,000 visitors in 1976 to roughly 860,000 visitors in 2007 (NPS 2013c). As can be seen in figure 18, visitation has shown a relatively steady increase, with occasional dips, particularly in the mid 1990s. There was a significant decline in visitation in 2008, with approximately 487,000 visitors visiting the Seashore, which was due to a busy parking lot at Harkers Island being closed to visitor use for 5 months. Figure 20 illustrates visitor use reports for 2012 which indicate that through December approximately 480,000 visitors had journeyed to the Seashore. Based on 2012 data, the summer (June through August) and fall (September through November) seasons experience the highest visitor numbers, with each season accounting for approximately 35 percent of annual visitation (70 percent combined visitation for summer and fall) (NPS 2013c). Another 22 percent of annual visitation occurs during the spring (March through May), and the remaining 8 percent in the winter (December through February) (NPS 2013c). Though overall visitation is relatively high in the summer, ORV use in the summer is relatively low compared to the fall. Non-ORV visitor use in the summer months is generally concentrated in the lighthouse area at the southern end of South Core Banks.



Source: NPS 2013c.

FIGURE 19: VISITATION BY YEAR, 1976–2012



Source: NPS 2013c.

FIGURE 20: VISITATION BY MONTH FOR THE YEAR 2012

Off-Road Vehicle Driving at Cape Lookout National Seashore

ORVs are currently used to provide vehicular access onto Cape Lookout National Seashore beaches for recreational purposes, including surf-fishing, camping, surfboarding, sunbathing, swimming, bird-watching, scenic driving, etc. ORV use at the Seashore is seasonal. Vehicle ferries generally have ceased operation from mid-December through mid-March. Island vehicle parking/storage lots close from January 1 through mid-March when ferry services resume. The heaviest ORV use is concentrated during September, October, and November. Highway vehicles are brought to the islands via vehicle ferries whereas ATVs may be brought via ferries or by private boat. Some private boats (very few) carry ATVs that boaters use on the islands once the boat is moored. Probably the primary use of ORVs at the Seashore is for transport to desired fishing and camping locations along the long stretches of beaches. Fishermen use ORVs to find ever changing fishing “holes,” to pursue migrating schools of fish, and to reach more productive areas such as the point of Cape Lookout or the inlets. Since these areas, as well as the entire beach, are habitat for the protected shorebird and sea turtle species that are the subject of this plan/EIS, there is a potential for conflict between necessary closures and ORV use. Because productive fishing areas may change daily with the tides, the impact of closures may be greater than simply the number of fishermen or area affected; if the fishermen cannot get to what they perceive as the right spot, they may be unsuccessful.

Off-Road Vehicle Use Data

Table 34 provides numbers of ORVs transported to the islands by the ferry services at Long Point and Great Island from 2000 to 2009. At Long Point, the number of ORVs transported to the island annually has ranged from a low of 997 (during 2003, when Hurricane Isabel hit) to 2,664 with an average 2,073 vehicles for all 10 years. At Great Island, annual ORVs transported to the island ranged from 1,480 in 2003 to 3,363 in 2009, with an annual average of 2,697 vehicles.

Table 34 also provides the total vehicle days for each location. This is an annual cumulative total of the vehicles on the island each day. This number is much larger than the number of vehicles that are transported to the islands because each vehicle that arrives may spend multiple days on the island. For example, 15 vehicle days may represent 1 ORV that is on the island for 15 days, or it may represent 15 different ORVs on the island for 1 day each, or any other combination of vehicles and days. Numerous ORVs remain on the islands for more than one day and are either in use or parked in a long-term parking lot. Some visitors transport their vehicles to the islands and park them for the entire season for a current fee of \$15 per week from approximately mid-March through mid-December when vehicle ferries are in operation. Approximately 2 to 3 times more annual vehicle days occur at South Core Banks than at North Core Banks.

The NPS uses vehicle days to estimate the number of vehicles on South Core and North Core Banks daily. The number of vehicles that arrive each day on the ferry at Great Island and Long Point is added to the vehicles that are currently on each island. Likewise, the number of vehicles that depart each day is subtracted from the daily vehicle total. For example, if 8 ORVs arrive on Great Island via the ferry in early-March, 8 is added to the 0 that are currently on the island resulting in 8 vehicle days. The next day when 19 ORVs arrive, 19 is added to the previous 8 resulting in 27 total vehicle days. The following day when 10 vehicles arrive and 4 depart, 33 total vehicle days result ($10 - 4 = 6$ net vehicles). At the end of each month and for the year, a cumulative number of vehicle days is available by adding and subtracting the daily arrival and departure of vehicles.

TABLE 34: LONG POINT AND GREAT ISLAND VEHICLE/PASSENGER FERRIES AND VEHICLE DAYS, 2000–2012

Year	Long Point Vehicles ^a	Total Vehicle Days ^b	Comments	Great Island Vehicles ^a	Total Vehicle Days ^b	Comments
2000	2,174	9,207		2,722	38,007	Missing May, June, and July data
2001	2,000	18,003		2,883	41,384	
2002	1,992	15,308	Missing June data	2,622	28,539	Possible late start date March or April
2003	997	6,392	Isabel closure September 15 through October 30; missing data from November after Hurricane Isabel	1,480	23,325	Isabel closure September 15 through October 30; missing data from November after Hurricane Isabel
2004	1,794	5,648	Missing July data; end date may be in error	2,566	36,472	Missing June and July data
2005	2,557	17,283		2,753	38,207	
2006	2,460	13,088	Estimates were used for June, July, August, September, and October data	2,895	46,480	
2007	2,664	21,004	Relied on estimates for most of this data	3,045	52,952	Relied on estimates for most of this data
2008	1,749	31,343	Relied on estimates for June and August data	2,638	37,923	Relied on estimates for November data
2009	2,340	11,888		3,363	33,633	Relied on estimates for November data
2010	2,317	13,820		3,784	33,782	
2011	826	Data unavailable	Hurricane Irene – the Seashore was closed for 2.5 months	3,186	Data unavailable	Hurricane Irene – the Seashore was closed for 2.5 months
2012	1,358	Data unavailable		2,799	Data unavailable	
Average	1,944	11,642	Total vehicle days data is unavailable for 2011 and 2012, which skews this average	2,826	29,336	Total vehicle days data is unavailable for 2011 and 2012, which skews this average

Sources: NPS 2006a, pers. comm. 2010i, pers. comm. 2013g.

^a The total number of vehicles that arrived by ferry during the year at Long Point and Great Island.

^b The number of vehicles operating (not stationary, in lots) on the island each day totaled for the 10-month visitor use season. The Seashore is closed in January and February; there is no ferry access to the islands from mid-December through mid-March.

Based on this data, approximately 14,960 vehicle days occurred annually on North Core Banks, and approximately 34,786 vehicle days occurred annually on South Core Banks between 2000 and 2011. Vehicle days are generally much higher during the fall fishing season on South Core Banks at Great Island. Vehicle days on North Core Banks at Long Point during the fall are also higher than in summer months, but not as high as on South Core Banks (NPS 2013g).

NPS staff compiled data on active ORV use (ORVs operating at the Seashore, as opposed to ORVs parked in the parking lots) for North Core and South Core Banks, to better understand seasonal ORV use trends at the Seashore. NPS staff compiled vehicle data from ferries (both concessioner ferries and NPS ferries), and visual counts by law enforcement and resource management staff. After compiling these data sets for the years 2008–2011, the NPS was able to illustrate active ORV use trends at the Seashore. As figure 21 illustrates, the average number of active ORVs at the Seashore is highest in the fall season.

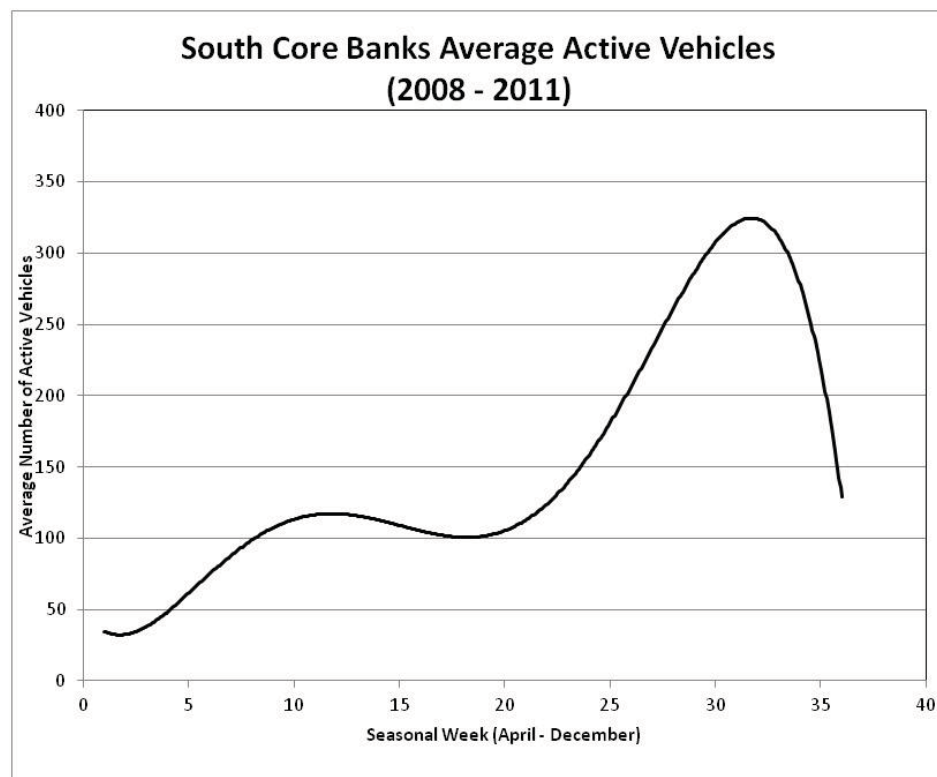
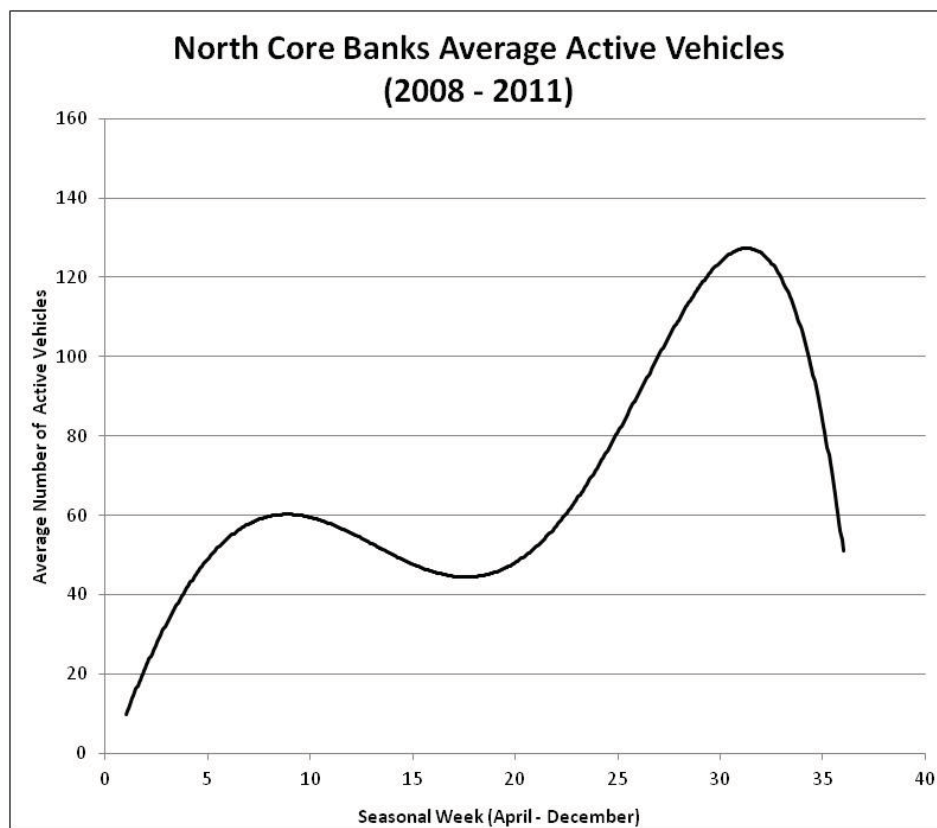
An ORV tour is available at Ocracoke Inlet and a shuttle service is available at the lighthouse complex on South Core Banks (both operated by a NPS permitted vendors). The tour travels via ATV and utility-type vehicle (UTV) from Ocracoke Inlet south to approximately mile marker 5. The shuttle service transports visitors on South Core Banks, typically passengers are taken to and from the point of Cape Lookout and the historic village. The tour and the shuttle service must adhere to the same rules as recreational ORV users.

Off-Road Vehicle Use Areas

ORVs can be used only on the oceanside beach (below the primary dune line) and on designated marked routes, including the interior back route, crossover ramps, vehicle parking/storage areas, cabin camp areas, and marked sound access routes, on both North Core Banks and South Core Banks. Public vehicle use is not permitted on Shackleford Banks because it is a proposed wilderness area. The interior back route generally parallels the center of the islands and is connected to several other designated routes. ORVs access the beach through a system of ramps that connect the back route with the beach. Mile signs mark the beach in 1-mile increments along the ocean dune line, starting at Ocracoke Inlet, and the ramps are numbered as possible to coincide with these mile markers. Figure 22 depicts the approved public ORV routes on the islands, including the beach ramps.

Off-Road Vehicle Closures

ORVs are allowed to drive along the ocean shoreline throughout Cape Lookout National Seashore, except in areas that are closed permanently, temporarily, or seasonally for safety reasons or to protect sea turtles and shorebirds such as piping plovers, American oystercatchers, and colonial waterbirds during critical nesting and breeding periods. Closures to protect bird nesting areas, or full recreation closures, are marked with posts and signs and prohibit any unauthorized vehicles, pedestrians, or pets. When sections of beach are closed to ORVs only because of turtle nesting, referred to as ORV closures, unauthorized vehicle entry is prohibited. Areas that are permanently closed within the Seashore because of sensitive bird habitat include Portsmouth Flats on North Core Banks and Power Squadron Spit on South Core Banks. The interior of the point of Cape Lookout is closed due to bird nesting activities.



Source: NPS 2014.

FIGURE 21: AVERAGE ACTIVE VEHICLES ON NORTH CORE AND SOUTH CORE BANKS (2008–2011)

North Core Banks and Middle Core Banks

South Core Banks and “Ophelia” Island

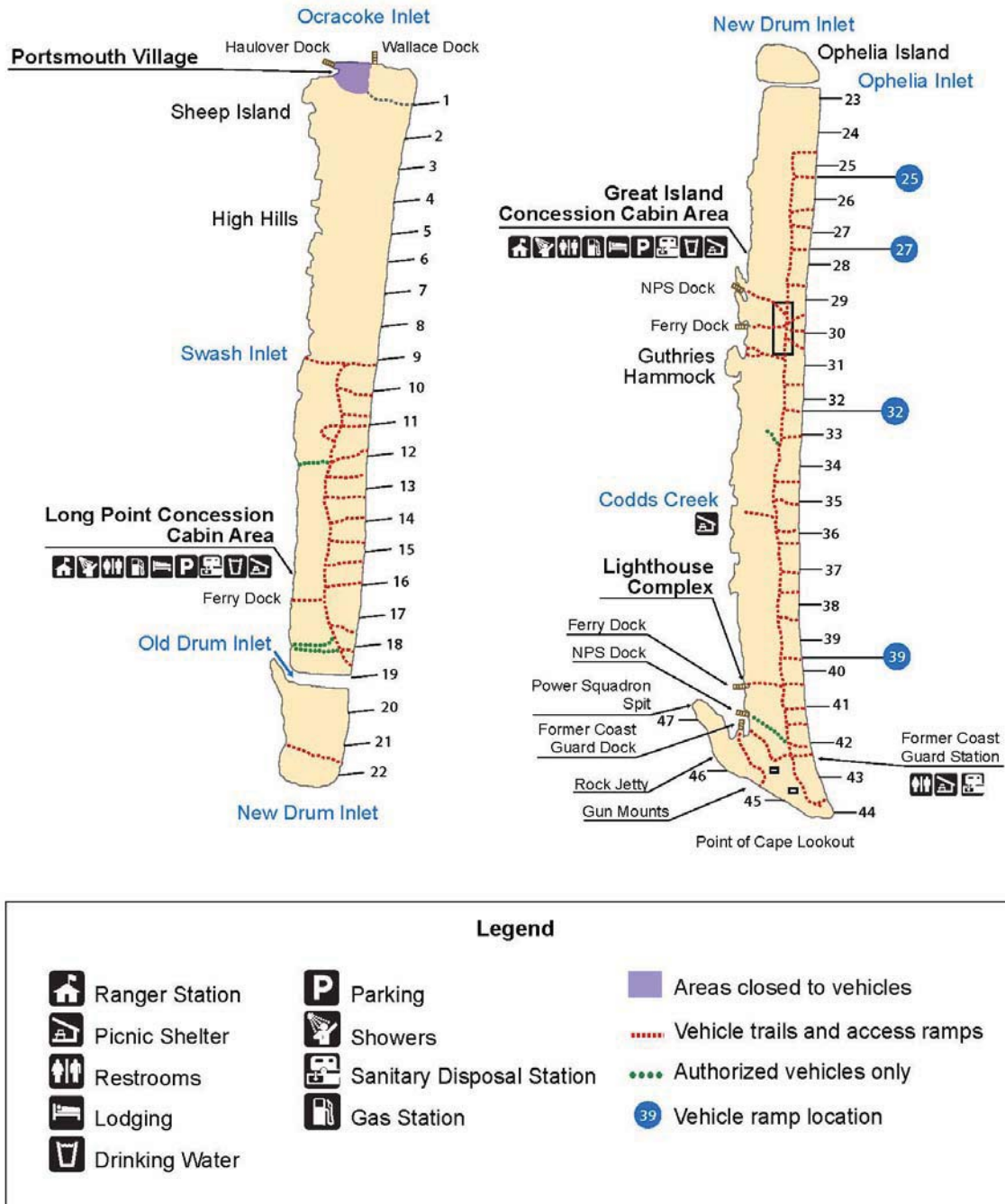


FIGURE 22: ORV ROUTE MAP

The areas subject to closures that have the most potential for conflict with ORV users are areas near the inlets, and the area around the point of Cape Lookout. These are prime fishing areas and popular spots for boat access and hikers, photographers, etc., but also provide important or critical habitat for nesting plovers and other protected species. Recent closures are described below.

American Oystercatchers—American oystercatcher nests are not concentrated in small areas like colonial waterbird nests but are scattered along the entire 56-mile length of ocean beach within the Seashore. Beginning in 2005, the beach between the ocean water line and the dune line was closed to ORVs in the vicinity of successfully hatched American oystercatcher nests throughout the Seashore. ORVs operating near these nests were routed to the back route via designated ramps. In areas without a back route system, ORV traffic was allowed on the beach at 15 mph and signs were posted warning operators about flightless chicks in the area. These areas were reopened to ORV traffic after the chicks fledged (i.e., the chicks were capable of sustained flight) or were lost (NPS 2005c).

Piping Plover—Nesting areas are closed to entry by pedestrians, ORVs, and pets, using the Seashore's standard "Bird Sanctuary" signs mounted on wood posts. ORV traffic and pedestrians are allowed outside the buffer along the shoreline on the ocean beach, as long as at least a 50-meter or 150-foot buffer from active nests is maintained. If a piping plover chick is found using the ocean beach, that area will immediately be closed to ORVs. "No vehicle" signs and educational signs explaining the purpose of the closure will be posted in the area. The closure remains in effect until the chicks move to a different location or are fledged.

Following the *Cape Lookout National Seashore Interim Protected Species Management Plan / Environmental Assessment* (NPS 2006a), the ocean beach from ramp 24 north to Ophelia Inlet (1 mile in length) has been closed to vehicles (except for NPS monitors) when the first plover nest hatches until the last chick fledges. A second ocean beach closure to all vehicles was established on the west side of the point of Cape Lookout (0.45 mile in length) from May 28 through June 9 and from July 18 through August 11. The third ocean beach closure to vehicles was established from ramp 18 to Old Drum Inlet (0.6 mile in length) from July 1 through August 5. The closures began the day of expected hatch of the first nest in that area and remained in place until the last chick was confirmed lost or fledged. A seasonal vehicle closure for Middle Core Banks and Ophelia Island (approximately 3 miles in length) was in effect from April 1 through August 31 (NPS 2008c).

Sea Turtles—Temporary closures to ORVs are implemented prior to hatching activities for all sea turtle species that are known to nest at the Seashore. Generally, ORVs can negotiate around these posted closures. However, when turtle eggs are ready to hatch, the NPS implements a beach closure from the nest to the water's edge. If sufficient room exists, ORVs can go around the landward side of the fence. In some cases, the beach must be closed from the dune line to the ocean because the location of a nest relative to a dune or vegetation prevents ORV access through the area.

Three nest relocation areas, up to 1 mile in length, are designated on each of North Core Banks and South Core Banks, for a total of six relocation areas. These are located in between mile markers 5 and 6; 11 and 12; 16 and 17; 26 and 27; 35 and 36; and 42.5 and 43.5. These nest relocation areas are closed to ORV traffic beginning 50 days after the first nest is relocated to the area. The nest relocation area is reopened to ORV traffic after the last nest within it has hatched and has been excavated.

Nests laid in locations likely exposed to repeated flooding were relocated to a higher elevation on the primary dune in one of the relocation areas. Relocated nests were moved into one of three designated turtle nest relocation areas on each island and vehicles were detoured to the back route around these areas when nests neared hatching. Smaller vehicle detours were established around nests that had not been relocated. Vehicle closures provide a rut-free corridor from the nest site to the ocean, preventing hatchlings from being run over or becoming entrapped in tire ruts and dying from predation or desiccation. Camping and campfires were not permitted in the closures to prevent disturbance of hatchlings by artificial lights (NPS 2008d).

Other Recreational Opportunities at Cape Lookout National Seashore

Recreational fishing is often accompanied by overnight camping stays. Many fishermen use four-wheel-drive vehicles or ATVs to increase accessibility to productive fishing beaches. Seasonal waterfowl hunting is permitted in conformity with state and federal laws and NPS policies. Limited hunting and fishing guided services are available to visitors. The state of North Carolina is in the process of developing a recreational trail between the Tennessee boundary and Jockey's Ridge State Park, known as the Mountains to Sea Trail. A spur of the trail would pass through the Cape Lookout National Seashore, providing visitors with another recreational opportunity (NPS 2007f).

Based on ranger patrol records and NPS staff observations, the most active recreation occurs on or in the waters surrounding Shackleford Banks and South Core Banks, with North Core Banks and Middle Core Banks receiving fewer visitors. However, those using ORVs to access fishing or camping areas tend to distribute themselves relatively evenly over the island beaches of the Core Banks, with no particular areas of high use (Ketel 2005). The majority of non-ORV visitors are day visitors, although many visitors take advantage of the on-island cabin accommodations at Great Island and Long Point, or camp along the beach for several days. Although general Seashore visitation is highest in the summer months, lodging data shows that use of the cabin facilities is actually higher in the fall months of October and/or November, during the peak fishing season. Backcountry camping experiences the highest numbers of overnight visits in the summer and the fall fishing months. Hurricanes can greatly affect visitor use patterns. Table 35 provides monthly recreational visitor use statistics for the entire Seashore, lodging, and backcountry camping for the year 2012, which is relatively representative of other recent years (NPS 2013c).

Seashore Facilities

The major facilities at Cape Lookout National Seashore include the visitor center and Seashore headquarters (located across from the main portion of the Seashore on the east end of Harkers Island); the Cape Lookout Lighthouse and Keepers' Quarters (on the south end of South Core Banks, near Cape Lookout Lighthouse); Portsmouth Village (a historic village at the very north end of the Seashore); Cape Village (at the very south end of the Seashore) and the Long Point and Great Island cabins.

Much of the day-use visitation on Core Banks focuses around the lighthouse complex, which includes a seasonal visitor contact station and museum in the Keepers' Quarters, picnic shelter, restrooms, a parking area, and the lighthouse itself. With the exception of the cabin camp areas, the remainder of the Seashore is undeveloped, with only a few scattered picnic areas and composting toilets.

TABLE 35: MONTHLY RECREATIONAL VISITS, CONCESSIONER LODGING, AND BACKCOUNTRY CAMPING, 2012

Month	Recreational Visits	Cabin Lodging	Backcountry Camping
January	14,718	0	1
February	5,671	0	5
March	16,568	364	347
April	46,927	2,442	1,101
May	41,780	2,899	1,730
June	50,492	3,437	1,286
July	50,492	2,962	881
August	54,461	2,116	939
September	72,589	251	813
October	72,785	0	1,279
November	24,768	516	1,324
December	17,079	0	97
TOTAL	468,330	14,987	9,803

Source: NPS 2013c.

Cabins

The Seashore-run cabins at Long Point and Great Island are the only accommodations on the islands; there are no developed campgrounds. Guests at the cabins generally bring their vehicles for island access.

The Long Point cabins are on the southern end of North Core Banks, near the Long Point ferry landing. They consist of 6 duplexes containing 12 units, built in 1995 by the NPS, plus 4 duplex octagonal buildings constructed in the mid-1980s. Additional facilities constructed over the years include comfort stations, picnic shelters, a public shower/restroom facility, a dump station, and a gas pump. One parking area that accommodates approximately 60 vehicles is located adjacent to the cabin area. Fishermen often leave their vehicles or campers on the island from April through December.

The Great Island cabins are located on the northern third of South Core Banks adjacent to the Great Island ferry landing. The camp consists of 25 cabins most of which have been rebuilt after Hurricane Isabel in 2003. Similar to Long Point, the cabin area includes a picnic shelter, a public restroom/shower facility, a dump station, and a gas pump. One parking area accommodating approximately 100 vehicles is located adjacent to the cabin area and is sometimes full, particularly in the fall.

Summer occupancy of cabins rose nearly 25 percent from 1998 to 2001 at the Long Point location, while the numbers at Great Island were more constant during that period (NPS 2001d). The increase in occupancy at Long Point may be attributed to the upgraded facilities, which may appeal to a wider variety of Seashore visitors. Table 36 summarizes the numbers of visitors staying at both cabin locations between 1995 and 2012. Overall, cabin occupancy has been relatively steady over this period, generally in the range of 20,000 to 25,000 visitor use days per year. The lower figure for 2003 is due to the effects of Hurricane Isabel; the cabins were closed from the mid-September through mid-November of that year (NPS 2006b, Winstead 2009).

TABLE 36: LODGING, 1995–2012

Year	Overnight Lodging Visits
1995	16,579
1996	21,983
1997	24,395
1998	25,994
1999	22,586
2000	26,108
2001	15,502
2002	24,671
2003	12,015
2004	20,819
2005	20,725
2006	26,047
2007	26,506
2008	29,290
2009	27,972
2010	17,922
2011	14,821
2012	14,987

Source: NPS 2013c.

Island Access (Boats and Ferry Service)

Private Boats—Many visitors use private motorboats to reach the Seashore. There are no public boat launches or boat slips within the Seashore; however, several public launches on the mainland provide access to the islands. The soundside sandy beaches and inlet areas, provide the predominant access for private boat owners, who anchor their boats offshore. Cape Lookout National Seashore patrol logs maintained in 2000 and 2001 show that 6,140 to 6,880 boats were observed accessing the islands on the soundside and up to 523 boats were counted in one day (NPS 2004e).

Access is also possible using nonmotorized boats such as kayaks, sailboats, and canoes. Not all of these trips result in island access; many visitors remain in the shallow waters surrounding the islands, taking advantage of various paddling opportunities.

Passenger Ferries—Passenger ferries operated by permittees have been the predominant method of island access for visitors without vehicles or private boats. Authorized ferry services have been provided from Ocracoke to Portsmouth Village; and from Harkers Island and Beaufort to the Cape Lookout Lighthouse area and Shackleford Banks. Passengers debark on the beaches or at the public docks, and are then picked up at a later, pre-arranged time. Some ferry operators allow the transport of pets. In 2014, passenger ferries for the southern portion of the park will be operated under a concession contract. Concession ferries will depart from Harkers Island and Beaufort and transport visitors to the Lighthouse area and Shackleford Banks.

One of the most popular passenger ferry routes is to the lighthouse complex at the Seashore. Statistics maintained on annual ferry arrivals at the lighthouse area between 1999 and 2004 are shown in table 37.

TABLE 37: LIGHTHOUSE AREA PASSENGER FERRY ARRIVALS (1999–2012)

Year	Number of Arriving Passengers
1999	26,416
2000	39,095
2001	44,718
2002	45,058
2003	43,551
2004	40,476
2005	24,673
2006	29,411
2007	38,288
2008	33,681
2009	32,956
2010	26,768
2011	21,381
2012	32,239

Vehicle/Passenger Ferries—Vehicle/passenger ferries travel from the mainland to the Great Island ferry landing on South Core Banks and the Long Point ferry landing on North Core Banks. Most of the ferry passengers are overnight visitors who occupy cabins, camp in their own recreational vehicle (RV), or camp in tents.

Fishing

Spring and fall at the Seashore offer what many consider to be some of the best fishing on the Atlantic coast. There are no fishing piers or boat slips, but surf-fishing along the beaches is extremely popular. Hundreds of fishing enthusiasts return each year, and fishing tournaments are held in the spring and fall, drawing 50 to 250 participants at one time (Ketel 2005).

Fishermen are one of the predominant users of ORVs on the islands, especially during the fall months. They rely on ORVs to access their favorite fishing spots, locate ever changing fishing “holes,” and follow migrating fish along the length of the Core Banks in their own vehicles, camping overnight in their vehicles and tents or staying in cabins at Great Island and Long Point. Areas near the inlets and the point of Cape Lookout are popular fishing spots, but are also areas of high concentrations of protected shorebirds.

Others fish from boats moored along the soundside of the Seashore, and areas near the inlets are known to be popular fishing spots.

Camping

Backcountry camping is also popular at the Seashore. There are no designated campgrounds in the Seashore; however, camping is allowed anywhere on Shackleford Banks and Core Banks, with the following exceptions:

- Within 100 yards of a well, shade shelter, bulletin board, dock, or other structure
- Within 100 yards of any cabin, house, or the lighthouse
- In concession cabin areas
- Portsmouth Village Historic District
- Cape Lookout Light Station Complex
- Cape Lookout Village
- Areas of private rights (leases and life estates)
- Harkers Island Administrative Site
- Turtle and bird closure areas
- Designated long-term parking areas
- Directly on top of dunes, so as to disturb vegetation
- Trailers must camp only seaward of the primary dune line or in an area marked with camping signs

Camping is limited to 14 consecutive days. Camping visitation is generally concentrated at the west end of Shackleford Banks, but is dispersed along the Core Banks.

Table 38 summarizes the number of backcountry campers (overnight visits) by year from 1995 through 2011. Over this 17-year period, annual backcountry camping has ranged from a low of 6,386 in 1996 to a high of 13,200 in 2004, with effects from Hurricane Isabel apparent in 2003. Since 1995, the Seashore has had an annual average of 9,592 overnight backcountry stays.

Campers must also be responsible for carrying out all trash, as Cape Lookout National Seashore is a trash-free Seashore and does not provide trash cans or garbage pickup on the islands. On the North Core Banks and South Core Banks, most camping is vehicle based, although boat-based camping does occur on beaches near the spits, near the lighthouse, and particularly on the west end of Shackleford Banks. Most campers transport ORVs or vehicle campers to the island via the ferry services and stay on the islands for periods ranging from a few days to two weeks. Campers that stay next to or hike near bird closure areas can be an issue because of the noise and physical presence of humans and dogs near those areas.

TABLE 38: BACKCOUNTRY CAMPERS, 1995–2012

Year	Number of Backcountry Campers
1995	8,395
1996	6,386
1997	6,753
1998	7,598
1999	8,989
2000	8,988
2001	11,190
2002	9,007
2003	6,799
2004	13,200
2005	8,906
2006	8,626
2007	11,849
2008	12,162
2009	8,841
2010	11,346
2011	14,033
2012	9,803

Source: NPS 2013c.

Night Skies

The NPS defines a natural lightscape as “a place or environment characterized by the natural rhythm of the sun and moon cycles, clean air, and of dark nights unperturbed by artificial light. Natural lightscapes, including dark night skies, are not only a resource unto themselves, but are an integral component of countless park experiences” (NPS 2007d). The NPS created the Night Sky Team in 1999 to address increasing alarm over the loss of night sky quality throughout the network of national parks. The Night Sky Team functions as a center of expertise that provides advice, guidance, and technical support in characterizing and preserving park lightscapes (NPS 2007d).

The NPS Night Sky Team has performed night sky measurements and examinations at the Seashore in 2012, but at the time of this writing (winter 2014), their findings have not been published. However, in November 2007, the NPS Night Sky Team performed a preliminary night sky analysis for Cape Hatteras National Seashore. The results of that analysis concluded that the Seashore has better night sky quality as compared to most other national park system units east of the Mississippi River. Furthermore, measurements showed that light pollution sources beyond the Seashore boundary illustrated the need to be aware of the easily impacted night skies (NPS 2008d). Because Cape Hatteras National Seashore is closer to light sources (buildings and street lamps), it is generally expected that Cape Lookout National Seashore experiences better night sky conditions.

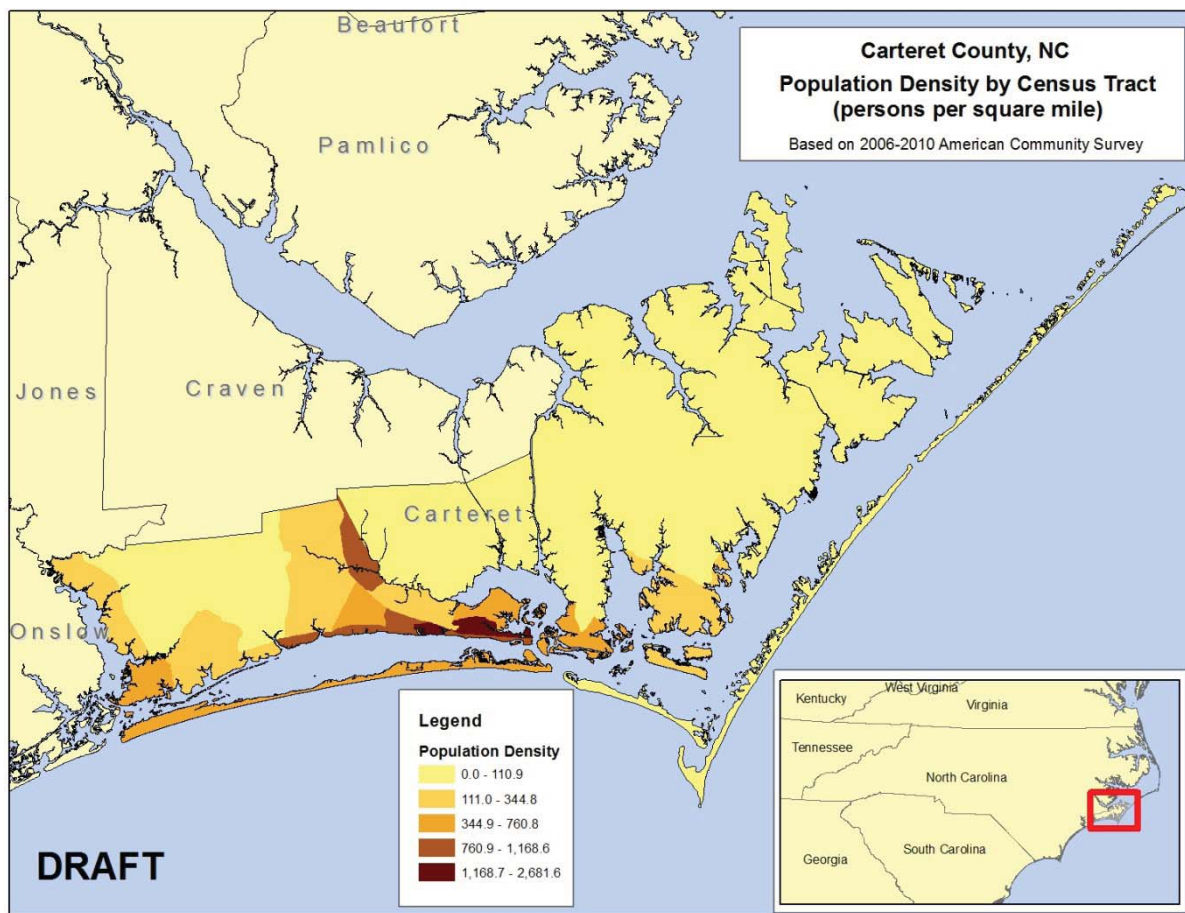
SOCIOECONOMIC RESOURCES

The Seashore contributes to the local economy directly through local purchases of goods and services and indirectly by attracting visitors to the area and contributing to the overall quality of life in the region. The impact of management changes in the Seashore on the local community depends in part on the size and diversity of the economy in the area surrounding the Seashore. The social and economic environment of a region is characterized by its demographic composition, the structure and size of its economy, and the types and levels of public services available to its citizens. These characteristics influence the ability of the community to adapt to management changes in the Seashore that result in changes in spending by the Seashore or changes in visitation to the Seashore. This section describes the social and economic environment that potentially would be affected by the proposed alternatives. At the end of the section, information about businesses that directly serve visitors to the Seashore is presented.

Carteret County forms the economic region of influence (ROI) and defines the geographic area in which the predominant social and economic impacts from the proposed alternatives are likely to take place. Eastern Carteret County includes Beaufort and the area east of it, including Harkers Island and all of Cape Lookout National Seashore. Western Carteret County includes Morehead City, Atlantic Beach, Emerald Isle, and other towns.

DEMOGRAPHICS

The economic ROI is primarily rural in character, with only 67 percent of the population living in small urban areas in Carteret County. The total population of Carteret County was 66,469 in 2010. Much of Carteret County's permanent population resides near Morehead City, Atlantic Beach, and Beaufort (figure 23). Table 39 provides population statistics for the state of North Carolina and Carteret County. Between 2000 and 2010, Carteret County's population grew 12 percent, from 59,383 to 66,469. Carteret County grew more slowly than the rest of North Carolina. The change in population in Carteret County is six points less than the percentage change in population of the state of North Carolina as a whole. According to population projections published by the North Carolina Office of State Budget and Management's State Demographics unit, the state and Carteret County populations will both continue to grow into the foreseeable future. By 2030, population in Carteret County is projected to increase to 85,906, a 45 percent increase relative to 2000 (Office of State Budget and Management North Carolina 2012, 1).



Data in figure 23 is from the U.S. Census Bureau, which counts people according to “usual residence” where the person lives most of the year.

FIGURE 23: 2010 POPULATION DENSITY BY CENSUS TRACT

TABLE 39: POPULATION STATISTICS

Geographic Area	2000 ^a	2010 ^b	2020 ^c	2030 ^c	Percent Change, 2000–2010	Percent Change, 2000–2030
North Carolina	8,049,313	9,535,483	10,614,862	11,629,556	18%	44%
Carteret County	59,383	66,469	76,317	85,906	12%	45%

Sources:

^a U.S. Census Bureau 2000.

^b U.S. Census Bureau 2012c.

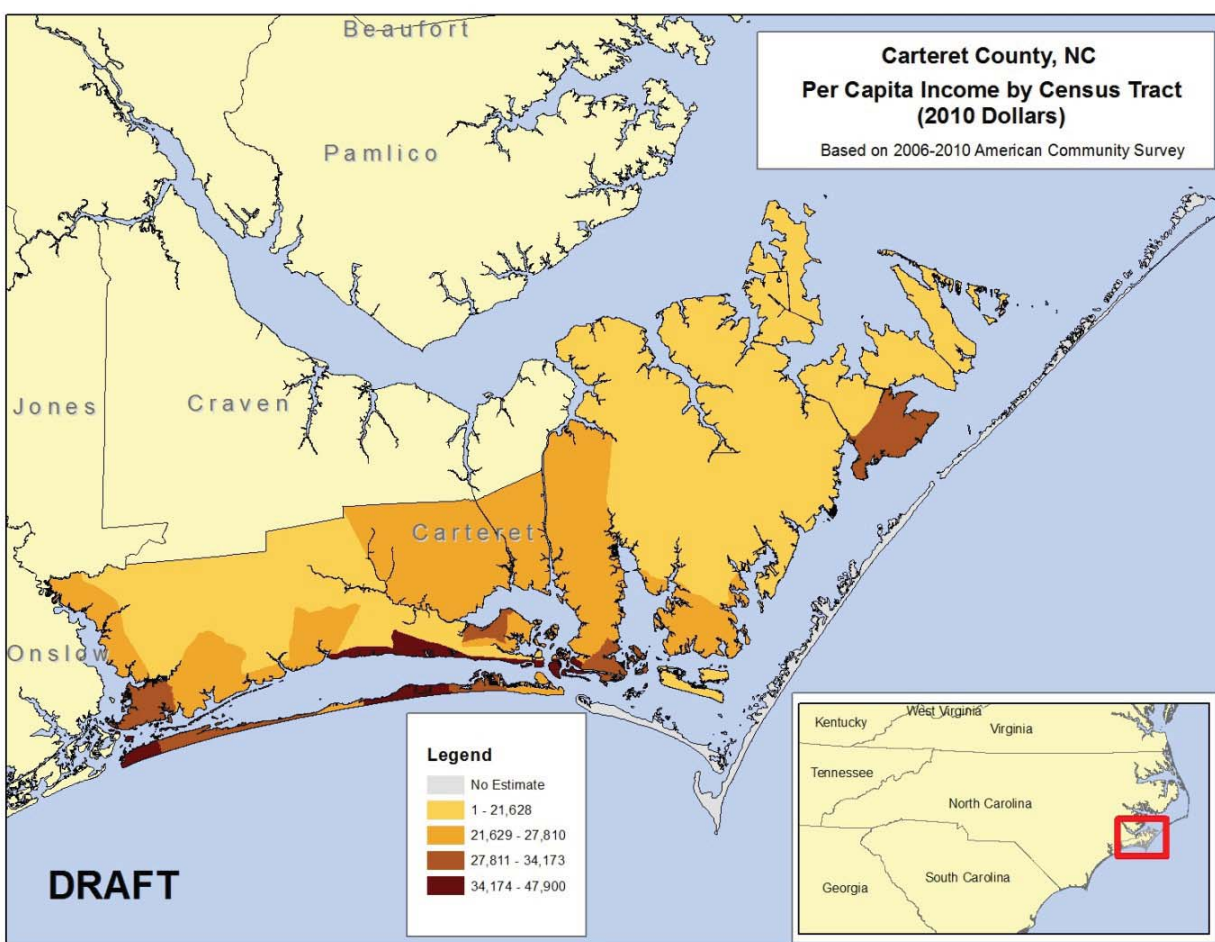
^c Office of State Budget and Management, North Carolina 2012.

Demographic and economic trends during the last three decades have contributed to growing differences in the population characteristics and income levels in different parts of Carteret County. Table 40 reports figures on per capita income. Carteret County had a somewhat higher per capita income than the rest of North Carolina in 2011. However, the distribution of per capita income varies across the ROI. The highest per capita incomes in Western Carteret County occur along the strip of beaches including Emerald Isle,

Atlantic Beach, and Indian Beach while the lower income block groups are the furthest inland (figure 24). In 2011, the minority population of Carteret County was 13 percent of the population. This is less than in North Carolina and the U.S. as a whole, which had 37 percent and 35 percent minority populations respectively. Carteret County had 3 percent fewer people under the poverty level compared to the state average. Carteret County also has a lower percentage of the population without a high school diploma compared to the national and state averages. The distribution of poverty rates by block groups is shown in figure 25. The areas near Morehead City and the beaches in the western part of Carteret County have lower poverty rates than the areas closer to the Seashore.

TABLE 40: ENVIRONMENTAL JUSTICE STATISTICS, 2011

Geographic Area	Per Capita Income	Percent of Population		
		Minority	Below the Poverty Level	Without High School Diploma
United States	\$27,915	37%	14%	15%
North Carolina	\$25,256	35%	16%	16%
Carteret County	\$27,707	13%	13%	13%



Source: U.S. Census Bureau 2012c.

FIGURE 24: 1999 PER CAPITA INCOME BY CENSUS TRACT

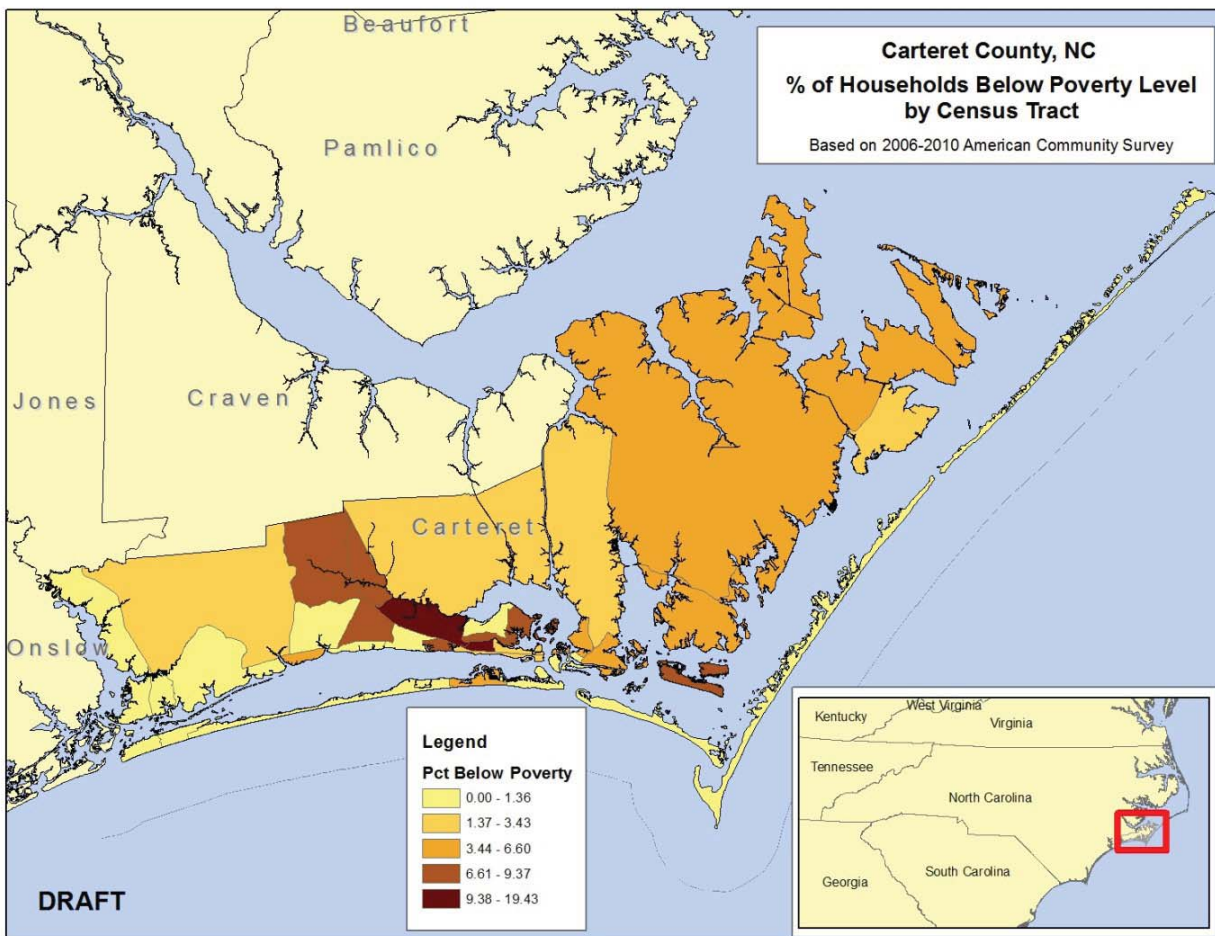


FIGURE 25: PERCENTAGE OF POPULATION BELOW THE POVERTY LINE BY CENSUS TRACT

EMPLOYMENT

As noted above, the majority of the ROI is rural. Within the ROI, the employment centers around coastal activities, including tourism, fishing, and coastal research and management. As shown in table 41, Carteret County has a high percentage of employment in the public administration sector, primarily due to the location of North Carolina's Division of Marine Fisheries as well as the Division of Coastal Management in Morehead City. The sectors of accommodation and food services; real estate, rental and leasing; arts, entertainment, and recreation; and the retail trade account for 37 percent of the total employment within the ROI. These sectors only account for 23 percent of employment in the state of North Carolina and in the U.S. as a whole. In addition to these employees, Carteret County had 5,909 self-employed individuals in 2010. Table 42 shows the breakdown of industry for self-employed individuals. Compared to the rest of the state and the United States as a whole, a greater percent of self-employed individuals in Carteret County are engaged in construction; real estate, rental and leasing; and agriculture, forestry, fishing and hunting (of which, 93 percent are commercial fishermen).

TABLE 41: EMPLOYMENT BY SECTOR, 2011

Industry	Number of Employees Carteret County	Percentage		
		Carteret County	North Carolina	United States
Public administration	5,304	15%	16%	14%
Construction	2,662	8%	6%	5%
Accommodation and food services	3,786	11%	7%	7%
Agriculture; forestry; fishing and hunting	767	2%	2%	2%
Real estate, rental and leasing	3,041	9%	4%	4%
Arts; entertainment; and recreation	1,075	3%	2%	2%
Retail trade	4,709	14%	10%	10%
Administrative and support and waste management services	2,092	6%	7%	6%
Mining	15	0%	0%	1%
Other services (except public administration)	2,593	8%	5%	6%
Management of companies and enterprises	25	0%	2%	1%
Information	370	1%	2%	2%
Utilities	120	0%	0%	0%
Educational services	328	1%	2%	2%
Wholesale trade	676	2%	4%	3%
Health care and social assistance	2,445	7%	10%	11%
Transportation and warehousing	393	1%	3%	3%
Finance and insurance	1,213	4%	4%	5%
Professional; scientific; and technical services	1,578	5%	6%	7%
Manufacturing	1,192	3%	9%	7%

Source: U.S. Bureau of Economic Analysis 2012.

TABLE 42: SELF-EMPLOYMENT BY INDUSTRY, 2010

Industry	Number of Nonemployers* Carteret County	Percentage		
		Carteret County	North Carolina	United States
Agriculture, forestry, fishing and hunting	429	7%	1%	1%
Construction	988	17%	13%	11%
Real estate, rental and leasing	877	15%	11%	11%
Accommodation and food services	81	1%	1%	1%
Information	47	1%	1%	1%
Utilities	7	0%	0%	0%
Mining, quarrying, and oil and gas extraction	5	0%	0%	0%
Manufacturing	82	1%	1%	1%
Arts, entertainment, and recreation	211	4%	5%	5%
Educational services	102	2%	3%	3%
Administrative and Support and Waste Management and Remediation Services	585	10%	10%	9%
Retail trade	477	8%	8%	8%
Wholesale trade	60	1%	2%	2%
Transportation and warehousing	177	3%	4%	5%
Finance and insurance	124	2%	3%	3%
Other services (except public administration)	877	15%	17%	15%
Health care and social assistance	236	4%	7%	9%
Professional, scientific, and technical services	544	9%	12%	14%

Source: U.S. Census Bureau 2012d.

*From <http://www.census.gov/econ/nonemployer/intro.htm>: "Nonemployers are typically self-employed individuals operating very small businesses, which may or may not be the owner's principal source of income...Data are primarily comprised of sole proprietorship businesses filing IRS Form 1040, Schedule C, although some of the data is derived from filers of partnership and corporation tax returns that report no paid employees."

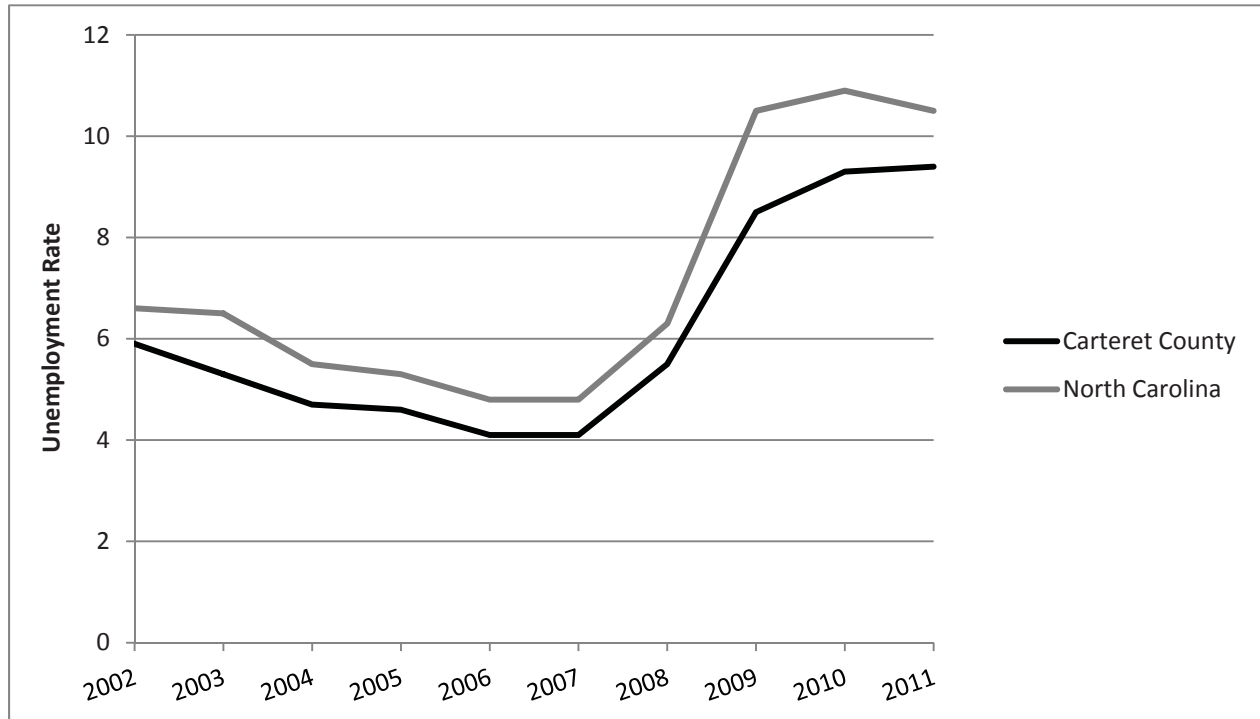
UNEMPLOYMENT

In 2011, an average of 9.4 percent of the civilian labor force in Carteret County was unemployed (3,082 individuals) (table 43). The unemployment rate for Carteret County was lower than the unemployment rate in North Carolina as a whole (10.5 percent) in 2011. In September 2012, the unemployment rate (seasonally unadjusted) had fallen to 7.7 percent in Carteret County and 9.0 percent in North Carolina (BLS 2012). As figure 26 shows, Carteret County has fared better than the state following the recession of 2008 in terms of unemployment and has been consistently lower than the state average since 2002.

TABLE 43: EMPLOYMENT CHARACTERISTICS, 2011

	North Carolina	Carteret County
Labor Force	4,653,911	32,734
Employment	4,164,814	29,652
Unemployment	489,097	3,082
Unemployment Rate	10.5%	9.4%

Source: Bureau of Labor Statistics 2012.



Source: Bureau of Labor Statistics, 2012. "Local Area Unemployment Statistics." <<http://www.bls.gov/lau>>; (December 10, 2012).

FIGURE 26: UNEMPLOYMENT RATE, 2002–2011

TOURISM CONTRIBUTIONS TO THE ECONOMY

The economy of the ROI is largely driven by the region's tourist draw, mainly during the summer months. As estimated by the U.S. Travel Association, Carteret County ranked 14th out of 100 North Carolina counties in impact of tourism expenditures (U.S. Travel Association 2012). Table 44 shows estimated domestic travel expenditures for Carteret County compared with expenditures in North Carolina. Looking at table 45, 32 percent of homes in Carteret County are for seasonal, recreational, or occasional use, compared to 4 percent in North Carolina and the United States as a whole. The large percentage of vacation homes compared to the state and national averages is further evidence of the importance of tourism to the region's economy.

TABLE 44: ESTIMATED DOMESTIC TRAVEL EXPENDITURES (\$2011 MILLIONS)

Geographic Area	1991	2000	2011	2000 to 2011 CAGR
North Carolina	\$7,017.13	\$12,068.94	\$18,421.06	6.23%
Carteret County	\$138.43	\$210.09	\$278.74	4.12%

Source: North Carolina Department of Commerce 2012.

TABLE 45: HOUSING UNIT STATISTICS, 2010

	United States	North Carolina	Carteret County
Total	131,704,730	4,327,528	48,179
Urban	104,019,731	2,787,646	35,096
% of Total	79%	64%	73%
Occupied	116,716,292	3,745,155	28,870
Vacant	14,988,438	582,373	19,309
For seasonal, recreational, or occasional use	4,649,298	191,508	15,402
% of Total for seasonal, recreational, or occasional use	4%	4%	32%

Source: U.S. Census Bureau 2012e.

QUALITY OF LIFE

Quality of life encompasses those attributes of resources (human-made or naturally occurring) of a region that contribute to the well-being of its residents. The relative importance of these attributes to a person's well-being is subjective (e.g., some individuals consider outdoor recreational opportunities essential to their well-being, others require access to cultural institutions essential to their quality of life, and still others may hold public safety as their primary quality of life concern). Quality of life analyses typically address issues relating to potential impacts of the proposed action on the availability of public services and leisure activities that contribute to the quality of life of an affected ROI's inhabitants.

The natural environment, including beaches and wildlife, provide the primary basis for quality of life in Carteret County. As discussed above, beach-related tourism is an important component of the economy, whereas fishing and research represent another. Local residents also receive significant recreational benefits from the area's natural assets. In addition to the Seashore, the ROI includes Fort Macon State Park, Cedar Island National Wildlife Refuge, and part of Croatan National Forest. There are also public and private beaches, marinas, piers and other recreational outlets. Two categories of outdoor recreation pertinent to the assessment of alternative management plans, recreational fishing and bird-watching, are discussed further below using data from the National Survey of Fishing, Hunting, and Wildlife-Associated Recreation.

North Carolina is the sixth most popular state for fishing, with an estimated 1,263,000 residents and nonresidents participating in 2006 (U.S. Department of the Interior, U.S. Fish and Wildlife Service, and U.S. Department of Commerce Census Bureau 2008). Recreational fishing is a significant part of North Carolina's economy, attracting spending from both local and out-of-state anglers. Approximately 519,000 anglers in North Carolina engaged in saltwater fishing in 2006 (table 46). Expenditures from fishing trips totaled an estimated \$692,977,000 in 2006, with \$450,313,000 coming from saltwater anglers. Although

only 40 percent of anglers report participating in saltwater fishing, nearly 65 percent of all trip-related expenditures go toward this activity.

TABLE 46: RECREATIONAL FISHING IN NORTH CAROLINA, BY RESIDENTS AND NONRESIDENTS

	Resident	Nonresident	Total
Total participants	868,000	395,000	1,263,000
% Total participants	69%	31%	100%
Number of saltwater anglers	253,000	266,000	519,000
% Saltwater anglers	49%	51%	100%
Total trip-related expenditures	\$395,296,000	\$297,681,000	\$692,977,000
Average trip-related expenditures per participant	\$456	\$753	\$549

Source: USFWS, and U.S. Department of Commerce, U.S. Census Bureau 2006.

Nonresident angler expenditures are important to regional economic impacts, as they represent an addition to area wealth rather than a change in the mix of spending by residents. Nonresidents make up only 31 percent of all anglers in North Carolina but comprise 51 percent of saltwater anglers. Nonresidents, who often must pay greater lodging and transportation fees, spend an average of 65 percent more than residents for trip-related expenditures over all types of fishing.

Separate expenditure data for residents and nonresidents on saltwater fishing was not available. However, trip-related expenditures (including food, lodging, transportation, ice, bait, guide and usage fees, rental equipment, and other items, but excluding the cost of purchased equipment) are much higher for saltwater anglers than for all anglers combined, averaging \$754 per person for both residents and nonresidents, compared to \$549 per person for all fishing. Saltwater fishermen spend more per angler on food and lodging, transportation, and other trip costs.

Carteret County sold 18 percent of coastal recreational fishing licenses sold within the eight coastal counties in North Carolina and 9 percent of all coastal recreational fishing licenses sold in 2011. Carteret County ranks third behind Dare and Wake Counties among all North Carolina counties in coastal recreational fishing license sales (table 47).

Among all states, North Carolina ranks nineteenth for number of wildlife watchers, with 2,641,000 participants in 2006. Wildlife watching is classified as activities for which wildlife watching is the primary purpose, and does not include trips to zoos or museums or accidental observation of wildlife. Wildlife watchers may be feeding, photographing, or observing wildlife. Approximately 15 percent of wildlife watchers in North Carolina were nonresidents in 2006.

TABLE 47: NUMBER OF COASTAL RECREATIONAL FISHING LICENSES SOLD BY NORTH CAROLINA COUNTY OF SALE (LOCATION WHERE LICENSE SALES AGENT RESIDES), EXCLUDING BLANKET COASTAL RECREATIONAL FISHING LICENSES, 2010 AND 2011

County	2010	2011
Dare	87,850	76,943
Hyde	5,479	5,193
Brunswick	36,074	34,975
Carteret	41,210	38,706
Currituck	2,516	2,105
New Hanover	31,256	29,566
Onslow	17,228	16,377
Pender	16,361	15,462
Total	453,519	439,260

Source: NCWRC 2011.

Away-from-home wildlife watching is defined as wildlife observation occurring at least 1 mile away from home. Table 48 presents information about away-from-home wildlife watching in North Carolina. Among away-from-home wildlife watchers in North Carolina, approximately 56 percent are nonresidents. Away-from-home bird-watchers made up 620,000 or 90 percent of all away-from-home wildlife watchers. Of these, 50 percent reported watching “other water birds.” This category includes shorebirds, cranes, herons, and all other water birds not classified as waterfowl and serves as the best representation of birds on Cape Lookout. Among wildlife watchers observing “other water birds,” nonresidents made up 69 percent of participants. Thus, nonresidents are more likely to participate in wildlife watching for birds other wildlife watching.

TABLE 48: AWAY-FROM-HOME WILDLIFE WATCHING IN NORTH CAROLINA, BY RESIDENTS AND NONRESIDENTS

	Resident	Nonresident	Total
Total away-from-home participants	300,000	386,000	686,000
Percent of total participants	44%	56%	100%
Total away-from-home birders	284,000	336,000	620,000
Total birders	46%	54%	100%
Away-from-home “other water bird” observers	95,000	215,000	310,000
Percent of “other water bird” observers	31%	69%	100%
Total trip-related expenditures	\$84,245,000	\$162,662,000	\$246,906,000
Average trip-related expenditure per participant	\$281	\$421	\$360

Source: USFWS, U.S. Department of Commerce, and U.S. Census Bureau 2006.

Wildlife watchers in North Carolina spent a total of \$246,906,000 in trip-related costs in 2006. This number includes food, lodging, transportation, rented equipment, and guide or permit fees, but not expenditures on purchased equipment. Away-from-home resident wildlife watchers spent an average of

\$281 per person per trip, whereas nonresident participants spent \$421. Although separate expenditure data for other water bird-watchers was not available, other water birds such as shorebirds are more likely to attract out-of-state wildlife watchers, who then spend on average 50 percent more than resident wildlife watchers.

PRESERVATION AND NONUSE VALUES

Preservation or nonuse impacts represent a category of values held by people independent of their use of the resources that also includes existence value and bequest value. The main assumption underlying the concept of nonuse values is that individuals' welfare can be enhanced simply by the knowledge that specific ecosystems are being protected or improved. As the name implies, individuals receive these types of services without any specific use of or interaction with the ecosystems. For example, nonuse values from preserving a natural area may come from the knowledge that future generations are more likely to experience and enjoy the area (i.e., "bequest values"). Evidence of nonuse values comes from donations to national and international organizations that protect habitat, species and the environment worldwide by individuals who will never visit or use the environmental goods and services they are paying to help protect. Economic theory recognizes that individuals can hold value for the Seashore and the ecosystems contained within its boundaries because they want future generations to enjoy the area, because they value the protected species supported by the area, or because they feel the natural communities contained within the National Seashore have intrinsic value separate from the value they provide to visitors.

Measuring values for these "nonuse" services is more difficult and involves more uncertainty than measuring values for recreational and aesthetic services. Nevertheless, a variety of studies demonstrate that nonuse values exist and may be quite large depending on the resource in question. Loomis and White (1996) synthesized key results from 20 threatened and endangered species valuation studies using meta-analysis methods. They were able to identify variables that explain the observed variation in estimated willingness-to-pay values for threatened and endangered species and examine how per-household benefit estimates compare with cost estimates for protection. In their meta-analysis, Loomis and White reviewed 20 contingent value studies coming from both the published and gray literature. They found that annual willingness-to-pay estimates range from a low of \$8 for the Striped Shiner fish to a high of \$124 for the Northern Spotted Owl. Although the study does not include species found at the Seashore, it demonstrates that the public may hold nonuse values for the species protected within the Seashore.

BUSINESSES SERVING VISITORS TO THE SEASHORE

Visitors to the Seashore are served by a variety of local businesses including those that provide lodging, food, transportation, gas, recreation services and equipment, and other goods such as souvenirs. According to the Chamber of Commerce of Carteret County online business directory, there are 15 hotels and motels in the county, as well as 68 restaurants (Carteret County Chamber of Commerce 2012). Most of these businesses are located in more populated areas of Beaufort and Morehead City. The majority of the ORV users are ferried to the Seashore using ferry services provided in the towns of Davis and Atlantic. In Davis there are a few businesses including a gas station, provisions shop, hair salon, and a fishing net and twine company, in addition to the two ferry operators. Further north in Atlantic there is a landing field operated by the Marine Corps, three restaurants, a gas station, grocery store, and an RV park, in addition to the services provided at the Morris Marina ferry operation.

The ferry businesses that transport visitors and their vehicles over to the islands may be most directly affected by any change in ORV management. A total of five ferry operators transport visitors and their vehicles to the Seashore from locations on Harkers Island and Ocracoke Island, including the towns of Beaufort, Davis, and Atlantic. Table 49 lists the ferry operators along with their departures, destinations, and the types of ferries they operate (NPS 2012i). Based on the information collected in 2011 for a new

transportation management plan (NPS 2012l), the operators have been in business for between 3 years and 50 years. Vehicle ferries serve only locations on the Seashore, whereas some of the passenger ferries go to other islands or offer tours. Vehicle ferry operators reported that business was highest during the fall fishing season, particularly in October, whereas passenger ferries are busier in the summer. Table 50 provides information about the fares for passengers and vehicles.

TABLE 49: NATIONAL PARK SERVICE-AUTHORIZED FERRY SERVICE PROVIDERS

Departure Locations	Operator	Destination Locations	Ferry Type
Ocracoke	Austin Boat Tours	North Core Banks, Portsmouth Village	Passenger
Atlantic	Morris Marina Ferry Service	North Core Banks, Long Point	Vehicle/passenger
Davis	Davis Shore Ferry Service Cape Lookout Cabins & Camps Ferry Service	South Core Banks, Great Island	Vehicle/passenger
Harkers Island	Island Express Ferry Service	South Core Banks, Cape Lookout Lighthouse and Shackleford Banks	Passenger
Beaufort	Island Express Ferry Service	Cape Lookout Lighthouse and Shackleford Banks Shackleford Banks	Passenger

Source: NPS 2012m.

TABLE 50: AMOUNTS CHARGED FOR FERRY SERVICES

Passenger Fares	Amount Charged, Peak Season
Passengers	\$15 to \$20 (median \$17.50)
Children	Free to \$10, averaging 50% of standard fare
Age for children	<1 year old to <12 years old
Group fare (10 to 16 people required for group rate)	\$8 to \$14
Vehicle Fares	Amount Charged
Standard Vehicle	\$75 to \$80
Larger vehicle	\$90 to \$100
Vehicle with trailer	\$130 to \$150
ATV (4 wheel, with or without small trailer)	\$35 to \$75
Kayak/canoe	\$35
Additional Charges	Amount Charged
Additional fees for bulky items (camping or fishing gear)	\$5 to \$10

Source: NPS 2011j.

SEASHORE MANAGEMENT AND OPERATIONS

Seashore management and operations activities related to ORV management fall within the various operational divisions of the Seashore that include Protection, Resource Management, Administration, Facility Management, and Interpretation. The baseline for park operations and management is discussed in terms of existing conditions under the *Cape Lookout National Seashore Interim Protected Species Management Plan / Environmental Assessment*.

VISITOR AND RESOURCE PROTECTION

Visitor and resource protection staff at the Seashore are responsible for assuring compliance with all closures erected by the resources management staff, and monitoring; ORV use, pets, visitor use, camping, hunting, and all other visitor activities occurring on the Seashore. Protection staff provide for safety through enforcement of the laws, emergency medical services, search and rescue operations, and fire protection. Visitor and resource protection efforts at the Seashore focused on ORV management require approximately \$259,600 in personnel costs (NPS pers. comm. 2013i). Current funding levels limits staffing primarily to temporary employees that can only work 6 months of the total 9-month ORV season. Reliance on temporary employees fails to cover the full ORV season, increases training costs and equipment costs, and is generally less efficient.

RESOURCE MANAGEMENT

Resource management staff at the Seashore are responsible for all monitoring and surveying of species at the Seashore, as well as establishing and changing the required resource closures once state- or federally listed species are found at the Seashore. Resource management staff is responsible for training and monitoring equipment, preparation of all required annual species reports, compiling and sending out weekly access and resource updates, and coordination of regulatory and scientific activities with other entities such as the USFWS and NCWRC. This staff includes supervisory roles as well as full- and part-time field staff to implement species management measures. Support and material costs for these NPS staff members include vehicles and vehicle rentals (such as ATVs and UTVs), watercraft vessels, fuel, training, field supplies (such as signs, string, flagging, and rope), monitoring supplies, and travel. Resource management efforts related to ORV use at the Seashore require approximately \$191,700 in personnel costs, and \$10,000 in support costs (total cost approximately \$201,700) (NPS pers. comm. 2013i). Current funding relies primarily on temporary field staff, and there is only one professional-level biologist on staff to provide training, field training, and supervision for a 7-day per week monitoring program that spans 56 miles across three or more separate islands. Furthermore, current funding does not allocate sufficient funds for geographic information systems (GIS) and information management, nor long-term supervision of field staff.

ADMINISTRATION

Management and administrative staff members at the Seashore have a variety of responsibilities related to ORV management, including procurement, managing payroll for the Seashore, fielding questions from visitors regarding ORV management, fulfilling human resources functions and supervisory roles, and providing information technology and other technical support, in addition to the superintendent's role in ORV management. The administrative staff is responsible for all fiscal matters at the Seashore, including the receipt and accounting of current fee program and special use permit revenue. Administrative support related to ORV management requires approximately \$12,500 in personnel costs (NPS pers. comm. 2013i).

FACILITY MANAGEMENT

Facility management staff at the Seashore are responsible for providing maintenance and repairs for the ferry landings, docks, and parking lots, supplies for maintenance of ranger stations and garages, maintenance of cabin camps, provision of utilities, as well as installation of informational signs along the beach. This division is also responsible for maintaining and repairing the vehicles, vessels and other equipment used by all other divisions of the Seashore, including those used for law enforcement and resource management patrols. Support and material costs for these NPS staff members include fuel, vehicle parts, and maintenance supplies. Facility management efforts requires approximately \$12,700 in personnel costs (NPS pers. comm. 2013i). The maintenance division is not sufficiently funded to provide routine maintenance of the back route, ramps and routes.

INTERPRETATION AND EDUCATION

There is currently insufficient funding for focused ORV education activities at the Seashore. There are no personnel costs allocated to ORV use in the interpretation and education division at the Seashore (NPS pers. comm. 2013i).

Chapter 4:

Environmental Consequences

CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

This “Environmental Consequences” chapter analyzes both beneficial and adverse impacts that would result from implementing any of the alternatives considered in this long-term Off-road Vehicle Management Plan / Environmental Impact Statement (ORV management plan/EIS). This chapter also includes a summary of laws and policies relevant to each impact topic, methods used to analyze impacts, and the analysis methods used for determining cumulative impacts. As required by the Council on Environmental Quality (CEQ) regulations implementing the National Environmental Policy Act (NEPA), a summary of the environmental consequences for each alternative is provided in table 6, which can be found at the end of “Chapter 2: Alternatives.” The resource topics presented in this chapter, and the organization of the topics, correspond to the resource discussions in “Chapter 3: Affected Environment.”

For a complete discussion of guiding authorities, refer to the sections titled “Federal Laws, Policies, Regulations, and Plans Directly Related to Off-road Vehicle Management” and “Other Applicable Federal Laws, Policies, Regulations, and Plans” in “Chapter 1: Purpose of and Need for Action.”

Collectively, these guiding laws and corresponding regulations provide a framework and process for evaluating the impacts of the alternatives considered in this ORV management plan/EIS.

IMPACT ASSESSMENT METHODOLOGY AND ASSUMPTIONS

This impact analysis evaluates proposed changes in off-road vehicle (ORV) management at Cape Lookout National Seashore through the evaluation of four action alternatives and the no-action alternative. For natural resource topics addressed in this ORV management plan/EIS, the impact of the actual physical changes to natural resources indirectly resulting from each of the alternative regulatory rule scenarios is analyzed. The approach to this analysis includes the following elements:

- Focusing the analysis on those management changes in the alternatives that have measurable impacts on the resources or values being evaluated.
- Using general analysis methods that follow CEQ and U.S. Department of the Interior NEPA regulations and National Park Service (NPS) Director’s Order 12 policy and its implementing Handbook.
- Following basic assumptions used in NEPA analysis relating to area of analysis, timeframe, and types of impacts.
- Evaluating cumulative impacts for each impact topic that address impacts from each alternative in combination with other actions that can affect the same resource or value.
- Determining significance of the impacts resulting from each alternative.

GENERAL ANALYSIS METHOD

The analysis of impacts follows CEQ guidelines and Director’s Order 12 procedures (NPS 2011h).

A substantial body of scientific literature has described the effects of off-road vehicle (ORV) use on the environment. The NPS interdisciplinary planning team reviewed literature and studies applicable to the region and setting and the resources being evaluated. This information was used to augment the on-site observations and documentation gathered by NPS personnel at the Seashore and the advice of internal and external resource management experts to support the qualitative and quantitative statements presented in

this impact analysis section. When resource-specific data, observations, studies, or other evidence are available, these resources are noted in the methodology section for each impact topic.

ASSUMPTIONS

Several guiding assumptions, as defined below, were made to provide context for this analysis.

Analysis Period—This ORV management plan/EIS establishes goals, objectives, and specific implementation actions needed to manage ORV use for the next 15 to 20 years.

Analysis Area—The geographic study area for this ORV management plan/EIS is Cape Lookout National Seashore, including all barrier islands within the Seashore from Ocracoke Inlet to Beaufort Inlet. As of December 2012, these islands included North Core Banks, South Core Banks (collectively known together as the Core Banks), and Shackleford Banks. Should any inlets or new islands form due to natural processes within the study area during this decision-making process, those areas would be addressed with this ORV management plan/EIS.

Duration and Type of Impacts—For the purpose of the analysis provided in this ORV management plan/EIS, the following assumptions are used for all impact topics.

Duration describes the length of time an effect will occur, either short term or long term:

- *Short-term* impacts are those that last up to one year.
- *Long-term* impacts are those occurring from off-road vehicle management actions over several seasons through the next 15 to 20 years and beyond.

Type describes the classification of the impact as beneficial or adverse, direct or indirect:

- *Beneficial*: A change in the condition or appearance of the resource that moves the resource toward a desired condition.
- *Adverse*: A change that moves the resource away from a desired condition or detracts from its appearance or condition.
- *Direct*: An effect that is caused by an action and occurs in the same time and place.
- *Indirect*: An effect that is caused by an action but is later in time or farther removed in distance, but is still reasonably foreseeable.

ASSESSING IMPACTS USING CEQ CRITERIA

According to the NEPA regulations adopted by the President's CEQ (40 CFR 1500–1508), the term “significantly” is based on the criteria of context and intensity (40 CFR 1508.27).

Context—This means that the significance of an action must be analyzed in several contexts such as society as a whole (human, national), the affected region, the affected interests, and the locality. Significance varies with the setting of the proposed action. For instance, in the case of a site-specific action, significance would usually depend upon the effects in the locale rather than in the world as a whole. Both short- and long-term effects are relevant.

Intensity—This refers to the severity of impact. Responsible officials must bear in mind that more than one agency may make decisions about partial aspects of a major action. The following should be considered in evaluating intensity:

- Impacts that may be both beneficial and adverse. A significant effect may exist even if the federal agency believes that on balance the effect will be beneficial.
- The degree to which the effects on the quality of the human environment are likely to be highly controversial.
- The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks.
- The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration.
- Whether the action is related to other actions with individually insignificant but cumulatively significant impacts. Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts.
- The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places (National Register) or may cause loss or destruction of significant scientific, cultural, or historical resources.
- The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act (ESA) of 1973.
- Whether the action threatens a violation of federal, state, or local law or requirements imposed for the protection of the environment.

CUMULATIVE IMPACTS

The CEQ regulations for implementing NEPA 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 nonfederal) or person undertakes such other actions” (40 CFR 1508.7). Cumulative impacts are considered for all alternatives, including the no-action alternative.

Cumulative impacts were determined by combining the impacts of the alternative being considered with other past, present, and reasonably foreseeable future actions. Therefore, it was necessary to identify other ongoing or reasonably foreseeable future projects and plans at the park and, if applicable, the surrounding region. Past actions are those that have been occurring since the establishment of the Seashore and reasonably foreseeable future projects are those that would occur within the life of the plan. Following CEQ guidance, past actions were included, “to the extent that they are relevant and useful in analyzing whether the reasonably foreseeable effects of the agency proposal for the actions and its alternatives may have a continuing, additive, and significant relationship to those effects” (CEQ 2005).

Table 51 lists the actions that could affect the various resources at the park. These actions are described in more detail in the “Other Applicable Federal Laws, Policies, Regulations, and Plans” section in chapter 1.

TABLE 51: CUMULATIVE IMPACT SCENARIO

Impact Topic	Study Area	Past Actions	Current Actions	Future Actions (20 years)
Federally Listed Endangered, Threatened, or Candidate Species	Specific to species as identified in their Recovery Plans, along the North Carolina coast	Concessioners and ferry operations Dredging Beaufort Inlet Commercial fishing Military overflights Stabilization of Historic Structures Project U.S. Fish and Wildlife Service (USFWS) Critical Habitat Designation <i>Cape Hatteras National Seashore Interim Protected Species Management Strategy / Environmental Assessment</i>	Same as past + <i>Cape Lookout National Seashore Interim Protected Species Management Plan/Environmental Assessment</i> <i>Horse Management Plan</i> Dredging Oregon Inlet Interim Off-road Vehicle Management Plan and <i>Evaluation of Existing ORV Use at Cape Lookout National Seashore</i> Predator Study Special Use Permits USFWS Species Recovery Plans <i>Final Long-term ORV Management Plan/EIS for Cape Hatteras National Seashore</i> <i>Commercial Services Plan / Environmental Assessment / Assessment of Effect</i> Beaufort and Harkers Island Development for Ferry Facilities Planning for Off-shore Commercial Wind Leasing (Bureau of Ocean Energy Management (BOEM) Task Force activities) <i>Foundation Document</i> (NPS 2012s) <i>Cape Lookout National Seashore Long-Range Interpretive Plan</i> (NPS 2011k)	Same as current + Harkers Island Master Plan Great Island and Long Point Master Plan Resource stewardship strategy Comprehensive Sign Plan Nonnative species and predator management plan Sustainability plan/green plan
State-listed and Special-status Species	North Carolina populations	Same as Federally Listed Endangered, Threatened, or Candidate Species	Same as Federally Listed Endangered, Threatened, or Candidate Species	Same as Federally Listed Endangered, Threatened, or Candidate Species
Other Wildlife and Wildlife Habitat	North Carolina populations	Same as Federally Listed Endangered, Threatened, or Candidate Species	Same as Federally Listed Endangered, Threatened, or Candidate Species	Same as Federally Listed Endangered, Threatened, or Candidate Species

Impact Topic	Study Area	Past Actions	Current Actions	Future Actions (20 years)
Soundscapes / Acoustic Environment	Park Boundary	<p>Marine engines, including ferries, private motorboats and commercial fisheries traveling to or near the island (including ferry operators)</p> <p>Personal watercraft use</p> <p>Hunting</p> <p>Diesel Generators</p> <p>Dredging Beaufort Inlet</p> <p>Military overflights</p>	<p>Same as past +</p> <p>Cape Lookout National Seashore Interim Protected Species Management Plan/Environmental Assessment</p> <p>Special Use Permits</p> <p>Beaufort and Harkers Island Development for Ferry Facilities</p> <p>Foundation Document (NPS 2012s)</p>	<p>Same as current +</p> <p>Strategy for management of Cape Lookout lighthouse and associated historic structures</p> <p>Portsmouth Village Master Plan</p> <p>Harkers Island Master Plan</p> <p>Great Island and Long Point Master Plan</p> <p>Resource stewardship strategy</p> <p>Comprehensive Sign Plan</p> <p>Nonnative species and predator management plan</p> <p>Sustainability plan/green plan</p> <p>Dredge Material Management Plan</p> <p>Morehead City Harbor</p>

Impact Topic	Study Area	Past Actions	Current Actions	Future Actions (20 years)
Visitor Use and Experience	Park Boundary	Concessioners and ferry operations Harkers Island and Cape Lookout National Seashore Keepers' Quarters Exhibit Plan Portsmouth Village Exhibit Plan Wayside Exhibit Plan Stabilization of Historic Structures Project Visitor Use Study Reopening of the Lighthouse and Increased Visitor Amenities	Same as past + <i>Horse Management Plan</i> Cape Lookout Historic District Management Plan <i>Cape Lookout National Seashore Interim Protected Species Management Plan/Environmental Assessment</i> Special Use Permits <i>Interim Off-road Vehicle Management Plan and Evaluation of Existing ORV Use at Cape Lookout National Seashore</i> Military overflights <i>Final Long-term ORV Management Plan/EIS for Cape Hatteras National Seashore</i> Beaufort and Harkers Island Development for Ferry Facilities Planning for Off-shore Commercial Wind Leasing (BOEM Task Force activities) <i>Foundation Document (NPS 2012s)</i> <i>Cape Lookout National Seashore Long-Range Interpretive Plan (NPS 2011k)</i>	Same as current + Comprehensive Interpretation Plan Strategy for management of Cape Lookout lighthouse and associated historic structures Portsmouth Village Master Plan Harkers Island Master Plan Great Island and Long Point Master Plan Resource stewardship strategy Comprehensive Sign Plan Nonnative species and predator management plan Sustainability plan/green plan

Impact Topic	Study Area	Past Actions	Current Actions	Future Actions (20 years)
Socioeconomic Resources	Regional	Concessioners and ferry operations <i>Cape Hatteras National Seashore Interim Protected Species Management Strategy / Environmental Assessment</i> Reopening of the Lighthouse and Increased Visitor Amenities	Same as past + Special Use Permits <i>Cape Lookout National Seashore Interim Protected Species Management Plan/Environmental Assessment</i> <i>Final Long-term ORV Management Plan/EIS for Cape Hatteras National Seashore</i> Beaufort and Harkers Island Development for Ferry Facilities Planning for Off-shore Commercial Wind Leasing (BOEM Task Force activities) <i>Foundation Document (NPS 2012s)</i>	Same as current + <i>Commercial Services Plan / Environmental Assessment / Assessment of Effect</i> Cape Lookout Historic District Management Plan Carteret County Comprehensive Plan Strategy for management of Cape Lookout lighthouse and associated historic structures Portsmouth Village Master Plan Harkers Island Master Plan Great Island and Long Point Master Plan Resource stewardship strategy Comprehensive Sign Plan Nonnative species and predator management plan Sustainability plan/green plan

Impact Topic	Study Area	Past Actions	Current Actions	Future Actions (20 years)
Seashore Management and Operations	Park Boundary	Concessioners and ferry operations Species management activities Harkers Island and Cape Lookout National Seashore Keepers' Quarters Exhibit Plan Wayside Exhibit Plan Stabilization of Historic Structures Project Visitor Use Study	Same as past+ Reopening of the Lighthouse and Increased Visitor Amenities <i>Cape Lookout National Seashore Interim Protected Species Management Plan/Environmental Assessment</i> Special Use Permits <i>Interim Off-road Vehicle Management Plan and Evaluation of Existing ORV Use at Cape Lookout National Seashore</i> Predator Study Beaufort and Harkers Island Development for Ferry Facilities <i>Foundation Document</i> (NPS 2012s) <i>Cape Lookout National Seashore Long-Range Interpretive Plan</i> (NPS 2011k)	Same as current+ <i>Commercial Services Plan / Environmental Assessment / Assessment of Effect</i> Strategy for management of Cape Lookout lighthouse and associated historic structures Portsmouth Village Master Plan Harkers Island Master Plan Great Island and Long Point Master Plan Resource stewardship strategy Comprehensive Sign Plan Nonnative species and predator management plan Sustainability plan/green plan

The analysis of cumulative impacts was accomplished using four steps:

Step 1 — Identify Resources Affected

Fully identify resources affected by any of the alternatives. These include the resources addressed as impact topics in chapters 3 and 4 (this chapter) of this document.

Step 2 — Set Boundaries

Identify an appropriate spatial and temporal boundary for each resource. The temporal boundaries are from the establishment of the Seashore through the life of the plan (15 to 20 years) and the spatial boundary for each resource topic is listed under each topic.

Step 3 — Identify Cumulative Action Scenario

Determine which past, present, and reasonably foreseeable future actions to include with each resource. Reasonably foreseeable future actions include those federal and nonfederal activities not yet undertaken, but sufficiently likely to occur, that a reasonable official of ordinary prudence would take such activities into account in reaching a decision. These activities include, but are not limited to, activities for which there are existing decisions, funding, or proposals identified. Reasonably foreseeable future actions do not include those actions that are highly speculative or indefinite (43 CFR 46.30).

Past, present and reasonably foreseeable future actions are listed in table 51 and described in chapter 1.

Step 4 — Cumulative Impact Analysis

Summarize impacts of these other actions plus impacts of the proposed action (the alternative being evaluated, to arrive at the total cumulative impact. This analysis is included for each resource in chapter 4 (this chapter).

FEDERALLY LISTED ENDANGERED, THREATENED, OR CANDIDATE SPECIES

GUIDING REGULATIONS AND POLICIES

The ESA (16 USC 1531 et seq.) mandates all federal agencies to consider the potential effects of their actions on species listed as threatened or endangered. If the NPS determines that an action may affect a federally listed species, consultation with the USFWS is required to ensure that the action would not jeopardize the species' continued existence or result in the destruction or adverse modification of critical habitat. NPS *Management Policies 2006* state that the NPS will survey for, protect, and strive to recover all species native to national park system units that are listed under the ESA, and proactively conserve listed species and prevent detrimental effects on these species (NPS 2006d, section 4.4.2.3). NPS *Management Policies 2006* also state that "[the NPS will] manage state and locally listed species in a manner similar to its treatment of federally listed species to the greatest extent possible" (NPS 2006d, section 4.4.2.3).

METHODOLOGY AND ASSUMPTIONS

The following information was used to assess impacts on all listed species from ORV management actions:

- Species found in areas likely to be affected by actions described in the alternatives.
- Habitat loss or alteration caused by the alternatives.
- Displacement and disturbance potential of the actions and the species' potential to be affected by the activities.

According to the ESA, the term "take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.

Specific methodologies and assumptions pertaining to the piping plover, red knot, sea turtles, or seabeach amaranth are described under the relevant descriptions in the following text; however, for all species the following assumption is made. Under all of the alternatives, the Seashore establishes resource closures and buffers that are designed to protect piping plovers, sea turtles, and seabeach amaranth, as well as other sensitive species. No species specific closures or buffers are put into place for red knots, though they do benefit from closures for other species. The Seashore also conducts routine law enforcement patrols of the beach areas to enforce the closures, respond to violations, conduct investigations, and assist in public education. Although most public users of the Seashore respect the closures and buffers, noncompliance does occur (NPS 2012t, 2011a, 2010b, 2009a, 2008c, 2007i) and can adversely impact piping plovers. Studies have shown that increasing enforcement of regulations increases future compliance by not only the violator, but also of people other than the violator (Shimshack 2010;

Shimshack and Ward 2005; Van Houten et al. 2013). Thus, under the alternatives that increase law enforcement and resource management staffing levels, it is assumed that increased enforcement would result in increased compliance with the closures and other rules and regulations of the Seashore.

The term “insignificant” as used in the ESA determinations is not the same as the significance determination made in the conclusion sections for NEPA purposes.

The ESA defines the terminology used to assess impacts on the piping plover, sea turtles, and seabeach amaranth as follows.

<i>No effect:</i>	When a proposed action would not affect a listed species or designated critical habitat.
<i>May affect / not likely to adversely affect:</i>	When effects on listed species are expected to be discountable, insignificant, or completely beneficial. Beneficial effects are contemporaneous positive effects without any adverse effects on the species. Insignificant effects relate to the size of the impact and should never reach the scale where “take” occurs. Discountable effects are those extremely unlikely to occur. Based on best judgment, a person would not (1) be able to meaningfully measure, detect, or evaluate insignificant effects; or (2) expect discountable effects to occur.
<i>May affect / likely to adversely affect:</i>	When any adverse effect on listed species may occur as a direct or indirect result of the proposed action or its interrelated or interdependent actions, and the effect is not discountable, insignificant, or beneficial. If the overall effect of the proposed action is beneficial to the listed species, but is also likely to cause some adverse effects, the proposed action “is likely to adversely affect” the listed species. If incidental take is anticipated to occur as a result of the proposed action, then it “is likely to adversely affect” the species. Incidental take is the take of a listed species that results from, but is not the purpose of, carrying out an otherwise lawful activity.
<i>Is likely to jeopardize species / adversely modify critical habitat:</i>	The appropriate conclusion when the NPS or the USFWS identifies an adverse effect that could jeopardize the continued existence of a species or destroy or adversely modify critical habitat of a species within or outside Seashore boundaries.

The plan/EIS will serve as the biological assessment in compliance with section 7 consultation requirements and analyzes impacts using the above terminology. Each alternative includes an ESA determination of effect to facilitate this compliance.

STUDY AREA

The study area for assessment of the various species is described separately for each listed species.

PIPING PLOVER

SPECIES-SPECIFIC METHODOLOGY AND ASSUMPTIONS

Potential impacts on the federally threatened piping plover populations and habitat were evaluated based on available data on past and present occurrence of the species at the Seashore; scientific literature on the species, life history, and the impacts of human disturbance on piping plovers and other bird species; and documentation of the species association with humans, pets, predators, and ORVs. Information on habitat and other existing data were acquired from NPS staff, the USFWS, and available literature.

Although the action alternatives involve minimal construction of ramps, parking areas, and interdunal roads, construction activities would occur outside of the bird breeding season, during daylight hours, and outside of any key breeding or foraging habitat. Therefore, impacts from construction are assumed to be negligible.

STUDY AREA

The geographic study area for assessment of the various alternatives is Cape Lookout National Seashore. The geographic study area for the cumulative impacts analysis is the Seashore and the region, including the North and South Carolina area in the recovery plan for the piping plover (USFWS 1996a).

ALTERNATIVE A

Impacts of Alternative A: No Action

Resource Management Activities

Surveying and Monitoring—Under alternative A, NPS staff would perform surveys of recent breeding areas for piping plovers and would continue to monitor breeding, nesting, and fledging activities throughout the breeding season. Surveying for the arrival of piping plovers and pre-nesting behavior would begin on March 16 at least one time per week and would increase to three times per week (or every other day) on April 1. Surveying locations where piping plover territorial, courtship, or mating behavior is observed would increase to seven days per week on North Core Banks and South Core Banks and one day per week in other areas. During nesting and hatching, piping plover nests and broods would be checked every day on North Core Banks and South Core Banks and at least once per week elsewhere. Additionally, the Seashore would monitor plover breeding activities at nesting sites to identify factors that may be limiting the abundance of nesting plovers and productivity. The Seashore would also monitor the impact of predators on piping plover breeding productivity. Surveying and monitoring piping plovers and their habitat provides long-term beneficial impacts to the species because it allows the Seashore to better manage piping plovers, which may lead to increased reproductive success of the species at the Seashore.

While overall surveying activities would provide beneficial impacts to piping plovers, they could also cause some short-term adverse impacts by negatively impacting feeding, reproduction, resting, or other actions of piping plovers. Piping plovers are highly vulnerable to disturbance and are known to abandon habitat when they are disturbed in or near their nesting habitat (refer to “Risk Factors” in chapter 3 under the “Piping Plover” section), and surveying activities for piping plover by NPS staff would bring people and/or essential vehicles into direct short-term contact with individuals and their habitat.

Piping plovers respond to intruders in their habitat (avian, human, and other mammals) by squatting, false brooding, high-tailed running, crouch run, feigning injury, and emitting “whirring” vocalizations (Cairns

1982). Human disturbance of any kind, even that presented by pedestrians, has a negative effect on piping plovers. Burger (1991 and 1994) found that the presence of people (sunbathers, walkers, joggers, etc.) on plover beaches caused shifts in habitat use to create distance from humans, a decrease in time spent foraging, and an increase in time spent in vigilance (time devoted to being alert), and had a differential effect on foraging time in broods of different sizes. Also, the increased time and energy spent in vigilance due to the presence of humans may make piping plovers more susceptible to predation. Likewise, Zonick (2000) found that human activity on beaches reduced the net foraging success of piping plovers on beach habitat by increasing the amount of energy plovers had to expend while foraging due to moving away from humans. Zonick (2000) also found that human disturbance was the most important factor in affecting piping plover abundance at the study sites.

In addition to human disturbance, using ORVs during surveys would have a slight risk of crushing an undetected nest or chick. However, to minimize any potential short-term adverse impacts, NPS staff would use best professional judgment and take precautions to minimize disturbance during surveying, such as observing incubating birds with optical equipment from appropriate distances and maintaining slow speeds while using ORVs in or near piping plover habitat. In addition, to evaluate the effects of Seashore management activities on piping plovers, during all monitoring for the various life cycle stages of piping plovers, monitoring reports would include descriptions of the management measures/actions currently in place and document piping plover behavior.

Establishment of Prenesting Closures—As noted in chapter 3, piping plovers generally arrive at the Seashore in mid-March, begin courting and pairing in April and begin to scrape or build nests by the third week of April (Cohen et al. 2010; USFWS 1994; Patterson, Fraser, and Roggenbuck 1990). To protect piping plovers and their habitat, full recreational closures (no pedestrian or vehicle access) would be established by April 1. The closures would be established in all active (where birds are presently nesting or nested the previous breeding season), historical (areas where the birds have nested in the past 5 years), and potential new piping plover habitat as determined appropriate by a qualified staff biologist. Bird sanctuary signage would be posted around all closure areas as is the current practice at the Seashore (NPS 2012t). Establishing prenesting closures would provide long-term beneficial impacts for piping plovers at the Seashore through the increased likelihood of reproductive success resulting from the reduction in disturbance of the birds by pedestrians, pets, and ORVs during critical periods of reproduction (Parnell et al. 1988; Elliot-Smith and Haig 2004; Cohen, Houghton, and Fraser 2009; Burger 1987; Boettcher et al. 2007; Lauro and Tanacredi 2002; Patterson, Fraser, and Roggenbuck 1990).

While prenesting closures would not afford protection to piping plovers arriving at the Seashore prior to April 1, no piping plover nests have been documented prior to April 1 at the Seashore (Rikard pers. comm. 2013a). Additionally, any potential adverse impacts to the birds during this time would also be minimized because NPS staff begin surveying and monitoring for piping plovers once per week on March 15 when the Seashore becomes open to ORV use, and would erect closures to protect any birds exhibiting territorial, courtship, or mating behavior. Prenesting closures would also not protect habitat used by piping plovers prior to the last 5 years. If this habitat is still suitable for piping plovers, human disturbance (e.g., vehicles, pedestrians, kites) may cause any birds to abandon their attempts to use these unprotected areas in the early spring or increase the amount of time they spend in vigilant behavior (Anderson and Keith 1980; Ellison and Cleary 1978; Tremblay and Ellison 1979; Burger et al. 2004; Burger 1991; Flemming et al. 1988). However, again, any potential adverse impacts would be minimized by NPS staff surveying and monitoring for piping plovers beginning on March 15 when the Seashore becomes open to ORV use, and full recreational closures would be expanded to protect any birds exhibiting territorial, courtship, or mating behavior outside of existing closures (see below).

Buffer/Closure Establishment—Alternative A provides protection for piping plover nests through the use of buffer distances recommended in the Piping Plover Recovery Plan (USFWS 1996a). Appendix G

of the recovery plan indicates that a 50-meter (approximately 164 feet) buffer should be adequate to prevent the disturbance of a majority of piping plovers. Therefore, under alternative A, if nesting behavior such as courtship or mating (scrapes) are observed outside of full recreational closures during prenesting, a buffer would be established or expanded to ensure a 150-foot buffer for the observed birds. When nesting occurs, a 150-foot buffer/closure would be established around piping plover nests outside existing closures. These closures would be expanded, if necessary, to prevent disturbance, using flexible increments dependent on observed bird behavior. This may be necessary since birds are known to exhibit disturbance behavior in response to pedestrians at distances of over 100 feet (Lafferty 2001a), dogs at distances of over 130 feet (Lafferty 2001a), personal watercraft at over 400 feet (Rodgers and Schwikert 2002), and outboard-powered boats at approximately 300 feet (Rodgers and Schwikert 2002). The USFWS (1996a) found that the mean flushing distance for nesting piping plovers was at distances of 78 to 225 feet. Further, additional information would be collected during nesting from daily observations via use of optical equipment outside symbolic fencing and from close approaches to nests weekly to observe and record data.

For unfledged chicks, alternative A would establish a minimum 600-foot ORV buffer on either side of the brood based on observation of bird behavior and terrain conditions at the site. If chicks come onto the beach to forage, the beach would be closed to ORV traffic. ORVs would be routed around these areas using the back route. If there is no back route available, the Seashore would consider an escort program on a case-by-case basis if sufficient staff is available to maintain access to areas of the Seashore beyond the closure. Escorts would be led by trained resource management staff and would be limited to 25 vehicles or less. If implemented, a limited escort program would benefit piping plovers by likely increasing compliance with the closure by helping to decrease visitor frustration with not being able to access areas beyond the closure. However, benefits would likely be limited because an escort program would only be used on a case-by-case basis.

Piping plovers would experience long-term benefits from the full recreational closures and frequency of observations that adjust in response to chick behavior, which would allow NPS staff to change buffer sizes and locations in response to highly mobile broods. Basing buffer size on chick behavior and adjusting these buffers in response to brood movements may result in some long-term adverse impacts since frequent adjustment of the buffers could result in additional disturbance to piping plovers by NPS staff (Anderson and Keith 1980; Ellison and Cleary 1978; Tremblay and Ellison 1979; Hand 1980). However, the potential adverse impacts resulting from disturbance by NPS staff while adjusting the buffers would be outweighed by the beneficial impacts provided to the plovers by protecting them from ORV and pedestrian impacts through the timely adjustment of the buffers during the critical reproductive stage as discussed above and in chapter 3.

Management of Wintering Habitat for Nonbreeding Plovers—As provided in the USFWS Amended Biological Opinion (USFWS 2007a), the NPS would monitor the presence, abundance, and behavior of migrating and wintering piping plovers between August 1 and March 31 of each year. During surveys, specific observations would be made regarding vehicle, pedestrian, and pet tracks in posted habitat; signs of predators, including species types; specific management measures in place at the time of the observation; observed behaviors; and reactions to disturbance by pedestrians, pets, or vehicles. The Seashore would coordinate with Cape Hatteras National Seashore to conduct simultaneous surveys or receive survey data from Portsmouth Island during winter, because, based on past banding data, wintering birds move across Ocracoke Inlet. Limited noise disturbance and short-term displacement of individual birds could result from the presence of resource staff in foraging/resting habitat. However, data collected would result in long-term beneficial impacts on plovers by providing Seashore managers with information on the types and locations of habitats used, seasonality of plover use of the Seashore, tidal influence on habitat use, and potential threats the habitat may contain. Survey data would increase knowledge on how and when piping plovers use the Seashore and allow for management to adjust based on this knowledge.

Fall migrating piping plovers generally begin arriving at the Seashore during July, peak in August and September, and leave by November; though some depart as late as February (Dinsmore, Callazo, and Walters 1998; USFWS 2008b). The closure of the Seashore to vehicles from January 1 through March 15 would result in long-term benefits for migrating and wintering plovers by providing protected habitat during the winter and allowing the beach profile to recover from heavy fall fishing use. Outside of the January 1 through March 15 timeframe, no closures would be specifically implemented for migrating and wintering shorebird protection which could result in disturbance of individuals, leading to displacement and altered foraging behavior (Burger 1991; Zonick 2000; McAtee and Drawe 1981). However, impacts would be minimized by the fact that much of the habitat where migrating and wintering piping plovers are found is protected through permanent ORV closures which include Shackleford Banks, Portsmouth Flats, the interior of the point of Cape Lookout, the ocean beach between mile markers 41a and 41b, and Power Squadron Spit. Additionally, during the timeframe of March 16 through April 1 and October 1 through December 31 when other full recreational closures for bird protection are generally not in place, the number of nonbreeding plovers is at its lowest. During the years 2008 through 2012, there was an average of only 8 birds each on North Core Banks and South Core Banks in March, 22 birds on North Core Banks and 12 birds on South Core Banks in October, 9 birds each on North Core Banks and South Core Banks in November, and 7 birds each at North Core Banks and South Core Banks in December. This is compared to 82 nonbreeding birds on North Core Banks and 27 nonbreeding birds on South Core Banks in the month of August and 22 nonbreeding birds on North Core Banks and 13 nonbreeding birds on South Core Banks in September during the same years of 2008 through 2012 (NPS 2012t).

While the closure of the Seashore to vehicles from January 1 through March 15 would help protect wintering plovers, no closures would be established for pedestrians, which could result in disturbance of individuals and habitat from pedestrian use, leading to displacement and altered foraging behavior. However, adverse impacts of pedestrians on wintering plovers would be largely imperceptible because many passenger ferries stop operating in the winter, the amount of pedestrian use during the winter months is very low, and without a means of transportation on the beach, most visitor use would be confined to areas in the immediate vicinity of the ferry landings.

Predator Management—Predation continues to be a major factor affecting the reproductive success of piping plovers throughout its range (Boettcher et al. 2007; Burger 1987; Cohen, Houghton, and Fraser 2009; Doherty and Heath 2011; Elliot-Smith and Haig 2004; Lauro and Tanacredi 2002; Patterson, Fraser, and Roggenbuck 1990). Mink, short-tailed weasels, red fox, skunks, raccoons, opossum, lined ground squirrels, coyotes, dogs, and cats are known or suspected mammalian predators of piping plovers (Elliot-Smith and Haig 2004), and Boettcher et al. (2007) summarized the results of several studies showing significant predation on piping plover nests by mammals, birds, and ghost crabs. At the Seashore, predation of piping plover nests by raccoons, mink, ghost crabs, and a gull-billed tern has been documented, while other predators such as feral cats, grackles, coyotes, bobcats, and red fox have also been documented in piping plover breeding territories (NPS 2012t, 2011a, 2010b, 2009a, 2008c, 2007i, 2006f, 2005a, 2004c, 2003a, 2002b, 2001b, 2000c, 1999a, 1998b, 1997a).

Under alternative A, where topography is suitable and monitoring is sufficient, piping plover nests would continue to be protected from predation by placing circular predator exclosures around nests. The exclosures are 10 feet in diameter, made of 4-inch × 2-inch mesh wire fence, anchored with steel rebar, and topped with 3/4-inch mesh bird netting. Predator exclosures do not always prevent predators from accessing nests, especially ghost crabs. The exclosures may also have the unintended consequence of causing nest abandonment, loss of young, or adult mortality, by serving as an attractant for predators that have learned to associate exclosures with a prey source (Boettcher et al. 2007; Doherty and Heath 2011; Isaackson, Wallander, and Larsson 2007; Lauro and Tanacredi 2002). However, from 1997 to 2012, 69 percent of the nests protected with exclosures hatched, while unprotected nests had only a 42 percent hatch rate (NPS 2012t). Additionally, for those nests protected by exclosures that were lost to predation,

the predation was generally attributed to ghost crabs and not mammalian or bird predators (NPS 2012t, 2011a, 2010b, 2009a, 2008c, 2007i, 2006f, 2005a, 2004c, 2003a, 2002b, 2001b, 2000c, 1999a, 1998b, 1997a). Therefore, the use of predator exclosures at the Seashore has generally been effective at increasing hatch success. While predators would not be removed under alternative A, resulting in continued predation pressure for piping plovers, placing predator exclosures over nests where possible would help protect piping plovers from predators and provide short- and long-term beneficial impacts.

Similar to impacts described above under “Surveying and Monitoring,” predator management activities such as placement and checking of predator exclosures would have some short-term adverse impacts on piping plovers by bringing people and/or essential vehicles into direct short-term contact with individual birds and their habitat. These impacts; however, would be far outweighed by the overall beneficial impacts of protecting the nests from predators.

An indirect impact from recreational use at the Seashore is the attraction of predators to trash associated with recreational use (NPS 2006e; USFWS 1996a; Anderson 1995). Under alternative A, the Seashore would manage trash disposal, and enforce proper trash disposal and anti-wildlife feeding regulations to reduce the attraction of predators to the area, providing short- and long-term beneficial impacts to piping plovers.

Education/Public Outreach—Under alternative A, the public would continue to receive information at the visitor centers as well as information boards and from NPS staff about piping plovers, their ecology, and the measures the Seashore is taking to protect the species. Annual protected species reports would continue to be published on the Seashore’s website regarding the previous breeding season. The public would continue to be notified about closures that would limit ORV or pedestrian traffic, as well as when these closures reopen. Education and outreach materials would be provided regarding the impacts of trash disposal, wildlife feeding, fireworks, and pets on sensitive species at the Seashore. Such public outreach is beneficial to piping plovers. Public outreach educates the public about the specific needs of the species and alerts the public about closures due to potential impacts on the species. Public education has long been recommended as a way to reduce disturbance to sensitive species and habitats and garner support for conservation programs (Boettcher et al. 2007; Carlson and Godfrey 1989; Klein, Humphrey, and Franklin 1995). Therefore, public outreach as part of species management would result in long-term beneficial impacts.

Research/Monitoring—Ongoing research at the Seashore under alternative A would include monitoring American oystercatcher nesting and chick survival and success and document causes of chick mortality. Research efforts have the potential to negatively impact feeding, reproduction, resting, or other piping plover behavior over the long-term due to the increased human presence and use of ORVs (Anderson and Keith 1980; Ellison and Cleary 1978; Hand 1980; Tremblay and Ellison 1979). However, research efforts would continue to result in long-term beneficial impacts for piping plovers, because it is likely that results from ongoing research would lead to increased resource protection and management at the Seashore.

ORV and Other Recreational Use

ORVs and Pedestrian Access—Under alternative A, 81 percent (45 miles) of the Seashore beaches would be available for public ORV use in designated routes and areas (as documented in the Superintendent’s Compendium) from March 16 through December 31. In addition, ATV and utility-type vehicle (UTV) use would continue to be permitted. As described above under “Buffer/Closure Establishment,” the Seashore establishes resource closures to protect piping plovers as well as other species. The Seashore also establishes safety closures when certain areas of the beach become too hazardous for safe public use. Based on data from 2008 to 2013, the total amount of ORV resource and safety closures at the Seashore averages approximately 10 miles during the summer months and

approximately 5.4 miles during the fall. These closures protect approximately 22 percent more of the Seashore that would otherwise be open to ORV impacts during the summer months, and approximately 12 percent more of the Seashore during the fall months. Although these closures are not exclusively put in place for the protection of piping plovers, and all closures may not encompass piping plover habitat, they do provide beneficial impacts by protecting habitat and birds from the adverse impacts caused by ORV use.

Without buffers or other full recreational closures, ORV use and other recreational activities during the months when piping plovers are in residence on Seashore beaches have the potential to disrupt nesting and foraging birds from the noise associated with vehicle use and the presence of pedestrians. Impacts on plovers from human disturbance are well documented in scientific literature and could result in direct mortality and behavioral changes (Melvin et al. 1994; Patterson et al. 1991; Flemming et al. 1988; Patterson, Fraser, and Roggenbuck 1990; Burger 1991), ultimately resulting in lower reproductive success because of lower survival rates of eggs and chicks (Zonick 2000; Burger 1991). Melvin et al. (1994) found daytime mortality of adult piping plovers and chicks due to daytime ORV use on eastern beaches, even in cases where monitors and signage were present and vehicle use was light (less than or equal to 20 passes per day). Chicks often move between the upper berm or foredune and the wrack line or intertidal zone while feeding, which places them in the path of vehicles (USFWS 1996a). Vehicles leave ruts in the sand and pedestrians leave footprints, which can trap chicks, making them more susceptible to collisions with vehicles. In a study of Australian beaches, Schlacher and Thompson (2008) found mean tire rut depths from 1.5 to more than 3 inches. Chicks walk in tire ruts, which they often have difficulty getting out of and may respond slowly to a moving vehicle, sometimes even remaining motionless or appearing indifferent to the approaching vehicle (Flemming et al. 1988; Melvin et al. 1994; USFWS 1996a). While no occurrences have been documented at the Seashore, deaths of piping plover chicks from collisions with ORVs in beach areas have been reported at other locations (Culbert 2004; Melvin et al. 1994; USFWS 2010).

ORV use can modify coastal habitat by affecting the beach profile and substrate characteristics. Vehicle traffic on beaches displaces large amounts of sand (Schlacher and Thompson 2008) and can contribute to erosion, especially during high tides or on narrow beaches where driving is concentrated higher on the beach. Anders and Leatherman (1987) found that ORV traffic displaces sand seaward and changes the compaction of the sand in the vicinity of the track. They found that it compacts the sand at depth while loosening the sand at the surface making it more susceptible to erosion, which may lead to steeper dune profiles. These changes in beach profile and substrate characteristics may reduce the suitability of the habitat for piping plover nesting (Cohen et al. 2010).

ORV traffic can also adversely impact beach invertebrates, which are a food source for piping plovers and other shorebirds. In Australia, Schlacher and others (2008) found ORV impacted beaches had significantly fewer species at reduced densities than non-ORV beaches, and while these impacts were detectable throughout the year, they increased during the summer when ORV traffic was greater. At Cape Cod National Seashore, Leatherman and Godfrey (1979) found that in the soft sands of intertidal sand flats amphipods (*Talorshestia*) numbered fewer where ORV driving occurred than where it did not occur. They also found that polychaete worm (clam worm) populations and soft-shell clam (*Mya arenaria*) populations were totally decimated when applying 50 vehicle passes per day over 20 days to experimental plots. Not all invertebrates are susceptible to impacts from ORVs though, especially those species that burrow into the sand in the intertidal zone when the tide is out, as ORVs only sink into the firm sand one tenth of an inch or so (Wolcott and Wolcott 1984). Wolcott and Wolcott (1984) found that in the intertidal zone coquina clams and mole crabs, both of which reside below the sand surface when the tide is out, are immune to ORV damage, while Vande Merwe and Vander Merwe (1991) found in a study in South Africa that the gastropod (*Bullia rhodostoma*), the clams (*Donax serra* and *Donax sordidus*), and the benthic mysid (*Gastrosaccus psammodytes*) showed a high tolerance for ORV traffic.

In addition to impacting some invertebrates living in the sand, access to the intertidal zone often requires vehicles to cross over the wrack line, an area of high concentrations of invertebrates. Driving over the wrack line would crush and scatter seaweed, shells, and macroinvertebrates, causing damage and dispersal to an important source of food and habitat for many beach invertebrates (Kluft and Ginsberg 2009; Stephenson 1999). When piping plover chicks are on the ocean beach to forage, the Seashore would close the beach to ORV traffic with a 600-foot buffer around the brood of chicks, eliminating the continued damage and impacts to the wrack line caused by ORVs. Although no information could be found in the literature regarding the recovery or recolonization of macroinvertebrates in a disturbed wrack line once the disturbance is removed, the closing of the ocean beach around the foraging chicks would allow new a new wrack line to develop undisturbed with subsequent tidal cycles, providing new forage habitat for piping plovers, both adults and chicks, reducing the overall impact on piping plovers from ORVs disturbing the wrack line.

Although all ORV use has the potential to disturb bird nesting behavior (refer to appendix B), ATV use, and to some extent UTV use, may impact these behaviors differently than other types of ORVs (e.g., passenger vehicles and trucks). At Cape Lookout and Cape Hatteras National Seashores, McGowan and Simons (2006) found that while increases in ATV traffic increased the rate of trips to and away from the nest and reduced the percent of time spent incubating in American oystercatchers, other ORVs (i.e., four-wheel drive passenger vehicles) and pedestrian traffic had little measured effect on incubation. ATVs are louder and faster than other ORVs and pedestrians, which may be why birds are affected more by ATV traffic (McGowan and Simons 2006). Non-ATV ORVs and pedestrians also tend to stay closer to the water's edge where the sand is packed firm, thus generally traveling farther away from nesting areas than ATVs (McGowan and Simons 2006).

In another study, Simons and Borneman (2012) found that American oystercatchers were on their nests significantly less during all types of ORV (passenger vehicles, ATVs – single passenger, and UTVs – all-terrain vehicles with side-by-side passengers) and pedestrian events than before those events occurred, with the most significant decline in percentage of observations on the nest attributable to ATVs followed by UTVs. Based on the authors' graphical display of the data, American oystercatchers were on their nests approximately 85 percent of the time 20 minutes prior to all observances of human activities (e.g., passing of ORVs, ATVs, or UTVs). During the passing of an ORV (i.e., passenger vehicle) American oystercatchers were on their nests approximately 80 percent of the time, whereas during the passing of UTVs and ATVs they were observed on their nests approximately 62 percent and 33 percent of the time, respectively. However, in the same study Simons and Borneman (2012) found that the average heart rate of 36 incubating oystercatchers during all types of human activity (pedestrians, ORVs, ATVs, and UTVs) was not significantly higher than the heart rate from birds 20 minutes before a human activity event occurred. Therefore, while the physiological response of American oystercatchers seems to indicate habituation to disturbance, their behavioral response does not indicate a habituation to disturbance. Although these studies did not investigate impacts on piping plovers, it is reasonable to assume that piping plovers may react to vehicle disturbances in a manner similar to the American oystercatcher. Therefore, even with buffers and other ORV or full recreational closures, ATV and UTV use as allowed in this alternative could adversely affect piping plovers at the Seashore more than other types of ORVs because of the disturbance and noise associated with their use.

Human disturbance of any kind, even that presented by pedestrians, has a negative effect on piping plovers. Burger (1991) found that the presence of people (sunbathers, walkers, joggers, etc.) on plover beaches caused shifts in habitat use to create distance from humans, a decrease in time spent foraging, and an increase in time spent in vigilance (time devoted to being alert), and had a differential effect on foraging time in broods of different sizes. Burger (1991) found that chicks in broods of three or four spent more time being alert and running than chicks in broods of one or two. Habitat shifts could be critical if foraging is shifted to suboptimal areas to avoid people. Also, the increased time and energy spent in

vigilance due to the presence of humans may make piping plovers more susceptible to predation. In a separate study of shorebirds on Delaware Bay beaches in New Jersey, Berger et al. (2004) found that wintering shorebirds flew away and did not return to forage in response to 58 percent or more of the human disruptions and showed no indications of habituating to disturbance. Likewise, Zonick (2000) found that human activity on beaches reduced the net foraging success of piping plovers on beach habitat by increasing the amount of energy plovers had to expend while foraging due to moving away from humans. Zonick (2000) also found that human disturbance was the most important factor in affecting piping plover abundance at the study sites. Flemming et al. (1988) found that humans elicited a significantly higher level of response from piping plovers than either potential predators or nonpredatory species, with adults flushing at distances of less than 132 feet. However, Flemming et al. (1988) found that chick behavior in response to pedestrians did not appear to change until the humans were approximately 525 feet away. Pedestrians within 525 feet of chicks reduced the incidents of chick brooding or feeding; significantly increased vigilant behavior and time spent sitting; and, significantly lowered the pecking rate while feeding (Flemming et al. 1988).

As described above for wintering/nonbreeding management, the closure of the Seashore to vehicles from January 1 through March 15 every year would protect wintering plovers from the impacts of ORV use and would allow the beach profile to recover from heavy fall fishing use. Passenger ferries would continue to enable pedestrians to access the Seashore during this time. Any potential adverse impacts to wintering plovers such as temporary displacement, reduced foraging success, and increased susceptibility to predators would be minimal. This would be due to reduced use of the Seashore by pedestrians during the winter months and the fact that without a means of transportation on the beach, most visitor use would be confined to areas in the immediate vicinity of the ferry landings.

Under alternative A, pedestrian-only areas would include the following:

- Shackleford Banks;
- The lighthouse beach; as defined between mile markers 41a and 41b;
- Power Squadron Spit from mile marker 46.2 west to the end of the spit.

ORVs would not be permitted in these areas, which would reduce the threat of motorized vehicle use on piping plovers in those areas. However, the presence of pedestrians and continued occurrence of non-ORV recreational activities could result in short-term adverse impacts (as described above and in chapter 3) that are detectable, depending on the time of year and life stage of the bird. One such non-ORV recreation activity that could adversely impact piping plovers is kite flying. Piping plovers are highly disturbed by kites; it is believed this may be because plovers perceive kites as potential avian predators (USFWS 1996a). Because of the potential impact from kite flying, the Piping Plover Recovery Plan recommends a 200-meter buffer (approximately 656 feet) around nesting or territorial adults and unfledged juvenile piping plovers between April 1 and August 31 (USFWS 1996a). While kite flying is allowed at the Seashore, a 600-foot pedestrian buffer is not provided around adult and unfledged piping plovers. As a result, some adverse impacts from kite flying could occur. However, kite flying at the Seashore is rare (Rikard 2013b), so the potential for adverse impacts due to kite flying would be minimal.

Buffers established under alternative A are designed to protect piping plovers. However, noncompliance with buffers and closures does occur (NPS 2012t, 2011a, 2010b, 2009a, 2008c, 2007i). From 2010 to 2012 an average of six citations for pedestrians in bird nesting areas and five citations for vehicles in bird nesting areas were issued by Seashore law enforcement, while an average of 195 citations or warnings were given for dogs off of leash (NPS 2012t, 2011a, 2010b). These numbers, however, do not reflect all of the violations that occur; just ones where law enforcement was present when they did. For example, in 2009, 53 pedestrian violations and 20 vehicle violations were documented (foot prints or vehicle tracks

found within closures), but only one pedestrian and 6 vehicle citations were issued, while in 2008 42 pedestrian and 55 vehicle violations were documented, but only 1 pedestrian and 7 vehicle citations were issued (NPS 2009a and 2008c).

Noncompliance with buffers and closures results in vehicles, people, and/or pets entering plover habitat and coming in close proximity to plovers. This can lead to flushing responses or other behavioral changes in birds, which in turn could have the potential to negatively impact feeding, reproduction, resting, or other activities (Burger 1991; Flemming et al. 1988; Melvin et al. 1994; Patterson et al. 1991; Patterson, Fraser, and Roggenbuck 1990; Zonick 2000). In 2007, one pedestrian violation of the bird nesting area at Ophelia Inlet may have caused abandonment of the nest due a pedestrian walking right over a nest with two eggs (NPS 2007i). Footprints led right over the nest and only missed stepping on the nest by a few inches. While regular patrols of areas by law enforcement rangers, trained observers, and field biologists help to deter closure and leash violations, with continued ORV and pedestrian access at the Seashore and no planned increases in law enforcement or resource protection staffing under alternative A it is anticipated that noncompliance (either intentional or unintentional) with regulations and closures would continue to occur. These violations would adversely impact piping plover habitat and bring vehicles, pedestrians, and possibly pets in close proximity to birds. This would cause short-term adverse impacts at the location of the violation and could result in long-term adverse impacts from decreased reproductive output if there is a chronic lack of compliance (Burger 1991; Culbert 2004; Flemming et al. 1988; Melvin et al. 1994; Patterson et al. 1991; Patterson, Fraser, and Roggenbuck 1990; USFWS 2010; Zonick 2000).

The back route from mile marker 44 to mile marker 45, which is normally closed to ORV traffic, would be opened to ORV traffic when the point of Cape Lookout is closed to ORV through-traffic for resource protection or safety reasons. As discussed above, most ORV users respect closures, however, some noncompliance has occurred in the past (NPS 2012t, 2011a, 2010b, 2009a, 2008c, 2007i) and would be expected to continue in the future. The point of Cape Lookout is a popular visitor destination and when it is closed it prevents easy access on the beach to the west without driving through Cape Village. Allowing use of the back route from mile marker 44 to 45 when the point of Cape Lookout is closed would allow ORV users to continue to easily access the beach area to the west of the point of Cape Lookout. This would likely help reduce visitor frustration with the closure of the point of Cape Lookout and may help prevent potential noncompliance with the closure, thus providing some short-term beneficial impacts to piping plovers and their habitat.

Night-Driving—Under alternative A, night driving would continue to be allowed. Plovers are known to be active at night (Staine and Burger 1994; Majka and Shaffer 2008), and plover chick response to vehicles can increase their vulnerability to ORVs (USFWS 1996a). Chicks often move between the upper berm or foredune and the wrack line or intertidal zone while feeding, which places them in the path of vehicles (USFWS 1996a). Chicks walk in tire ruts, which they often have difficulty getting out of and they may respond slowly to a moving vehicle, sometimes even remaining motionless or appearing indifferent to the approaching vehicle (Flemming et al. 1988; Melvin et al. 1994; USFWS 1996a;). When chicks are found to be using the ocean beach, buffers would be expanded under alternative A to include a 600-foot ORV closure around each brood which would help protect them from ORV traffic, including at night. However, piping plovers can be highly mobile at all life stages and can range outside of a bird closure before surveying and management can respond. If plovers move outside of buffers at night they would be susceptible to impacts from night driving especially since they are even more difficult to see at night. Allowing night driving under alternative A would result in observable, long-term adverse impacts because the impacts listed above might occur during critical periods of reproduction and result in harassment, injury, or mortality to one or more individuals if chicks are not observed and avoided.

Permit Requirements—Under alternative A, there would be no permitting requirements (except for long-term parking) for ORV use at the Seashore. It is anticipated that visitation to the Seashore will

slowly grow in the future, with an estimated annual increase of approximately 1.5 percent (NPS 2010j). With increased visitation, it is assumed that the number of ORVs on the beach at the Seashore would also slowly grow in the future. As described under the alternatives where a permit system would be implemented, such a system would provide the Seashore with a means for providing additional education to ORV users regarding the importance of piping plover habitat at the Seashore, as well as additional methods (i.e., revoking permits) for dealing with noncompliance of Seashore regulations. Although ORV use would continue to be prohibited in ORV or full recreational closures, the lack of a permit system could result in limited adverse impacts on piping plovers because without a permit program, there would be less user education regarding these closures. Also, without a permit program, the number of ORVs on the Seashore would be allowed to grow unencumbered, and as the number of vehicles at the Seashore continues to increase, the potential for vehicle disturbance to piping plovers would also likely increase from current levels. This disturbance could include direct mortality, flushing response, nest abandonment, and other behavioral changes. The continued increase in vehicles on the Seashore could also result in corresponding increase the amount of noncompliance (intentional or unintentional) with closures and other Seashore regulations that are in place to protect piping plovers.

Camping—Camping activities have been observed to cause adult piping plovers to flush from nests, resulting in loss of eggs or chicks, complete abandonment of the nest, and increased susceptibility to predation (Elliot-Smith and Haig 2004; Cohen, Houghton, and Fraser 2009; Burger 1987; Boettcher et al. 2007; Lauro and Tanacredi 2002; Patterson, Fraser, and Roggenbuck 1990). Under alternative A, camping and campfires would be permitted on all beaches of the Seashore that are not otherwise closed by the Superintendent's Compendium, closed for safety, or closed for species protection. For species protection, because public entry is prohibited in full recreational closures, camping and campfires would not be allowed within these areas. In addition, although turtle nesting closures are just ORV closures, camping and campfires would also be prohibited in the six sea turtle nest relocation areas on North Core and South Core Banks. For piping plovers, full recreational closures are established April 1 in active, historic, and potential new habitat; expanded to provide a 150-foot buffer round all areas of territorial, courtship, or mating behavior; and expanded to provide a 150-foot buffer around all nests. Prohibiting camping and campfires in these full recreational closures would remove the potential impacts camping and campfires could have on nesting piping plovers, providing short-and long-term beneficial impacts.

Cumulative Impacts under Alternative A

Other past, present, and future planned actions within the Seashore have the potential to impact piping plovers at the Seashore. Various dredging activities have been conducted and would continue to be conducted in the vicinity of the Seashore. After Hurricane Irene, the Long Point ferry basin was dredged in 2011 (NPS 2011i). In addition, the Beaufort Inlet has been dredged and would continue to be dredged on an annual basis as long as funding is available. In the past, dredge material from the dredging of Beaufort Inlet has not been placed on any Seashore beaches. However, moving forward, as part of the EIS for the Morehead City Harbor Dredged Material Management Plan (DMMP), NPS has agreed to allow consideration for the deposition of restricted amounts of dredged material on Shackleford Banks during the 20-year period beginning in 2015 and extending through 2034 (USACE 2013). As it relates to Shackleford Banks, if the NPS allows dredged material to be deposited on the beach, placement of material would potentially occur every 3 to 4 years along a 3.65-mile-long stretch of the beach, dredged material would be compatible with the existing beach (>90 percent sand), and in any year that the NPS allows beach disposal to occur, the NPS would only permit it to occur from November 16 through March 30, which is outside of the piping plover nesting season. Piping plovers rarely nest on Shackleford Banks, with only one breeding pair (in 2005) recorded since 1989 (NPS 2012t). With any potential beach disposal only occurring outside of the piping plover's nesting season, there would be no effect on breeding piping plovers. If it occurs, disposal of material on the beach would occur from the base of the existing frontal dune to the -24 foot depth. This would potentially add up to 33 acres of new ocean beach

as often as every 3 years about 1 mile east of the Shackleford Spit off Beaufort Inlet (USACE 2013). Although disposal activities could temporarily displace wintering plovers from the immediate vicinity, long-term beneficial impacts would result from the increase in acres of designated critical habitat for the wintering piping plover on Shackleford Banks.

Oregon Inlet has been dredged in the past and would continue to be dredged in the future. Due to the presence of nesting sea turtles, dredging activities do not take place during the spring or summer, which is also when piping plovers are breeding; so there would be no direct impacts to breeding plovers. The dredging of inlets can affect spit formation adjacent to inlets, which over time could result in the loss of potential plover habitat, resulting in long-term adverse impacts (USFWS 1996a). However, dredging operations can also result in long-term beneficial impacts to plovers as well. Sand from dredging operations is often used for onshore beach nourishment which can help to curtail erosion and expand plover nesting habitat. Because dredging and beach nourishment projects require permits, stipulations in the permits generally do not allow these activities to occur when plovers are present. The locations of sand disposal associated with future dredging activities of Oregon Inlet are not known. However, through informal consultation between the USFWS and the Army Corps of Engineers regarding impacts of appropriately conditioned beach nourishment proposals (not necessarily related to Oregon Inlet) it has been determined that the proposed projects would not adversely affect piping plovers (USFWS 1996a). Therefore, the Oregon Inlet dredging operations would also not adversely affect piping plovers.

Several past, current, and future plans and actions at the Seashore address visitation and improvement of visitor amenities and, therefore, could impact piping plovers at the Seashore. The *Commercial Services Plan / Environmental Assessment / Assessment of Effect* (NPS 2007m) guides the Seashore in improving the management and operation of commercial visitor services, while providing self-directed and facilitated visitor opportunities. Visitor services that are offered and could continue to be offered at the Seashore include land transportation services, sale of limited food and sundry supplies, and ferry transportation. Very little new facility construction to support projected visitor demands for transportation, rental services, and sales of supplies is proposed as part of the Commercial Services Plan, and what little construction is proposed would occur at the current arrival locations on the islands. Since these areas are already developed and do not provide habitat for piping plovers, there would be no impact from any of the limited construction activities.

Land transportation services include a beach shuttle service originating in the lighthouse area and traveling to points on South Core Banks, limited UTV tours at the northern end of North Core Banks, and limited vehicle transportation service from the Long Point and Great Island concession areas. These transportation services could have adverse impacts on piping plovers and their habitat similar to those previously described for public ORV use. However, any adverse impacts would be relatively small given the size of the operations and because their vehicles would continue to use established transportation routes including the back route and would adhere to all buffers/closures and other Seashore regulations. While the sale of food could increase trash at the Seashore and attract predators, sales are limited and confined to developed areas of the Seashore, so impacts would be negligible. Ferry operations occur on the soundside of South Core and North Core Banks where there is no piping plover habitat, so there would be no impacts from the continued operation of these services. Therefore, the overall impact of commercial services and improved visitor amenities is expected to be adverse but limited.

The U.S. Navy and Marine Corps conduct flight operations in the area of the Seashore. These operations include recent actions taken by the military to lower the ceiling (or altitude) above which planes may fly up to the speed of sound from 10,000 feet to 3,000 feet, and increased capabilities of offshore training. In addition, Marine Corps Cherry Point Air Station is located approximately 30 miles northwest of the Seashore. The air station and its associated support locations occupy more than 29,000 acres, which served as an alternate emergency landing site for the space shuttle launches out of Cape Canaveral,

Florida (U.S. Marine Corps n.d.). Two studies assessed the impacts of the lowered ceiling on nesting shorebirds at the Seashore: one studied American oystercatchers (Simmons and Borneman 2006), and the other studied Wilson's plover and colonial waterbirds (least terns, common terns, gull-billed terns, and black skimmers) (Derose-Wilson et al. n.d.). These studies were conducted during the 2010 and 2011 nesting seasons. Simmons and Borneman (2012) concluded that at their peak sound level, military overflights contributed to a 72.5 dBA (A-weighted decibel) sound level, which is comparable to walking along the oceanside of the point of Cape Lookout (see "Soundscapes/Acoustic Environment"). Thus, the report concluded that there is no noteworthy evidence that military overflights affect the behavioral responses of American oystercatchers, including low-altitude flyovers (Simmons and Borneman 2012). Derose-Wilson et al. (n.d.) found that Wilson's plovers did not exhibit any behavior changes to the military overflights while least terns incubated their nests more after an overflight, but only during overflights in sound exposure levels greater than 90 dBA, which was the top 10 percent of sound exposure levels for all military overflights. Though sample sizes were small for other nesting colonial waterbirds, the authors found no indication that their responses would be different than those of the least tern. Although neither study specifically assessed the impacts to piping plovers, the authors of both studies concluded that the lower altitude flights did not have an appreciable effect on the behavior of any of the birds in question. Given the similarity in nesting and habitat use between all of the birds and piping plovers, it is reasonable to assume that the military overflights would also not have an appreciable adverse effect on piping plovers.

Currently, the BOEM is analyzing the issuance of leases for developing offshore commercial wind energy. BOEM in cooperation with the State of North Carolina has established a task force, comprised of relevant federal agencies, state government officials, and local and Tribal elected government officials, in the planning and decision-making process in identifying a wind energy area off the coast of North Carolina. Although the planning process includes a thorough analysis of reasonable alternatives and cumulative impacts on sensitive resources, including birds, it is likely that the development of offshore wind stations would adversely impact piping plovers (including those that may use the Seashore). Adverse impacts associated with wind turbines include direct mortality from collisions with turbine blades and turbine avoidance, which can reduce fitness by exclusion from key foraging habitat or by energetic costs of inducing longer flight paths (especially for migrating shorebirds and ducks) (BOEM n.d.).

Many past, present, and future actions, plans, and programs at the Seashore provide benefits for piping plovers. The *Cape Lookout National Seashore Interim Protected Species Management Plan/Environmental Assessment* states that the NPS will meet its obligations under the NPS Organic Act and the ESA to both proactively conserve listed species and prevent detrimental effects on these species. To meet these obligations, the NPS will "manage designated critical habitat, essential habitat, and recovery areas to maintain and enhance their value for the recovery of threatened and endangered species." In addition, the NPS will take on active management programs to inventory, monitor, restore, and maintain listed species' habitats, control detrimental nonnative species, control detrimental visitor access, and re-establish extirpated populations as necessary to conserve listed species and prevent detrimental effects on these species (NPS 2006a). Although the plan permits continued ORV access, which has the potential to impact piping plovers at the Seashore, the plan is beneficial for piping plovers, because it includes measures to educate visitors about resources at the Seashore and management measures, including buffers, to protect those resources. In addition, the plan includes future ongoing monitoring and staff resource protection activities, which have the potential to benefit the species by providing additional information to drive future management decisions. The education aspect of the plan provides long-term benefits to piping plovers because it helps to educate visitors about the conservation needs of the species at the Seashore and the protection measures that are put in place to help protect it. Cape Hatteras National Seashore also previously implemented the *Cape Hatteras National Seashore Interim Protected Species Management Strategy / Environmental Assessment* and more recently

implemented a long-term ORV management plan/EIS; both of which include protection measures for piping plovers to minimize potential adverse impacts from ORVs, pedestrians, and pets. Because Cape Hatteras National Seashore is in such close proximity to Cape Lookout National Seashore the benefits to piping plovers at Cape Hatteras from these two plans also provides benefits to piping plovers at Cape Lookout through the long term protection of the entire regional population.

The USFWS recovery plan and designation of critical habitat for the piping plover provides protection for species at the Seashore. Critical habitat designation for the piping plover includes all of the inlets in the Seashore, Portsmouth Flats, Kathryn-Jane Flats, and the point of Cape Lookout. The habitat includes ocean beach, mud flats, sand flats, and soundside beach used as foraging areas and sparsely vegetated low dunes. All piping plover breeding sites at the Seashore were designated as critical habitat for wintering birds. Critical habitat designation at the Seashore would continue to result in long-term beneficial impacts on piping plovers as breeding and foraging habitat would be protected and disturbance to these areas would be limited.

A population of culturally important wild horses exists on Shackleford Banks. The population of approximately 109 wild horses is legislatively protected (NPS 2012b) and is maintained through a horse management plan that defines how the population is cooperatively managed by both the NPS and the foundation of Shackleford Horses (NPS 2007h). The horses are generally found on the dunes, in the swales between the dunes, on the marsh or in the forest. Part of the management of horses calls for the population to be maintained at a prescribed level so that it does not get too large. To the extent that they roam on the beaches in habitat where piping plovers are found, there is potential for piping plover eggs and chicks to be trampled. However, since only one pair of breeding piping plovers has been documented on Shackleford Banks since 1989 (NPS 2012t), the potential for adverse impacts from the presence of the wild horses is minimal. When roaming the beaches during the winter months, the horses could also disturb wintering plovers, though impacts would be temporary and likely minimal.

The Seashore is implementing a long-range interpretive plan (NPS 2011k) that further articulates the purpose, significance, and themes of the Seashore. The long-range interpretive plan informs and guides the Seashore's interpretive and education program, and includes goals to provide education programs to the public about threatened and endangered species within the Seashore. Such education programs, if implemented, would provide long-term benefits to piping plovers because it helps to educate visitors about the conservation needs of the species at the Seashore and the protection measures that are put in place to help protect it.

The *Foundation Document* (NPS 2012s) for the Seashore identifies the following projects that may impact piping plovers at the Seashore: Harkers Island Master Plan, Great Island and Long Point Master Plan, Resource stewardship strategy, Comprehensive Sign Plan, nonnative species and predator management plan, and the sustainability plan/green plan. These planning efforts would establish development patterns at the Seashore, taking in to consideration the location of piping plover and other sensitive species breeding and plan to avoid or minimize impacts to these habitats. A comprehensive sign plan would allow the NPS to more effectively communicate messages to visitors, including those regarding the importance of species management at the Seashore and a nonnative species and predator management plan would provide for additional protection of piping plover and their habitat. All of these planned efforts would have beneficial impacts on piping plover at the Seashore.

Finally, the Seashore conducted a predator study to evaluate if predator removal is an effective means to alleviate predator threats to threatened and endangered species at the Seashore. A three-year research study (2007-2009) evaluated the response of predator (raccoon) and prey populations to raccoon removal. The NPS implemented the preferred alternative (experimental reduction of raccoon population to evaluate removal as an option for protected species management) outlined in the predator study / environmental

assessment (EA). During the study approximately half of the raccoon population on the South Core Banks was removed and euthanized. In the year after removal, there was a decrease in piping plover nest predation from 27.6 percent of the nests in 2008 to 5.6 percent of the nests in 2009 (Waldstein 2010). Piping plover productivity also increased from 0.23 fledglings per pair in 2008 to 0.64 fledglings per pair in 2009, although the increase was not statistically significant (Waldstein 2010). Predator trapping might result in short-term disturbance to nests and young, or in loss of nests or hatchlings if trappers are not cognizant of nest locations. However, overall predator management actions, including predator removal, would likely provide long-term benefits to piping plovers by reducing the predation pressure on the piping plover population at the Seashore.

The overall combined impacts of these past, current, and future actions on piping plover would be short- and long-term, limited, and adverse from disturbance to foraging and nesting birds from visitor/ORV use, dredging activities, shoreline stabilization, visitor amenity improvements, and military overflights. There would also be long-term beneficial impacts from the protection afforded to piping plovers and their habitat by species monitoring, species buffers, habitat protection, visitor protection patrols, visitor education programs, control of the wild horse population, predator management, and future planning efforts under the Foundation Plan. While adverse effects on piping plover from other actions occurring in the region would still exist, actions under alternative A would provide additional protection that would be beneficial to the regional population of this species and would offset some of the adverse effects.

ALTERNATIVE B

Impacts of Alternative B

Resource Management Activities

Surveying and Monitoring—Surveying and monitoring for piping plovers and their habitat under alternative B and the impacts from these actions would be the same as described under alternative A. As described under alternative A, surveying and monitoring piping plovers and their habitat provides long-term beneficial impacts to the species because it allows the Seashore to better manage piping plovers, which may lead to increased reproductive success of the species at the Seashore. While overall surveying activities would provide beneficial impacts, they could also cause some short-term adverse impacts by negatively impacting feeding, reproduction, resting, or other piping plover behavior (Burger 1991, 1994). However, NPS staff would use best professional judgment and take precautions to minimize disturbance during surveying, such as observing incubating birds with optical equipment from appropriate distances and maintaining slow speeds while using ORVs in or near piping plover habitat. Additionally, there would be more consistent training and supervision of resource staff who conduct the surveys. This would result in a higher quality of monitoring for the species, resulting in beneficial impacts.

Establishment of Prenesting Closures—Under alternative B, establishing prenesting closures would be the same as alternative A (full recreational closure), except that historical shorebird nesting areas would be posted by March 16, prior to opening the beach to vehicles. This action would result in short- and long-term benefits for piping plovers by protecting their habitat as well as any birds when they first arrive at the Seashore, which is typically in mid-March (Cohen et al. 2010; Patterson, Fraser, and Roggenbuck 1990), from ORV and pedestrian impacts during the early season when territories are being established and mating behavior begins.

Buffer/Closure Establishment—Establishing buffers/closures under alternative B would occur the same as under alternative A. This includes establishing a minimum 600-foot ORV buffer on either side of a brood for unfledged chicks based on observation of bird behavior and terrain conditions at the site. This also includes the possibility of implementing an escort program on a case-by-case basis to allow access to

the Seashore beyond the closure if ORVs could not be routed around the closure and there is sufficient staff available to implement the escort program. Establishing a full recreational closure for resource protection around birds and adjusting them based on chick behavior would result in short- and long-term benefits by reducing the potential for contact between Seashore visitors and birds. While frequent adjustment of buffers by NPS staff may result in additional disturbance to piping plovers, (Anderson and Keith 1980; Ellison and Cleary 1978; Hand 1980; Tremblay and Ellison 1979), any potential adverse effects would be outweighed by the benefits to the chicks from adjusting the buffers to protect them from disturbance due to pedestrians and ORVs.

Management of Wintering Habitat for Nonbreeding Plovers—Surveying nonbreeding populations of piping plover under alternative B would be the same as under alternative A and would occur once per month from August 1 through March 31. Surveying activities could potentially result in some noise disturbance and short-term displacement of birds from the presence of resource staff in foraging/resting habitat. However, any small amount of adverse impacts would only occur once per month and as described for alternative A, surveying would increase knowledge on how and when piping plovers use the Seashore, providing long-term benefits by better informing management decisions. Like alternative A, under alternative B the Seashore would be closed to vehicles from January 1 through March 15. This would result in long-term benefits for wintering plovers by providing protected habitat during the winter and allowing the beach profile to recover from heavy fall fishing use. While the closure of the Seashore to vehicles from January 1 through March 15 would help protect wintering plovers, no full recreational closures would be established that would include pedestrians, which could result in disturbance of individuals and habitat from pedestrian use, leading to displacement and altered foraging behavior. However, impacts of pedestrians on wintering plovers would be largely imperceptible because many passenger ferries stop operating in the winter, the amount of pedestrian use during the winter months is very low, and such use is predominantly concentrated at ferry arrival nodes.

Predator Management—Similar to alternative A, under alternative B the Seashore would continue to use predator exclosures to protect piping plover nests resulting in short- and long-term beneficial impacts. However, under alternative B, the Seashore would also perform limited removal of mammalian predators when predation is observed that impacts sensitive species. Predator removal is considered more effective than nest exclosures in increasing reproductive output, likely due to increased chick survival (Cohen, Houghton, and Fraser 2009). A predator removal study conducted on South Core Banks found a decrease in piping plover nest predation (down from 27.6 percent in 2008 to 5.6 percent in 2009) one year after removal and euthanasia of half of the raccoon population (Waldstein 2010). The study also found increased piping plover productivity one year after the raccoon removal (up to 0.64 fledglings per pair in 2009 from 0.23 fledglings per pair in 2008), but the increase was not statistically significant (Waldstein 2010). By helping to reduce predation pressure and potentially increasing nesting and fledging success for piping plovers, the limited removal of mammalian predators under alternative B would result in short- and long-term beneficial impacts for piping plovers.

Education/Public Outreach—In addition to the outreach and education measures that would be implemented under alternative A, under alternative B staffing levels would increase for interpretation positions (to provide formal outreach and on-site ORV education on the subject of protected species management) and law enforcement (among other duties, law enforcement assists with public education). Also, educational materials would be provided to Seashore users through an operator education certificate, which would be required for all ORV operators and would be valid for one year. Under alternative B, the Seashore would work with vehicle ferry operators to coordinate distribution of educational materials regarding ORV rules and regulations. In addition, a uniform system of ORV and full recreational closure signage would be provided, as well as regularly updated maps of closures, which would also be available online. Such public outreach is beneficial to piping plovers because it further educates the public about the specific needs of the species and alerts the public about closures due to

potential impacts on the species. Public education has long been recommended as a way to reduce disturbance to sensitive species and habitats and garner support for conservation programs (Klein, Humphrey, and Franklin 1995; Boettcher et al. 2007; Carlson and Godfrey 1989). Therefore, public outreach under alternative B as part of species management would have long-term beneficial impacts on piping plovers.

Research/Monitoring—Research and monitoring under alternative B would be the same as alternative A, except that ORV use on beaches and visitor compliance would be closely monitored to determine the success of specific regulations or the need to re-focus enforcement and education efforts. Research efforts have the potential to negatively impact feeding, reproduction, resting, or other piping plover behavior over the long term due to the increased human presence and use of ORVs (Anderson and Keith 1980; Ellison and Cleary 1978; Tremblay and Ellison 1979; Hand 1980). However the research, including the additional elements under alternative B, would contribute to the long-term beneficial impacts of research and monitoring on piping plovers by focusing efforts on visitor compliance and species sensitivity, so that management actions could be adjusted accordingly.

ORV and Other Recreational Use

ORVs and Pedestrian Access—The same amount of beach area (approximately 81 percent or 45 miles) would be open to ORV use from March 16 through December 31 under alternative B as it would be under alternative A. Therefore, management of ORV and other recreational use under alternative B would be similar to alternative A with a few exceptions that would result in additional protection of piping plovers and their habitat.

On sections of Core Banks where no ferry landing access is available (e.g., Middle Core Banks or future areas that may become cut off during storm events) designated ORV routes would be closed. These areas would reopen to ORV use if they become rejoined to an area with ferry access. During times when areas are cut off from ferry access, impacts from ORVs would be eliminated in those areas, providing short- and potentially long-term beneficial impacts.

The back route from mile marker 44 to mile marker 45 which is normally closed to ORV traffic, would be opened to ORV traffic when the point of Cape Lookout is closed to ORV through-traffic for resource protection or safety reasons. As discussed under alternative A, most ORV users respect closures, however, some noncompliance has occurred in the past (NPS 2012t, 2011a, 2010b, 2009a, 2008c, 2007i) and would be expected to continue to occur in the future. The point of Cape Lookout is a popular visitor destination and when it is closed it also prevents easy access on the beach to the west without driving through Cape Village. Allowing use of the back route from mile marker 44 to 45 when the point of Cape Lookout is closed would allow ORV users to continue to easily access the beach area to the west of the point of Cape Lookout. This would likely help reduce visitor frustration with the closure of the point of Cape Lookout and may help prevent any potential noncompliance with the closure, thus providing some short-term beneficial impacts to piping plovers and their habitat.

Under alternative B, the back route would be regularly maintained by the Seashore and re-established if impacted by a storm event. This would continue to allow the back route to be used by ORVs as a bypass when full beach closures occur for species protection or safety reasons. Additionally, if driving conditions on the back route deteriorate significantly vehicles are less likely to use it on a routine basis to traverse long distances along the Seashore and are more likely to drive on the beach. Regularly maintaining the back route and re-establishing it after impacts from storms would help encourage vehicles to use it instead of the beach, lessening potential vehicle impacts on piping plovers and their habitat. Also under alternative B, there is the potential for small changes to the number and location of ramps as needed, and ramps may be moved or re-established after major storm events to restore access. While no maintenance

or construction of ramps would be conducted near piping plover habitat during the nesting season, to the extent that new ramps are constructed or existing ramps are re-established in areas that might provide suitable habitat for piping plovers, these activities would remove potential habitat for the species. However, the area impacted by any new or re-established ramps would be small compared to the overall habitat available to piping plovers, minimizing any adverse impacts.

Although all ORV use has the potential to disturb bird nesting behavior, as discussed under alternative A, based on studies by McGowan and Simons (2006) and Simons and Borneman (2012), it appears that ATV use, and to some extent UTV use, impacts shorebirds to a greater extent than other types of ORVs (e.g., four-wheel drive passenger vehicles) likely due to the fact that they are louder and faster. The studies do not differentiate between different types of ATVs and/or UTVs because high-performance sport-model ATVs and UTVs, as well as two-stroke models, are designed for racing, jumping, and moving at high rates of speed; however, these models likely could cause more impacts to shorebirds than utility-model ATVs and UTVs that are designed to be used in a utilitarian way. The speed and noise of high-performance sport-model and two-stroke ATVs and UTVs may be perceived by shorebirds as a greater threat, causing shorebirds to alter their behavior. Because of this, all high-performance sport-model and two-stroke ATVs and UTVs would be prohibited at the Seashore under alternative B after a five-year grace period. Eliminating these vehicles and their potential impacts from the Seashore would provide short- and long-term benefits to piping plovers.

Pedestrian access on the Seashore would be the same as described for alternative A, potentially resulting in disturbance and potential displacement of piping plovers, depending on visitor density and the timing of disturbance (e.g., during critical periods of reproduction). Disturbance as a result of pedestrian and ORV access during the most critical periods of reproduction and within key habitats could occur. Such disturbance could result in abandonment of nests, loss of habitat, or potentially direct mortality if closure compliance is lacking or if the breach of the closure occurs during the earlier life stages (Melvin et al. 1994; Patterson et al. 1991; Flemming et al. 1988; Patterson, Fraser, and Roggenbuck 1990; Zonick 2000; Burger 1991; Culbert 2004; USFWS 2010). Overall impacts would be reduced, however, through higher quality of monitoring due to more consistent training and supervision of resource staff and increased compliance through increased staffing levels in law enforcement and interpretation positions.

Night-Driving—Under alternative B, regulations would be established that would prohibit driving between the hours of 9 p.m. and 6 a.m. from May 1 through August 31, except in the Great Island and Long Point cabin areas. The May 1 through August 31 timeframe covers the majority of the nesting/fledging season at the Seashore as the first piping plover nests are initiated in late April, and the brood-rearing period extends from late May through mid-August (Cohen 2005b). Most adults and young then depart the breeding grounds between mid-July and early September (Cohen 2005a). Because plovers are known to be active at night (Staine and Burger 1994; Majka and Shaffer 2008), and plover chick and fledgling responses to vehicles can increase their vulnerability to ORVs (USFWS 1996a; Melvin et al. 1994), prohibiting night driving from May 1 through August 31 under alternative B would provide long-term beneficial impacts to piping plovers. However, some short- and long-term adverse impacts to nonnesting piping plovers could still result outside of the May 1 through August 31 timeframe when night driving is permitted. Impacts could include interrupting foraging behavior, injury, or mortality from collisions with vehicles.

Permit Requirements—Under alternative B, long-term (annual) and short-term (10-day) vehicle permits would be instituted to better manage vehicles at the Seashore, though it would not limit the number of vehicles that could operate on the Seashore at any one time. Additionally, each licensed driver would be required to obtain an operator education certificate to operate a vehicle at the Seashore. Both the permit and operator education certificate could be revoked for violation of applicable Seashore regulations or terms and conditions of the permit. The permit would be fee-based and fees collected from the permitting

system could be used by the Seashore to put towards among other things species management and protection, as well as education measures which would benefit piping plovers. Educational information provided with the permit and operator education certificate would benefit piping plovers by making ORV users more aware of the need for and benefit of ORV and full recreational closures for resource protection and of the regulations in place to protect this species. This, along with the deterrent of potentially losing driving privileges would likely result in a higher level of compliance with buffers, closures, and other Seashore regulations, resulting in short- and long-term beneficial impacts to piping plovers. While most ORV users respect closures, closure violations do occur (NPS 2012t, 2011a, 2010b, 2009a, 2008c). Such violations bring vehicles, people, and pets in close proximity to piping plovers which can result in adverse impacts on feeding, reproduction, resting, or other behaviors (Burger 1991; Flemming et al. 1988; Melvin et al. 1994; Patterson et al. 1991; Patterson, Fraser, and Roggenbuck 1990; Zonick 2000).

Camping—Under alternative B, camping and campfire activities along the ocean beach would be permitted in areas similar to alternative A (i.e., on all beaches of the Seashore that are not otherwise closed by the Superintendent's Compendium, closed for safety, or closed for species protection). As described under alternative A, species protection areas where camping and campfires would be prohibited include full recreational closures established in active, historic, and potential new piping plover habitat; areas where territorial, courtship, or mating behavior is observed; and around piping plover nests. Prohibiting camping and campfires in these areas would provide short- and long-term beneficial impacts to piping plovers by removing the impacts from these activities which could otherwise cause adult piping plovers to flush from nests and potentially result in the loss of eggs or chicks, complete abandonment of the nest, or increased susceptibility to predation (Elliot-Smith and Haig 2004; Cohen, Houghton, and Fraser 2009; Burger 1987; Boettcher et al. 2007; Lauro and Tanacredi 2002; Patterson, Fraser, and Roggenbuck 1990).

Additionally, under alternative B campsites for emergency camping would be designated in areas along the back route. However, they would not be designated in areas suitable for piping plover nesting so there would be no impact to the species.

Adaptive Management Strategy—Under alternative B, an adaptive management strategy would be implemented to ensure that the goals of species protection are being met. Although the adaptive management strategy depends on the American oystercatcher as the indicator species, it would provide both short- and long-term beneficial impacts to piping plovers. If levels of disturbance to the American oystercatcher from ORVs are triggered (see chapter 2 for the trigger thresholds) more intensive management actions could be implemented. These management actions would potentially include increased education and focused enforcement, which would help reduce closure violations that could impact piping plovers; additional trash management and fish scrap disposal, which would likely reduce the number of predators attracted to the beach that could prey upon piping plovers; additional predator control, which would help protect piping plovers, their nests, and fledglings from raccoons and other mammalian predators; ORV route restrictions and increased buffer sizes, both of which would protect piping plover habitat, as well as the plovers themselves and their nests; and a reduction in the number of long-term (annual) and/or short-term (10-day) vehicle permits along with managing the size of the vehicle storage lots, both of which would help to reduce the number of vehicles on the Seashore at any one time, and thus likely reducing the potential impacts from ORVs. If species indicators continue to be triggered due to visitor use impacts for two consecutive years after implementing the previously mentioned actions, then reducing the number of long-term (annual) and/or short-term (10-day) vehicle permits issued and increasing the size of species protection buffer could be implemented. These actions would reduce the number of vehicles driving on the beach and increase the distance the vehicles could approach birds and nests, thereby reducing the amount of potential impacts caused by ORVs, providing short- and long-term beneficial impacts to piping plovers.

Cumulative Impacts under Alternative B

Past, present and reasonably foreseeable actions that have the potential to impact piping plover under alternative B would be the same as those described under alternative A. The overall combined impacts of these past, present, and future actions on piping plover would be short- and long-term, limited, and adverse from disturbance to foraging and nesting birds from visitor/ORV use, dredging activities, shoreline stabilization, visitor amenity improvements, and military overflights. The overall combined impacts would also have long-term beneficial impacts from the protection afforded to piping plovers and their habitat by species monitoring, species buffers, habitat protection, visitor protection patrols, visitor education programs, control of the wild horse population, predator management, and future efforts under the Foundation Plan. While adverse effects on piping plover from other actions occurring in the region would still exist, actions under alternative B would provide additional protection that would be beneficial to the regional population of this species and would offset some of the adverse effects.

ALTERNATIVE C

Impacts of Alternative C

Resource Management Activities

Surveying and Monitoring—Surveying and monitoring for piping plovers and their habitat, and the impacts from the actions under alternative C would be the same as described for alternative A. As described under alternative A, surveying and monitoring piping plovers and their habitat provides long-term beneficial impacts to the species because it allows the Seashore to better manage piping plovers, which may lead to increased reproductive success of the species at the Seashore. While overall surveying activities would provide beneficial impacts, they could also cause some short-term adverse impacts by negatively impacting feeding, reproduction, resting, or other piping plover behavior (Burger 1991, 1994). However, NPS staff would use best professional judgment and take precautions to minimize disturbance during surveying, such as observing incubating birds with optical equipment from appropriate distances and maintaining slow speeds while using ORVs in or near piping plover habitat. Additionally, there would be more consistent training and supervision of resource staff who conduct the surveys. This would result in a higher quality of monitoring for the species, resulting in beneficial impacts.

Establishment of Prenesting Closures—Under alternative C, establishing full recreational closures for prenesting and the impacts from these actions would be the same as under alternative B. Short- and long-term benefits to piping plovers would result from establishing full recreational closures in historical shorebird nesting areas prior to opening the beach to vehicles on March 16 by protecting their habitat. These benefits would also apply to other birds when they first arrive at the Seashore, which is typically in mid-March (Cohen et al. 2010; Patterson, Fraser, and Roggenbuck 1990), from ORV and pedestrian impacts during the early season when territories are being established and mating behavior begins.

Buffer/Closure Establishment—Under alternative C, the establishment of resource buffers/closures would be the same as described for alternative A. This includes establishing a minimum 600-foot ORV buffer on either side of a brood for unfledged chicks on the beach. This also includes the possibility of implementing an escort program on a case-by-case basis to allow access to the Seashore beyond the closure if ORVs could not be routed around the closure and there is sufficient staff available to implement the escort program. As described under alternative A, an escort program would likely reduce noncompliance with the closure by helping to decrease visitor frustration with not being able to access areas beyond the closure, and thus help protect piping plovers. Establishing full recreational closures around birds and adjusting them based on chick behavior would result in short- and long-term benefits by reducing the potential for contact between Seashore visitors and birds. While frequent adjustment of

buffers by NPS staff may result in additional disturbance to piping plovers, (Anderson and Keith 1980; Ellison and Cleary 1978; Hand 1980; Tremblay and Ellison 1979), any potential adverse effects would be outweighed by, the benefits to the chicks from adjusting the buffers to protect them from disturbance due to pedestrians and ORVs.

Management of Wintering Habitat for Nonbreeding Plovers—Under alternative C, management of wintering habitat for nonbreeding plovers and the resulting impacts would be the same as described for alternative A. Some limited noise disturbance and short-term displacement could result from the presence of resource staff in foraging/resting habitat during surveying activities. However, these impacts would only occur once per month and would be outweighed by the fact that surveying would increase knowledge on how and when piping plovers use the Seashore which would help better inform future management for the species; resulting in long-term beneficial impacts.

Additionally, under alternative C the Seashore would extend the beginning date it closes the Seashore to vehicles from January 1 to December 16, meaning the Seashore would be closed to vehicles from December 16 through March 15 each year. Though not specifically implemented to protect nonbreeding plovers, the December 16 closure date would provide an additional 15 days of protection for wintering plovers compared to alternative A and would allow the beach profile a greater opportunity to recover from heavy fall fishing use.

Similar to alternative A, no full recreational closures for resource protection would be established for pedestrians during the winter months. However, any adverse impacts from pedestrians on wintering plovers would be largely imperceptible because the amount of pedestrian use during the winter months is very low, and without a means of transportation on the beach, most visitor use would be confined to areas in the immediate vicinity of the ferry landings.

Predator Management—Under alternative C, predator management activities, including the use of predator exclosures and the limited removal of mammalian predators, would be the same as under alternative B. Protecting piping plover nests with predator exclosures and reducing predation pressure through the limited removal of mammalian predators would likely increase nesting and fledging success for piping plovers, resulting in short- and long-term beneficial impacts.

Education/Public Outreach—Education and public outreach measures under alternative C would be the same as for alternative B, including increase in staffing levels for interpretation positions and law enforcement positions, and would provide short- and long term benefits. Benefits would occur because the public would receive education about the specific needs of the species and alerts ahead of time about closures due to the potential for species or habitat disturbance and injury.

Research/Monitoring—Research and monitoring under alternative C would be the same as alternative B. Research efforts have the potential to negatively impact feeding, reproduction, resting, or other piping plover behavior over the long term due to the increased human presence and use of ORVs (Anderson and Keith 1980; Ellison and Cleary 1978; Tremblay and Ellison 1979; Hand 1980). However, the research to be conducted would provide long-term beneficial impacts by increasing knowledge about the species that would help inform future management actions.

ORV and Other Recreational Use

ORVs and Pedestrian Access—ORV routes under alternative C would be the same as under B, with the exception that approximately 4 miles of pedestrian-only use areas would be added to the Seashore. During the summer season 3.1 miles of additional pedestrian-use only area would be added (0.35 miles at Long Point Cabin Camp, 1.9 miles at Great Island Cabin Camp, and 0.8 miles at Codd's Creek), while the year-

round pedestrian-use only area at the lighthouse would be expanded by 0.7 miles. While impacts to piping plovers from ORV use would be eliminated in these new pedestrian-only use areas, the new areas are not in key nesting habitat for piping plover, so the benefits to the species may be limited (Rikard pers. comm. 2013a).

Adding 4 miles of pedestrian-only use areas means that the amount of ocean beach available for ORV use, prior to other possible temporary ORV or full recreational closures for species protection and safety, would be approximately 74 percent (41 miles) from the Friday preceding Memorial Day through Labor Day and approximately 79 percent (44 miles) during the rest of the year (from March 16 through the Thursday preceding Memorial Day and from Labor Day through December 15) (as compared to 81 percent [45 miles] under alternatives A and B) when ORVs are allowed on the beach (ORVs are prohibited from December 16 through March 15). As described under alternative A, ORV resource and safety closures have historically averaged approximately 10 miles during the summer and approximately 5.4 miles during the fall. Reducing the amount of beach available for ORV use increases the amount of area where piping plovers would be free from potential impacts of ORVs. Under alternative C, ORV use would be kept at historical levels. Keeping ORV use at historical levels and slightly reducing the areas where ORVs are allowed may slightly increase the potential for impacts in areas where ORVs are allowed due to higher density use in those areas. However, any increase in density, and resultant impacts from that, would be extremely slight given the relatively small increase in the amount of pedestrian-only use areas compared to the overall amount of Seashore available to ORVs and where the increases are occurring.

Under alternative C all high-performance sport-model and two-stroke ATVs and UTVs would be prohibited after a five-year grace period. Utility-model ATVs and UTVs would be permitted at the Seashore only between September 15 and December 15. As discussed under alternative A, based on studies by McGowan and Simons (2006) and Simons and Borneman (2012), it appears that ATV use, and to some extent UTV use, impacts shorebirds to a greater extent than other types of ORVs (e.g., four-wheel drive passenger vehicles) likely due to the fact that they are louder and faster. The studies do not differentiate between different types of ATVs and/or UTVs because high-performance sport-model ATVs and UTVs, as well as two-stroke models are designed for racing, jumping, and moving at high rates of speed; however, these models likely could cause more impacts to shorebirds than utility-model ATVs and UTVs that are designed to be used in a utilitarian way. The speed and noise of high-performance sport-model and two-stroke ATVs and UTVs may be perceived by shorebirds as a greater threat, causing shorebirds to alter their behavior. Eliminating these vehicles and their potential impacts from the Seashore after a five-year grace period would provide short- and long-term benefits to piping plovers. Additionally, limiting utility-model ATV and UTV use during the majority of the nesting season and removing their adverse impacts on piping plovers would provide both short- and long-term beneficial impacts.

Similar to alternative B, ORV use would be discontinued in areas on Core Banks that are cut off from ferry access; though it would be restored if/when the areas rejoin an area with ferry access. During the time that ORV use is discontinued there would be no potential adverse impacts from vehicles which would result in both short- and long-term beneficial impacts on piping plovers. Also similar to alternative B, the back route between mile marker 44 and mile marker 45 would be open to ORV use when the point of Cape Lookout is closed to through-traffic. This would provide easy access to the beach area to the west of the point of Cape Lookout that would otherwise require ORVs to traverse the Cape Village and potentially help prevent closure violations on the point of Cape Lookout by likely reducing visitor frustration due to the closure.

Like alternative B, there is the potential for small changes to the number and location of ramps as needed, and ramps may be moved or re-established after major storm events to restore access to the beach. While ramps would not be constructed near piping plover habitat during the nesting season, to the extent that

new ramps are constructed or existing ramps are re-established in areas that might provide suitable habitat for piping plovers, these activities would remove potential habitat for the species. However, the area impacted by any new or re-established ramps would be small compared to the overall habitat available to piping plovers, minimizing any potential adverse impacts.

Night-Driving—Under alternative C, all recreational ORV use on the ocean beach and back route would be prohibited from 9 p.m. to 6 a.m. from May 1 through September 14, extending the end date beyond August 31, which is the end date under alternative B. Restrictions on night driving under alternative C would reduce potential impacts on chicks and foraging adults at night, which include disturbance of nesting and foraging behaviors and injury or mortality from collisions with a vehicle. Since most adults and young piping plovers depart the breeding grounds on the Seashore between mid-July and early September (Cohen 2005a), the longer range of dates provides night time protection for essentially the entire breeding season, resulting in long-term beneficial impacts.

Permit Requirements—Under alternative C, and similar to alternative B, a fee-based, long-term (annual) and short-term (10-day) vehicle permit, and an ORV operator education certificate would be required to operate an ORV on the Seashore. This would result in short- and long-term benefits through increased education about protected species, as well as likely greater compliance with buffers, closures, and other Seashore regulations through the threat of being able to revoke an operator's driving privileges or a vehicle permit on the Seashore.

In addition, to manage the number of vehicles operating on the Seashore at any one time a limit would be established on the number of annual and 10-day permits issued each year. The limit would be based on the historical average use on each island. Placing a limit on the number of permits issued for ORV use on the beach would prevent the level of ORV use from increasing, thus preventing likely increased amounts of adverse impacts, compared to historical levels, on piping plovers and their habitat. This would result in short- and long-term beneficial impacts.

Camping—Under alternative C, camping and campfire activities along the ocean beach would be permitted in areas similar to alternative B (on all beaches of the Seashore that are not otherwise closed by the Superintendent's Compendium, closed for safety, or closed for species protection to include full recreational closures and the six sea turtle nest relocation areas). Because full recreational closures are established in active, historic, and potential piping plover habitat; in areas where territorial, courtship, and mating behavior is observed; and around nests; prohibiting camping and campfires in these areas would remove the potential impacts from these activities on nesting piping plovers as described under alternatives A and B.

Similar to alternative B, under alternative C campsites for emergency camping would be designated in areas along portions of the back route. However, campsites would not be established in suitable piping plover nesting habitat, so there would be no impact to the species.

Adaptive Management Strategy—Under alternative C, an adaptive management strategy would be implemented the same as under alternative B, to ensure that the goals of species protection are being met. The additional management actions that could be implemented would provide short- and long-term beneficial impacts to piping plovers and their habitat. Benefits would result from reducing closure violations through increased education and focused enforcement; reducing predation through trash management and fish scrap disposal; and reducing ORV impacts through route restrictions, increased buffer sizes, and limits on the number of vehicle permits issued as well as managing the size of vehicle storage lots.

Cumulative Impacts under Alternative C

Past, present, and reasonably foreseeable future actions under alternative C would be the same as those described under alternative A. The overall combined impacts of these past, present, and future actions on piping plover would be short- and long-term, limited, and adverse from disturbance to foraging and nesting birds from visitor/ORV use, dredging activities, shoreline stabilization, visitor amenity improvements, and military overflights. These combined actions would also result in long-term beneficial impacts from the protection afforded to piping plover and their habitat by species monitoring, species buffers, habitat protection, visitor protection patrols, visitor education programs, control of the wild horse population, predator management, and planning efforts under the Foundation Plan. While adverse effects on piping plover from other actions occurring in the region would still exist, actions under alternative C would provide additional protection that would be beneficial to the regional population of this species and would offset and/or prevent some of the adverse effects.

ALTERNATIVE D

Impacts of Alternative D

Resource Management Activities

Surveying and Monitoring—Surveying and monitoring for piping plovers and their habitat, and the impacts from the actions under alternative D would be the same as described for alternative A. As described under alternative A, surveying and monitoring piping plovers and their habitat provides long-term beneficial impacts to the species because it allows the Seashore to better manage piping plovers, which may lead to increased reproductive success of the species at the Seashore. While overall surveying activities would provide beneficial impacts, they could also cause some short-term adverse impacts by negatively impacting feeding, reproduction, resting, or other piping plover behavior (Burger 1991, 1994). However, NPS staff would use best professional judgment and take precautions to minimize disturbance during surveying, such as observing incubating birds with optical equipment from appropriate distances and maintaining slow speeds while using ORVs in or near piping plover habitat. Additionally, there would be more consistent training and supervision of resource staff who conduct the surveys. This would result in a higher quality of monitoring for the species, resulting in beneficial impacts.

Establishment of Prenesting Closures—Under alternative D, establishing prenesting closures and the impacts from these actions would be the same as under alternative B. Short- and long-term benefits to piping plovers would result from establishing full recreational closures in historical shorebird nesting areas prior to opening the beach to vehicles on March 16 by protecting their habitat. These closures would also benefit any birds when they first arrive at the Seashore, which is typically in mid-March (Cohen et al. 2010; Patterson, Fraser, and Roggenbuck 1990), from ORV and pedestrian impacts during the early season when territories are being established and mating behavior begins.

Buffer/Closure Establishment—Under alternative D, establishing resource buffers and closures would be the same as described for alternative A, except that for unfledged chicks the minimum size of buffers for pedestrian-only areas (within ORV closures) would be based on the mobility of broods observed on the site in previous years. Based on one set of recommendations in the Piping Plover Recovery Plan (USFWS 1996a), unless data from previous years show that broods at a site forage close to their nests, buffers would extend at least 650 feet on each side of the nest site during the first week following hatching; this is an increase of 50 feet compared to alternatives A, B, and C, and would result in some small additional beneficial impacts from keeping ORVs further away from the chicks. The size and location of the buffer would be adjusted in response to the observed mobility of the brood, but in no case would it be reduced to less than 650 feet on each side. While frequent adjustment of buffers by NPS staff

may result in additional disturbance to piping plovers, (Anderson and Keith 1980; Ellison and Cleary 1978; Hand 1980; Tremblay and Ellison 1979), any potential adverse effects would be outweighed by, the benefits to the chicks from adjusting the buffers to protect them from disturbance due to pedestrians and ORVs.

In some cases, highly mobile broods may require buffers up to 3,250 feet, even when intensively monitored. Because of the narrow width of most of Core Banks, such buffers would likely extend from the oceanside low water line to the soundside low water line or the farthest extent of dune habitat. In accordance with recommendations in the Piping Plover Recovery Plan, vehicles may be allowed to pass through portions of the protected area that are considered inaccessible to plover chicks because of steep topography (USFWS 1996a). A buffer of this size (i.e., 3,250 feet), depending on where it needed to be established, could close approximately 3 miles of Portsmouth Flats, 7 miles of Kathryn-Jane Flats (if chicks are present), or the tip (approximately 2.5 miles) of Old Drum Inlet (unless the inlet fills in). If such a large buffer were established, piping plovers would likely experience observable long-term benefits, such as higher fledgling rates, from the size of the buffer due the amount of area closed to and protected from ORV impacts.

Management of Wintering Habitat for Nonbreeding Plovers—Management of wintering habitat for nonbreeding piping plover populations under alternative D would be the same as those under alternative A. Some limited noise disturbance and short-term displacement could result from the presence of resource staff in foraging and resting habitat during surveying activities. However, these small impacts would only occur once per month and would be outweighed by the fact that surveying would increase knowledge on how and when piping plovers use the Seashore which would help better inform future management for the species; resulting in long-term beneficial impacts. Additionally, and similar to alternative C, under alternative D the Seashore would extend the beginning date it closes the Seashore to vehicles from January 1 back to December 16, meaning the Seashore would be closed to vehicles from December 16 through March 15 each year. Though not specifically implemented to protect nonbreeding plovers, the December 16 closure date would provide an additional 15 days of protection for wintering plovers compared to alternative A and would allow the beach profile a greater opportunity to recover from heavy fall fishing use.

While no ORV or full recreational closures for resource protection would be established for pedestrians during the winter months, any adverse impacts from pedestrians on wintering plovers would be largely imperceptible. The amount of pedestrian use during the winter months is very low, and without a means of transportation on the beach, most visitor use would be confined to areas in the immediate vicinity of the ferry landings.

Predator Management—Under alternative D, predator management activities, including the use of predator exclosures and the limited removal of mammalian predators, would be the same as under alternative B. Protecting piping plover nests with predator exclosures and reducing predation pressure through the limited removal of mammalian predators would likely increase nesting and fledging success for piping plovers, resulting in short- and long-term beneficial impacts.

Education/Public Outreach—Education and public outreach measures under alternative D would be the same as for alternative B, including increase in staffing levels for interpretation positions and law enforcement positions, and would provide short- and long term benefits. Benefits would occur because the public would receive education about the specific needs of the species and alerts ahead of time about closures due to the potential for species or habitat disturbance and injury.

Research/Monitoring—Research and monitoring under alternative D would be the same as alternative B. Research efforts have the potential to negatively impact feeding, reproduction, resting, or other piping

plover behavior over the long term due to the increased human presence and use of ORVs (Anderson and Keith 1980; Ellison and Cleary 1978; Tremblay and Ellison 1979; Hand 1980). However, the research to be conducted would provide long-term beneficial impacts by increasing knowledge about the species that would help inform future management actions.

ORV and Other Recreational Use

ORVs and Pedestrian Access—Under alternative D, ORV routes and pedestrian-only use areas would include those areas under alternative C. However, the closures at Long Point, Great Island, and Codds Creek would be pedestrian-only use areas year-round instead of just during the summer, as under alternative C. The total amount of pedestrian-only use areas would increase in comparison with alternative A by approximately 8 percent (from 2 to 10 miles).

Under alternative D about 0.5 miles of summertime pedestrian-only use area would be created at Johnsons Creek, and the 3.6 miles of Middle Core Banks would be a pedestrian-only use area during the summer whether or not it is contiguous with North Core Banks (currently it is a separate island). The ocean beach from the Portsmouth Access Road north to the demarcation line at Ocracoke Inlet would also become a summer pedestrian-only use area. In addition, the year-round pedestrian-only use area in front of the lighthouse would be expanded approximately 0.9 miles to the south, for a total closure of approximately 1.6 miles, or 0.9 miles larger than under alternative A and 0.2 miles larger than under alternative C. Adding these pedestrian-only use areas would reduce the amount of Seashore beaches open to ORV use. About 63 percent (35 miles) of the beach would be open to ORV use from the Friday preceding Memorial Day through Labor Day, not considering any temporary ORV resource or safety closures, which as described under alternative A have historically averaged approximately 10 miles during the summer months. About 73 percent (41 miles) of the beach would be open to ORV use during the rest of the year (from March 16 through the Thursday preceding Memorial Day and from Labor Day through December 15) when ORVs are allowed on the beach (ORVs are prohibited from December 16 through March 15), not considering any temporary ORV resource or safety closures, which as described under alternative A have historically averaged approximately 5.4 miles during the fall months. While impacts to piping plovers from ORV use would be eliminated in these new pedestrian-only use areas, the new areas are not in key nesting habitat for piping plover, so the benefits to the species may be limited (Rikard pers. comm. 2013a). Reducing the amount of area open to ORV use could have the potential to increase the density of ORVs in areas that remain open to ORVs, potentially resulting in some increased impacts to piping plovers and their habitat in those areas. However, to offset this potential, the Seashore would reduce the number of permits issued by 8 percent (see “Permit Requirements”).

ORV access (related to species closures) under alternative D would be similar to alternative B. On sections of Core Banks where no ferry landing access is available (i.e., Middle Core Banks), designated ORV routes would be closed, which could provide further protection for piping plovers at the Seashore by reducing the amount of Seashore available to ORV access. This would limit the potential for species contact with vehicles and vehicle operators/passengers.

Under alternative D, all ATVs and high-performance sport-model and two-stroke UTVs would be prohibited year-round after a five-year grace period. Additionally, utility-model UTVs would be permitted only between September 15 and December 15. As discussed under alternative A, based on studies by McGowan and Simons (2006) and Simons and Borneman (2012), it appears that ATV use, and to some extent UTV use, impacts American oystercatchers to a greater extent than other types of ORVs (e.g., four-wheel drive passenger vehicles) likely due to the fact that they are louder and faster. (As noted under alternative B, given that neither piping plovers nor American oystercatchers are solitary species and

colonial in nature, it is reasonable to assume that piping plovers would react in a similar manner to ATVs and UTVs as American oystercatchers do.) The studies do not differentiate between different types of ATVs and/or UTVs because high-performance sport-model ATVs and UTVs, as well as two-stroke models are designed for racing, jumping, and moving at high rates of speed; however, these models likely could cause more impacts to shorebirds than utility-model ATVs and UTVs that are designed to be used in a utilitarian way. The speed and noise of high-performance sport-model and two-stroke ATVs and UTVs may be perceived by shorebirds as a greater threat, causing shorebirds to alter their behavior. Eliminating all ATVs (which Simons and Borneman (2012) showed has a greater impact on birds than UTVs) as well as their potential impacts from the Seashore after a five-year grace period would provide short- and long-term benefits to piping plovers. Additionally, limiting utility-model UTV use to only the non-nesting season and removing the adverse impacts of UTV use on piping plovers would provide short- and long-term beneficial impacts.

Unlike alternatives B and C, regular maintenance of the back route would not occur under alternative D. With no maintenance, the condition of the back route is likely to deteriorate. As it does ORV users may opt to use the beach more often which could increase ORV impacts on piping plovers and their habitat slightly. However, the back route would be re-established when impacted by a storm event, which would encourage use of the back route instead of the beach, which would benefit piping plovers by removing some vehicle travel from the beach. Although ramps would be re-established to restore access after storm events, no new ramps would be added to the Seashore beach. While construction of ramps would not be conducted near piping plover habitat during the nesting season, to the extent that ramps are re-established in areas that might provide suitable habitat for piping plovers, these activities would remove potential habitat for the species. However, the area impacted by any re-established ramps would be small compared to the overall habitat available to piping plovers, minimizing any adverse impacts.

Night-Driving—Under alternative D, night driving restrictions would be the same as described for alternative C, resulting in long-term beneficial impacts on piping plovers because it would further reduce the potential for disturbance to night-foraging birds and late nesters.

Permit Requirements—Under alternative D, vehicle permit and ORV operator education certificate requirements would be similar to alternative C, except that the number of vehicle permits would be reduced by 8 percent. The reduction of permits by 8 percent compared to alternative C is based on the percentage increase of pedestrian-only use areas under alternative D and is intended to keep average vehicle density similar to current average use to help prevent increases in ORV impacts due to higher densities of vehicles in areas where ORV use is allowed. Although ORV use would not be allowed in resource protection areas, placing a limit on the number of permits issued for ORV use would prevent future unlimited growth of ORV use, thus preventing likely increased amounts of adverse impacts, compared to historical levels, on piping plovers and their habitat. This would result in short- and long-term beneficial impacts.

As described for alternative B, fees collected from a permitting program would be used toward species management and protection, which would benefit piping plovers. Educational information provided by the permit and education requirement would benefit piping plovers because ORV users would be more aware of the regulations in place to protect this species. ORV users would also be more likely to comply with buffers, closures, and other Seashore regulations due to the potential threat of losing their individual driving privileges through the revocation of their operator education certificate or their vehicle permit if violations occur.

Camping—Under alternative D, camping and campfire activities along the ocean beach would be permitted in areas similar to alternative B (on all beaches of the Seashore that are not otherwise closed by

the Superintendent's Compendium, closed for safety, or closed for species protection, that is, full recreational closures and the six sea turtle nest relocation areas). This would result in short- and long-term beneficial impacts by removing the impacts from these activities which could otherwise cause adult piping plovers to flush from nests and potentially result in loss of eggs or chicks, complete abandonment of the nest, or increased susceptibility to predation (Elliot-Smith and Haig 2004; Cohen, Houghton, and Fraser 2009; Burger 1987; Boettcher et al. 2007; Lauro and Tanacredi 2002; Patterson, Fraser, and Roggenbuck 1990). Also under alternative D, campsites for emergency camping would be designated in portions of the existing long-term parking lots. These areas, however, do not provide piping plover habitat, so there would be no impacts on the species from designating these areas as emergency camping sites.

Adaptive Management Strategy—Under alternative D, an adaptive management strategy would be implemented, the same as under alternative B, to ensure that the goals of species protection are being met. The additional management actions that could be implemented would provide short- and long-term beneficial impacts to piping plovers and their habitat. Benefits would result from reducing closure violations through increased education and focused enforcement; reducing predation through trash management and fish scrap disposal; and reducing ORV impacts through route restrictions, increased buffer sizes, and limits on the number of vehicle permits issued as well as managing the size of vehicle storage lots.

Cumulative Impacts under Alternative D

Past, present, and reasonably foreseeable actions under alternative D would be the same as those described under alternative A. The overall combined impacts of these past, present, and future actions on piping plover would be short- and long-term, limited, and adverse from disturbance to foraging and nesting birds from visitor/ORV use, dredging activities, shoreline stabilization, visitor amenity improvements, and military overflights. There would also be long-term beneficial impacts from the protection afforded to piping plovers and their habitat by species monitoring, species buffers, habitat protection, visitor protection patrols, visitor education programs, control of the wild horse population and predator management. While adverse effects on piping plover from other actions occurring in the region would still exist, actions under alternative D would provide additional protection that would be beneficial to the regional population of this species and would offset and /or prevent some of the adverse effects.

ALTERNATIVE E

Impacts of Alternative E

Resource Management Activities

Surveying and Monitoring—Though public use of ORVs on the Seashore would be prohibited under alternative E, the NPS would still use ORVs to conduct resource management and resource and visitor protection activities. Surveying for and protecting piping plovers and their habitat under alternative E would occur in the same manner as under alternative A. However, given the prohibition of ORVs at the Seashore, the likely lower pedestrian presence resulting from this, and the fact that with no public ORV access, pedestrian use would likely be greatest around the ferry landing areas, the cabins, and Power Squadron Spit where visitors can easily access the beach using their own boats, surveying and monitoring protocols would be reviewed and may change. Overall, surveying activities would provide long-term beneficial impacts to piping plovers by allowing the Seashore to better manage species, which may lead to increased reproductive success of the species at the Seashore, though they could also cause some short-term adverse impacts by negatively impacting feeding, reproduction, resting, or other piping plover behavior (Burger 1991, 1994). However, NPS staff would use best professional judgment and take

precautions to minimize disturbance during surveying, such as observing incubating birds with optical equipment from appropriate distances and maintaining slow speeds while using ORVs near piping plover habitat.

Establishment of Prenesting Closures—To protect piping plovers and their habitat, full recreational closures for prenesting piping plover habitat would be established, similar to alternative A. These closures would be established by April 1 in all active habitat (where birds are presently nesting or nested the previous breeding season), historical habitat (areas where the birds have nested in the past 5 years), and potential new piping plover habitat as determined appropriate by a qualified staff biologist. However, since public use of ORVs would be prohibited on the Seashore under alternative E, the closures would be applicable to pedestrians only. As described for alternative A, establishing prenesting closures would provide long-term beneficial impacts for piping plovers at the Seashore through the increased likelihood of reproductive success resulting from the reduction in disturbance of the birds by pedestrians and pets during critical periods of reproduction (Parnell et al. 1988; Elliot-Smith and Haig 2004; Cohen, Houghton, and Fraser 2009; Burger 1987; Boettcher et al. 2007; Lauro and Tanacredi 2002; Patterson, Fraser, and Roggenbuck 1990). While prenesting closures would not afford protection to piping plovers arriving at the Seashore prior to April 1, no piping plover nests have been documented prior to April 1 at the Seashore (Rikard pers. comm. 2013a). Additionally, with no ORV use on the beach, pedestrian use would likely occur mostly around the ferry landings, limiting the amount of piping plover habitat potentially impacted by pedestrians.

Buffer Closure/Establishment—Under alternative E, establishing buffers and closures would be the same as described for alternative A, except that no recreational ORV-specific closures would be established because public use of ORVs would not be permitted on the Seashore under this alternative. Any disturbance to piping plovers would be limited to that by monitoring, and emergency response vehicles, and concession operated vehicles. Establishing buffers and full recreation closures outside of prenesting closures would result in short- and long-term benefits for piping plovers by protecting adults, nests, and unfledged chicks from potential impacts caused by pedestrians and pets.

Management of Wintering Habitat for Nonbreeding Plovers—Under alternative E, nonbreeding surveying activities would be the same as described for alternative A even though public recreational ORV use at the Seashore would be prohibited year-round. While surveying activities would likely result in some limited noise and habitat disturbance (potentially causing temporary displacement) of piping plovers from the presence of resource staff, surveying would only occur once per month, minimizing any adverse impacts. Additionally, the data collected during the surveys would result in long-term beneficial impacts on plovers by providing Seashore managers with information on the types and locations of habitats used, seasonality of plover use of the Seashore, tidal influence on habitat use, and potential threats the habitat may contain.

Under alternative E, a seasonal closure of the Seashore would not be established because public ORVs would not be permitted at the Seashore; thereby removing any potential habitat or behavioral alterations that could be caused by the presence of vehicles, resulting in long-term beneficial impacts on piping plovers at the Seashore. Pedestrians would still access the Seashore during the winter months. However, adverse impacts from them on wintering plovers would be largely imperceptible because the amount of pedestrian use during the winter months is very low, and without a means of transportation on the beach, most visitor use would be confined to areas in the immediate vicinity of the ferry landings.

Predator Management—Under alternative E, predator management would be the same as alternative A. While predators would not be removed, resulting in continued predation pressure for piping plovers, placing predator exclosures over nests where possible would help protect piping plovers from predators and provide short- and long-term beneficial impacts. Prohibiting public ORV use on the Seashore under

alternative E may also help to indirectly protect piping plovers from predators. With no public ORV use the amount of trash at the Seashore is likely to be reduced, especially in areas more remote from pedestrian ferry landing areas. Trash often attracts predators, so a reduction of trash may correlate to a reduction in the number of predators and predation of piping plovers, resulting in long-term beneficial impacts.

Education/Public Outreach—Under alternative E, education and outreach would be the same as described under alternative A; however, all efforts would be directed toward pedestrian use as public use of ORVs would not be permitted at the Seashore. Such public outreach is beneficial to piping plovers as it educates the public to the specific needs of the species.

Research/Monitoring—Research and monitoring under alternative E would be the same as alternative A. Research efforts have the potential to negatively impact feeding, reproduction, resting, or other piping plover behavior over the long term due to the increased human presence and use of ORVs (Anderson and Keith 1980; Ellison and Cleary 1978; Tremblay and Ellison 1979; Hand 1980). However, the research to be conducted would provide long-term beneficial impacts by increasing knowledge about the species that would help inform future management actions.

ORV and Other Recreational Use

ORVs and Pedestrian Access—Under alternative E, the public use of ORVs would be prohibited along the entire Core Banks and Shackleford Banks. However, other recreation use on the ocean beach such as swimming, camping, beach fires, fishing, and the use of the cabins would still occur, though likely at a reduced rate and in general proximity to the ferry landing sites. With no public use of ORVs on the beach, impacts on piping plovers and their habitat from public ORV use as described under alternative A would not occur, resulting in short- and long-term beneficial impacts. In addition, the use of vehicles by NPS staff for law enforcement purposes would likely be reduced from current levels because staff would only be dealing with pedestrians, and management of recreational use would be simplified compared with the other alternatives.

Under alternative E, full recreational closures for pre-nesting would continue to be established by April 1 for all active, historical, and potential piping plover nesting habitat, as determined by a qualified staff biologist. These closures would be expanded to ensure a 150-foot buffer around mating pairs and nests, and 600 feet around each brood that is found on the beach. Establishing full recreational closures under alternative E would result in long-term beneficial impacts on nesting plovers and broods, as pedestrian access would be prohibited within these closures. It is likely that some adverse impacts (disturbance, displacement, increased predation, etc.) on piping plovers would continue from the presence of pedestrians and pets at the Seashore due to potential closure violations. However, with limited access to areas outside of the arrival points on the Core Banks due to no public use of ORVs, potential impacts from pedestrians and pets would be greatly reduced.

Night-Driving—Under alternative E, there would be no night driving on the Seashore because public ORV use would be prohibited year-round. This would eliminate all potential adverse impacts from night driving on piping plover adults and unfledged chicks, resulting in short- and long-term beneficial impacts.

Permit Requirements—Under alternative E, there would be no vehicle permit requirements because public ORV use would not be permitted at the Seashore; therefore, there would be no additional adverse or beneficial impacts on piping plovers from a permit system to manage ORV use.

Camping—Under alternative E, camping and campfire activities along the ocean beach would be permitted in areas similar to alternative A (on all beaches of the Seashore that are not otherwise closed by

the Superintendent's Compendium, closed for safety, or closed for species protection, that is, full recreation closures and the six sea turtle nest relocation areas). As described under alternative A, prohibiting camping and campfires within these areas would result in short- and long-term beneficial impacts by removing the impacts from these activities which could otherwise cause adult piping plovers to flush from nests and potentially result in loss of eggs or chicks, complete abandonment of the nest, and increased susceptibility to predation (Elliot-Smith and Haig 2004; Cohen, Houghton, and Fraser 2009; Burger 1987; Boettcher et al. 2007; Lauro and Tanacredi 2002; Patterson, Fraser, and Roggenbuck 1990). Additionally, with no public ORV use allowed on the Seashore under this alternative, camping and campfires would likely be limited to those areas readily accessible by foot such as in front of the cabins, by the lighthouse, or possibly Power Squadron Spit which is accessible by private boat, reducing the amount of area where impacts from these activities could occur.

Adaptive Management Strategy— Under alternative E, an adaptive management strategy would be adopted similar to that under alternative B, to ensure that the goals of species protection are being met, providing short- and long-term beneficial impacts to piping plovers. With no public ORV use allowed on the Seashore under alternative E, American oystercatcher disturbance would be monitored as it relates to impacts from pedestrians and other recreational use and not from ORVs, and only those non-ORV management actions indicated in chapter 2 would be implemented. The management actions could include increased education and focused enforcement, which would help reduce closure violations that could impact piping plovers; additional focused trash management and fish scrap disposal, which would likely reduce the number of predators attracted to the beach that could prey upon piping plovers; additional predator control, which would help protect piping plovers, their nests, and fledglings from raccoons and other mammalian predators; and increased buffer sizes, which would protect piping plover habitat, as well as the plovers themselves and their nests. If species indicators continue to be triggered due to visitor use impacts for two consecutive years after implementing the previously mentioned actions, increasing the size of species protection buffers could be implemented. This action would increase the distance visitors could approach birds and nests, providing short- and long-term beneficial impacts to piping plovers.

Cumulative Impacts under Alternative E

Past, present, and reasonably foreseeable future actions under alternative E would be the same as those described under alternative A. The overall combined impacts of these past, present, and future actions on piping plover would be short- and long-term, limited, and adverse from disturbance to foraging and nesting birds from visitor use, ORV use by NPS staff, contractors, commercial providers, dredging activities, shoreline stabilization, visitor amenity improvements, and military overflights. There would also be long-term beneficial impacts from the protection afforded to piping plovers and their habitat by species monitoring, species buffers, visitor protection patrols, visitor education programs, habitat protection, control of the wild horse population, predator management, and planning efforts under the *Foundation Document*. While adverse effects on piping plover from other actions occurring in the region would still exist, actions under alternative E would provide additional protection that would be beneficial to the regional population of this species and would offset and/or prevent some of the adverse effects.

DETERMINATION OF EFFECT

Under the ESA implementing regulations (50 CFR 402), federal agencies must review their actions and determine whether the action may affect federally listed and proposed species or proposed or designated critical habitat. Federal agencies need to determine whether their actions may affect any of those species or their critical habitat. According to 50 CFR 402.02, "Effects of the action refers to the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline."

The environmental baseline includes “the past and present impacts of all Federal, State, or private actions and other human activities in the action area...” “Effects of the action” is defined to include “the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action.” (50 CFR 402.02). However, the ESA only requires the consideration of effects that are “reasonably certain to occur.”

Alternative A

The management of piping plovers (buffer/closure establishment, education/outreach, and monitoring) would provide a certain level of benefit, although the manner in which buffers would be established, along with the need to adjust buffers frequently, would have some adverse impact on the species from the presence of resource staff in piping plover habitat. However, the beneficial impacts of reducing disturbance to piping plovers from pedestrians and ORVs are anticipated to outweigh any adverse impacts from monitoring activities (Rikard pers. comm. 2013a). Additionally, protecting piping plover nests with predator exclosures would help reduce predation on adults and their nests, resulting in beneficial impacts. Overall, impacts on piping plovers from ORV use and other recreational uses would be long-term adverse because much of the Seashore would be open to recreational use with the potential for piping plovers to be directly impacted by disturbance from recreational activities (including injury and mortality of individuals). Lack of a permit system for education, management of ORV numbers, and law enforcement purposes; no night-driving restrictions; and a lack of compliance with species closures and pet leash requirements would contribute to these adverse impacts. The overall impacts of alternative A on piping plovers would be long-term adverse due to the likelihood of piping plovers failing to nest or flushing from nests due to human disturbance from recreational activities such as ORV use, walking, and fishing; noncompliance with closure/buffer restrictions and leash regulations; research; or surveying and monitoring activities. Failure to nest can result in loss of reproductive output for that season if a nesting attempt is not made at a later date. Flushing of birds from a nest can result in loss of eggs or chicks, complete abandonment of the nest, and increased susceptibility to predation. Habitat alteration from recreational uses can also modify foraging and nesting habitat and piping plovers can suffer direct mortality from ORV collisions. Resource management activities would provide long-term beneficial impacts by helping to protect piping plovers, their nests, and their habitat. However, because of the potential adverse impacts related to resource management activities and recreational use, actions under alternative A would result in a finding of *may affect / are likely to adversely affect* under the ESA because the action would result in direct or indirect impacts to piping plover that are not discountable, insignificant (under the ESA), or beneficial. Although alternative A does provide some additional protection, the adverse effects on piping plover from other actions occurring in the region would still exist. Therefore, the effects of these other actions, added to the effects of actions under alternative A, *may affect/are likely to adversely affect* piping plover on a regional basis.

Under alternative A, critical wintering habitat for piping plovers is protected for the most part through permanent ORV closures, and the entire Seashore is closed to ORV use from January 1 through March 15. Though surveying for birds during the winter months brings NPS staff into proximity to the birds and may result in some disturbance, surveys only occur once per month from August through March, so impacts would be minimal. During the winter months there would be no pedestrian-related closures at the Seashore. However, impacts from pedestrians on wintering plovers and their critical habitat would be largely imperceptible because many passenger ferries stop operating during the winter, the amount of pedestrian use is very low during the winter, and without a means of transportation on the beach, most visitor use would be confined to areas in the immediate vicinity of ferry landings, and this is not where the critical habitat is located. Therefore, actions under alternative A would result in a finding of *may affect / not likely to adversely affect* for designated critical wintering habitat for the piping plover.

Alternative B

Overall impacts under alternative B from resource management activities (buffer/closure establishment, education/outreach, and monitoring) would be long-term beneficial, with limited long-term adverse impacts. Closing historical shorebird nesting areas by March 16 would provide 15 additional days of protection for early arriving birds. There would be limited direct and indirect adverse impacts from resource staff presence during monitoring activities, but more consistent training and supervision of resource staff who conduct the surveys would help reduce those impacts. Additionally, the whole the establishment of prenesting closures early in the breeding season, monitoring activities, education and outreach efforts (including the institution of a permit system), night-driving restrictions, and the establishment of prescribed buffers would provide long-term beneficial impacts on the species. However, compliance with closures may not be absolute, resulting in continued disturbance of breeding habitat and potential mortality of individual species if noncompliance occurs. However, increased staffing levels of law enforcement and interpretation positions would help reduce noncompliance through increased enforcement and education. Being able to revoke an ORV operator's education certificate or vehicle permit would also help reduce closure violations and other violations. Additionally, protecting piping plover nests with predator exclosures and conducting limited removal of mammalian predators would help reduce predation on adults, their nests, and unfledged chicks, resulting in beneficial impacts. Overall, under alternative B impacts on piping plovers from ORV use and other recreational uses would be long-term adverse because much of the Seashore would continue to be open to recreational use, resulting in the potential for disturbance leading to displacement and direct mortality of plover adults and chicks. The overall impacts of alternative B on piping plovers would be long-term adverse due to likelihood of piping plovers failing to nest or flushing from nests due to human disturbance from monitoring and research activities; recreational activities such as walking, fishing, and ORV use; or noncompliance with closure/buffer restrictions and leash regulations. Failure to nest can result in loss of reproductive output for that season if a nesting attempt is not made at a later date. Flushing of birds from a nest can result in loss of eggs or chicks, complete abandonment of the nest, and increased susceptibility to predation. Habitat alteration from recreational uses can also modify foraging and nesting habitat for piping plovers and piping plovers can suffer direct mortality from ORV collisions. However, increased education and outreach; the use of additional species management measures, such as a seasonal restriction on night driving; closing ORV routes where no ferry landing access is available; and restricting high-performance sport-model and two stroke model ATV and UTV use could reduce vehicular contact with individual species and educate visitors on the importance of resource protection. Additionally, if species protection goals are not being met, the Seashore would implement intensive management actions under an adaptive management strategy, such as increased education and focused enforcement, additional trash management and fish scrap disposal, additional predator control, ORV route restrictions and increased buffer sizes, and limits on the number of vehicle permits issued (would also help reduce ORV and recreational impacts on piping plovers and their habitat). All of these measures would help mitigate/reduce the potential for long-term adverse impacts of ORV use on piping plovers. The resource management, ORV use, and other recreational uses under alternative B would result in a finding of *may affect / are likely to adversely affect* under the ESA because the action would result in direct or indirect impacts to piping plover that are not discountable, insignificant, or beneficial. Although alternative B does provide additional protection, the adverse effects on piping plover from other actions occurring in the region would still exist. Therefore, the effects of these other actions, added to the effects of actions under alternative B, *may affect/are likely to adversely affect* piping plover on a regional basis.

Under alternative B, critical wintering habitat for piping plovers is protected for the most part through permanent ORV closures, and the entire Seashore is closed to ORV use from January 1 through March 15. Though surveying for birds during the winter months brings NPS staff into proximity to the birds and may result in some disturbance, surveys only occur once per month from August through March, so impacts would be minimal. During the winter months there are no pedestrian related closures at

the Seashore. However, impacts from pedestrians on wintering plovers and their critical habitat would be largely imperceptible because during the winter months many passenger ferries stop operating and the amount of pedestrian use is very low, and without a means of transportation on the beach, most visitor use would be confined to areas in the immediate vicinity of ferry landings, and this is not where the critical habitat is located. Therefore, actions under alternative B would result in a finding of *may affect /not likely to adversely affect* for designated critical wintering habitat for the piping plover.

Alternative C

Overall impacts under alternative C from resource management activities (buffer/closure establishment, education/outreach, and monitoring) would be long-term beneficial. Direct and indirect short-term adverse impacts would likely occur from resource staff presence during monitoring activities, but more consistent training and supervision of resource staff who conduct the surveys would help reduce those impacts. Additionally, the establishment of prenesting closures earlier in the season, expanded night-driving restrictions, monitoring activities, education and outreach efforts, the extended closure of the Seashore during winter, and expanded closures for unfledged chicks would provide long-term beneficial impacts on the species. Additionally, protecting piping plover nests with predator exclosures and conducting limited removal of mammalian predators would help reduce predation on adults, their nests, and unfledged chicks, resulting in beneficial impacts. Overall, impacts on piping plovers from ORV use and other recreational uses would be long-term adverse because there would be recreational use in the vicinity of this species. Limiting ORV access, prohibiting high-performance sport-model ATV and UTV use and limiting utility-model ATV and UTV use along the Seashore, limiting the number of permits issued, and establishing night-driving restrictions under alternative C would likely reduce some of the adverse impacts of ORV and pedestrian access by decreasing the potential for species disturbance (flushing, displacement, etc.) and species-vehicle collisions. However, adverse impacts would continue due to pedestrian and ORV access and the potential for noncompliance with species closures, though increased staffing levels of both law enforcement and interpretation positions would help reduce noncompliance through increased enforcement and education, as would the ability to revoke a ORV operator's education certificate or vehicle permit. Additionally, if species protection goals are not being met, the Seashore would implement intensive management actions under an adaptive management strategy, such as increased education and focused enforcement, additional trash management and fish scrap disposal, additional predator control, ORV route restrictions and increased buffer sizes, and limits on the number of vehicle permits issued would also help reduce ORV and recreational impacts on piping plovers and their habitat. All of these measures would help mitigate/reduce the potential for long-term adverse impacts of ORV use on piping plovers. Resource management actions and ORV use and other recreational uses under alternative C would result in a finding of *may affect / are likely to adversely affect* under the ESA because the action would result in direct or indirect impacts to piping plover that are not discountable, insignificant, or beneficial. Although alternative C does provide additional protection, the adverse effects on piping plover from other actions occurring in the region would still exist. Therefore, the effects of these other actions, added to the effects of actions under alternative C, *may affect/are likely to adversely affect* piping plover on a regional basis.

Under alternative C, critical wintering habitat for piping plovers is protected for the most part through permanent ORV closures, and the entire Seashore is closed to ORV use from December 16 through March 15. Though surveying for birds during the winter months brings NPS staff into proximity to the birds and may result in some disturbance, surveys only occur once per month from August through March, so impacts would be minimal. During the winter months there are no pedestrian related closures at the Seashore. However, impacts from pedestrians on wintering plovers and their critical habitat would be largely imperceptible because many passenger ferries stop operating during the winter, the amount of pedestrian use is very low during the winter, and without a means of transportation on the beach, most visitor use would be confined to areas in the immediate vicinity of ferry landings, and this is not where

the critical habitat is located. Therefore, actions under alternative C would result in a finding of *may affect /not likely to adversely affect* for designated critical wintering habitat for the piping plover.

Alternative D

Overall resource management activities (buffer/closure establishment, education/outreach, and monitoring) would have long-term beneficial impacts on piping plovers, with limited long-term adverse impacts. The expanded closures for unfledged chicks would provide additional protection and would likely result in increased fledging success. As with all species management activities, there could be limited short-term adverse impacts from resource staff presence during monitoring activities, but more consistent training and supervision of resource staff who conduct the surveys would help reduce those impacts. Additionally, the establishment of prenesting closures early in the breeding season, monitoring activities, expanded night-driving restrictions, education and outreach efforts, and expanding buffers for unfledged chicks would provide long-term beneficial impacts on the species by reducing vehicular contact with individual birds and educating visitors on the importance of resource protection. Additionally, protecting piping plover nests with predator exclosures and conducting limited removal of mammalian predators would help reduce predation on adults, their nests, and unfledged chicks, resulting in beneficial impacts. Overall impacts under alternative D from ORV use and other recreational uses would be long-term adverse from noise disturbance, temporary displacement, and possibly injury/mortality of individual species. The establishment of a permitting system and limiting the number of vehicles on the Seashore, night-driving restrictions, prohibiting all ATVs and high-performance sport-model UTVs and limiting utility-model UTV use, and reducing the percentage of Seashore available for ORV use would provide benefits in terms of species protection, which would likely help mitigate/reduce some of the adverse impacts of ORV and recreational use on piping plovers. Additional benefits would result under alternative D because species buffers/closures could increase considerably to account for highly mobile unfledged chicks and nests that may occur near or outside of current closure boundaries. However, as described for alternatives A, B, and C, compliance with closures may not be absolute, potentially resulting in continued disturbance of breeding habitat and mortality of individual species if noncompliance occurs, and disturbance from frequent adjustment of the buffers would occur. Increased staffing levels of both law enforcement and interpretation positions would help reduce noncompliance through increased enforcement and education, as would the ability to revoke a ORV operator's education certificate or vehicle permit. Additionally, if species protection goals are not being met, the Seashore would implement intensive management actions under an adaptive management strategy, such as increased education and focused enforcement, additional trash management and fish scrap disposal, additional predator control, ORV route restrictions and increased buffer sizes, and limits on the number of vehicle permits issued would also help reduce ORV and recreational impacts on piping plovers and their habitat. All of these measures would help mitigate/reduce the potential for long-term adverse impacts of ORV use on piping plovers. Although alternative D does provide additional protection, resource management actions and ORV use and other recreational uses under alternative D would result in a finding of *may affect / are likely to adversely affect* under the ESA because the action would result in direct or indirect impacts to piping plover that are not discountable, insignificant, or beneficial. Although alternative D does provide additional protection, the adverse effects on piping plover from other actions occurring in the region would still exist. Therefore, the effects of these other actions, added to the effects of actions under alternative D, *may affect/are likely to adversely affect* piping plover on a regional basis.

Under alternative D, critical wintering habitat for piping plovers is protected for the most part through permanent ORV closures, and the entire Seashore is closed to ORV use from December 16 through March 15. Though surveying for birds during the winter months brings NPS staff into proximity to the birds and may result in some disturbance, surveys only occur once per month from August through March, so impacts would be minimal. During the winter months there are no pedestrian related closures at the Seashore. However, impacts from pedestrians on wintering plovers and their critical habitat would be

largely imperceptible because many passenger ferries stop operating during the winter, the amount of pedestrian use is very low during the winter, and without a means of transportation on the beach, most visitor use would be confined to areas in the immediate vicinity of ferry landings, and this is not where the critical habitat is located. Therefore, actions under alternative D would result in a finding of *may affect /not likely to adversely affect* for designated critical wintering habitat for the piping plover.

Alternative E

Overall impacts under alternative E from resource management activities (buffer/closure establishment, education/outreach, and monitoring) would be long-term beneficial. As with all species management activities, limited adverse impacts could result from resource staff presence during monitoring activities, but on the whole the establishment of prenesting and nesting closures, monitoring activities, and education and outreach efforts would have a beneficial effect on the species. Additionally, protecting piping plover nests with predator exclosures would help reduce predation on adults and their nests resulting in beneficial impacts. Overall impacts from not allowing public ORV use would be long-term beneficial, with some direct and indirect, short-term adverse impacts from continued pedestrian access. Prohibiting public ORV access to the Seashore under alternative E would benefit piping plovers over the short- and long-term because species disturbance and the potential for injury or mortality would be eliminated and nesting/foraging habitat would have the opportunity to recover from historical vehicle use. It would also likely reduce the amount of trash left on the Seashore which would help to not attract predators that could adversely impact plovers. Some adverse impacts could still result from continued pedestrian access (e.g., disturbance leading to displacement, etc.) to the Seashore; however, with the limited ability to get to more remote areas of the Seashore due to no public ORV use, impacts would be reduced. If species protection goals are not being met, the Seashore would implement additional intensive management actions under an adaptive management strategy, such as increased education and focused enforcement, additional trash management and fish scrap disposal, additional predator control, and increased buffer sizes. All of these measures would help mitigate/reduce the potential for long-term adverse impacts due to pedestrian use of the Seashore. Resource management activities and other recreational uses under alternative E would result in a finding of *may affect /not likely to adversely affect* under the ESA because the action would result in direct or indirect impacts to piping plover that are discountable, insignificant, or beneficial.

Although alternative E provides additional protection and would offset some of the adverse effects from regional impacts, the adverse effects on piping plover from other actions occurring in the region would still exist. Therefore, the effects of these other actions, added to the effects of actions under alternative E, *may affect/are likely to adversely affect* piping plover on a regional basis.

Under alternative E, there would be no public ORV use allowed at the Seashore, therefore any potential impacts from ORV use to critical wintering habitat for piping plovers would be eliminated. Though surveying for birds by NPS staff would still occur during the winter months and would bring NPS staff into proximity to the birds, the surveys only occur once per month from August through March, so any potential disturbance from staff would be minimal. During the winter months there are no pedestrian related closures at the Seashore. However, impacts from pedestrians on wintering plovers and their critical habitat would be largely imperceptible because many passenger ferries stop operating during the winter, the amount of pedestrian use is very low during the winter, and without a means of transportation on the beach, most visitor use would be confined to areas in the immediate vicinity of ferry landings, and this is not where the critical habitat is located. Therefore, actions under alternative E would result in a finding of *may affect /not likely to adversely affect* for designated critical wintering habitat for the piping plover.

COMPARISON OF ALTERNATIVES

Under alternative B, impacts on piping plovers from resource management activities would be slightly less than impacts under alternatives A (the no-action alternative) and E (the no-ORV alternative). This is because there would be more consistent training and supervision of resource staff who conduct the surveys, limited predator removal, pre-nesting closures established by March 16 (15 days earlier than under alternative A, not applicable to alternative E), and increased education and research programs. Impacts on piping plovers from ORV use and other recreational uses under alternative B would be less than the impacts incurred under alternative A. This is due to the closing of ORV routes where no ferry access is available, the prohibition on all high-performance sport-model and two-stroke ATVs and UTVs at the Seashore, the night driving restriction from May 1 through August 31, the likely increased compliance with resource closures due to increased law enforcement and interpretative staffing positions, the ORV permitting system, and the more intensive management actions that could be implemented under the adaptive management strategy. However, the impacts on piping plovers from recreational uses under alternative B would be greater than those incurred under alternative E because no public ORV access at the Seashore is allowed under alternative E.

Impacts on piping plovers from resource management activities under alternative C would be slightly less than from alternatives A (the no-action alternative) and E (the no ORV alternative). This is due to more consistent training and supervision of resource staff who conduct the surveys, the limited predator removal under alternative C, increased educational and research efforts, and the winter vehicle closure from December 16 through March 15 (not applicable to alternative E). Impacts of ORV use and other recreational uses under alternative C would be less than those incurred under alternative A. This is due to a seasonal restriction on night driving from May 1 through September 14, the increase in the amount of pedestrian-only use areas by 4 miles, the closing of ORV routes where no ferry access is available, the prohibition on all high-performance sport-model and two-stroke ATVs and UTVs at the Seashore, shortening the timeframe that utility-model ATVs and UTVs would be permitted within the Seashore each year (reducing the March 16 through December 31 time under alternative A to September 15 through December 15), the reduction in the amount of Seashore open for ORV use, the fee-based ORV permitting system that would also limit the number of vehicles on the Seashore, the likely increased compliance with resource closures due to increased law enforcement and interpretative staffing positions, and the more intensive management actions that could be implemented under the adaptive management strategy. Compared to alternative E, the amount of impacts on piping plovers under alternative C would be greater due to public ORV use being allowed under alternative C whereas it would be prohibited under alternative E.

Under alternative D, impacts on piping plovers from resource management activities would be less than those under alternatives A (the no-action alternative) and E (the no ORV alternative). This is due to more consistent training and supervision of resource staff who conduct the surveys, limited predator removal, slightly expanded buffers around chicks on the beach (650 feet under alternative D compared to 600 feet under alternatives A and E), the expansion of brood buffers based on the mobility of the brood, and the increased education and monitoring efforts. Impacts from ORV use and other recreational uses would be reduced when compared to alternative A. This is due to the expansion of pedestrian-use only areas by 10 miles, night time driving restrictions from May 1 through September 14, the closing of ORV routes where no ferry access is available, the prohibition on all ATVs as well as all high-performance sport-model and two-stroke UTVs at the Seashore, shortening the timeframe that utility-model UTVs would be permitted within the Seashore each year (reducing the March 16 through December 31 time under alternative A to September 15 through December 15), the reduction in the amount of Seashore open for ORV use, the fee-based ORV permitting system with a limit on the number of vehicles allowed (which would be 8 percent less than current use), the likely increased compliance with resource closures due to increased law enforcement and interpretative staffing positions, and the more intensive management actions that could

be implemented under the adaptive management strategy. Compared to alternative E, the amount of impacts on piping plovers under alternative D would be greater due to public ORV use being allowed under alternative C whereas it would be prohibited under alternative E.

The resource management activities proposed for alternative E (the no ORV alternative) are essentially the same activities proposed for alternative A (the no-action alternative) except that with no public ORV use allowed on the Seashore under alternative E, there would be no recreational ORV-specific closures established and surveying and monitoring protocols would be reviewed and may change due to the elimination of impacts from recreational ORV use and a reduction in the amount of impacts from pedestrians. Under alternative A, the North and South Core Banks of the Seashore would remain open to ORV use in designated routes and areas (as documented in the Superintendent's Compendium), except where resource or safety closures are present. There would be no night driving restrictions under alternative A and no restrictions on the number of vehicles allowed on the Seashore either. Therefore, when compared to alternative A, alternative E would provide more protection to piping plovers because there would be no impacts related to public ORV use, and impacts related to other recreational uses would be reduced due to limited access to the ocean front beaches due to no public ORV use.

CONCLUSION

Overall, impacts on piping plover from ORVs and other recreational uses under alternatives A, B, C, and D are expected to be long-term and adverse, although compared to the existing condition, the proposed changes under each action alternative are beneficial. Allowing ORVs access to North and South Core Banks under alternative B would contribute to these adverse impacts, including noise disturbance, temporary displacement, and increased frequent escape flights. However, increased education and outreach, the use of additional species management measures, such as seasonal restriction on night driving, focused predator management, and restricting ATV and UTV use under alternatives B, C, and D would likely help mitigate the long-term adverse impacts of ORV use on piping plover by reducing mortality due to predators, reducing vehicular contact with individual birds, and educating visitors about the importance of resource protection. Additional benefits would result under alternative B, as posting of nesting areas for piping plover would occur 15 days earlier in the season (potentially catching early nesters). Benefits may also result under alternative D because pedestrian-only closures for nesting/fledging piping plover would be a minimum of 650 feet and based on brood mobility. However, compliance with closures may not be absolute, resulting in continued disturbance of breeding habitat and potential mortality of individuals if noncompliance occurs. Impacts on piping plover from pedestrian access under alternative E would likely be slight, short-term and adverse due to limited noise disturbance and temporary species displacement. Prohibiting ORV access at the Seashore under alternative E would remove a source of disturbance for piping plover, resulting in long-term beneficial impacts, which could eventually reduce the need for special management of and mitigation for piping plover at the Seashore.

Significance Discussion

The purpose of Cape Lookout National Seashore (the Seashore) is to preserve the outstanding natural, cultural, and recreational resources and values of a dynamic, intact, natural barrier island system where ecological processes dominate. The Seashore is one of the few remaining locations on the Atlantic coast where visitors can experience and recreate in an undeveloped, remote barrier island environment that can be reached only by boat or ferry. North Carolina is currently the only state on the Atlantic Coast that hosts piping plovers during all phases of their annual cycle. The Seashore is a significant nesting area, containing 70 percent of the nesting pairs in the state of North Carolina. The Seashore is used by the Great Lakes and Great Plains populations of piping plover for wintering, and the Atlantic Coast population for breeding and wintering. Piping plovers were common along the Atlantic Coast during much of the 19th century, but nearly disappeared due to excessive hunting for decorative feathers.

Following passage of the Migratory Bird Treaty Act (MBTA) in 1918, plover numbers recovered to a 20th century peak during the 1940s. However, an increase in development and beach recreation after World War II caused a population decline that led to federal protection for the plover. Habitat loss caused by human development and recreation, and low reproductive rates caused by disturbance and predation, were considered to be the primary causes of the decline. The Atlantic Coast piping plover population was federally listed in 1986 as threatened. The USFWS first designated critical habitat for the wintering population of the piping plover in 2001 along the coasts of North Carolina through Texas. Critical wintering habitat for piping plovers is identified by the USFWS in six geographic locations of Cape Lookout National Seashore. In 2008, the greatest concentration of piping plover nests at Cape Lookout National Seashore was found around New Drum Inlet, which is now considered the most important site in North Carolina for the survival of this species. Monitoring of piping plovers began in 1989. In 2012 the number of piping plovers was at its highest with 51 breeding pairs, and in 2004 the number of piping plovers was at its lowest with 13 breeding pairs. Predators, human disturbance, and limited or blocked access to foraging habitat have been identified in past research as contributing to impacted reproductive success for plovers using the Seashore. The greatest concerns related to wintering and migrating birds are habitat loss and degradation from development and beach stabilization and chronic human disturbance.

Piping plovers at the Seashore currently receive substantial protections, which would increase in varying degrees under alternatives A, B, C, and D. These protections would increase under alternatives C and D, which limit ORVs to historical limits, and would dramatically increase under alternative E, since the elimination of ORVs may cause an increase in plover fledgling success. Adverse impacts to piping plovers across all alternatives would be small, as described in the impacts analysis above. While there may be occasional adverse impacts to individual plovers, under all alternatives the Seashore would continue to conduct monitoring, installation of buffers and closures to increase nest success. Piping plover nests would be marked to improve visibility and prevent impacts from ORVs, which can negatively impact nest success. A decrease in recreational uses during seasonal closures, as discussed in the alternatives, help protect wintering populations of piping plover along the Seashore. The alternatives would also have full recreational prenesting closures at all active and historical nest locations. Daily monitoring and subsequent buffers and closures would occur at active nesting locations for the duration of the brooding period. Under alternatives B, C, and D, additional protections for piping plovers (above and beyond the no-action alternative and existing condition) are added, including light pollution mitigation measures, a ban on night driving, predator management, a permit system which limits ORV numbers in alternatives C and D, ORV route restrictions and reductions, creation of additional pedestrian-only areas, ATV and UTV restrictions, and an adaptive management strategy. These additional measures under alternatives B, C, and D would primarily result in increased protections and beneficial impacts to piping plovers, as described in detail in the impacts analysis above. This is a beneficial change for piping plovers compared to the existing condition, (greatly reducing, and in some cases eliminating, impacts from ORVs), and does not result in significant adverse impacts.

Under alternatives A, B, C, and D, designating legal routes for ORV use does not establish a precedent for future actions with significant effects, as ORV use has occurred at the Seashore since the 1930s and continued since the establishment of the Seashore as a park unit in 1976, and the current and proposed species protection measures are substantial, resulting in a low overall level of impacts to piping plovers. ORV use is also currently legally permitted in several other national seashores and recreation areas, and in this regard is not precedent-setting within the national park system. As described above, ORV use does not cause significant impacts to piping plovers, in part because of the substantial resource protection and mitigation measures taken by the Seashore, as well as the adaptive management strategy in alternatives B, C, and D, which would further strengthen mitigation measures and even limit use if certain indicators are met. Alternative E, which prohibits ORV use, would not establish a precedent for future actions with significant effects to piping plovers, as many other national park units do not allow ORV use.

There are a number of cumulative impacts to piping plovers, described in the impacts analysis above, which may be short- and long-term, limited, and adverse, as well as long-term beneficial. However, while adverse effects on piping plover from other actions occurring in the region would still exist, actions under alternatives A, B, C, D, and E would provide additional protections that would be beneficial to the regional population of this species and would mitigate any adverse cumulative impacts already occurring.

In conclusion, compared to the existing condition, additional impacts to piping plovers under alternatives A, B, C, D, and E would be small. The Seashore has in place substantial resource protection and mitigation measures that would continue and would be strengthened in the action alternatives. When compared to the existing condition, in light of the significance criteria at 40 CFR 1508.27, there would be no significant adverse impacts to piping plovers from alternatives A, B, C, D, or E.

RED KNOT

SPECIES-SPECIFIC METHODOLOGY AND ASSUMPTIONS

Potential impacts on the red knot populations (proposed for federal listing as a threatened species as of September 2013) and habitat were evaluated based on available data on the species' past and present occurrences at the Seashore, scientific literature on the species, life history, scientific studies on the impacts of human disturbance on red knots and other species, as well as documentation of the species' association with humans, pets, predators, and ORVs. Information on habitat and other existing data were acquired from NPS staff, the USFWS, and available literature.

STUDY AREA

The geographic study area for assessment of the various alternatives is Cape Lookout National Seashore in its entirety. The geographic study area for the cumulative impacts analysis is the Seashore and the state of North Carolina.

ALTERNATIVE A

Impacts of Alternative A: No Action

Resource Management Activities

Surveying and Monitoring—Other than surveying for migrating and wintering red knots (see “Management of Wintering and Nonbreeding Birds”) the Seashore would not conduct any surveying or monitoring activities targeted specifically for red knots, as they do not breed at the Seashore. Instead, red knots use the Seashore as a stopover during their spring and fall migrations. Some birds also winter at the Seashore. However, under alternative A, NPS staff would perform surveys of recent breeding areas for protected bird species (i.e., piping plover, American oystercatcher, and colonial waterbirds) other than red knots, and would also continue to monitor breeding, nesting, and fledging activities throughout the breeding season. They would also conduct daily surveying and monitoring activities for sea turtle nesting. Surveying and monitoring activities bring NPS staff and/or vehicles in proximity to shorebird species, including red knots. These activities have the potential to lead to flushing responses or other behavioral changes that have been known to occur in other types of birds, and could have the potential to negatively impact feeding, resting, or other actions of red knots as well (Anderson and Keith 1980; Ellison and Cleary 1978; Hand 1980; Tremblay and Ellison 1979). This would be especially true during the spring and fall migrations when red knots are most abundant at the Seashore. Breeding bird related surveys start in April and extend into the summer until the end of the nesting season, while red knot numbers at the

Seashore typically peak in April and May for the spring migration with a smaller peak in August for the fall migration (NPS 2012u, 2011b, 2010k, 2009b, 2008b, 2007q, 2006i). Red knots are likely to react to disturbance from research and monitoring activities similarly to the way they react to nonresearch and monitoring related disturbance. Harrington (unpublished data reported in Niles et al. 2009) found that the proportion of red knots that flew out of site during research activities was similar to the proportion of red knots that flew out of site in reaction to disturbances not related to research and monitoring. Likewise, Harrington (unpublished data reported in Niles et al. 2009) found no statistically significant difference in the mean number of calories used by red knots when reacting to the activities of researchers and red knots reacting to nonresearch related disturbances.

Establishment of Prenesting Closures—Red knots do not breed at the Seashore so there would be no prenesting closures established targeting them. However, under alternative A, full recreational prenesting closures would be established by April 1 in all active, historical, and potential new piping plover habitat, recent piping plover breeding areas, as well as in active colonial waterbird nesting areas. ORV closures would also be established by April 1 in historical tern and black skimmer nesting areas and any potential new habitat where, from site inspection, a qualified staff biologist determines that nesting may be likely to occur. The symbolic fencing would deter the entry of people, pets, and ORVs into these habitats and minimize potential disturbances. While these areas could provide protection from disturbance to red knots if they use this habitat, red knots are generally found in the intertidal area of the beach where they forage in the wet sand. Thus, any potential beneficial impacts to red knots from prenesting closures for other species would be minimal.

Buffer/Closure Establishment—Under alternative A, no ORV or full recreational closures would be implemented that specifically target the red knot, putting individual birds at risk of disturbance from ORVs, pedestrians, and pets causing short- and long-term adverse impacts. Disturbance can lead to flushing (or escape) responses, which in turn could disrupt foraging and resting behavior (Anderson and Keith 1980; Ellison and Cleary 1978; Hand 1980; Tremblay and Ellison 1979). However, red knots would benefit from the establishment of ORV and full recreational closures under alternative A for other protected species, including sea turtles, to the extent that the buffers and closures encompass the red knot's prime foraging habitat; the ocean shoreline.

For sea turtles, six nest relocation areas (three each on North Core and South Core Banks) would be designated and would be closed to ORV traffic beginning 50 days after the first nest is relocated to the area. The nest relocation areas would reopen to ORV traffic when the last nest in the area has been excavated. These ORV closures would be ramp to ramp closures, and would generally be 0.5 to 1.0 mile long. Additionally, camping and campfires would be prohibited in these areas. Red knots using the ocean shoreline for foraging or resting in the relocation areas would be free from disturbance by ORVs, providing beneficial impacts. However, because of the timing of the closures, the beneficial impacts would be minimized. The timeframe that the nest relocation areas would be closed to ORVs does not cover the red knot's spring migration (April/May) which is when the species is most abundant at the Seashore, with peak numbers typically in excess of 1,000 birds (NPS 2012u, 2011b, 2010k, 2009b, 2008b, 2007q, 2006i). From June through October, red knots generally number less than 200 birds at the Seashore, though in 2012 the fall migration peaked at close to 800 birds in early August (NPS 2012u).

For protected bird species, under alternative A, after a piping plover nest hatches and chicks are found on the ocean beach, a minimum 600-foot ORV closure around each brood would be established. A 2-mile ORV closure would also be established at the north end of South Core Banks from the first nest hatch until the last chick has fledged or is lost. Ramp-to-ramp ORV closures would occur for American oystercatcher chicks found on the beach unless no back route was available, then ORVs would be allowed to traverse the area at 15 mph. For colonial waterbird chicks present at the point of Cape Lookout beach, 150-foot buffers would be established around the broods. All of these closures and buffers would be

reopened to ORV traffic when the last chick is fledged or lost. Additionally, all of Shackleford Banks, Portsmouth Flats, the interior of the point of Cape Lookout, the beach between mile markers 41a and 41b, and Power Squadron Spit would be permanently closed to public ORV use. Since habitat protected by these buffers and closures overlaps red knot foraging habitat, red knots would see beneficial impacts from the lack of ORV disturbance in these areas while they are in place. The buffers for the unfledged chicks of other protected species would also provide benefits to red knots. The buffers would be adjusted in response to brood movements, and the frequent adjustment of the buffers by NPS staff could cause some disturbance of foraging red knots causing some adverse impacts (Anderson and Keith 1980; Ellison and Cleary 1978; Tremblay and Ellison 1979; Hand 1980).

Management of Wintering and Nonbreeding Birds—Red knots do not breed at the Seashore, but use the Seashore as a stopover point during spring and fall migrations. As a result, surveys for red knots would be conducted in the spring and fall during their migration period on North and South Core Banks according to the International Shorebird Survey guidelines for frequency and timing. In accordance with the International Shorebird Survey guidelines, surveying for red knots would occur at 10-day intervals on the 5th, 15th, and 25th of each month from March 15 through June 5 and from July 15 through October 15 (NPS 2012u). Surveying activities could have short-term adverse impacts on red knots as the presence of resource staff and vehicles in proximity to the birds could result in flushing responses or other behavioral changes that negatively impact feeding, resting, or other actions of red knots (Anderson and Keith 1980; Ellison and Cleary 1978; Hand 1980; Tremblay and Ellison 1979). However, resource protection staff would take proper measures, such as using binoculars so they can observe the species from greater distances, to minimize any disturbance to red knots during the surveys. Additionally, the survey intervals (i.e., 10 days) would also help minimize adverse impacts from surveying by not causing chronic disturbances. While the actual survey activities may cause some short-term adverse impacts, overall, surveying the nonbreeding population of red knots at the Seashore would also result in long-term benefits, due to increased knowledge and awareness of the species.

Some red knots winter over at the Seashore. Additional winter counts in recent years found 370 birds on February 17 and 39 birds on November 16 on North Core Banks; and 69 birds on November 14 on Shackleford Banks in 2012 (NPS 2012u); 58 birds on South Core Banks on December 9, 2011 (NPS 2011b); 120 birds on North Core Banks on December 15, 2010 (NPS 2010k); and 340 birds on North Core Banks on December 15, 2009 (NPS 2009b). Some short-term disturbance to foraging or resting red knots may occur due to the presence of NPS staff and vehicles during these surveys. However, the data collected would provide long-term beneficial impacts by providing Seashore managers with information on the types and locations of habitats used, the seasonality of red knot use of the Seashore, as well as other pertinent information, allowing the Seashore to better understand and manage the species.

Surveys would also occur for the nonbreeding population of piping plovers that spend the winter months at the Seashore. Surveys for nonbreeding plovers would occur just once per month from August 1 through March 31. Surveying activities for nonbreeding plovers could cause some disturbance to red knots on the beach through the presence of NPS staff and vehicles causing flushing behavior. However, any impacts would be greatly minimized by the fact that the surveys for nonbreeding plovers only occur once per month.

Under alternative A, the Seashore would be closed to vehicles from January 1 through March 15. This closure would result in long-term benefits for wintering red knots by providing protected habitat during the winter and allowing the beach profile to recover without any vehicles on it. Outside of the January 1 through March 15 timeframe, no closures would be specifically implemented for migrating or wintering shorebird protection which could result in disturbance of individuals, leading to displacement and altered foraging behavior (Burger 1991; Zonick 2000; McAtee and Drawe 1981). However, impacts would be minimized somewhat through permanent ORV closures which include all of Shackleford Banks,

Portsmouth Flats, the interior of the point of Cape Lookout, the ocean beach between mile markers 41a and 41b, and Power Squadron Spit.

While the closure of the Seashore to vehicles from January 1 through March 15 would help protect wintering red knots, no closures would be established for pedestrians, which could result in disturbance of birds and habitat from pedestrian use, leading to displacement and altered foraging behavior. However, adverse impacts would be largely imperceptible because many passenger ferries stop operating in the winter, the amount of pedestrian use during the winter months is very low, and without a means of transportation on the beach, most visitor use would be confined to areas in the immediate vicinity of the ferry landings.

Predator Management—In migratory stopover areas for the red knot, such as the Seashore, a number of avian predators, such as the peregrine falcon or large gulls such as the great black-back gull and the herring gull, are the most common predators of red knots (FR 2013b). While mammalian predators may be a threat by causing disturbance to red knots, direct mortality from them is low (FR 2013b). An indirect impact from ORV and recreational use is the attraction of mammalian and avian predators to the waste stream (food, trash, fish bait, and scraps, etc.) associated with recreational use (NPS 2006e; USFWS 1996a). Although the Seashore would enforce proper trash disposal and anti-wildlife feeding regulations, recreational use of the ocean beach would continue to attract predators, which could slightly enhance the occurrence of disturbance from predators, or in the case of large gulls, mortality, of red knots, resulting in some small amount of adverse impacts.

Education/Public Outreach—Under alternative A, the public would continue to receive information at the visitor centers about listed/sensitive species and their ecology, as well as the measures the Seashore is taking to protect these species. Annual protected species reports would continue to be published on the Seashore's website regarding the previous season. The public would continue to be notified about closures that would limit ORV or pedestrian traffic, as well as when these closures reopen. Also, education and outreach materials would be provided regarding the impacts of trash disposal, wildlife feeding, and pets on sensitive species at the Seashore. Such public outreach is beneficial to red knots as it educates the public on the specific needs of the species and alerts the public ahead of time to areas where they cannot go due to potential impacts on sensitive birds. Public education has long been recommended as a way to reduce disturbance to sensitive species and habitats and garner support for conservation programs (Klein, Humphrey, and Franklin 1995; Boettcher et al. 2007; Carlson and Godfrey 1989). Therefore, public outreach as part of species management would result in long-term beneficial impacts to red knots.

Research/Monitoring—Ongoing research at the Seashore under alternative A would include monitoring American oystercatcher nesting and chick survival and success and document causes of chick mortality. In the future, there would likely be other research to study wildlife at the Seashore. Research efforts have the potential to negatively impact feeding and resting behavior of shorebirds over the long-term due to the increased human presence and use of ORVs (Anderson and Keith 1980; Ellison and Cleary 1978; Hand 1980; Tremblay and Ellison 1979). However, any research directed at red knots would result in long-term beneficial impacts for the species because it is likely that results from the research would lead to a greater understanding of the red knot which could inform future protection and management of the species.

ORV and Other Recreational Use

ORVs and Pedestrian Access— Under alternative A, 81 percent (45 miles) of the Seashore beaches would be open for public ORV use, including ATVs and UTVs, in designated routes and areas (as documented in the Superintendent's Compendium) from March 16 through December 31. As described above under "Buffer/Closure Establishment," the Seashore does not establish ORV and full recreational

closures for red knots, but full recreational closures are established for other species, such as piping plovers, sea turtles, seabeach amaranth, and state-listed and special-status species. Safety closures are also established when certain areas of the beach become too hazardous for safe public use. Based on data from 2008 to 2013, the total amount of ORV resource and safety closures at the Seashore averages approximately 10 miles during the summer months and approximately 5.4 miles during the fall. These closures protect approximately 22 percent more of the Seashore that would otherwise be open to ORV impacts during the summer months, and approximately 12 percent more of the Seashore during the fall months. To the extent that these closures encompass the ocean beach where red knots forage and rest, the closures provide beneficial impacts by protecting habitat and birds from the adverse impacts caused by ORV use.

ORV use and other recreational activities that occur in the months when red knots are present at the Seashore (stopovers during spring and fall migration; winter residents) have the potential to adversely impact red knots by disturbing their resting and foraging behaviors. Disturbance of shorebirds can cause behavioral changes that result in less time resting or foraging, shifts in feeding times, decreased food intake, and more time and energy spent in alert postures or fleeing from the disturbance, also known as frequent escape flight (Burger 1994; Burger et al. 2007; Johnson and Baldassarre 1988; Lafferty 2001a, 2001b; Tarr 2008).

Each year red knots migrate long distances between their breeding grounds in the Arctic and their wintering areas. Wintering areas include the Atlantic and Gulf of Mexico coasts of North America, the Caribbean, and along the north and southeast coasts of South America (FR 2013b). Because of the long distances traveled, stopover areas, such as the Seashore, are important for the birds to be able to feed on easily digestible food to quickly restore weight gain for the next leg of their migration (FR 2013b). Disturbance of migratory birds at stopover areas is of concern because frequent escape flights result in a reduction in time foraging or resting and an increase in the time spent flying (Tarr 2008). By reducing time spent foraging and increasing energy spent fleeing, disturbance by ORVs and other recreational activities may hinder the red knot's ability to replenish its fat reserves for the next phase of its migration (FR 2013b). In a study of shorebirds on Delaware Bay beaches in New Jersey, Burger et al. (2004) found that wintering shorebirds flew away and did not return to forage in response to 58 percent or more of the human disruptions and showed no indications of habituating to disturbance. Escudero et al. (2012) also found that total red knot feeding time was 0.5 hours shorter due to continuous disturbance and flushing of birds by ORVs, people, and dogs during prime feeding time just after high tide.

Although ATVs and UTVs are considered to be a type of ORV, their use may impact shorebird behaviors differently than other types of vehicles. At Cape Lookout and Cape Hatteras National Seashores, McGowan and Simons (2006) found that while increases in ATV traffic increased the rate of trips to and away from the nest and reduced the percent of time spent incubating in American oystercatchers, other types of ORVs (i.e., four-wheel drive passenger vehicles) and pedestrian traffic had little measured effect on incubation. ATVs are louder and faster than other ORVs and pedestrians, which may be why birds are affected more by ATV traffic (McGowan and Simons 2006).

In another study, Simons and Borneman (2012) found that American oystercatchers were on their nests significantly less during all types of ORV (passenger vehicles, ATVs – single passenger, and UTVs – all-terrain vehicles with side-by-side passengers) and pedestrian events than before those events occurred, with the most significant decline in percentage of observations on the nest attributable to ATVs followed by UTVs. Based on the authors' graphical display of the data, American oystercatchers were on their nests approximately 85 percent of the time 20 minutes prior to all observances of human activities (e.g., passing of ORVs, ATVs, and UTVs). During the passing of an ORV (i.e., passenger vehicle), American oystercatchers were on their nests approximately 80 percent of the time, while during the passing of UTVs and ATVs the birds were observed on their nests approximately 62 percent and 33 percent of the

time respectively. However, in the same study, Simons and Borneman (2012) found that the average heart rate of 36 incubating oystercatchers during all types of human activity (pedestrians, ORVs, ATVs, and UTVs) was not significantly higher than the heart rate from birds 20 minutes before a human activity event occurred. Therefore, although the physiological response of American oystercatchers seems to indicate habituation to disturbance, their behavioral response does not indicate a habituation to disturbance. While the study was looking at nesting birds, it is reasonable to surmise that because they are louder and faster, ATVs and UTVs would also have an increased disturbance effect on other bird behavior such as foraging. Thus, even with buffers and other ORV or full recreational closures, ATV and UTV use as allowed under alternative A could adversely affect red knots at the Seashore because of the potential for greater disturbance and disruption of foraging behavior along the ocean shoreline as compared to other types of ORVs.

ORV traffic can also adversely impact beach invertebrates, which are a food source for red knots. In Australia, Schlacher and others (2008) found ORV impacted beaches had significantly fewer species at reduced densities than non-ORV beaches, and although these impacts were detectable throughout the year, the impacts increased during the summer when ORV traffic was greater. At Cape Cod National Seashore, Leatherman and Godfrey (1979) found that in the soft sands of intertidal sand flats, amphipods (*Talorshestia*) numbered fewer where ORV driving occurred than where it did not occur. The authors also found that polychaete worm (clam worm) populations and soft-shell clam (*Mya arenaria*) populations were totally decimated when applying 50 vehicle passes per day over 20 days to experimental plots. ORV traffic has also been shown to affect the burrowing performance of clams (Sheppard, Pitt, and Schlacher 2009). Not all invertebrates are susceptible to impacts from ORVs though, especially those species that burrow into the sand in the intertidal zone when the tide is out, because ORVs only sink into the firm sand one tenth of an inch or so (Wolcott and Wolcott 1984). Wolcott and Wolcott (1984) found that in the intertidal zone coquina clams and mole crabs, both of which reside below the sand surface when the tide is out, are immune to ORV damage, whereas Vande Merwe and Vander Merwe (1991) found in a study in South Africa that the gastropod *Bullia rhodostoma*, the clams *Donax serra* and *Donax sordidus*, and the benthic mysid (*Gastrosaccus psammodytes*) showed a high tolerance for ORV traffic.

The number of red knots wintering at the Seashore is far less than the number of birds that use it as a migratory stopover (winter numbers range from less than 100 to upwards of 400, while spring migration numbers generally exceed 1,000 and reached approximately 1,600 in 2012 (NPS 2012u, 2011b, 2010k, 2009b)). However, the closure of the Seashore to vehicles from January 1 through March 15 every year would help protect any wintering red knots from the impacts of ORV use (e.g., displacement, frequent escape flights) during this time. The seasonal closure would allow the beach profile to recover from heavy fall fishing use, which would indirectly benefit red knots by protecting potential habitat in the spring. Passenger ferries would continue to enable pedestrians to access the Seashore from January 1 through March 15. Any potential adverse impacts to wintering red knots, such as temporary displacement and reduced foraging success, would be minimal due to reduced use of the Seashore by pedestrians during the winter months and the fact that without a means of transportation on the beach, most visitor use would be confined to areas in the immediate vicinity of the ferry landings.

Under alternative A, pedestrian-only use areas would include Shackleford Banks, Portsmouth Flats, the lighthouse beach as defined between mile markers 41a and 41b, and Power Squadron Spit from mile marker 46.2 west to the end of the spit. Although ORVs would not be permitted in these areas, which would reduce the impact of motorized vehicle use on red knots in those areas, the presence of pedestrians and continued non-ORV recreational activities could result in short-term adverse impacts, such as species displacement and frequent escape flights, depending on the time of year and frequency of activities.

Buffers, closures, and other species management measures under alternative A are designed to help protect special-status species, including the red knot. However, noncompliance with these measures does

occur (NPS 2012t, 2011a, 2010b, 2009a, 2008c, 2007i). Noncompliance can result in people, vehicles, and pets coming into close proximity to red knots. This could lead to flushing responses or other behavioral changes, which in turn could have the potential to negatively impact birds during feeding, resting, or other activities (Burger 1991; Flemming et al. 1988; Melvin et al. 1994; Patterson et al. 1991; Patterson, Fraser, and Roggenbuck 1990; Zonick 2000). Dogs are of particular concern, as shorebirds are more likely to be flushed by dogs than people, and birds react to dogs at greater distances than people (Lafferty 2001a, 2001b). In reacting to dogs, Burger et al. (2007) found that foraging shorebirds in migratory habitat did not return to the beach following the disturbance. Unleashed dogs also often chase shorebirds (Burger 1986; Lafferty 2001b). From 2010 to 2012, an average of 195 citations or warnings were given for dogs off leash (NPS 2012t, 2011a, 2010b). While regular patrols of areas by law enforcement rangers, trained observers, and field biologists help to deter closure and leash violations, with continued ORV and pedestrian access at the Seashore, and no planned increases in law enforcement or resource protection staffing under alternative A, it is anticipated that noncompliance (either intentional or unintentional) with regulations and closures would likely continue to occur. These violations would adversely impact red knots by bringing vehicles, pedestrians, and likely pets in close proximity to the birds, causing short term adverse impacts at the location of the violation and could result in long-term adverse impacts from decreased fitness for the next leg of the red knot's migration.

Night-Driving—Under alternative A, there would be no restrictions on night driving. Red knots are known to be active at night (Niles et al. 2009) and would be subject to vehicular and pedestrian disturbance, which could impact their foraging behavior. As described above under “ORVs and Pedestrian Access,” red knots rely on foraging at migration stopovers to add necessary body fat reserves for their long migration, and disturbance can result in less time foraging as well as expending energy in flight responses. Therefore, allowing night driving under alternative A would result in long-term adverse impacts.

Permit Requirements—Under alternative A, there would be no permitting requirements (except for long-term parking) for ORV use at the Seashore. It is anticipated that visitation to the Seashore will slowly grow in the future, with an estimated annual increase of approximately 1.5 percent (NPS 2010j). With increased visitation, it is assumed that the number of ORVs on the beach at the Seashore would also slowly grow in the future. As described under the alternatives where a permit system would be implemented, such a system would provide additional education to ORV users regarding protected species and important habitat at the Seashore, as well as additional methods (i.e., revoking permits) for dealing with noncompliance of Seashore regulations. The lack of a permit system could result in limited adverse impacts on red knots because without a permit program, there would be less user education regarding protected species. Also, without a permit program, the number of ORVs on the Seashore would be allowed to grow unencumbered, and as the number of vehicles at the Seashore continues to increase, the potential for vehicle disturbance to red knots would also likely increase from current levels. This disturbance could include flushing response and other behavioral changes. The continued increase in vehicles on the Seashore could also result in an increase in the amount of noncompliance with Seashore regulations that are in place to protect special-status species, including the red knot.

Camping—Under alternative A, camping and campfires would be permitted on all beaches of the Seashore that are not otherwise closed by the Superintendent's Compendium, closed for safety, or closed for species protection. For species protection, areas where camping and campfires would be prohibited include all full recreational closures and the six sea turtle nesting relocation areas on North Core and South Core Banks. Prohibiting camping and beach fires in full recreational closures would benefit red knots where these closures overlap their habitat on the foreshore of the ocean beach, as disturbance from these activities would be reduced or eliminated. The sea turtle nesting relocation areas encompass the full beach area, including the foreshore, and each is approximately 0.5 to 1.0 mile long; thus prohibiting camping and campfires in these areas would provide beneficial impacts to red knots using these areas to

rest or forage by removing any disturbance from these activities. However, for red knots outside buffers or closures for other protected species, the use of ORVs and the presence of pedestrians associated with camping and beach fires could result in temporary displacement and/or increased stress responses for foraging and resting birds.

Cumulative Impacts under Alternative A

Other past, present, and reasonably foreseeable future actions within the Seashore have the potential to impact red knots. Various dredging has occurred and will continue to occur in the vicinity of the Seashore. Following Hurricane Irene, the Long Point ferry basin received dredging in 2011 (NPS 2011). However, dredging activities at the Seashore are generally minor and do not affect the ocean beach where red knots occur. In addition, the Beaufort Inlet has been dredged and would continue to be dredged on an annual basis as long as funding is available to the Army Corps of Engineers. In the past, dredge material from the dredging of Beaufort Inlet has not been placed on any Seashore beaches. However, moving forward, as part of the Morehead City Harbor DMMP, NPS has agreed to allow consideration for the deposition of restricted amounts of dredged material on Shackleford Banks during the 20-year period beginning in 2015 and extending through 2034 (USACE 2013). As it relates to Shackleford Banks, if the NPS allows dredged material to be deposited on the beach, the placement of material would potentially occur every 3 to 4 years along a 3.65-mile-long stretch of beach; the dredged material would be compatible with the existing beaches (>90 percent sand); and in any year that the NPS allows beach disposal to occur, the NPS would only permit it from November 16 through March 30. If it occurs, disposal of material on the beach would occur from the base of the existing frontal dune to the -24 foot depth, adding up to 33 acres of new ocean beach every 3 years about 1 mile east of the Shackleford Spit off Beaufort Inlet (USACE 2013). While disposal activities could temporarily disturb wintering red knots, causing short-term adverse impacts, long-term beneficial impacts would result from the increase in acres of beach habitat on Shackleford Banks.

Oregon Inlet has been dredged in the past and would continue to be dredged in the future. Due to the presence of nesting sea turtles, dredging activities do not take place during the spring or summer, which is also when red knot numbers peak during their spring and fall migration period (April/May and August); so there would be no direct impacts to migrating red knots. The dredging of inlets can affect spit formation adjacent to inlets, which over time could result in the loss of potential prime ocean shoreline foraging habitat, resulting in long-term adverse impacts. Dredging operations can also result in long-term beneficial impacts to red knots as well. Sand from dredging operations is often used for onshore beach nourishment which can help to curtail erosion and expand ocean beach habitat where red knots forage, though wintering plovers may be temporarily disturbed during the beach nourishment activities.

Several past, present, and future plans and actions at the Seashore address visitation and improvement of visitor amenities and, therefore, could impact red knots at the Seashore. The *Commercial Services Plan / Environmental Assessment / Assessment of Effect* (NPS 2007m) guides the Seashore in improving the management and operation of commercial visitor services, while providing self-directed and facilitated visitor opportunities. Visitor services that are offered and could continue to be offered at the Seashore include, land transportation services, sale of limited food and sundry supplies, and ferry transportation.

Land transportation services include a beach shuttle service originating in the lighthouse area and traveling to points on South Core Banks, limited UTV tours at the northern end of North Core Banks, and limited vehicle transportation service from the Long Point and Great Island concession areas. These services could have adverse impacts on red knots and their habitat similar to those previously described for public ORV use. However, any adverse impacts would be relatively small given the size of the operations and because their vehicles would continue to use established transportation routes including the back route and would adhere to all buffers/closures and other Seashore regulations. While the sale of

food could increase trash at the Seashore and attract predators, sales are limited and confined to developed areas of the Seashore, so impacts would be negligible. Ferry operations occur on the soundside of South Core and North Core Banks where there are no red knots, so there would be no impacts from the continued operation of these services.

The U.S. Navy and Marine Corps conduct flight operations in the area of the Seashore. These operations include recent actions taken by the military to lower the ceiling (or altitude) above which planes may fly up to the speed of sound from 10,000 feet to 3,000 feet, and increased capabilities of offshore training. In addition, Marine Corps Cherry Point Air Station is located approximately 30 miles northwest of the Seashore. The air station and its associated support locations occupy more than 29,000 acres, (U.S. Marine Corps n.d.). A 2012 report on the effects of military overflights on American oystercatchers at the Seashore (Simmons and Borneman, 2012), concluded that at their peak sound level, military overflights contributed to a 72.5 dBA (A-weighted decibel) sound level, which is comparable to walking along the oceanside of the point of Cape Lookout (see “Soundscapes/Acoustic Environment”). Thus, the report concluded that there is no noteworthy evidence that military overflights affect the behavioral responses of American oystercatchers, including low-altitude flyovers (Simmons and Borneman 2012). A separate study (Derose-Wilson et al. n.d.) looked at the potential impacts of the military flights on Wilson’s plover and colonial waterbirds (least terns, common terns, gull-billed terns, and black skimmers). Derose-Wilson et al. (n.d.) found that Wilson’s plovers did not exhibit any behavior changes to the military overflights, whereas least terns incubated their nests more after an overflight, but only during overflights in sound exposure levels greater than 90 dBA, which was the top 10 percent of sound exposure levels for all military overflights. Though sample sizes were small for other nesting colonial waterbirds, the authors found no indication that responses from colonial waterbirds would be different than those of the least tern. Although neither study specifically assessed the impacts to red knots, the authors of both studies concluded that the lower altitude flights did not have an appreciable effect on the behavior of any of the birds in question. Given the red knots do not nest at the Seashore and their similar use of the beach as foraging habitat to the American oystercatchers, it is reasonable to assume that the military overflights would not have an appreciable adverse effect on the red knot.

Currently, the BOEM is analyzing the issuance of leases for developing offshore commercial wind energy. BOEM in cooperation with the State of North Carolina has established a task force, comprised of relevant federal agencies, state government officials, and local and Tribal elected government officials, in the planning and decision-making process in identifying a wind energy area off the coast of North Carolina. Although the planning process includes a thorough analysis of reasonable alternatives and cumulative impacts on sensitive resources, including migrating birds, the development of off-shore wind turbines could adversely impact migrating red knots (including those that may use the Seashore). However, whether they impact red knots would depend on how far offshore the wind turbines are located, and if they are within the migratory path of the red knot. Adverse impacts associated with wind turbines include direct mortality from collisions with turbine blades and/or turbine avoidance, which can reduce fitness by exclusion from key foraging habitat or by energetic costs of inducing longer flight paths (especially for migrating shorebirds and ducks) (BOEM n.d.).

Many past, present and future actions, plans, and programs at the Seashore provide benefits for red knots. The *Cape Lookout National Seashore Interim Protected Species Management Plan/Environmental Assessment* states that the NPS will meet its obligations under the NPS Organic Act and the ESA to both proactively conserve listed species and prevent detrimental effects on these species. To meet these obligations, the Service will “manage designated critical habitat, essential habitat, and recovery areas to maintain and enhance their value for the recovery of threatened and endangered species.” In addition, the Service will take on active management programs to inventory, monitor, restore, and maintain listed species’ habitats, control detrimental nonnative species, control detrimental visitor access, and re-establish extirpated populations as necessary (NPS 2006a). Although the plan permits continued ORV

access, which has the potential to impact red knots at the Seashore, the plan is beneficial for red knots, because it includes measures to educate visitors about resources at the Seashore and management measures, including buffers and closures for other species along the ocean shoreline that also protect red knots. In addition, the plan includes future ongoing monitoring and staff resource protection activities, which have the potential to benefit the species by providing additional information to drive future management decisions. The education aspect of the plan provides long-term benefits to red knots because it helps to educate visitors about the conservation needs of the species at the Seashore and the protection measures that are put in place to help protect it.

Cape Hatteras National Seashore also previously implemented an Interim Protected Species Management Strategy/EA and more recently implemented a long-term ORV management plan/EIS; both of which include protection measures for special-status species to minimize potential adverse impacts from ORVs, pedestrians, and pets. Though measures are not specifically targeted towards the red knot, the red knot does benefit from them, as many of the measures protect other species using the ocean shoreline for foraging. Since this is where the red knot is primarily found, they too would benefit from these protective measures. Because Cape Hatteras National Seashore is in such close proximity to Cape Lookout National Seashore, the benefits to red knots at Cape Hatteras from these two plans also provide benefits to red knots at Cape Lookout through the long term protection of the entire regional population.

The USFWS recovery plan and designation of critical habitat for the piping plover provides protection to other species inhabiting the same areas, including red knots. Designated critical habitat for the piping plover at the Seashore includes all of the inlets in the Seashore, Portsmouth Flats, Kathryn-Jane Flats, and the point of Cape Lookout. The habitat includes ocean beach, mud flats, sand flats, and soundside beach used as foraging areas and sparsely vegetated low dunes. The critical habitat designated for the piping plover at the Seashore is protected and disturbance to these areas is limited. Because the critical habitat includes areas of ocean beach where red knots also forage, the red knot would also experience long-term benefits from the protection of these areas. An American Oystercatcher Conservation Plan exists as well, which focuses on the East and Gulf coast populations, including American oystercatchers occurring at the Seashore. The plan addresses major threats to the health of the species and outlines recommended conservation activities to remedy these threats. Because American oystercatchers share habitat with other shorebirds, conservation efforts for oystercatchers would likely result in long-term benefits for red knots at the Seashore (Schulte et al. 2007).

A population of culturally important wild horses exists at the Seashore on Shackleford Banks. The population of approximately 109 wild horses is legislatively protected (NPS 2012u) and is maintained through a horse management plan that defines how the population is cooperatively managed by both the NPS and the foundation of Shackleford Horses (NPS 2007h). The horses are generally found on the dunes, in the swales between the dunes, on the marsh or in the forest. Because they are generally not found on the ocean shoreline where red knots forage, management of the horses under the horse management plan would have no impacts on red knots.

The Seashore is implementing a long-range interpretive plan (NPS 2011k) that further articulates the purpose, significance, and themes of the Seashore. The long-range interpretive plan informs and guides the Seashore's interpretive and education programs, which includes information about threatened and endangered species within the Seashore. Such education programs, if implemented, would provide long-term benefits to red knots as they would help to educate visitors about the conservation needs of sensitive species at the Seashore and the protection measures that are put in place to help protect them.

The *Foundation Document* (NPS 2012s) for the Seashore identifies the following projects that may impact red knots at the Seashore to some degree: Harkers Island Master Plan, Great Island and Long Point Master Plan, Resource stewardship strategy, Comprehensive Sign Plan, nonnative species and predator

management plan, and the sustainability plan/green plan. These planning efforts would establish development patterns at the Seashore, taking into consideration the location of sensitive species, especially their breeding locations, and plan to avoid or minimize impacts to these habitats. A comprehensive sign plan would allow the NPS to more effectively communicate messages to visitors, including those regarding the importance of species management at the Seashore. A nonnative species and predator management plan would provide for additional protection of red knots by helping to reduce disturbance from mammalian predators. All of these planned efforts would have some measure of beneficial impacts on red knots at the Seashore to the extent that they provide beneficial impacts or along the ocean shoreline where the red knots are generally found foraging.

Finally, Cape Lookout National Seashore conducted a predator study to evaluate ways to alleviate threats to federally listed species at the Seashore. A three-year research study (2007-2009) evaluated the response of both predator (raccoon) and prey populations to raccoon removal. The NPS decided to implement the preferred alternative (Experimental Reduction of Raccoon Population to Evaluate Removal as an Option for Protected Species Management) outlined in the predator study/EA. Although the preferred alternative would result in direct removal of raccoons and reduction in the raccoon population at the Seashore, the overall impact would provide some slight long-term benefits to red knots by helping to control mammalian predators, such as fox and others, which can cause disturbance to adult birds. Predator trapping might result in short-term disturbance to foraging red knots. However, overall predator management actions would likely be beneficial to red knots.

The overall combined impacts of these past, current, and future actions on red knot would be short- and long-term, and adverse from disturbance to foraging and nesting birds from visitor/ORV use, dredging activities, visitor amenity improvements, and military overflights. There would also be long-term beneficial impacts from the protection afforded to red knots and their habitat by species monitoring, other protected species' buffers, habitat protection, visitor protection patrols, visitor education programs, predator management, and future planning efforts under the Foundation Plan. While adverse effects on red knot from other actions occurring in the region would still exist, actions under alternative A would provide additional protection that would be beneficial to the regional population of this species and would offset some of the adverse effects.

ALTERNATIVE B

Impacts of Alternative B

Resource Management Activities

Surveying and Monitoring—Similar to alternative A, under alternative B the Seashore would not conduct any surveying or monitoring activities targeted specifically for red knots other than surveying for migrating and wintering red knots (see “Management of Wintering and Nonbreeding Birds”). However, surveying and monitoring for other protected bird species (i.e., piping plover, American oystercatcher, and colonial waterbirds) and sea turtles would be the same as under alternative A, and result in the same short-term adverse impacts. Surveying and monitoring activities would bring NPS staff and/or vehicles in proximity to shorebird species, including red knots. This would have the potential to lead to flushing responses or other behavioral changes that have been known to occur in other types of shorebirds, and could have the potential to negatively impact feeding, resting, or other actions of red knots as well (Anderson and Keith 1980; Ellison and Cleary 1978; Hand 1980; Tremblay and Ellison 1979). To help minimize any adverse impacts from monitoring and surveying activities, under alternative B there would be more consistent training and supervision of resource staff who conduct the surveys. This would result in a higher quality of monitoring for shorebird species, resulting in beneficial impacts.

Establishment of Prenesting Closures—Red knots do not breed at the Seashore, so there would be no prenesting closures established targeting them. Establishing full recreational prenesting closures for other protected bird species under alternative B would be the same as for alternative A, except that they would be established by March 16, prior to opening the beach to vehicles. While the protected prenesting areas could also provide protection from disturbance for any red knots that may use this same habitat, including those that may arrive prior to the peak migration timeframe of April and May, red knots are generally found in the intertidal area of the beach where they forage in the wet sand. Thus, any potential beneficial impacts from prenesting closures for other species would be minimal.

Buffer/Closure Establishment—Under alternative B, no ORV or full recreational closures would be implemented that specifically target red knots, putting individual birds at risk of disturbance from ORVs, pedestrians, and pets, causing short- and long-term adverse impacts. Disturbance can lead to flushing (or escape) responses, which in turn could disrupt foraging and resting behavior (Anderson and Keith 1980; Ellison and Cleary 1978; Hand 1980; Tremblay and Ellison 1979). However, ORV and full recreational closures for other protected bird species, as well as nest relocation areas for sea turtles, would occur under alternative B in the same manner as they would under alternative A. These buffers and closures would help protect red knots as they would under alternative A to the extent that they encompass the ocean shoreline, which is the red knots prime foraging habitat and where they are most often found at the Seashore. Buffers and closures that would benefit red knots include the minimum 600-foot ORV buffer on either side of a piping plover brood for unfledged chicks, a 2-mile ORV closure established at the north end of South Core Banks from the first piping plover nest hatch until the last chick has fledged or is lost, ramp-to-ramp ORV closures for American oystercatcher chicks, and the 150-foot buffers established at the point of Cape Lookout beach for colonial waterbird chicks. The six sea turtle nest relocation areas (0.5 to 1.0 miles in length) established on North Core and South Core Banks would also protect red knots once they are closed to ORV traffic beginning 50 days after the first nest is relocated to them until they are reopened after the last nest has been excavated. Red knots would also be afforded protection by the permanent closure to ORVs of Shackleford Banks, Portsmouth Flats, and the interior of the point of Cape Lookout, the beach between mile markers 41a and 41b, and Power Squadron Spit.

The buffers for the unfledged chicks of other protected species would also provide benefits to red knots. The buffers would be adjusted in response to brood movements, and the frequent adjustment of the buffers by NPS staff could cause some disturbance of foraging red knots causing some adverse impacts (Anderson and Keith 1980; Ellison and Cleary 1978; Tremblay and Ellison 1979; Hand 1980).

Management of Wintering and Nonbreeding Birds—Under alternative B, surveying activities for nonbreeding and wintering birds would be the same as described for alternative A, potentially resulting in noise disturbance and short-term displacement of red knots from the presence of resource staff and essential vehicles in foraging/resting habitat (Anderson and Keith 1980; Ellison and Cleary 1978; Hand 1980; Tremblay and Ellison 1979). However, resource protection staff would take proper measures, such as using binoculars so they can observe the species from greater distances, to minimize any disturbance to red knots during the surveys. Additionally, the survey intervals (i.e., 10 days) would also help minimize adverse impacts from surveying by not causing chronic disturbances. While the actual survey activities may cause some short-term adverse impacts, overall, surveying the nonbreeding population of red knots at the Seashore would also result in long-term benefits, due to increased knowledge and awareness of the species. Surveys would also occur for the nonbreeding population of piping plovers that spend the winter months at the Seashore. Surveys for nonbreeding plovers would occur just once per month from August 1 through March 31. Surveying activities for nonbreeding plovers could cause some disturbance to red knots on the beach through the presence of NPS staff and vehicles causing flushing behavior. However, any impacts would be greatly minimized by the fact that the surveys for nonbreeding plovers only occurs once per month.

As described for alternative A, some red knots use the Seashore as wintering habitat; therefore, the closure of the Seashore from January 1 through March 15 would result in long-term benefits for any wintering red knots by providing protected habitat during the winter and allowing the beach profile to recover from heavy fall fishing use. Recovery of the beach profile would also benefit red knots that use the Seashore as a stopover during their spring and fall migrations. Outside of the January 1 through March 15 timeframe, no closures would be specifically implemented for migrating or wintering shorebird protection which could result in disturbance of individuals, leading to displacement and altered foraging behavior (Burger 1991; Zonick 2000; McAtee and Drawe 1981). However, impacts would be minimized somewhat through permanent ORV closures which include all of Shackleford Banks, Portsmouth Flats, the interior of the point of Cape Lookout, the ocean beach between mile markers 41a and 41b, and Power Squadron Spit.

While the closure of the Seashore to vehicles from January 1 through March 15 would help protect wintering red knots, no closures would be established for pedestrians, which could result in disturbance of birds and habitat from pedestrian use, leading to displacement and altered foraging behavior. However, adverse impacts would be largely imperceptible because many passenger ferries stop operating in the winter, the amount of pedestrian use during the winter months is very low, and without a means of transportation on the beach, most visitor use would be confined to areas in the immediate vicinity of the ferry landings.

Predator Management—Under alternative B, the Seashore would perform limited removal of mammalian predators, when predation is observed that impacts sensitive species. In migratory stopover areas for the red knot, such as the Seashore, avian predators are the most common predators of red knots (FR 2013b). While mammalian predators may be a threat by causing disturbance to red knots, direct mortality from them is low (FR 2013b). Thus, while predator management may somewhat reduce disturbance to red knots from mammalian predators, the overall beneficial impacts would be small.

Education/Public Outreach—In addition to the outreach and education measures that would be implemented under alternative A, under alternative B staffing levels would increase for interpretation positions (to provide formal outreach and on-site ORV education on the subject of protected species management) and law enforcement (among other duties, law enforcement assists with public education). Also, educational materials would be provided to Seashore users through an operator education certificate, which would be required for all ORV operators and would be valid for one year. Under alternative B, the Seashore would work with vehicle ferry operators to coordinate distribution of education materials regarding ORV rules and regulations. In addition, a uniform system of resource closure signage would be provided, as well as regularly updated maps of closures, which would also be available online. Such public outreach is beneficial to red knots as it further educates the public on current resource protection measures, as well as the specific needs of sensitive species. Therefore, public outreach under alternative B, as part of species management, would likely have short- and long-term beneficial impacts on red knots.

Research/Monitoring—Research and monitoring under alternative B would be the same as alternative A, except that visitor compliance would be monitored to determine the success of specific regulations or the need to re-focus enforcement and education efforts. In the future, there would likely be other research to study wildlife at the Seashore. Research efforts have the potential to negatively impact feeding and resting behavior of shorebirds over the long-term due to the increased human presence and use of ORVs (Anderson and Keith 1980; Ellison and Cleary 1978; Hand 1980; Tremblay and Ellison 1979). However, any research directed at red knots would result in long-term beneficial impacts for the species because it is likely that results from the research would lead to a greater understanding of the red knot which could inform future protection and management of the species.

ORV and Other Recreational Use

ORVs and Pedestrian Access—The same amount of beach area (approximately 81 percent or 45 miles) would be open to public ORV use from March 16 through December 31 under alternative B as it would be under alternative A. Therefore, management of ORV and other recreational use under alternative B would be similar to alternative A, with a few exceptions that would result in additional beneficial impacts for red knots. On sections of Core Banks where no ferry landing access is available (e.g., Middle Core Banks and Ophelia Banks, or future areas that may become cut off during storm events) designated ORV routes would be closed. These areas would reopen to public ORV use if they become rejoined to an area with ferry access. During times when areas are cut off from ferry access, impacts from ORVs would be eliminated in those areas, providing short- and potentially long-term beneficial impacts.

The back route from mile marker 44 to mile marker 45, which is normally closed to ORV traffic, would be open to ORV traffic when the point of Cape Lookout is closed to ORV through-traffic for resource protection or safety reasons. As discussed under alternative A, most ORV users respect ORV closure, however, some noncompliance has occurred in the past (NPS 2012t, 2011a, 2010b, 2009a, 2008c, 2007i) and would be expected to continue to occur in the future. The point of Cape Lookout is a popular visitor destination and when it is closed it also prevents access on the beach to the west. Allowing use of the back route from mile marker 44 to 45 when the point of Cape Lookout is closed would allow ORV users to continue to easily access the beach area to the west of the point of Cape Lookout. This would likely help reduce visitor frustration with the closure of the point of Cape Lookout, and may help prevent any potential noncompliance with the closure, thus providing some short-term beneficial impacts to red knots that may be foraging along the ocean shoreline in that area.

In addition, alternative B would establish pass-through only areas for American oystercatcher nests, providing a minimum 300-foot buffer around nests, which could result in indirect protection of red knots that occur within American oystercatcher buffers. However, benefits would be limited, because many red knots occur outside of established buffers, and as mentioned above, some noncompliance with buffers and closures does exist and would be expected to continue to exist in the future.

Under alternative B, the back route would be regularly maintained by the Seashore and re-established if impacted by a storm event. This would continue to allow the back route to be used by ORVs as a bypass when full beach closures occur for species protection or safety reasons. Additionally, if driving conditions on the back route deteriorate significantly vehicles are less likely to use it to traverse long distances along the Seashore and are more likely to drive on the beach. Regularly maintaining the back route and re-establishing it after impacts from storms would help encourage vehicles to use it instead of the beach, lessening potential vehicle impacts on red knots that are foraging along the ocean shoreline. Also under alternative B, there is the potential for small changes to the number and location of ramps as needed, and ramps may be moved or re-established after major storm events to restore access. The area between the back route and the ocean beach where vehicle ramps are or would be located is not habitat generally used by the red knot. Additionally, no maintenance or construction of ramps would occur during the piping plover nesting season, which overlaps with the spring and fall migration of the red knot. As a result, there would be no impact to red knot habitat from establishing or reestablishing ramps, and there would be no impact to red knots from construction activities (e.g., disturbance from noise or the presence of construction vehicles) during the key spring and fall migration periods. Red knots do occur at the Seashore year-round so construction activities could potentially impact red knots by disturbing their foraging behavior, causing short-term adverse impacts. However, outside of the spring and fall migration period, red knots exist in smaller numbers, and the area impacted would be small compared to the overall habitat available to red knots, thus minimizing any adverse impacts.

Under alternative B, all high-performance sport-model and two-stroke ATVs and UTVs would be prohibited at the Seashore after a five-year grace period. As discussed under alternative A, based on studies by McGowan and Simons (2006) and Simons and Borneman (2012), it appears that ATV use, and to some extent UTV use, impacts American oystercatchers to a greater extent than other types of ORVs (e.g., four-wheel drive passenger vehicles) likely due to the fact that they are louder and faster. The studies do not differentiate between different types of ATVs and/or UTVs because high-performance sport-model ATVs and UTVs, as well as two-stroke models are designed for racing, jumping, and moving at high rates of speed; however, these models likely could cause more impacts to shorebirds than utility-model ATVs and UTVs that are designed to be used in a utilitarian way. The speed and noise of high-performance sport-model and two-stroke ATVs and UTVs may be perceived by shorebirds as a greater threat, causing shorebirds to alter their behavior. If ATV and UTV traffic has a greater effect on American oystercatchers on the beach, ATV and UTV traffic would likely have the same effect on other shorebirds, including the red knot. High-performance sport-model ATVs and UTVs also have greater technical mobility and are likely able to access areas of the Seashore that other larger ORVs cannot, increasing the possible area of disturbance with these vehicles and their passengers. Eliminating these vehicles and their potential impacts from the Seashore would provide short- and long-term benefits to red knots.

Night-Driving—Red knots are known to be active at night (Niles et al. 2009) and vehicular and pedestrian disturbance can impact shorebird foraging behavior, including red knots (Burger 1994; Burger et al. 2007; Johnson and Baldassarre 1988; Lafferty 2001a, 2001b; Tarr 2008). Red knots rely on foraging at migratory stopovers, such as the Seashore, to add necessary body fat reserves for their long migration, and disturbance can result in less time foraging, as well as expending energy in flight responses (FR 2013b). Under alternative B, night driving would be prohibited between the hours of 9 p.m. and 6 a.m. from May 1 through August 31, except in the Great Island and Long Point cabin areas. Prohibiting night driving during this timeframe would provide short- and long-term benefits to red knots by reducing potential impacts to foraging birds at night. However, this timeframe does not fully protect red knots, as it does not encompass the entire time that red knots are at the Seashore, particularly during their spring migration when their numbers peak at generally over 1,000 birds not only in May, but in April as well (NPS 2012u, 2011b, 2010k, 2009b, 2008b, 2007q, 2006i).

Permit Requirements—Under alternative B, long-term (annual) and short-term (10-day) vehicle permits would be instituted to better manage vehicles at the Seashore, though it would not limit the number of vehicles that could operate on the Seashore at any one time. Additionally, each licensed driver would be required to obtain an operator education certificate to operate a vehicle at the Seashore. Both the permit and the operator education certificate could be revoked for violation of applicable Seashore regulations or terms and conditions of the permit. The permit would be fee-based and fees collected from the permitting system could be used by the Seashore to put towards among other things species management and protection, as well as education measures which would benefit red knots. Educational information provided with the permit and operator education certificate would benefit red knots by making ORV users more aware of the need for and benefit of resource closures that may overlap red knot foraging habitat, as well as other Seashore regulations in place to protect this species. This, along with the deterrent of potentially losing driving privileges would likely result in a higher level of compliance with buffers, closures, and other Seashore regulations, resulting in short- and long-term beneficial impacts to red knots. While most ORV users respect resource closures, closure violations do occur (NPS 2012t, 2011a, 2010b, 2009a, 2008c). Such violations bring vehicles, people, and pets in close proximity to protected bird species which can result in adverse impacts on foraging, resting, or other behaviors in shorebirds, including the red knot (Anderson and Keith 1980; Ellison and Cleary 1978; Hand 1980; Tarr 2008; Tremblay and Ellison 1979). Although fees collected from the permitting system could be used toward species management and protection, benefits would be limited as unrestricted numbers of ORVs would be allowed at the Seashore, increasing the potential for disturbance (e.g., temporary displacement, frequent

escape flights) of resting and foraging birds. Since red knots regularly forage on the ocean shoreline outside of established closures, the potential for disturbance is greater as they often forage in areas used by ORVs.

Camping—Under alternative B, camping and campfire activities along the ocean beach would be permitted in areas similar to alternative A (on all beaches of the Seashore that are not otherwise closed by the Superintendent's Compendium, closed for safety, or closed for species protection, that is, full recreational closures and the six sea turtle nest relocation areas). As described under alternative A, prohibiting camping and beach fires in the full recreational closures would benefit red knots where these closures overlap their foraging habitat on the ocean beach, as disturbance from these activities would be reduced or eliminated. Prohibiting camping and campfires in the six sea turtle nest relocation areas, each of which is approximately 0.5 to 1.0 miles long, would remove any impacts from these activities since the prohibition would encompass the entire beach, including the foreshore where red knots forage, again, providing benefits to the red knot. However, for red knots outside buffers or closures for other protected species, the use of ORVs and the presence of pedestrians associated with camping and beach fires could result in temporary displacement and/or increased stress responses for foraging and resting birds. Additionally, alternative B would establish campsites designated for emergency camping in areas along the back route. However, these areas do not provide habitat for red knots, so there would be no impacts from these actions.

Adaptive Management Strategy—Under alternative B, an adaptive management strategy would be implemented to ensure that the goals of species protection are being met. Although the adaptive management strategy depends on the American oystercatcher as the indicator species, it would provide both short- and long-term beneficial impacts to red knots. If levels of disturbance to the American oystercatcher from ORVs are triggered (see chapter 2 for the trigger thresholds), more intensive management actions could be implemented. These management actions would potentially include increased education and focused enforcement, which would help reduce closure violations that could impact red knots if they occur in areas along the ocean shoreline; trash management and fish scrap disposal, which would likely reduce the number of predators attracted to the beach that could disturb red knots; predator control, which would again help reduce predator disturbance to red knots; ORV route restrictions and increased buffer sizes, both of which would protect red knots if they occur along the ocean shoreline; and a reduction in the number of long-term (annual) and/or short-term (10-day) vehicle permits along with managing the size of the vehicle storage lots, both of which would help to reduce the number of vehicles on the Seashore at any one time, and thus likely reducing the potential impacts on red knots from ORVs. If species indicators continue to be triggered due to visitor use impacts for two consecutive years after implementing the previously mentioned actions, then reducing the number of long-term (annual) and/or short-term (10-day) vehicle permits issued and increasing the size of species protection buffers could be implemented. These actions would reduce the number of vehicles driving on the beach and increase the distance vehicles could approach birds, thereby reducing the amount of potential impacts caused by ORVs, providing short- and long-term beneficial impacts to red knots.

Cumulative Impacts under Alternative B

Past, present and reasonably foreseeable future actions under alternative B would be the same as those described under alternative A. The overall combined impacts of these past, present, and future actions on red knots would be short- and long-term, limited, and adverse from disturbance to foraging and nesting birds from visitor/ORV use, dredging activities, visitor amenity improvements, and military overflights. There would also be long-term beneficial impacts from the protection afforded to red knots and their habitat by species monitoring, other protected species' buffers, habitat protection, visitor protection patrols, visitor education programs, predator management, and future planning efforts under the Foundation Plan. While adverse effects on red knots from other actions occurring in the region would still

exist, actions under alternative B would provide additional protection that would be beneficial to the regional population of this species and would offset some of the adverse effects.

ALTERNATIVE C

Resource Management Activities

Surveying and Monitoring—Under alternative C, surveying and monitoring activities for protected species at the Seashore would be the same as alternative A. There would be no surveying or monitoring activities targeted specifically for red knots other than surveying for migrating and wintering red knots (see “Management Wintering and Nonbreeding Birds”). Surveying and monitoring for other protected bird species (i.e., piping plover, American oystercatcher, and colonial waterbirds) and sea turtles would result in the short-term adverse impacts as described for alternative A. Surveying and monitoring activities would bring NPS staff and/or vehicles in proximity to shorebird species, including red knots. This would have the potential to lead to flushing responses or other behavioral changes that have been known to occur in other types of shorebirds, and could have the potential to negatively impact feeding, resting, or other actions of red knots as well (Anderson and Keith 1980; Ellison and Cleary 1978; Hand 1980; Tremblay and Ellison 1979). To help minimize any adverse impacts from monitoring and surveying activities, under alternative C there would be more consistent training and supervision of resource staff who conduct the surveys. This would result in a higher quality of monitoring for shorebird species, resulting in beneficial impacts.

Establishment of Prenesting Closures—Similar to alternative B, under alternative C full recreational prenesting closures for other protected bird species besides red knots would be established by March 16, prior to opening the beach to vehicles. No prenesting closures would be established for red knots since they do not nest at the Seashore. While the protected prenesting areas for other species could also provide protection from disturbance for any red knots that may use this same habitat, including those that may arrive prior to the peak migration timeframe of April and May, red knots are generally found in the intertidal area of the beach where they forage in the wet sand. Thus, any potential beneficial impacts from prenesting closures for other species would be minimal.

Buffer/Closure Establishment—Under alternative C, no ORV or full recreational closures would be implemented that specifically target red knots, putting individual birds at risk of disturbance from ORVs, pedestrians, and pets, causing short- and long-term adverse impacts. Disturbance can lead to flushing (or escape) responses, which in turn could disrupt foraging and resting behavior (Anderson and Keith 1980; Ellison and Cleary 1978; Hand 1980; Tremblay and Ellison 1979). However, ORV and full recreational closures for other protected bird species, as well as nest relocation areas for sea turtles, would occur under alternative C in the same manner as they would under alternative A. These buffers and closures would help protect red knots as they would under alternative A to the extent that they encompass the ocean shoreline, which is the red knots’ prime foraging habitat and where they are most often found at the Seashore. Buffers and closures that would benefit red knots include the minimum 600-foot ORV buffer on either side of a piping plover brood for unfledged chicks, a 2-mile ORV closure established at the north end of South Core Banks from the first piping plover nest hatch until the last chick has fledged or is lost, ramp to ramp ORV closures for American oyster chicks, and the 150-foot buffers established at the point of Cape Lookout beach for colonial waterbird chicks. The six sea turtle nest relocation areas (0.5 to 1.0 miles in length) established on North Core and South Core Banks would also protect red knots once they are closed to ORV traffic beginning 50 days after the first nest is relocated to them until they are reopened after the last nest has been excavated. Red knots would also be afforded protection by the permanent closure to ORVs of Shackleford Banks, Portsmouth Flats, the interior of the point of Cape Lookout, the beach between mile markers 41a and 41b, and Power Squadron Spit.

The buffers for the unfledged chicks of other protected species would also provide benefits to red knots. However, the buffers would be adjusted in response to brood movements, and the frequent adjustment of the buffers by NPS staff could create some disturbance of foraging red knots causing some adverse impacts (Anderson and Keith 1980; Ellison and Cleary 1978; Tremblay and Ellison 1979; Hand 1980).

Management of Wintering and Nonbreeding Birds—Under alternative C, surveying activities for nonbreeding and wintering birds would be the same as described for alternative A, potentially resulting in noise disturbance and short-term displacement of red knots from the presence of resource staff and essential vehicles in foraging/resting habitat (Anderson and Keith 1980; Ellison and Cleary 1978; Hand 1980; Tremblay and Ellison 1979). However, resource protection staff would take proper measures, such as using binoculars so they can observe the species from greater distances, to minimize any disturbance to red knots during the surveys. Additionally, the survey intervals (i.e., 10 days) would also help minimize adverse impacts from surveying by not causing chronic disturbances. While the actual survey activities may cause some short-term adverse impacts, overall, surveying the nonbreeding population of red knots at the Seashore would also result in long-term benefits, due to increased knowledge and awareness of the species. Surveys would also occur for the nonbreeding population of piping plovers that spend the winter months at the Seashore. Surveys for nonbreeding plovers would occur just once per month from August 1 through March 31. Surveying activities for nonbreeding plovers could cause some disturbance to red knots on the beach through the presence of NPS staff and vehicles causing flushing behavior. However, any impacts would be greatly minimized by the fact that the surveys for nonbreeding plovers only occurs once per month.

Additionally, under alternative C the Seashore would extend the beginning date it closes the Seashore to vehicles from January 1 through December 16, meaning the Seashore would be closed to vehicles from December 16 through March 15 each year. Though not specifically implemented to protect nonbreeding birds, the December 16 closure date would provide an additional 15 days of protection for wintering red knots compared to alternative A and would allow the beach profile a greater opportunity to recover from heavy fall fishing use. Similar to alternative A, no resource closures would be established for pedestrians during the winter months. Any adverse impacts from pedestrians on wintering plovers would be largely imperceptible because many passenger ferries stop operating in the winter, the amount of pedestrian use during the winter months is very low, and without a means of transportation on the beach, most visitor use would be confined to areas in the immediate vicinity of the ferry landings.

Predator Management—Under alternative C, the Seashore would perform limited removal of mammalian predators, when predation is observed that impacts sensitive species. In migratory stopover areas for the red knot, such as the Seashore, avian predators are the most common predators of red knots (FR 2013b). While mammalian predators may be a threat by causing disturbance to red knots, direct mortality from them is low (FR 2013b). Thus, while predator management may somewhat reduce disturbance to red knots from mammalian predators, the overall beneficial impacts would be small.

Education/Public Outreach—Education and outreach measures under alternative C would be the same as for alternative B, including increases in staffing levels for interpretation positions and law enforcement positions, and would provide short- and long-term benefits. Benefits would occur because the public would receive education about the specific needs of the species and alerts ahead of time about closures due to the potential for species or habitat disturbance or injury.

Research/Monitoring—Research and monitoring under alternative C would be the same as alternative B. Research efforts have the potential to negatively impact feeding and resting behavior of shorebirds over the long-term due to the increased human presence and use of ORVs (Anderson and Keith 1980; Ellison and Cleary 1978; Hand 1980; Tremblay and Ellison 1979). However, any research about red knots would result in long-term beneficial impacts for the species because it is likely that results from the research

would lead to a greater understanding of the red knot which could inform future protection and management of the species.

ORV and Other Recreational Use

ORVs and Pedestrian Access— ORV routes under alternative C would be the same as under B, with the exception that approximately 4 miles of pedestrian-only use areas would be added to the Seashore. During the summer season 3.1 miles of additional pedestrian-use only area would be added (0.35 miles at Long Point Cabin Camp, 1.9 miles at Great Island Cabin Camp, and 0.8 miles at Codd's Creek), while the year-round pedestrian-use only area at the lighthouse would be expanded by 0.7 miles.

Adding 4 miles of pedestrian-only use areas means that the amount of ocean beach available for ORV use, prior to temporary species and safety closures, would be approximately 74 percent (41 miles) from the Friday preceding Memorial Day through Labor Day (as compared to 81 percent (45 miles) under alternatives A and B) and approximately 79 percent (44 miles) during the rest of the year (from March 16 through the Thursday preceding Memorial Day and from Labor Day through December 15) when ORVs are allowed on the beach (ORVs are prohibited from December 16 through March 15). As described under alternative A, ORV resource safety closures have historically protected an additional approximately 10 miles (22 percent) of Seashore from ORV impacts during the summer and approximately 5.4 miles (12 percent) of Seashore during the fall. Reducing the amount of beach available for ORV use increases the amount of area where red knots would be free from potential impacts of ORVs, providing short- and long-term benefits to the red knot, though impacts from pedestrians could still occur in these areas. Also, the majority of the new pedestrian-only use areas are only in effect during the summer months (3.1 miles of the new approximately 4 miles of pedestrian-only use areas). Therefore these areas would not provide protection to the red knot during the majority of their spring migration when they are most numerous at the Seashore, reducing the overall beneficial impacts of the new pedestrian-only use areas. Under alternative C, ORV use would be kept at historical levels so reducing the percentage of Seashore available for ORV access could result in increased ORV density where ORVs are permitted which could result in increased disturbance of resting and foraging individuals in those areas (leading to changes in habitat preference and foraging behavior), causing short- and long-term adverse impacts on red knots. However, any increase in density, and resultant impacts from that, would be extremely slight given the relatively small increase in the amount of pedestrian-only use areas compared to the overall amount of Seashore available to ORVs and where the increases are occurring,

Similar to alternative B, ORV use would be discontinued in areas on Core Banks that are cut off from ferry access, though it would be restored if/when the areas rejoin an area with ferry access. During the time that ORV use is discontinued there would be no potential adverse impacts from vehicles on red knots which would result in both short- and long-term beneficial impacts. Also similar to alternative B, the back route between mile marker 44 and mile marker 45 would be opened to ORV use when the point of Cape Lookout is closed to through-traffic. This would provide easy access to the beach area to west of the point of Cape Lookout that would otherwise be inaccessible by ORVs, and would potentially help prevent closure violations on the point of Cape Lookout by likely reducing visitor frustration due to the closure; resulting in beneficial impacts to any red knots using that particular area.

Under alternative C all high-performance sport-model and two-stroke ATVs and UTVs would be prohibited after a five-year grace period. Additionally, utility-model ATVs and UTVs would be permitted at the Seashore only between September 15 and December 15. As discussed under alternative A, based on studies by McGowan and Simons (2006) and Simons and Borneman (2012), it appears that ATV use, and to some extent UTV use, impacts American oystercatchers to a greater extent than other types of ORVs (e.g., four-wheel drive passenger vehicles) likely due to the fact that they are louder and faster. The studies do not differentiate between different types of ATVs and/or UTVs because high-performance

sport-model ATVs and UTVs, as well as two-stroke models are designed for racing, jumping, and moving at high rates of speed however, these models likely could cause more impacts to shorebirds than utility-model ATVs and UTVs that are designed to be used in a utilitarian way. The speed and noise of high-performance sport-model and two-stroke ATVs and UTVs may be perceived by American oystercatchers (and likely other shorebirds such as the red knot) as a greater threat, causing the birds to alter their behavior. Eliminating these vehicles and their potential impacts from the Seashore after a five-year grace period would likely provide short- and long-term benefits to red knots. Additionally, limiting utility-model ATV and UTV use to the months of mid-September to mid-December would avoid the timeframe when red knots are at the Seashore, thus eliminating the potential impacts of these vehicles on the species, providing short- and long-term beneficial impacts.

Like alternative B, there is the potential for small changes to the number and location of ramps as needed, and ramps may be moved or re-established after major storm events to restore access to the beach. The area between the back route and the ocean beach where vehicle ramps are or would be located is not habitat generally used by the red knot. Additionally, no maintenance or construction of ramps would occur during the piping plover nesting season, which overlaps with the spring and fall migration of the red knot. As a result, there would be no impact to red knot habitat from establishing or reestablishing ramps, and there would be no impact to red knots from construction activities (e.g., disturbance from noise or the presence of construction vehicles) during the key spring and fall migration periods. Red knots do occur at the Seashore year-round so construction activities could potentially impact red knots by disturbing their foraging behavior, causing short-term adverse impacts. However, outside of the spring and fall migration period, red knots exist in smaller numbers, and the area impacted would be small compared to the overall habitat available to red knots, thus minimizing any adverse impacts.

Night-Driving—Under alternative C, all public ORV use would be prohibited on the ocean beach and back route from 9 p.m. to 6 a.m. from May 1 through September 14, extending the end date beyond August 31, which is the end date under alternative B. Red knots are known to be active at night, and they rely on foraging at migratory stopovers, such as the Seashore, to add necessary body fat reserves for their long migration, and disturbance can result in less time foraging, as well as expending energy in flight responses (FR 2013b). Prohibiting night driving during the above timeframe would reduce ORV impacts on red knots foraging at night providing short- and long-term beneficial impacts. While the extended time of prohibiting night driving would benefit red knots for two additional weeks in September, many birds have left the Seashore prior to this time, so the added benefits would be somewhat limited. The timeframe also does not fully protect the red knot during its spring migration, as it does not encompass the month of April which is during the peak of the migration when over 1,000 birds are generally at the Seashore (NPS 2012u, 2011b, 2010k, 2009b, 2008b, 2007q, 2006i). It would also not protect wintering red knots that may be at the Seashore in March when public ORV use begins at the Seashore or from September 15 through December 15.

Permit Requirements—Under alternative C, and similar to alternative B, a fee-based, long-term (annual) and short-term (10-day) vehicle permit and an ORV operator education certificate, would be required to operate an ORV at the Seashore. In addition, to manage the number of vehicles operating on the Seashore at any one time, a limit would also be established on the number of annual and 10-day permits issued each year, with the limit being based on the historical average use on each island. Although ORV use would not be allowed in resource protection areas, placing a limit on the number of permits issued for ORV use on the beach would prevent future unlimited growth of ORV use on the beach. This would likely prevent increased amounts of adverse impacts outside of closures, compared to historical levels, on red knots using the intertidal zone of Seashore beaches, and result in short- and long-term beneficial impacts. As described for alternative B, fees collected from the permitting system would be used toward species management and protection, which would benefit red knots. Educational information provided by the permit and education requirement would benefit red knots because ORV users would be more aware of

the regulations in place to protect this species. ORV users would also be more likely to comply with buffers and closures for other species that overlap red knot habitat, as well as other Seashore regulations due to the potential threat of losing their individual driving privileges through the revocation of their permit or operator education certificate if violations occur.

Camping—Under alternative C, camping and campfire activities along the ocean beach would be permitted in areas similar to alternative B (on all beaches of the Seashore that are not otherwise closed by the Superintendent’s Compendium, closed for safety, or closed for species protection, that is, full recreational closures and the six sea turtle nest relocation areas). Prohibiting camping and beach fires full recreational closures would benefit red knots where these closures overlap their foraging habitat on the ocean beach, as disturbance from these activities would be reduced or eliminated. Disturbances to resting and foraging red knots from these activities would also be removed from the six sea turtle nest relocation areas, each of which is approximately 0.5 to 1.0 miles long, providing beneficial impacts to red knots using these areas. However, for red knots outside buffers or closures for other protected species, the use of ORVs and the presence of pedestrians associated with camping and beach fires could result in temporary displacement and/or increased stress responses for foraging and resting birds.

Similar to alternative B, under alternative C campsites for emergency camping would be designated in areas along portions of the back route. However, these areas do not provide habitat for red knots, so there would be no impact to the species from these actions.

Adaptive Management Strategy—Under alternative C, an adaptive management strategy would be implemented, the same as under alternative B, to ensure that the goals of species protection are being met. The additional management actions that could be implemented would provide short- and long-term beneficial impacts to red knots and their habitat. Benefits would result from reducing closure violations through increased education and focused enforcement; reducing predation through trash management and fish scrap disposal; and reducing ORV impacts through route restrictions, increased buffer sizes, and limits on the number of vehicle permits issued, as well as managing the size of the vehicle storage lots.

Cumulative Impacts under Alternative C

Past, present, and reasonably foreseeable future actions under alternative C would be the same as those described under alternative A. The overall combined impacts of these past, present, and future actions on red knot would be short- and long-term, limited, and adverse from disturbance to foraging and nesting birds from visitor/ORV use, dredging activities, visitor amenity improvements, and military overflights. There would also be long-term beneficial impacts from the protection afforded to red knots and their habitat by species monitoring, other protected species’ buffers, habitat protection, visitor protection patrols, visitor education programs, predator management, and future planning efforts under the Foundation Plan. While adverse effects on red knot from other actions occurring in the region would still exist, actions under alternative C would provide additional protection that would be beneficial to the regional population of this species and would offset some of the adverse effects.

ALTERNATIVE D

Impacts of Alternative D

Resource Management Activities

Surveying and Monitoring—Under alternative D, surveying and monitoring activities for protected species at the Seashore would be that same as for alternative A. There would be no surveying or monitoring activities targeted specifically for red knots other than surveying for migrating and wintering

red knots (see “Management Wintering and Nonbreeding Birds”). However, surveying and monitoring for other protected bird species (i.e., piping plover, American oystercatcher, and colonial waterbirds) and sea turtles would result in the short-term adverse impacts as described for alternative A. Surveying and monitoring activities would bring NPS staff and/or vehicles in proximity to shorebird species, including red knots. This would have the potential to lead to flushing responses or other behavioral changes that have been known to occur in other types of shorebirds, and could have the potential to negatively impact feeding, resting, or other actions of red knots as well (Anderson and Keith 1980; Ellison and Cleary 1978; Hand 1980; Tremblay and Ellison 1979). To help minimize any adverse impacts from monitoring and surveying activities, under alternative D there would be more consistent training and supervision of resource staff who conduct the surveys. This would result in a higher quality of monitoring for shorebird species, resulting in beneficial impacts.

Establishment of Prenesting Closures—Similar to alternative B, under alternative D full recreational prenesting closures for other protected bird species besides red knots would be established by March 16, prior to opening the beach to vehicles. No prenesting closures would be established for red knots since they do not nest at the Seashore. While the protected prenesting areas for other species could also provide protection from disturbance for any red knots that may use this same habitat, including those that may arrive prior to the peak migration timeframe of April and May, red knots are generally found in the intertidal area of the beach where they forage in the wet sand. Thus, any potential beneficial impacts from prenesting closures for other species would be minimal.

Buffer/Closure Establishment—Under alternative D, no ORV or full recreational closures would be implemented that specifically target red knots, putting individual birds at risk of disturbance from ORVs, pedestrians, and pets, causing short- and long-term adverse impacts. Disturbance can lead to flushing (or escape) responses, which in turn could disrupt foraging and resting behavior (Anderson and Keith 1980; Ellison and Cleary 1978; Hand 1980; Tremblay and Ellison 1979). However, red knots would experience short- and long-term beneficial impacts from ORV and full recreational closures for other protected bird species, as well as nest relocation areas for sea turtles. Under alternative D, this would occur in the same manner as under alternative A, except that some buffer sizes for protected bird species would increase, especially for unfledged piping plover chicks.

Buffers around colonial water birds, least tern, and American oystercatchers exhibiting courtship or mating behavior, or nesting would be expanded to 600 feet, 300 feet, and 450 feet respectively. The extent to which these buffers provide additional protection for red knots depends on where they are put in place and the width of the beach at that location. On narrower sections of beach, these expanded buffers, especially the 600-foot buffers, may encompass some of the intertidal area where red knots are found foraging, and thus would provide them protection from ORV impacts.

Buffers would also be expanded for unfledged piping plover chicks. Based on one set of recommendations in the Piping Plover Recovery Plan (USFWS 1996a), unless data from previous years show that broods at a site forage close to their nests, buffers would extend at least 650 feet on each side of the nest site during the first week following hatching. The size and location of the buffer would be adjusted in response to the observed mobility of the brood, but in no case would it be reduced to less than 650 feet on each side. In some cases, highly mobile broods may require buffers up to 3,250 feet, even when intensively monitored. Because of the narrow width of most of Core Banks, such buffers would likely extend from the oceanside low water line to the soundside low water line or the farthest extent of dune habitat. This closure would close approximately 3 miles of Portsmouth Flats, 7 miles of Kathryn-Jane Flats (if chicks are present), and the tip (approximately 2.5 miles) of Old Drum Inlet (unless the inlet fills in), totaling a minimum of 9.5 miles of the Seashore. If these areas are closed to ORV use, it would eliminate ORV impacts for red knots in these areas, providing short- and long-term beneficial impacts. In accordance with recommendations in the Piping Plover Recovery Plan, vehicles may be allowed to pass

through portions of the protected area that are considered inaccessible to plover chicks because of steep topography (USFWS 1996a). However, any steep topography is likely to be located near the dune line, which is not where red knots are typically found, so this provision would have minimal adverse impacts on red knots.

While the buffers for the unfledged chicks of other protected species would also provide benefits to red knots, the buffers would be adjusted in response to brood movements, and the frequent adjustment of the buffers by NPS staff could create some disturbance of foraging red knots causing some adverse impacts.

Management of Wintering and Nonbreeding Birds—Under alternative D, surveying activities for nonbreeding and wintering birds, including both red knots and piping plovers, would be the same as described for alternative A. This would potentially result in noise disturbance and short-term displacement of red knots from the presence of resource staff and essential vehicles in foraging/resting habitat (Anderson and Keith 1980; Ellison and Cleary 1978; Hand 1980; Tremblay and Ellison 1979). However, resource protection staff would take proper measures, such as using binoculars so they can observe the species from greater distances, to minimize any disturbance to red knots during the surveys. Additionally, the survey intervals (i.e., 10 days for red knots and once per month for piping plovers) would also help minimize adverse impacts from surveying by not causing chronic disturbances. While the actual survey activities may cause some short-term adverse impacts, overall, surveying the nonbreeding population of red knots at the Seashore would also result in long-term benefits, due to increased knowledge and awareness of the species.

Additionally, and similar to alternative C the Seashore would extend the beginning date it closes the Seashore to vehicles from January 1 through December 16, meaning the Seashore would be closed to vehicles from December 16 through March 15 each year. Though not specifically implemented to protect nonbreeding birds, the December 16 closure date would provide an additional 15 days of protection for wintering red knots compared to alternative A and would allow the beach profile a greater opportunity to recover from heavy fall fishing use. No resource closures would be established for pedestrians during the winter months. Any adverse impacts from pedestrians on wintering plovers would be largely imperceptible because many passenger ferries stop operating in the winter, the amount of pedestrian use during the winter months is very low, and without a means of transportation on the beach, most visitor use would be confined to areas in the immediate vicinity of the ferry landings.

Predator Management—Under alternative D, the Seashore would perform limited removal of mammalian predators, when predation is observed that impacts sensitive species. In migratory stopover areas for the red knot, such as the Seashore, avian predators are the most common predators of red knots (FR 2013b). While mammalian predators may be a threat by causing disturbance to red knots, direct mortality from them is low (FR 2013b). Thus, while predator management may somewhat reduce disturbance to red knots from mammalian predators, the overall beneficial impacts would be small.

Education/Public Outreach—Education and outreach measures under alternative D would be the same as for alternative B, including increases in staffing levels for interpretation positions and law enforcement positions, and would provide short- and long-term benefits. Benefits would occur because the public would receive education about the specific needs of the species and alerts ahead of time about closures due to the potential for species or habitat disturbance or injury.

Research/Monitoring—Research and monitoring under alternative D would be the same as alternative B. Research efforts have the potential to negatively impact feeding and resting behavior of shorebirds over the long-term due to the increased human presence and use of ORVs (Anderson and Keith 1980; Ellison and Cleary 1978; Hand 1980; Tremblay and Ellison 1979). However, any research directed at red knots would result in long-term beneficial impacts for the species because it is likely that results from the

research would lead to a greater understanding of the red knot which could inform future protection and management of the species.

ORV and Other Recreational Use

ORVs and Pedestrian Access—Under alternative D, ORV routes and pedestrian-only use areas would include those areas under alternative C, except the closures at Long Point, Great Island, and Codds Creek would be pedestrian-only use areas year-round instead of just during the summer, as under alternative C. Additionally, the total amount of pedestrian-only use areas would increase by approximately 8 percent (from 2 to 10 miles).

Under alternative D about 0.5 miles of summertime pedestrian-only use area would be created at Johnsons Creek, and the 3.6 miles of Middle Core Banks would be a pedestrian-only use area during the summer whether or not it is contiguous with North Core Banks (currently it is an island). The ocean beach from the Portsmouth Access Road north to the demarcation line at Ocracoke Inlet would also become a summer pedestrian-only use area. In addition, the year-round pedestrian-only use area in front of the lighthouse would be expanded approximately 0.9 miles to the south, for a total closure of approximately 1.6 miles, or 0.9 miles larger than under alternative A and 0.2 miles larger than under alternative C. Adding these pedestrian-only use areas would reduce the amount of Seashore beaches open to ORV use. About 63 percent (35 miles) of the beach, prior to temporary species and safety closures, would be open to ORV use from the Friday preceding Memorial Day through Labor Day, while about 73 percent (41 miles) of the beach would be open to ORV use during the rest of the year (from March 16 through the Thursday preceding Memorial Day and from Labor Day through December 15) when ORVs are allowed on the beach (ORVs are prohibited from December 16 through March 15). As described under alternative A, ORV resource and safety closures historically protect an additional approximately 10 miles (22 percent) of Seashore during the summer and approximately 5.4 miles (12 percent) during the fall. Impacts to red knots from ORV use would be eliminated in these new pedestrian-only use areas, resulting in short- and long-term beneficial impacts, though impacts from pedestrian disturbance would still occur in these areas. Also, the new pedestrian-only use areas that are only in effect during the summer months would not provide protection to the red knot during the majority of their spring migration when they are most numerous at the Seashore, reducing the overall beneficial impacts of the new pedestrian-only use areas. Reducing the amount of area open to ORV use could increase the density of ORVs in areas that remain open to ORVs, potentially resulting in some increased adverse impacts to red knots in those areas. However, to offset this potential, the Seashore would reduce the number of vehicle permits issued by 8 percent. This would provide short- and long-term beneficial impacts to red knots by reducing the amount of potential ORV impacts.

Similar to alternative B, on sections of Core Banks where no ferry landing access is available (i.e., Middle Core Banks and Ophelia Banks), designated ORV routes would be closed, which could provide further protection for red knots at the Seashore by reducing the amount of Seashore available to ORV access. This would limit the potential for species contact with vehicles and vehicle operators/passengers, providing short- and possibly long-term beneficial impacts while the area(s) are closed to public ORV use.

Under alternative D, all ATVs and high-performance sport-model and two-stroke UTVs would be prohibited year-round after a five-year grace period. Additionally, utility-model UTVs would be permitted only between September 15 and December 15. As discussed under alternative A, based on studies by McGowan and Simons (2006) and Simons and Borneman (2012), it appears that ATV use, and to some extent UTV use, impacts American oystercatchers to a greater extent than other types of ORVs (e.g., four-wheel drive passenger vehicles) likely due to the fact that they are louder and faster. (As noted

under alternative B, given the impacts that ATVs and UTVs have on nesting American oystercatchers, it is also likely that ATVs and UTVs have similar impacts on other shorebirds, such as the red knot, and other bird behavior such as foraging and resting.) The studies do not differentiate between different types of ATVs and/or UTVs, because high-performance sport-model ATVs and UTVs, as well as two-stroke models are designed for racing, jumping, and moving at high rates of speed; however, these models likely could cause more impacts to shorebirds than utility-model ATVs and UTVs that are designed to be used in a utilitarian way. The speed and noise of high-performance sport-model and two-stroke ATVs and UTVs may be perceived by shorebirds as a greater threat, causing shorebirds to alter their behavior. Eliminating all ATVs (which Simons and Borneman (2012) showed has a greater impact on birds than UTVs) as well as their potential impacts from the Seashore after a five-year grace period would provide short- and long-term benefits to red knots. Additionally, limiting utility-model UTV use to the months of mid-September to mid-December would eliminate their potential impacts on red knots, providing short- and long-term beneficial impacts.

Unlike alternatives B and C, regular maintenance of the back route would not occur under alternative D. With no maintenance, the condition of the back route is likely to deteriorate. As it does, ORV users may opt to use the ocean beach more often, which could increase ORV impacts on red knots using the ocean shoreline for foraging. However, the back route would be re-established when impacted by a storm event, which would encourage use of the back route instead of the beach, which would benefit red knots by removing some vehicle travel from the ocean beach. Although ramps would be re-established to restore access after storm events, no new ramps would be added to the Seashore beach. The area between the back route and the ocean beach where vehicle ramps would be re-established is not habitat generally used by the red knot. Additionally, no construction of ramps would occur during the piping plover nesting season, which overlaps with the spring and fall migration of the red knot. As a result, there would be no impact to red knot habitat from reestablishing ramps, and there would be no impact to red knots from construction activities (e.g., disturbance from noise or the presence of construction vehicles) during the key spring and fall migration periods. Red knots do occur at the Seashore year-round so construction activities could potentially impact red knots by disturbing their foraging behavior, causing short-term adverse impacts. However, outside of the spring and fall migration period, red knots exist in smaller numbers, and the area impacted would be small compared to the overall habitat available to red knots, thus minimizing any adverse impacts.

Night-Driving—Under alternative D, night driving would be prohibited at the Seashore on the ocean beach and the back route during the same timeframe as described for alternative C, between 9 p.m. and 6 a.m. from May 1 through September 14. This would result in short- and long-term beneficial impacts on red knots, as it would eliminate potential disturbances from ORVs on red knots foraging at night. However, this timeframe would not encompass the month of April which is during the peak of the migration when over 1,000 birds are generally at the Seashore (NPS 2012u, 2011b, 2010k, 2009b, 2008b, 2007q, 2006i). It would also not protect wintering red knots that may be at the Seashore in March when public ORV use begins at the Seashore or from September 15 through December 15.

Permit Requirements—Under alternative D, vehicle permit and ORV operator education certificate requirements would be similar to those described for alternative C, except that the number of vehicle permits would be reduced by 8 percent. The reduction of permits by 8 percent compared to alternative C is based on the percentage increase of pedestrian-only use areas under alternative D. The reduction is intended to keep the average vehicle density similar to current average use to help prevent increases in ORV impacts due to higher densities of vehicles in areas where ORV use is allowed. Although ORV use would not be allowed in resource protection areas, placing a limit on the number of permits issued for ORV use on the beach would prevent future unlimited growth of ORV use on the beach. This would likely prevent increased amounts of adverse impacts, compared to historical levels, on red knots using the

intertidal zone of Seashore beaches and result in short- and long-term beneficial impacts. As described for alternative B, fees collected from a permitting program would be used toward species management and protection, which would benefit red knots. Educational information provided by the permit and education requirement would benefit red knots because ORV users would be more aware of the regulations in place to protect this species. ORV users would also be more likely to comply with buffers and closures for other species that overlap red knot habitat, as well as other Seashore regulations due to the potential threat of losing their individual driving privileges through the revocation of their permit or operator education certificate if violations occur.

Camping—Under alternative D, camping and campfire activities along the ocean beach would be permitted in areas similar to alternative B (on all beaches of the Seashore that are not otherwise closed by the Superintendent’s Compendium, closed for safety, or closed for species protection, that is, full recreational closures and the six sea turtle nesting relocation areas). Prohibiting camping and beach fires full recreational closures would benefit red knots where these closures overlap their foraging habitat on the ocean beach, as disturbance from these activities would be reduced or eliminated. Disturbances to resting and foraging red knots from these activities would also be removed from the six sea turtle nest relocation areas, each of which is approximately 0.5 to 1.0 miles long, providing beneficial impacts to red knots using these areas. However, for red knots outside buffers or closures for other protected species, the use of ORVs and the presence of pedestrians associated with camping and beach fires could result in temporary displacement and/or increased stress responses for foraging and resting birds. Although alternative D would also establish designated campsites for emergency camping in portions of the existing long-term parking lots, these areas do not provide habitat for red knots, so there would be no impact to the species from these actions.

Also under alternative D, campsites for emergency camping would be designated in portions of the existing long-term parking lots. These areas, however, do not provide habitat for the red knot, so there would be no impacts on the species from designating these areas as emergency camping sites.

Adaptive Management Strategy—Under alternative D, an adaptive management strategy would be implemented, the same as under alternative B, to ensure that the goals of species protection are being met. The additional management actions that could be implemented would provide short- and long-term beneficial impacts to red knots and their habitat. Benefits would result from reducing closure violations through increased education and focused enforcement; reducing predations through trash management and fish scrap disposal; and reducing ORV impacts through route restrictions, increased buffer sizes, and limits on the number of vehicle permits issued, as well as managing the size of the vehicle storage lots.

Cumulative Impacts under Alternative D

Past, present and reasonably foreseeable future actions under alternative D would be the same as those described under alternative A. The overall combined impacts of these past, present, and future actions on red knot would be short- and long-term, limited, and adverse (from disturbance to foraging and nesting birds from visitor/ORV use, dredging activities, visitor amenity improvements, and military overflights). There would also be long-term beneficial impacts from the protection afforded to red knots and their habitat by species monitoring, other protected species’ buffers, habitat protection, visitor protection patrols, visitor education programs, predator management, and future planning efforts under the Foundation Plan. While adverse effects on red knot from other actions occurring in the region would still exist, actions under alternative D would provide additional protection that would be beneficial to the regional population of this species and would offset some of the adverse effects.

ALTERNATIVE E

Impacts of Alternative E

Resource Management Activities

Surveying and Monitoring— Under alternative E, surveying and monitoring for other protected bird species, besides the red knot, would occur in the same manner as under alternative A. Similar to other alternatives, other than surveying for migratory and wintering red knots, there would be no specific surveying or monitoring activities targeting red knots. Surveying and monitoring for other bird species would bring NPS staff and/or vehicles in proximity to shorebird species, including red knots. This would have the potential to lead to flushing responses or other behavioral changes that have been known to occur in other types of shorebirds, and could have the potential to negatively impact feeding, resting, or other actions of red knots as well (Anderson and Keith 1980; Ellison and Cleary 1978; Hand 1980; Tremblay and Ellison 1979). However, these impacts would likely not occur as often under alternative E as they would under the other alternatives. Under alternative E, public use of ORVs would be prohibited on the Seashore. With the potential impacts on shorebirds from public ORV use eliminated the likely lower pedestrian presence resulting from this, and the fact that with no ORV access, pedestrian use would likely be centered around the ferry landing areas, the cabins, and Power Squadron Spit where visitors can easily access the beach by their own boats, surveying and monitoring protocols would be reviewed and may change.

Establishment of Preenesting Closures— Similar to alternative B, under alternative D full recreational prenesting closures for other protected bird species besides red knots would be established by March 16, prior to opening the beach to vehicles. No prenesting closures would be established for red knots since they do not nest at the Seashore. While the protected prenesting areas for other species could also provide protection from disturbance for any red knots that may use this same habitat, including those that may arrive prior to the peak migration timeframe of April and May, red knots are generally found in the intertidal area of the beach where they forage in the wet sand. Thus, any potential beneficial impacts from prenesting closures for other species would be minimal.

Similar to other alternatives, no prenesting closures would be targeted for red knots since they do not breed at the Seashore. To protect piping plover and colonial waterbirds and their habitat, full recreational prenesting closures for these species would be established by April 1, similar to alternative A. As described for alternative A, while these areas could provide protection from disturbance to red knots that may use this habitat, red knots are generally found on in the intertidal area of the beach where they forage in the wet sand. Thus, any potential beneficial impacts from prenesting closures for other species would be minimal.

Buffer Closure/Establishment—Under alternative E, no full recreational closures (public use of ORVs is prohibited under alternative E so ORV closures are not applicable) would be established targeting red knots, putting individual birds at risk of disturbance from pedestrians and pets, causing short- and long-term adverse impacts. However, impacts would be minimized by the fact that with no ORV transportation on the Seashore to easily access more remote areas, pedestrian use would likely occur mostly in general proximity to the ferry landings. Additionally, full recreational closures for other protected species would still occur in the same manner as under alternative A, and to the extent that they encompass the intertidal zone, they would also provide protection to red knots from pedestrians and pets.

Management of Wintering and Nonbreeding Birds—Under alternative E, surveying activities for nonbreeding and wintering birds, including both red knots and piping plovers, would be the same as described for alternative A even though recreational ORV use at the Seashore would be prohibited year-

round. While surveying activities would likely result in noise disturbance and short-term displacement of red knots from the presence of resource staff and essential vehicles in foraging/resting habitat, resource protection staff would take proper measures, such as using binoculars so they can observe the species from greater distances, to minimize any disturbance to red knots during the surveys. Additionally, the survey intervals (i.e., 10 days for red knots and once per month for piping plovers) would also help minimize adverse impacts from surveying by not causing chronic disturbances. While the actual survey activities may cause some short-term adverse impacts, overall, surveying the nonbreeding population of red knots at the Seashore would also result in long-term benefits, due to increased knowledge and awareness of the species.

Under alternative E, a seasonal closure of the Seashore would not be established because ORVs would not be permitted at the Seashore; thereby removing any potential habitat or behavioral alterations that could be caused by the presence of vehicles. This would result in long-term beneficial impacts on red knots at the Seashore. Pedestrians would still access the Seashore during the winter months. Adverse impacts from pedestrians on wintering red knots would be largely imperceptible because many passenger ferries stop operating in the winter, the amount of pedestrian use during the winter months is very low, and without a means of transportation on the beach, most visitor use would be confined to areas in the immediate vicinity of the ferry landings.

Predator Management—Under alternative E, predator management would be the same as alternative A. While predators would not be removed, mortality from mammalian predation on red knots is low (FR 2013b), so any short-term impacts would be from disturbance caused by mammalian predators. Prohibiting public ORV use on the Seashore under alternative E may also help to indirectly protect red knots from disturbances caused by mammalian predators. With no ORV use, the amount of trash at the Seashore is likely to be reduced, especially in areas more remote from pedestrian ferry landing areas. Trash often attracts predators, so a reduction of trash may correlate to a reduction in the number of predators and potential disturbance of red knots, resulting in long-term beneficial impacts.

Education/Public Outreach—Under alternative E, education and outreach would be the same as described under alternative A; however, all efforts would be directed toward pedestrian use because ORVs would not be permitted at the Seashore. Such public outreach is beneficial to red knots as it educates the public to the specific needs of the species.

Research/Monitoring—Research and monitoring under alternative E would be the same as alternative A. Research efforts have the potential to negatively impact feeding and resting behavior of shorebirds over the long-term due to the increased human presence and use of ORVs (Anderson and Keith 1980; Ellison and Cleary 1978; Hand 1980; Tremblay and Ellison 1979). However, any research directed at red knots would result in long-term beneficial impacts for the species because it is likely that results from the research would lead to a greater understanding of the red knot which could inform future protection and management of the species.

ORV and Other Recreational Use

ORVs and Pedestrian Access—Under alternative E, the public use of ORVs would be prohibited along the entire Core Banks and Shackleford Banks. Other recreation use on the ocean beach such as swimming, camping, beach fires, fishing, and the use of cabins would still occur. With no ORVs to access more remote areas of the beach, these activities and their impacts on red knots would likely occur at a reduced rate and only in general proximity to the ferry landing sites. With no public use of ORVs on the beach, impacts on red knots and their habitat from public ORV use as described under alternative A would not occur, resulting in short- and long-term beneficial impacts. In addition, the use of vehicles by NPS staff for law enforcement purposes would likely be reduced from current levels because staff would

only be dealing with pedestrians and management of recreational use would be simplified compared with the other alternatives.

Night-Driving—Under alternative E, there would be no night driving on the Seashore because public ORV use would be prohibited year-round. This would eliminate all potential adverse impacts from night driving on red knots, resulting in short- and long-term beneficial impacts.

Permit Requirements—Under alternative E, there would be no vehicle permit requirements because public ORV use would not be allowed at the Seashore. Therefore, there would be no effects on red knots.

Camping—Under alternative E, camping and campfire activities along the ocean beach would be permitted in areas similar to alternative A (on all beaches of the Seashore that are not otherwise closed by the Superintendent's Compendium, closed for safety, or closed for species protection, that is, full recreation closures and the six sea turtle nest relocation areas). Prohibiting camping and beach fires in full recreational closures would benefit red knots where these closures overlap their foraging habitat on the ocean beach, as disturbance from these activities would be reduced or eliminated. Disturbances to resting and foraging red knots from these activities would also be removed from the six sea turtle nest relocation areas, each of which is approximately 0.5 to 1.0 miles long, providing beneficial impacts to red knots using these areas. Additionally, with no public ORV use allowed on the Seashore under this alternative, camping and campfires would likely be limited to those areas readily accessible by foot such as in front of the cabins, by the lighthouse, or possibly Power Squadron Spit which is accessible by private boat. This would greatly reduce the amount of area where impacts from these activities could occur.

Adaptive Management Strategy—Under alternative E, an adaptive management strategy would be implemented similar to alternative B to ensure that the goals of species protection are being met, providing short- and long-term beneficial impacts to red knots. With no public ORV use allowed on the Seashore under alternative E, American oystercatcher disturbance would be monitored as it relates to impacts from pedestrians and other recreational use and not from ORVs, and only those non-ORV management actions indicated in chapter 2 would be implemented. The management actions that could be implemented include increased education and focused enforcement, which would help reduce closure violations that could impact red knots if they occur in areas along the ocean shoreline; additional focused trash management and fish scrap disposal, which would likely reduce the number of predators attracted to the beach that could disturb red knots; additional predator control, which would again help reduce predator disturbance to red knots; and increased buffer sizes, which would protect red knots if they occur along the ocean shoreline. If species indicators continue to be triggered due to visitor use impacts for two consecutive years after implementing the previously mentioned actions, increasing the size of species protection buffers could be implemented. This action would increase the distance visitors could approach birds, providing some short- and long-term beneficial impacts to red knots that may occur in the closures established for other species.

Cumulative Impacts under Alternative E

Past, present and reasonably foreseeable future actions under alternative E would be the same as those described under alternative A. The overall combined impacts of these past, present, and future actions on red knot would be short- and long-term, limited, and adverse (from disturbance to foraging and nesting birds from visitor use, ORV use, dredging activities, visitor amenity improvements, and military overflights). There would also be long-term beneficial impacts from the protection afforded to red knots and their habitat by species monitoring, other protected species' buffers, habitat protection, visitor protection patrols, visitor education programs, predator management, and future planning efforts under the Foundation Plan. While adverse effects on red knot from other actions occurring in the region would

still exist, actions under alternative E would provide additional protection that would be beneficial to the regional population of this species and would offset some of the adverse effects.

DETERMINATION OF EFFECT

As of September 2013 the USFWS proposed to list the red knot as a threatened species under the ESA of 1973, as amended. This does not obligate the NPS to consult with the USFWS on the red knot at this time. However, given the potential for the species to be listed as a threatened species during the process of this ORV management plan/EIS, the NPS is making a determination on this species to aid any future consultation with the USFWS should it become necessary to do so.

Alternative A

Impacts on red knots would be long-term adverse because their prime foraging habitat (ocean shoreline) would not be afforded protection by ORV or full recreational closures targeted specifically for the protection of the red knot, and while buffers and closures for other protected species at the Seashore (i.e., birds and sea turtles) would protect some of the red knot's prime foraging habitat, it would not protect all of it, especially during the spring migration when red knots are most numerous at the Seashore. Surveying activities for the red knot, as well as other protected species at the Seashore, could have short-term adverse impacts on red knots because the presence of resource staff could result in temporary displacement of foraging birds. However, surveys for the red knot would also result in long-term benefits, due to increased knowledge and awareness of the species. Impacts of ORV and other recreational use would be long-term and adverse because no specific management would be provided for this species, especially during key life stages (migration and wintering). The lack of fully protecting the red knot's prime foraging habitat through ORV and full recreational closures, a permitting system, limits on the number of public ORVs on the Seashore, or night-driving restrictions, and allowing pets outside of full recreational closures in the vicinity of foraging birds would contribute to adverse impacts under alternative A. Overall the impacts of the alternative A would result in a finding of *may affect / are likely to adversely affect* red knots at the Seashore under the ESA because the action would result in direct or indirect impacts to the species that are not discountable, insignificant, or beneficial. Although alternative A does provide some additional protection, the adverse impacts on the red knot from other actions occurring in the region would still exist. Therefore, the effects of these other actions, added to the effects of actions under alternative A, *may affect/are likely to adversely affect* red knots on a regional basis.

Alternative B

Impacts on red knots would be long-term adverse because their prime foraging habitat (ocean shoreline) would not be afforded protection by ORV or full recreational closures targeted specifically for the protection of the red knot, and while buffers and closures for other protected species at the Seashore (i.e., birds and sea turtles) would protect some of the red knot's prime foraging habitat, it would not protect all of it, especially during the spring migration when red knots are most numerous at the Seashore. Surveying activities for the red knot, as well as other protected species at the Seashore, could have short-term adverse impacts on red knots because the presence of resource staff could result in temporary displacement of foraging birds, but more consistent training and supervision of resource staff who conduct the surveys would help reduce those impacts. Surveys for the red knot would also result in long-term benefits, due to increased knowledge and awareness of the species. The red knot may benefit from expanded breeding season closures for other protected species, although benefits would be minimal as red knots prefer ocean beach habitat (Harrington 1996, 2001). They would also benefit from wintering closures for piping plover at the inlets and the point of Cape Lookout. Impacts of ORV and other recreational use would be long-term and adverse, because no specific management would be provided for this species especially during key life stages (migration and wintering), increasing the possibility of

habitat and noise disturbance (and potential injury or mortality) from recreational use. Allowing ORVs access to North and South Core Banks would contribute to these adverse impacts, including noise disturbance, temporary displacement, and increased frequent escape flights. However, increasing education and outreach, increasing compliance by increasing law enforcement staffing levels, implementing a vehicle permit program where driving privileges can be revoked, and implementing additional species management measures, such as a seasonal restriction on night driving and prohibiting high-performance sport-model ATV and UTV use would help lessen the long-term adverse impacts of ORV use on red knots by reducing vehicular disturbance of the species and educating visitors on the importance of resource protection. Additionally, if species protection goals are not being met, the Seashore would implement intensive management actions under an adaptive management strategy, such as increased education and focused enforcement, additional trash management and fish scrap disposal, additional predator control, ORV route restrictions and increased buffer sizes, and limits on the number of vehicle permits issued would also help reduce ORV and recreational impacts on piping plovers and their habitat. All of these measures would help mitigate/reduce the potential for long-term adverse impacts of ORV use. Overall, impacts of alternative B on red knots at the Seashore would result in a finding of *may affect / are likely to adversely affect* under the ESA because the action would result in direct or indirect impacts to the species that are not discountable, insignificant, or beneficial. Although alternative B does provide some additional protection, the adverse impacts on the red knot from other actions occurring in the region would still exist. Therefore, the effects of these other actions, added to the effects of actions under alternative B, *may affect/are likely to adversely affect* red knots on a regional basis.

Alternative C

Impacts on red knots would be long-term adverse because their prime foraging habitat (ocean shoreline) would not be afforded protection by ORV or full recreational closures targeted specifically for the protection of the red knot, and while buffers and closures for other protected species at the Seashore (i.e., birds and sea turtles) would protect some of the red knot's prime foraging habitat, it would not protect all of it, especially during the spring migration when red knots are most numerous at the Seashore. Surveying activities could have short-term adverse impacts on red knots because the presence of resource staff could result in temporary displacement of foraging birds, but more consistent training and supervision of resource staff who conduct the surveys would help reduce those impacts. Surveying for the red knot would also result in long-term benefits, due to increased knowledge and awareness of the species. The red knot would indirectly benefit from expanded closures for breeding American oystercatcher pairs and unfledged piping plover chicks where they encompass the ocean shoreline, because red knots that rest or forage within closures would be afforded the same protection. Impacts of ORV and other recreational use would be long-term and adverse, because no specific management would be provided for this species, especially during key life stages (migration and wintering), increasing the possibility of habitat and noise disturbance (and potential injury or mortality) from recreational use. However, increasing education and outreach, increasing the amount of pedestrian-only use areas, implementing a vehicle permit program with limits on the number of ORVs that can use the Seashore at any one time and the ability to revoke driving privileges, implementing additional species management measures, such as seasonal restrictions on night driving and prohibiting high-performance sport-model ATV and UTV use while also limiting utility-model ATV and UTV use would help lessen the long-term adverse impacts of ORV use on red knots by reducing vehicular disturbance with the species and educating visitors on the importance of resource protection. Additionally, if species protection goals are not being met, the Seashore would implement intensive management actions under an adaptive management strategy, such as increased education and focused enforcement, additional trash management and fish scrap disposal, additional predator control, ORV route restrictions and increased buffer sizes, and limits on the number of vehicle permits issued would also help reduce ORV and recreational impacts on piping plovers and their habitat. All of these measures would help mitigate/reduce the potential for long-term adverse impacts of ORV use. Overall, impacts of alternative C on red knots at the Seashore would result in a finding of *may affect /*

are likely to adversely affect under the ESA because the action would result in direct or indirect impacts to the species that are not discountable, insignificant, or beneficial. Although alternative B does provide some additional protection, the adverse impacts on the red knot from other actions occurring in the region would still exist. Therefore, the effects of these other actions, added to the effects of actions under alternative B, *may affect/are likely to adversely affect* red knots on a regional basis.

Alternative D

Impacts on red knots would be long-term adverse because their prime foraging habitat (ocean shoreline) would not be afforded protection by ORV or full recreational closures targeted specifically for the protection of the red knot, and while buffers and closures for other protected species at the Seashore (i.e., birds and sea turtles) would protect some of the red knot's prime foraging habitat, it would not protect all of it, especially during the spring migration when red knots are most numerous at the Seashore. Surveying activities could have short-term adverse impacts on red knots because the presence of resource staff could result in temporary displacement of foraging birds, but more consistent training and supervision of resource staff who conduct the surveys would help reduce those impacts. Surveying for the red knot would also result in long-term benefits, due to increased knowledge and awareness of the species. The red knot would indirectly benefit from expanded buffers and closures for state-listed birds and piping plovers where they encompass the ocean shoreline, because red knots that rest or forage within closures would be afforded similar protection. Impacts of ORV and other recreational use would be long-term and adverse because no specific management would be provided for this species, especially during a key life stage of wintering, increasing the possibility of habitat and noise disturbance (and potentially injury or mortality) from recreational use. However, increasing education and outreach; implementing a vehicle permit program with limits on the number of ORVs that can use the Seashore at any one time and the ability to revoke driving privileges; implementing additional species management measures, such as seasonal restriction on night driving, prohibiting all ATV use and high-performance sport-model UTV use; limiting utility-model UTV use; and reducing the percentage of Seashore available to ORV access would help lessen the long-term adverse impacts of ORV use on red knots by reducing vehicular disturbance with the species and educating visitors on the importance of resource protection. Additionally, if species protection goals are not being met, the Seashore would implement intensive management actions under an adaptive management strategy, such as increased education and focused enforcement, additional trash management and fish scrap disposal, additional predator control, ORV route restrictions and increased buffer sizes, and limits on the number of vehicle permits issued would also help reduce ORV and recreational impacts on piping plovers and their habitat. All of these measures would help mitigate/reduce the potential for long-term adverse impacts of ORV use. Overall, impacts of alternative D on red knots at the Seashore would result in a finding of *may affect / are likely to adversely affect* under the ESA because the action would result in direct or indirect impacts to the species that are not discountable, insignificant (under ESA), or beneficial. Although alternative D does provide some additional protection, the adverse impacts on the red knot from other actions occurring in the region would still exist. Therefore, the effects of these other actions, added to the effects of actions under alternative D, *may affect/are likely to adversely affect* red knots on a regional basis.

Alternative E

Prohibiting public ORV use at the Seashore under alternative E would remove a source of disturbance for red knots, resulting in long-term beneficial impacts. It would also indirectly limit disturbances from essential vehicle use and pedestrian use at the Seashore. While NPS staff would still conduct surveying and monitoring activities which could have short-term adverse impacts on red knots because the presence of resource staff could result in temporary displacement of foraging birds, they would likely do so at a reduced level of effort without the threat of ORV impacts on species, lessening the overall impact. However, surveying for the red knot would also result in long-term benefits, due to increased knowledge

and awareness of the species. Without ORVs to access more remote areas of the Seashore, pedestrian use and its impacts would likely be limited to areas in general proximity to the ferry landing areas, lessening the overall impacts on red knots from pedestrians. Additionally, if species protection goals are not being met, the Seashore would implement additional intensive management actions under an adaptive management strategy, such as increased education and focused enforcement, additional trash management and fish scrap disposal, additional predator control, and increased buffer sizes. All of these measures would help mitigate/reduce the potential for long-term adverse impacts due to pedestrian use of the Seashore. Overall, the impacts of alternative E on red knots at the Seashore would result in a finding of *may affect / are not likely to adversely affect* under the ESA because the action would result in direct or indirect impacts to the species that are discountable, insignificant (under ESA), or beneficial. Although alternative E provides additional protection to the red knot at the Seashore and would offset some of the adverse effects from regional impacts, the adverse effects on red knots from other actions occurring in the region would still exist. Therefore, the effects of these other actions, added to the effects of actions under alternative E, *may affect/are likely to adversely affect* red knots on a regional basis.

COMPARISON OF ALTERNATIVES

Impacts of ORV and other recreational use would result in long-term adverse impacts on red knots under alternative B. Allowing continued ORV access along 81 percent (45 miles) of the Seashore would contribute to these long-term impacts, including noise disturbance, temporary displacement, and possibly injury/mortality of individuals. However, impacts would be reduced when compared to alternative A (the no-action alternative) due to increased education and outreach; the use of additional species management measures, such as focused predator management, and the prohibition of all high-performance sport-model and two-stroke ATVs and UTVs, and the more intensive management actions that could be implemented under the adaptive management strategy. Red knots are active at night, so additional benefits would also result from a seasonal restriction on night driving from May 1 through August 3; however, benefits from this restriction would be limited since it does not cover the red knot's spring migration period when it is most numerous at the Seashore. Compared to alternative E, impacts on red knots would be greater under alternative B would provide less protection for red knots, because while alternative B allows public ORV use which can adversely impact red knots, under alternative E public ORV use on the Seashore would be prohibited, eliminating this source of adverse impact and reducing the impact from pedestrians, who without transportation opportunities to more remote areas of the Seashore would likely be limited to areas in general proximity to the ferry landing areas.

Under alternative C, the impacts of ORV and other recreational use would result in long-term adverse impacts on red knots from noise disturbance, temporary displacement, and possibly injury/mortality of individuals. However, impacts would be reduced when compared to alternative A (the no-action alternative), due to increased education and outreach; the use of additional species management measures, such as expanded species closures (for other protected birds); the increase in the amount of pedestrian-only use areas by 4 miles; the expansion of the winter vehicle closure timeframe (changing it to December 16 through March 15 compared to January 1 through March 15 under alternative A); the closing of ORV routes where no ferry access is available; the prohibition on all high-performance sport-model and two-stroke ATVs and UTVs at the Seashore; shortening the timeframe that non-sport ATVs and UTVs would be permitted within the Seashore each year (reducing the March 16 through December time under alternative A to September 15 through December 15); the reduction in the amount of Seashore open to public ORV use; and the fee-based ORV permitting system that would also limit the number of vehicles on the Seashore, and the more intensive management actions that could be implemented under the adaptive management strategy. Red knots are active at night, so additional benefits would also result from a seasonal restriction on night driving from May 1 through September 14; however, benefits from this restriction would be limited since it does not cover the red knot's spring migration period when it is most numerous at the Seashore, and most birds have already left the Seashore prior to the latter portion of

the period. Compared to alternative E, the amount of impacts on red knots under alternative C would be greater due to public ORV use being allowed under alternative C, whereas it would be prohibited under alternative E. The prohibition of public ORV use under alternative E would also reduce the amount of impacts from pedestrians, because without ORVs to access the more remote areas of the Seashore pedestrians would likely be limited to areas in general proximity to the ferry landing areas.

Alternative D would also result in long-term adverse impacts on red knots from disturbance, temporary displacement, and possibly injury/mortality of individuals. However, impacts would be reduced when compared to alternative A (the no-action alternative), due to increased education and outreach; the use of additional species management measures, such as expanded buffers/closures (for other protected birds); the closing of ORV routes where no ferry access is available; the reduction in the amount of Seashore open to public ORV use; the implementation of a vehicle permit program and the reduction in the number of public ORVs allowed on the Seashore by 8 percent; the prohibition of all ATVs, as well as all high-performance sport-model and two-stroke UTVs at the Seashore; and the shortening of the timeframe that non-sport UTVs would be permitted within the Seashore each year (reducing the March 16 through December 31 timeframe under alternative A to September 15 through December 15), and the more intensive management actions that could be implemented under the adaptive management strategy. Red knots are active at night, so additional benefits would also result from a seasonal restriction on night driving from May 1 through September 14; however, benefits from this restriction would be limited since it does not cover the red knot's spring migration period when it is most numerous at the Seashore, and most birds have already left the Seashore prior to the latter portion of the period. Compared to alternative E (the no ORV alternative), impacts on red knots under alternative D would be greater due to public ORV use being allowed under alternative D, whereas it would be prohibited under alternative, eliminating because ORV access would continue to be permitted under alternative D. The prohibition of public ORV use under alternative E would also reduce the amount of impacts from pedestrians, because without ORVs to access the more remote areas of the Seashore pedestrians would likely be limited to areas in general proximity to the ferry landing areas.

Under alternative E, prohibiting public ORV use at the Seashore would provide long-term beneficial impacts compared to alternative A where public ORV use would be allowed along 81 percent of the Seashore. While continued pedestrian access under alternative E would result in some short- and long-term disturbance (e.g., noise, temporary displacement, etc.) of red knots, these impacts would be reduced compared to alternative A because without the use of ORVs to access more remote areas of the Seashore, pedestrian use under alternative E would likely be limited to areas in the general proximity to the ferry landing areas. As a result, overall, alternative E would provide more protection and result in fewer adverse impacts to red knots compared to alternative A.

CONCLUSION

Overall, impacts on red knots from ORVs and other recreational uses under alternatives A, B, C, and D are expected to be long-term and adverse, although compared to the existing condition, the proposed changes under each action alternative are beneficial. Red knots do not breed at the Seashore, however, many red knots use the Seashore during migration, and some individuals may overwinter at the Seashore. The majority of red knots at the Seashore are observed in two locations: (1) from Ocracoke Inlet to mile 7 on North Core Banks, and (2) from Ophelia Inlet to mile 29 on South Core Banks. The red knot occurs at the Seashore during their northbound spring migration (April 15 to May 25), with peak counts ranging from 700 to 1,611 birds, based on data from 2006 to 2013. The red knot's southbound fall migration occurs at the Seashore in August, and peak counts range from 100 to 800 birds.

During the red knot's migration stopover at the Seashore, they can potentially encounter several sources of negative impact, including avian predators, dredging activities, and human disturbance. A number of

avian predators, including the peregrine falcon, great black-back gull, and the herring gull, are the most common predators of red knots, and can be attracted to the Seashore by the waste stream (fish bait, food scraps) associated with recreational uses at the Seashore. The types of UTVs (e.g., two stroke; with trailers) and the number of vehicles through a permit system would be increasingly limited under alternatives B, C, and D, but could negatively impact migrating or wintering red knot populations. Because red knots do not breed at the Seashore, there would be no red knot-specific recreational or ORV pre-nesting closures established, or red knot-specific surveying or monitoring. Surveying for other protected shorebirds (e.g., piping plover) under all of the alternatives may lead to temporary impacts on migrating red knots (e.g., flushing) and could negatively impact their feeding and resting behaviors. Outside of the January 1 through March 15 timeframe (alternatives A and B) or December 16 through March 15 timeframe (alternatives C and D), no closures would be specifically implemented for spring and fall migrating or wintering shorebird protection, which could result in disturbance of individuals, leading to displacement and altered foraging behavior of red knots.

Several sources of positive impacts at the Seashore on the red knot include mammalian predator management, other bird and turtle nesting closures, and seasonal recreational closures. Some mammalian predator management discussed in alternatives B, C, and D designed to benefit other sensitive shorebird species, would have an overall positive impact on the red knot. Also, active nests of other bird species identified during surveying, could lead to full recreational closures, which could benefit red knots. Under all of the alternatives, full recreational pre-nesting closures would be established by April 1 in all active, historical, and potential shorebird areas, which could provide some areas where migrating red knots would be protected from disturbance. Sea turtle closures which occur on the beach during the red knot's fall migration may provide additional protection. Also, a 600-foot ORV closure around a known piping plover's chick and a 150-foot buffer around other waterbird chicks would afford some protection for red knots at the end of their spring migration period. Under alternative A, the Seashore would be closed to vehicles from January 1 through March 15. This winter recreational closure would result in long-term benefits for wintering red knot populations by providing protected habitat during the winter and allowing the beach profile an extended time to recover without any vehicles on it.

Significance Discussion

The purpose of the Seashore is to preserve the outstanding natural, cultural, and recreational resources and values of a dynamic, intact, natural barrier island system where ecological processes dominate. The Seashore is one of the few remaining locations on the Atlantic Coast where visitors can experience and recreate in an undeveloped, remote barrier island environment that can be reached only by boat or ferry. The Seashore is an important migration stopover site for the red knot, particularly during springtime. Red knots have one of the longest migration routes of any shorebird, around 9,000 miles (Cornell Lab of Ornithology 2013), as they overwinter in southern Chile and Argentina and migrate north to the Canadian Arctic Regions for breeding. On September 27, 2013, the red knot was proposed for listing as a threatened species under the ESA. The USFWS plans to publish a separate proposed rule identifying critical habitat before the end of 2013, and plans to make a final decision on both rules in 2014 (USFWS 2013b). As of December 20, 2013, critical habitat has not yet been defined, and the red knot does not have special-status listing in North Carolina. The greatest concerns related to wintering and migrating red knots are disturbances at their stopover areas.

Red knots do not receive species-specific protections, but gain indirect protections that increase in varying degrees under alternatives A, B, C, and D. These protections would increase under alternatives C and D, which limit ORVs to historical limits, and would dramatically increase under alternative E, since the elimination of ORVs may cause a decrease in disturbances of wintering and wintering red knots. Overall, impacts on red knots from ORVs under alternatives A, B, C, and D are expected to be long-term and adverse. However, compared to the existing condition, the proposed changes under each action

alternative are beneficial. Allowing ORVs access to the North and South Core Banks under alternatives A, B, C, and D would contribute to other adverse impacts, including noise disturbance, temporary displacement, and an increased frequency of escape flights. However, several ORV management options in alternatives B, C, and D would help mitigate long-term adverse impacts on red knots, including the reduction of vehicular contact with individual birds, reducing mortality due to predators, increasing the education of visitors about the importance of resource protection, and increasing resource protection measures under the adaptive management strategy. Also, alternatives B, C, and D would impose seasonal restrictions on night driving and implement species buffers and closures, restrictions on ATV and UTV use, the exclusion of ORV use on Shackleford Banks, ORV permit limits under alternatives C and D, and several adaptive management strategies. Prohibiting ORV access at the Seashore under alternative E would remove a source of disturbance for red knots, resulting in long-term beneficial impacts, which could eventually reduce the need for mitigation of red knots at the Seashore. Despite some adverse effects to red knots, the action alternatives result in a beneficial change compared to the no-action alternative and existing condition, and would not result in significant adverse impacts to the red knot.

Under alternatives A, B, C, and D, designating legal routes for ORV use does not establish a precedent for future actions with significant effects, because ORV use has occurred at the Seashore since the 1930s and continued since the establishment of the Seashore as a park unit in 1976, and the current and proposed species protection measures benefit the red knot. Since the purpose of the Seashore is to preserve natural and recreational resources, and since ORV use is also currently legally permitted in several other national seashores, these alternatives would not be precedent-setting within the national park system. As described above, ORV use does not cause significant impacts to red knots, in part because of the substantial resource protection and mitigation measures taken by the Seashore. Alternative E, which prohibits ORV use, would not establish a precedent for future actions with significant effects to red knots, because many other national park units do not allow ORV use.

There are a number of cumulative impacts to red knots, described in the impacts analysis above, which may be short- and long-term, limited, and adverse, such as impacts from ORVs, as well as long-term beneficial. However, while adverse effects on red knots from other actions occurring in the region could be significant, resource management actions under alternatives A, B, C, D, and E would provide additional protections that would be beneficial to the species and would contribute minimally to any significant adverse cumulative impacts already occurring regionally.

In conclusion, compared to the existing condition, additional impacts to red knots under alternatives A, B, C, D, and E would be small. The Seashore has substantial resource protection in place, and mitigation measures would continue and would be strengthened in the action alternatives, many of which benefit red knots. When compared to the existing condition, in light of the significance criteria in 40 CFR 1508.27, there would be no significant adverse impacts to red knots from alternatives A, B, C, D, or E.

SEA TURTLES

SPECIES-SPECIFIC METHODOLOGY AND ASSUMPTIONS

Potential impacts on federally listed sea turtle populations and their habitat within the Seashore were evaluated based on the species' known interactions with humans, domestic pets, recreational and nighttime activities, predators, artificial lighting, and ORVs, as well as past and present occurrence at the Seashore. Information about habitat and species occurrence within the Seashore and potential impacts on sea turtles from recreation and other activities was acquired from staff at Cape Lookout National Seashore, the USFWS, the North Carolina Wildlife Resources Commission (NCWRC), and available literature.

Although five threatened or endangered sea turtle species occur in the waters of North Carolina, only three species, the loggerhead, green, and leatherback, are known to regularly nest at the Seashore. Occurrences of Kemp's ridley turtles at the Seashore are mostly from strandings, usually due to either prior death or incapacitation from hypothermia; however, in 2003 and 2012 a single nest was documented each year (NPS 2004d, 2012n). Kemp's ridley turtles nest almost exclusively on a single beach on the east coast of Mexico, with nesting occurrences outside that area extremely limited. Within the United States, the majority of Kemp's ridley nests are found along the south Texas coast. The hawksbill sea turtle has never been recorded nesting at the Seashore and is only known to the Seashore through three dead strandings, one in 2003 and two in 2005. Therefore, the analysis only focuses on the three species that nest at the Seashore with some frequency: the loggerhead, green, and leatherback sea turtles. For these three species, the analysis focuses on effects on sea turtles from a variety of human recreation and other activities, as well as impacts incurred as a result of surveying and management activities. Except for the timing of nest laying activities, the nesting habits for loggerhead, green, and leatherback sea turtles at the Seashore are similar. Therefore, the analysis generally discusses the impacts on the sea turtles as a group. Impacts on a specific species are noted where they differ from impacts on the other sea turtle species.

Sea turtle nesting habitat overlaps protected bird species habitat seaward of the primary dune line. Consequently, management of birds could also benefit nesting sea turtles and is included in the analysis. However, the extent to which the bird closures are beneficial to the turtles depends on the location, size, and duration of the closures. In the analysis, it is assumed that compliance with closures and other regulations such as leash requirements, disposal of bait and fish carcasses, etc., would increase from current levels where alternatives would result in an increase of natural resource and law enforcement staff at the Seashore.

It should also be noted that Cape Lookout National Seashore is at or near the northern limit of the breeding range for all four species of sea turtles that nest there. The loggerhead sea turtle is also the only species for which recovery criteria are designated for the state of North Carolina in its recovery plan (NMFS and USFWS 2008, 1992, 1991; NMFS, USFWS and SEMARNAT 2011). As such it may be difficult to manage the current populations for increased nesting density, especially for the green, leatherback, and Kemp's ridley sea turtles.

In general, direct and indirect impacts on sea turtles, their nests, eggs, and hatchlings would primarily occur during the sea turtle nesting and hatching seasons from May 1 through November 15 and during summer and fall storm events when post-hatchlings may wash ashore. There may be direct impacts on live stranded turtles year-round.

STUDY AREA

The study area for assessment of the various alternatives is the Seashore. Based on the fact that the loggerhead sea turtle is the primary nester within the Seashore (98 percent of all nests) and is the only sea turtle for which recovery criteria are designated for the state of North Carolina in its recovery plan, the study area for the cumulative impacts analysis is the state of North Carolina.

ALTERNATIVE A

Impacts of Alternative A: No Action

Resources Management Activities

Surveying and Monitoring—Under alternative A, NPS staff would survey for turtle crawls and nests between May 1 and September 15. On North Core Banks and South Core Banks surveys would occur

daily prior to 12 p.m. On Shackleford Banks surveys would occur 2–3 days per week while Middle Core Banks would be surveyed irregularly due to difficulty accessing the island. Periodic monitoring (e.g., 2–3 days) for unknown nesting and emerging hatchlings would continue through November 15. These monitoring periods encompass the nesting season for loggerhead sea turtles (mid-May to mid-August), the most prevalent nesters at the Seashore, and the vast majority of the nesting season for the green and leatherback sea turtles, which are infrequent nesters at the Seashore. Prior to May 1, the leatherback sea turtle is the only species likely to nest at the Seashore. Although turtle surveying would not occur prior to May 1, turtle crawls may be detected by bird monitors who are surveying the beaches three times per week (or every other day) beginning April 1. From 1990 to 2005 when daily monitoring for turtle nests did not start until June and ended August 15 of each year, staff patrolling the beaches for other reasons readily found turtle nests, documenting two nests in April, 135 nests in May, and two nests in September. ORVs are not allowed on Shackleford Banks; however, patrolling Shackleford only two to three times per week may result in missed crawls or nests, because pedestrian traffic, blowing sand, or rain may obscure turtle crawls. While surveying activities under alternative A could miss some nests, the risk is small; since 1990, following similar practices, less than 1 percent of nests were known to be missed and hatched without adequate protection (Altman pers. comm. 2010a; NPS 2011c, 2010h, 2010b, 2009c). The 1 percent of the nests that go undetected would not be subject to management by the NPS staff and would be exposed to adverse impacts because the nests would be subject to multiple potential threats such as being run over by ORVs (only pertains to North Core Banks and South Core Banks), which could destroy eggs or compact the sand to the point where hatchlings are unable to emerge; depredation by raccoons or other predators; and loss due to erosion or frequent flooding since a decision about potentially relocating the nest could not be made. Hatchlings emerging from unprotected nests would be at a greater risk of being disoriented by light pollution since wooden light barriers would not have been erected around the nest. If an undetected nest were located in an area open to ORV use hatchlings would be subjected to impacts associated with tire tracks because they would not be raked smooth by NPS staff. If tracks are not raked smooth, hatchlings can become easily trapped and disoriented in the ruts, leading to an increased risk of death by predation, being run over by subsequent ORV traffic, or exhaustion prior to reaching the ocean (Hosier, Kochhar, and Thayer 1981; Lamont, Percival, and Colwell 2002; NMFS and USFWS 2008).

NPS staff would use ORVs to survey for turtle crawls and nests providing short- and long-term benefits. Using ORVs during surveys allows NPS staff to cover the entire length of the shoreline each morning in search of turtle crawls and nests, significantly reducing the number of nests that would otherwise go undetected and unprotected. Using ORVs also allows NPS staff to take the necessary supplies with them to install closures around located nests to protect them. Conducting surveys, as called for in the monitoring protocols, during the morning would allow patrols to avoid potentially impacting emerging hatchlings or nesting females, since these activities typically occur at night. Overall, patrolling for sea turtle crawls and nests daily would be beneficial, as it greatly reduces the potential impacts of ORVs by allowing NPS staff to detect and protect nests. Daily patrols also allow staff to monitor closure violations, and on rare occasions vandalism, and repair any damage to the closure. They also allow staff to detect any predator activity and protect those nests with predator exclosures.

During periods following severe storm events or when large quantities of seaweed are washed ashore, post-hatchling washbacks would be monitored. This monitoring would provide benefits to hatchlings washed ashore by helping prevent them from being run over by vehicles or disturbed by pedestrians or their pets and by protecting them from potential predation.

Under alternative A, the Seashore would mark turtle nests using two posts with reflective tape on them, increasing the visibility of the turtle nests for ORV operators. However, the posts are only 5 feet apart and perpendicular to the shoreline. If an ORV accidentally violates a closure area, the small buffer size would greatly increase the risk that the nest would be run over.

Fifty days after a nest is laid, a funnel-shaped ORV closure would be established around each nest to 15 feet below the high tide line and any tire ruts not smoothed naturally by wind or rain would be raked smooth. The closure would be 60 feet wide at the nest and 150 feet wide below the high tide line, with a minimum of a 15-foot buffer duneward of the nest. If a 15-foot buffer behind the nest is not possible, a ramp-to-ramp ORV closure would be established, with vehicles routed around the nest via the back route. Relocation of nests solely to resolve recreational access issues would not be considered. The size of the expanded buffers would create a large vehicle-free area around the nest, protecting the nest and hatchlings from being run over. The expanded buffers would also create a large area free from tire ruts, eliminating the potential for hatchlings to become trapped or disoriented in the tire ruts as they make their way to the ocean. By protecting all of the detected turtle nests in the Seashore during the incubation and hatching periods, these buffers would provide substantial short- and long-term benefits to the sea turtles.

Sea turtle nesting habitat overlaps protected bird species habitat seaward of the primary dune line. Therefore, management for bird species under alternative A would also be beneficial to sea turtles and their habitat. However, the extent to which the bird management practices and closures are beneficial to turtles would depend on the location, size, and duration of the closures. For example, a closure extending further in front of the primary dune line where turtles nest, or a pre-nesting closure overlapping sea turtle nesting habitat that is kept in place after July 15 because birds are using it would provide more protection than a closure located mainly behind the primary dune line or a closure removed by July 15 because birds do not use it.

In the event of a hurricane, beaches would not be reopened to ORVs until all existing turtle nests were found and remarked and closures reestablished. This would help prevent nests from being impacted by ORVs or other recreational activities.

Relocating Nests—In accordance with NCWRC guidelines, relocating sea turtle nests for environmental reasons would be considered as a last resort because relocating nests has the risk of either damaging the eggs or the embryonic development process (Miller, Limpus, and Godfrey 2003). During monitoring when a nest is found staff would assess the need to relocate the nest. Nests that would be relocated are those that are laid below the high tide line and subject to frequent inundation, which can cause mortality of incubating egg clutches (Foley, Peck, and Harman 2006) or in areas where they are likely to be washed away or are in danger of erosion. If relocation is necessary, procedures for relocating nests provided in the NCWRC handbook (NCWRC 2006) would be followed. If a nest needs to be relocated it would be relocated to the nearest of six turtle relocation nesting areas established on the beach (three on North Core Banks and three on South Core Banks). Due to the fact that no ORVs are allowed on Shackleford Banks, nests on Shackleford Banks would be relocated to the nearest suitable habitat. The six relocation areas on North Core and South Core Banks would be designated during the sea turtle nesting period and would be established from one ramp to the next ramp and would generally be 0.5 to 1.0 miles long. The relocation areas would be closed to ORV traffic beginning 50 days after the first nest is relocated to the area and would not reopen until the last nest in the area has excavated. Camping and campfires would also be prohibited in these areas. Relocating nests would have both beneficial and adverse impacts.

Historically, the single greatest impact on hatching success has been weather related events such as hurricanes or other storms which can uncover nests through erosion, flood nests, or bury nests too deep for them to hatch properly (NPS 1991, 1992, 1993b, 1994, 1995, 1996, 1997b, 1998c, 1999b, 2000d, 2001c, 2002c, 2003b, 2004d, 2005b, 2006g, 2007j, 2008d, 2009c, 2010c, 2010h, 2011c, 2012n). Relocating nests prone to these events or located in areas below the high tide line to areas higher up on the beach increases the likelihood that these nests would not be lost by being washed away or continuously inundated with sea water, resulting in short- and long-term beneficial impacts. Because ORVs, as well as camping and campfires, are restricted from the relocation areas, relocating nests to these areas also protects the nests and emerging hatchlings from ORV and light pollution impacts.

Relocation of nests does have some potential adverse impacts. Six to 12 hours after deposition, the egg embryo becomes attached to the top of the eggshell (NCWRC 2006). After this time, the embryo becomes very sensitive to movement and can be dislodged if the egg is rotated. This would result in the death of the embryo. However, having three nest relocation areas per island reduces the travel time from a nest site to a relocation area, allowing staff to minimize the amount of time it takes to relocate a nest and the potential for adverse impacts to occur. If nesting pits are not constructed properly this can lead to loss of hatchlings was well. Relocating nests into a single beach closure can increase the risk of a large loss due to storms, pathogens, or predation. Additionally, relocated nests are often placed near the dune line where plants are increasing the risk of root invasion which can destroy eggs or trap hatchlings. However, these risks are minimal compared to the risk of a nest being lost due to overwash or erosion at its original location.

Relocating nests at the Seashore has been very successful to date, resulting in beneficial impacts. From 1990 to 2011 an average of 47 percent of the nests found at Cape Lookout National Seashore were relocated to protect them from frequent flooding and erosion (NPS 2012n). However, in 2005, the USFWS and the NCWRC recommended that the Seashore reduce the number of nests relocated to a target of 30 percent, preferring to allow nests to exist without human intervention and the potential impacts of relocating them (Cordes pers. comm. 2005b). Since 2005, an average of 27 percent of the nests have been relocated, ranging from a high of 39 percent in 2006 to a low of 13 percent in 2010 (NPS 2006g, 2007j, 2008d, 2009c, 2010c, 2010h, 2011c, 2012n). Hatching rates since 1990 for relocated nests have been the same as for nonrelocated nests, averaging 65 percent emergent success. However, when factoring unknown egg losses for nonrelocated nests due to predation and erosion, the average emergence success rate for nonrelocated nests is less than relocated nests (56 percent to 65 percent respectively) (NPS 2011c).

In addition to the inherent risks of relocating nests, nest relocation can also alter the natural sex ratio of the nest by altering the incubation temperature (Foley et al. 2006). Temperatures warmer than 84.6°F produce more females, while colder temperatures produce more males. Because North Carolina is near the northern limit of loggerhead nesting, it is believed that North Carolina contributes more males to the population (Mrosovsky 1988). By relocating nests from lower on the beach to areas higher on the beach where incubation temperatures would presumably be slightly higher, more females could be produced than would naturally occur. However, there is currently not enough temperature or sex ratio data to determine if sex ratios are being altered due to relocation efforts.

Besides sex ratios, relocating nests can also alter other hatchling characteristics. Loggerheads naturally distribute their nests both temporally (nest several times throughout the nesting season) and spatially (locate nests low or high on the beach and in different sections along the beach) (NMFS and USFWS 2008). This not only helps to avoid completely losing their reproductive effort in case environmental factors, such as storms, temperature, sand conditions, or other incubation environments preclude development of the hatchlings, but it also varies the incubation environment of the eggs. In addition to the sex ratio of the hatchlings, the incubation environment has also been shown to influence among other things size, early swimming behavior, and early growth in hatchlings (Foley et al. 2006). Because the characteristics of hatchlings vary with incubation environments, a scattered nesting pattern increases the variation of hatchling characteristics. This may ensure that at all times, at least some hatchlings have characteristics that are appropriate for survival, when the exact characteristics that are best suited for survival vary unpredictably over space and time (Carthy, Foley, and Matsuzawa 2003). Relocating nests and/or concentrating them in one area of a beach may very well reduce the variety of incubation environments that could influence the development of hatchling characteristics that increase survival rates (Foley et al. 2006).

Closing designated relocation areas along North Core Banks and South Core Banks to ORV traffic before the hatching of the first relocated nest would provide benefits for any turtles that come ashore in those areas to nest by eliminating potential disturbance from ORVs that might cause false crawls. This would be particularly true in the area south of the lighthouse on South Core Banks where the relocation area overlaps an area that generally receives the highest annual concentration of natural nests (refer to figure 11 in chapter 3).

Light Management—The sea-finding mechanisms in emerging hatchlings are complex and involve cues from both brightness and shape. Studies indicate that strong brightness stimuli can override competing cues (Witherington and Martin 1996). Hatchlings tend to orient toward the brightest direction over a broad horizontal direction, which on an undeveloped beach is often toward the open horizon of the ocean. However, light pollution, such as that from ORV headlights, beach fires, or lights from nearby residences or other developments, can cause emerging hatchlings to become disoriented (meander or circle) or misoriented (led in the wrong direction) (Witherington and Martin 1996). Depending on the location of the artificial lights with respect to a hatching nest, hatchlings may move toward the artificial light in a direction that is away from or parallel to the ocean. This can result in the hatchlings never finding their way to the ocean. It can also cause the hatchlings to expend more energy than necessary to find the ocean, leading to exhaustion and an increased risk of predation or desiccation (NMFS and USFWS 2008). Erecting 2-foot high plywood barriers behind and to the sides of nests 10 days before the estimated hatch date for those nests in locations deemed vulnerable to light pollution (i.e., in front of the cabins at Long Point and Great Island) would decrease the impact of light pollution on hatchlings emerging from their nests, providing short- and long-term beneficial impacts. For example, in 2005 a light barrier was used successfully on a nest directly in front of the Long Point cabin area (NPS 2006g). While erecting the light barriers would not completely eliminate the impacts from light pollution on hatchlings, due to the remote undeveloped nature of the Seashore and the limited amount of night driving that takes place, relatively few artificial-light impacts on hatchlings have been documented, with only 22 incidences recorded since 1990 (NPS 1991, 1992, 1993b, 1994, 1995, 1996, 1997b, 1998c, 1999b, 2000d, 2001c, 2002c, 2003b, 2004d, 2005b, 2006g, 2007j, 2008d, 2009c, 2010c, 2010h, 2011c, 2012n). There were an additional five incidences where hatchlings crawled inland, but these were in areas relatively free from light pollution and were attributed to hatchlings being confused by the topography. There have been several other incidences where hatchlings appeared to be disoriented while crawling outside of the closure areas, but no causes were attributed to this by NPS staff (NPS 2011c).

Prohibiting camping and beach fires in the nest relocation areas when the ORV closures go into effect would help protect hatchlings and nesting turtles in those areas from artificial light pollution; however, throughout the rest of the Seashore, these activities would not be prohibited and could contribute to false crawls in nesting adults or disorientation in hatchlings. Encouraging concessionaires and cabin users to minimize light use would help minimize light pollution on the beach. The extensive back route system throughout the Seashore also helps to minimize light pollution on the beach by allowing vehicles to drive behind the primary dune line rather than along the shoreline.

Predator Management—Under alternative A, all nests would be protected from predation by placing wire screens anchored by rebar over the nest. In past years the highest rate of predation, primarily by raccoon, has occurred on South Core Banks south of the lighthouse (NPS 1991, 1992, 1993b, 1994, 1995, 1996, 1997b, 1998c, 1999b, 2000d, 2001c, 2002c, 2003b, 2004d, 2005b, 2006g, 2007j, 2008d, 2009c, 2010c, 2010h, 2011c, 2012n). In this location, nests would be afforded greater protection by placing wire cages over the nests. While some nests still suffer some egg loss due to raccoon predation, screening nests does help protect against total nest loss. Using predator exclosures would entail a slight risk of damaging eggs during placement or trapping emerging hatchlings as occurred in one nest in 2011 (NPS 2011c); however, the risk is minimal and is far outweighed by the benefits of protecting the nests against predation.

Education/Public Outreach—Under alternative A, the Seashore would continue to encourage concessionaires and people staying in Seashore cabins to minimize the use of outdoor lights. These actions would provide benefits to sea turtles by reducing the amount of light pollution on the beaches that could disorient emerging hatchlings or cause nesting females to abort their nesting attempts.

The public outreach that would continue to be provided under alternative A would be beneficial to the sea turtle. Providing the public information as to the specific needs of the species and alerting them ahead of time to areas where they cannot go would help avoid potential impacts on the species. Enforcing proper trash disposal (pack in/pack out) would also be beneficial by eliminating trash on the beach that attracts predators such as raccoons that could also prey on eggs or hatchlings.

ORV and Other Recreational Use

Under alternative A, 81 percent (45 miles) of the Seashore beaches would be available for ORV use in designated routes and areas (as documented in the Superintendent's Compendium) from March 16 through December 31. In addition to the ORV closures described above that are established for the protection of sea turtles, the Seashore also establishes ORV and full recreational closures for piping plovers and other special-status bird species at the Seashore, as well as safety closures when certain areas of the beach become too hazardous for safe public use. Based on data from 2008 to 2013, the total amount of ORV resource and safety closures at the Seashore averages approximately 10 miles during the summer months and approximately 5.4 miles during the fall. These closures protect approximately 22 percent more of the Seashore that would otherwise be open to ORV impacts during the summer months, and approximately 12 percent more of the Seashore during the fall months. While these closures are not exclusively put in place for the protection of sea turtles, sea turtle nesting habitat significantly overlaps with shorebird nesting habitat, so all of these closed areas likely provides beneficial impacts to sea turtles by protecting their nesting habitats from the adverse impacts caused by ORV use.

While all of the species management actions provide substantial protection to sea turtles, there would still be some risk of disturbance or injury to adult nesting females, hatchlings, and live stranded sea turtles due to ORV use and other activities (i.e., pedestrian use, pets). Sea turtles nest along all of the Seashore ocean beaches. Although the process of nest site selection is not well understood, and there is a lack of data describing the characteristics of nesting sites at the Seashore, 24-hour-per-day ORV use may affect the beach profile and substrate characteristics in a way that reduces suitability for nesting and hatching success (Cohen et al. 2010). Vehicle traffic on beaches displaces large amounts of sand (Schlachter and Thompson 2008) and can contribute to erosion, especially during high tides or on narrow beaches, where driving is concentrated higher on the beach, which may make some areas unsuitable for nesting (NMFS and USFWS 2008). Vehicle driving also compacts the sand, making it more difficult for females to dig their nest cavities. Vehicles also leave ruts in the sand and although these ruts would be raked smooth 50 days into the incubation period when nest closures are expanded, closure violations do occur, leaving ruts which can trap hatchlings attempting to reach the ocean (Hosier, Kochhar, and Thayer 1981). Closure violations can also result in hatchlings being run over, as happened to one hatchling in 2006 (NPS 2007d). Adverse impacts from ORVs would occur along all areas of the beach open to ORV use during the sea turtle nesting and hatching season. In areas of the Seashore closed to ORV use (Portsmouth Flats, between mile markers 41a and 41b, the interior of the point of Cape Lookout at mile marker 44, Power Squadron Spit from mile marker 46.2 west to the end of the spit and all of Shackelford Banks), and in other areas that are closed temporarily (i.e., safety closures and turtle nest relocation areas and other resource closures), these impacts would be eliminated. Over the years, closure violations, and on rare occasion vandalism of closures and nests, has continued to occur (NPS 2001c, 2002c, 2003b, 2004d, 2005b, 2006g, 2007j, 2008d, 2009c, 2010c, 2010h, 2011c, 2012n), and with no increase in law enforcement or resource staffing levels under alternative A, closure violations, and on rare occasion vandalism, would be expected to continue.

There has never been a recorded death of a nesting sea turtle at the Seashore due to being struck by an ORV, and such incidents are extremely rare in general. However, the 2010 death of a nesting female loggerhead sea turtle at Cape Hatteras National Seashore and three previous incidents in the state of Texas show that ORV use on beaches can result in nesting sea turtles being killed. At Cape Hatteras National Seashore, on June 24, 2010, a female loggerhead sea turtle was struck and killed by an ORV that was illegally driving at night on Ocracoke Island (NPS 2010h). In 2002 on Matagorda Island in Texas, a nesting Kemp's ridley sea turtle was struck by an ORV after having laid her eggs. It was not known if the turtle died or not, as visitors put the injured turtle back in the water. While a dead Kemp's ridley washed ashore two weeks later approximately 8 kilometers from the accident site, there was no way of knowing if it was the turtle that was struck (Shaver 2004). Additionally, in 2008 two nesting Kemp's ridley turtles documented on South Padre Island in Texas were apparently struck by passing vehicles and ultimately died as a result of their injuries (Shaver 2009). Because night driving is allowed at the Seashore there is a slight risk that a vehicle could strike and either injure or kill a nesting or live stranded turtle, resulting in short- and long-term adverse impacts.

Night-driving—Under alternative A, the Seashore would continue to provide sea turtles with protection from human disturbance, although there would be no restriction on night driving. False crawls (aborted turtle crawls that do not result in a nest, also often referred to as nonnesting crawls) can be detrimental to sea turtles and can be caused by, among other things, suboptimal sand conditions; encounters with roots, debris, or rocks while digging a nest; encounters with obstacles while crawling up a beach; disturbance from lights, noise, or other unusual activities; or other reasons that are not known. If too many false crawls occur for one individual, turtles can shed their eggs in the water and, thus, those eggs would be lost (Witherington and Martin 1996). Although turtles may attempt to nest again that same night or on subsequent nights, causing a turtle to abort a nesting attempt is considered an incidental take under section 7 of the ESA, and it may cause the turtle to nest in another location that is less optimal. It may also cause the turtle to expend more energy than it otherwise would, potentially reducing its fitness level.

Under normal, undisturbed conditions, there is generally a one to one ratio between the number of nests and the number of false crawls in a given area (i.e., 50 percent of nesting activities are false crawls) (Godfrey pers. comm. 2005b). Since 1990, an average of 49.2 percent of all turtle activity at the Seashore each year was false crawls, with individual years ranging from 35.8 percent to as high as 61.5 percent (NPS 1991, 1992, 1993b, 1994, 1995, 1996, 1997b, 1998c, 1999b, 2000d, 2001c, 2002c, 2003b, 2004d, 2005b, 2006g, 2007j, 2008d, 2009c, 2010c, 2010h, 2011c, 2012n). By island, false crawls average 52.6 percent of the nesting activities on North Core Banks (range: 34.5 percent to 67.4 percent), 50.0 percent of nesting activities on South Core Banks (range: 39.2 percent to 66.7 percent), and 32.3 percent of the nesting activities on Shackleford Banks (range: 0.0 percent to 73.3 percent). While no ORV use is allowed on Shackleford Banks, the island is not monitored daily, therefore, the number of false crawls may be underreported as tracks may become washed out or obscured by wind, rain, or pedestrian tracks prior to discovery. While it is not known how many false crawls on North Core Banks and South Core Banks have been caused directly by ORVs, Schofield (1995) did show a weak positive correlation between an increase in the number of vehicles operating at night at the Seashore and increases in the number of false crawls. With the number of ORVs at the Seashore expected to slowly grow over the coming years (overall visitation is expected to grow by 1.5 percent annually [NPS 2010j]), the number of ORVs driving at night would also likely increase. Based on the weak positive correlation shown by Schofield (1995), it is possible that an increase in the number of ORVs operating at night in the future under alternative A would cause an increase in the number of false crawls, resulting in long-term adverse impacts on sea turtles. It is important to note, however, that many different factors can contribute to false crawls, and no definitive assessment exists of how the level of ORV use, or any other recreational use, may influence sea turtle nesting activity.

Permit Requirements—Under alternative A, there would be no permit requirements placed on ORV users at the Seashore. As described under the alternatives where a permit system would be implemented, such a system would provide the Seashore with a method for providing additional education to ORV users regarding sensitive habitat and species at the Seashore, as well as additional methods (i.e., revoking permits) for dealing with noncompliance of Seashore regulations. It is anticipated that visitation to the Seashore will slowly grow in the future, with an estimated annual increase of approximately 1.5 percent (NPS 2010j). With increased visitation, it is assumed that the number of ORVs on the beach at the Seashore would also slowly grow in future. Without the additional avenue for increasing education and compliance related to ORV use, the anticipated increase in the number of ORVs on the beach would potentially increase the risk of vehicle disturbance on sea turtles from current levels. Disturbance could include injuries, direct or indirect mortality, and/or false crawls.

Adaptive Management Strategy—Under alternative A, there would be no adaptive management strategy at the Seashore. An adaptive management strategy would monitor disturbance to American oystercatcher (an indicator species), primarily related to impacts from ORVs, and management actions protecting species could be altered based on the results of that monitoring. The lack of an adaptive management strategy may result in an increased risk of false crawls, injury, and/or mortality to sea turtles from current levels from vehicle use as the number of ORVs on the beach is anticipated to continue to slowly increase in the future NPS (NPS2010j).

Cumulative Impacts under Alternative A

Other past, current, and future planned actions within and around Cape Lookout National Seashore have the potential to impact the populations of all three species of sea turtles that regularly nest at the Seashore. The dredging of Beaufort Inlet and Oregon Inlet to the north has occurred in the past and would continue to occur in the future. Details of the dredging operations are not known, but if a hopper dredge is used, especially during nesting season when more turtles are present, it may have short- to long-term adverse impacts on sea turtles. Hopper dredges are historically known to be responsible for incidental takes of sea turtles (NMFS and USFWS 2008).

Commercial fishing can adversely impact sea turtles; and while commercial fishing does not occur within the Seashore, it does occur in the adjacent waters and throughout the state of North Carolina as a whole. Commercial fishing, whether from shore or boat, may result in the incidental take of sea turtles, because they can get hooked or entangled in fishing line and nets. Sea turtles can also be injured or killed by propeller strikes from commercial fishing boats, resulting in short- to long-term adverse impacts on sea turtles. Limited concessionaire services are offered, and would continue to be offered, at Cape Lookout National Seashore. Services offered include a beach shuttle service originating in the lighthouse area and traveling to points on South Core Banks, limited UTV tours at the northern end of North Core Banks, and limited vehicle transportation service from the Long Point and Great Island concession areas. Adverse impacts to nesting sea turtles and hatchlings from these concessionaire services would include affecting the beach profile and substrate characteristics in ways that reduce suitability for nesting and hatching success, though these impacts would be relatively small given the size of the operations and because their vehicles would continue to use established transportation routes including the back route.

Several NPS past, current, and future planning efforts could also affect the sea turtles. Cape Hatteras National Seashore implemented a long-term ORV management plan/EIS. The plan, which includes restrictions on night driving, provides beneficial protection measures for nesting and hatching sea turtles and greatly minimizes the potential impacts on sea turtles caused by ORV and other recreational use on Cape Hatteras National Seashore, though some adverse impacts would still occur.

The Seashore is currently implementing the results of a predator study it conducted. The study provided the Seashore with long term monitoring protocols for raccoons on the Seashore and guidelines for future management. The Seashore will experimentally reduce the raccoon population which will help reduce the adverse impacts that raccoon predation has on sea turtles nests. The Seashore is also implementing a long-range interpretive plan (NPS 2011k that further articulates the purpose, significance, and themes of the Seashore. It is necessary to inform and guide the Seashore's interpretive and education programs, which includes information about threatened and endangered species within the Seashore. By doing so it provides beneficial short- and long-term impacts on sea turtles.

In 2008 NMFS and USFWS published the latest recovery plan for the loggerhead sea turtle. The plan indicates that North Carolina is part of the Northern Recovery Unit for the species (includes areas from the Florida/Georgia state boundary to southern Virginia). The plan also lays out recommended conservation measures for activities affecting all aspects of the loggerhead's life history, along with the goal of increasing the number of loggerhead nests over a 50-year period. For the Northern Recovery Unit the goal is to increase the number of nests to 14,000 with North Carolina contributing 2,000 of the nests. Recovering the loggerhead sea turtle population through conservation measures enacted on nesting beaches as well as in the marine environment would have substantial short- and long-term beneficial impacts on the nesting population of loggerhead sea turtles at the Seashore.

The overall combined impacts of these past, present, and future actions on sea turtles would be short- and long-term adverse as well as long-term beneficial. These impacts, combined with the impacts described under alternative A, would result in short- and long-term adverse cumulative impacts. While adverse effects on sea turtles from actions occurring in the region would still exist, actions under alternative A would provide additional protection that would be beneficial to the regional sea turtle population and would offset some of the adverse effects.

ALTERNATIVE B

Impacts of Alternative B

Resources Management Activities

Surveying and Monitoring—Surveying for sea turtle nests/crawls and monitoring for evidence of hatching and the impacts of these actions under alternative B would be the same as under alternative A and would result in overall short- and long-term benefits to sea turtles due to the protection provided by daily surveys for nests during the sea turtle nesting season, marking each nest found, and expanding closures when turtles are hatching. Additionally, there would be more consistent training and supervision of resource staff who conduct the surveys. This would result in a higher quality of monitoring for the species, resulting in beneficial impacts.

Relocating Nests—Similar to alternative A, relocating nests from areas prone to erosion or frequent flooding would provide short- and long-term beneficial impacts. While inherent risks from relocating nests as described under alternative A and potential adverse effects from altering the natural sex ratio and other hatchling characteristics in relocated nests, also described under alternative A, would still occur, the benefits of having relocated nests successfully hatch would outweigh these potential adverse impacts.

Light Management—Light management activities under alternative B would be the same as under alternative A and would result in overall short- and long-term beneficial impacts. These would arise from erecting 2-foot high plywood barriers behind and to the sides of nests 10 days before the estimated hatch date for those nests in areas vulnerable to light pollution (i.e., in front of the cabins at Long Point and Great Island), prohibiting camping and beach fires in the turtle nest relocation areas, encouraging

concessionaires and cabin users to minimize light use, and continuing use of the back route system which minimizes the number of vehicles driving up and down the ocean beach. Similar to alternative A, some adverse impacts (false crawls and disorientation of hatchlings) from light pollution produced by campers and campfires outside of the turtle relocation areas would still occur.

Predator Management—Similar to alternative A, predator enclosure cages would be placed over all nests. Additionally under alternative B, the Seashore, on a limited basis, would remove nonnative mammalian predators that have the potential to adversely impact federally listed species or species of special concern. The Seashore would also remove native mammalian predators, such as raccoons, on a limited basis when predation on federally listed or species of special concern is observed. Since 1990, raccoons have impacted on average eight turtle nests each year (NPS 1991, 1992, 1993b, 1994, 1995, 1996, 1997b, 1998c, 1999b, 2000d, 2001c, 2002c, 2003b, 2004d, 2005b, 2006g, 2007j, 2008d, 2009c, 2010c, 2010h, 2011c, 2012n). The overall impacts of raccoon predation on turtle nests has been greatly reduced by installing cages over the nests, limiting the number of eggs that a raccoon can reach within a nest. As a result few nests have been completely lost to raccoon predation. Removal of mammalian predators such as raccoons would further reduce the number of eggs lost to predation each year.

Education/Public Outreach—In addition to the outreach and education measures that would be implemented under alternative A, under alternative B staffing levels would increase for interpretation positions (to provide formal outreach and on-site ORV education on the subject of protected species management) and law enforcement (among other duties, law enforcement assists with public education). The Seashore would standardize their resource closure signs, and possibly color code them for ease of understanding. A telephone number to report law enforcement violations would be established, and additional education materials about ORV regulations and species protection would be provided to the ferry operators to distribute. This information would be made available in the cabins on the islands. Additional interpretive programs related to ORV use would be added at the Seashore and maps of closure areas would be regularly updated online and posted throughout the Seashore where possible. All of these additional measures would serve to better educate ORV operators to the resource management measures of the Seashore as described in chapter 2 and better inform them about species protection, providing short- and long-term beneficial impacts.

ORV and Other Recreational Use

Under alternative B, the same amount of beach area would be open to ORV use as under alternative A. Therefore management of ORV and other recreational use under alternative B would be similar to alternative A, except that alternative B would also include some restrictions on night driving, as well as an adaptive management strategy, and a vehicle permit and operator education certificate program that would result in additional protection of sea turtles and hatchlings.

Night-Driving—Under alternative B, the Seashore would be closed to all ORV use from 9 p.m. to 6 a.m. from May 1 through August 31, except in the Great Island and Long Point cabin areas. The May 1 through August 31 timeframe essentially encompasses the entire turtle nesting season. Since 1990 there have been only two nesting activities before May 1 (the earliest was on April 21) and four nesting activities after August 31 (the latest was on September 8) (NPS 1991, 1992, 1993b, 1994, 1995, 1996, 1997b, 1998c, 1999b, 2000d, 2001c, 2002c, 2003b, 2004d, 2005b, 2006g, 2007j, 2008d, 2009c, 2010c, 2010h, 2011c, 2012n). Turtle nesting and hatching occurs mostly during nighttime hours; however, on rare occasions these events do take place during daylight hours (Altman pers. comm. 2010a). A review of 21 years of nesting data on Casey Key in Sarasota County, Florida showed that the majority of loggerhead nesting activities take place after dusk (Dusk occurs after sunset and is the time at which the sun is 6 degrees below the horizon in the evening. At this time objects are distinguishable, but there is no longer enough light to perform any outdoor activities.) and before dawn (Dawn is the time of morning at

which the sun is 6 degrees below the horizon. At this time, there is enough light for objects to be distinguishable and that outdoor activities can commence.) with only 1.4 percent of nesting occurring around dusk and no recorded nesting activities occurring during dawn (Welsh and Tucker 2009). A study on Masonboro Island in North Carolina found that hatchling emergence occurred mostly from 8 p.m. to 1 a.m. with some activity before and after these times (Neville et al. 1988).

As discussed under alternative A, ORVs can adversely impact sea turtles by causing false crawls, disorienting turtles with their headlights, killing them by running over them, leaving tire ruts that hatchlings can get trapped in, and running over turtle crawls which can obscure the tracks that help NPS staff identify and protect nests. Prohibiting beach driving from 9 p.m. to 6 a.m. would protect turtles from these potential impacts, though some impacts could still occur between the hours of sunset and 9 p.m. Additionally, some adverse impacts could still occur to emerging hatchlings after August 31. Since 1990, approximately 25 percent of nests laid in areas open to ORV use (i.e., North Core and South Core Banks) hatched after August 31 (NPS 1991, 1992, 1993b, 1994, 1995, 1996, 1997b, 1998c, 1999b, 2000d, 2001c, 2002c, 2003b, 2004d, 2005b, 2006g, 2007j, 2008d, 2009c, 2010c, 2010h, 2011c, 2012n). This means that for those nests in areas open to ORV use, hatchlings would still be exposed to potential adverse impacts from ORVs. Potential impacts after August 31 would be minimized, however, through the continued use of expanded buffers, light barriers around the nests, and greater compliance with closures and regulations through Seashore law enforcement staff conducting night patrols.

Permit Requirements—Alternative B would include a vehicle permit and an operator education certificate requirement for those visitors wishing to operate an ORV on the Seashore. Permits would either be valid long-term (annual) or short-term (10 days), while the education certificate would be valid for one calendar year. The permit or certificate may also be revoked for violation of applicable Seashore regulations or terms and conditions of the permit. Requiring a vehicle permit and operator education certificate would provide beneficial impacts on sea turtles by actively educating operators about species protection at the Seashore and providing a deterrent (i.e., losing driving privileges) to driving behavior that could endanger sea turtles. While most ORV users respect sea turtle nest protection areas, since 2000 there has been an annual average of 29 documented violations of vehicle closures for turtle nests (NPS 2001c, 2002c, 2003b, 2004d, 2005b, 2006g, 2007j, 2008d, 2009c, 2010c, 2010h, 2011c, 2012n). Vehicles disregarding beach closures threaten the survival of turtle hatchlings by leaving tire ruts that can impede hatchlings on their way to the ocean or by running them over. The potential deterrent of losing driving privileges on the Seashore would likely reduce the number of closure violations, resulting in short- and long-term beneficial impacts.

Adaptive Management Strategy—Under alternative B, an adaptive management strategy would be implemented to ensure that the goals of species protection are being met. While the American oystercatcher would be used as the indicator species to determine if levels of disturbance warrant implementing more intensive management actions, the additional management actions, if implemented, would provide both short- and long-term beneficial impacts for protecting sea turtles. The additional management actions that could be implemented under the adaptive management strategy would potentially include increased education and focused enforcement, which would help reduce closure violations that could impact sea turtles; additional trash management and fish scrap disposal, which would likely reduce the number of predators attracted to the beach that could prey upon sea turtle eggs and hatchlings; additional predator control, which would help protect nests and hatchlings from raccoons and other predators; ORV route restrictions and increased buffer sizes, both of which would protect beach nesting habitat, as well as sea turtle nests; and a reduction in the number of vehicle permits issued along with managing the size of the vehicle storage lots, both of which would help reduce the number of vehicles driving on the beach and the amount of impacts caused by ORVs. If species indicators continue to be triggered due to visitor use impacts for two consecutive years after implementing the previously mentioned actions, then reducing the number of vehicle permits issued and increasing the size of species

protection buffers could be implemented. These actions would reduce the number of vehicles driving on the beach and increase the distance vehicles could approach nests, thereby reducing the amount of impacts caused by ORVs and providing short- and long-term beneficial impacts to sea turtles.

Cumulative Impacts under Alternative B

The past, present, and future actions discussed under the cumulative impacts scenario for alternative A would be the same under alternative B. The cumulative impact of these past, present, and future actions, would likely be short- and long-term adverse, as well as long-term beneficial. These impacts when combined with the impacts of alternative B, would likely be short- and long-term adverse. While adverse effects on sea turtles from actions occurring in the region would still exist, actions under alternative B would provide additional protection that would be beneficial to the regional sea turtle population and would offset some of the adverse effects.

ALTERNATIVE C

Impacts of Alternative C

Resources Management Activities

Surveying and Monitoring—Surveying for sea turtle nests/crawls and monitoring for evidence of hatching, nest protection measures, and the impacts of the actions under alternative C would be the same as under alternative A. Impacts from these resource management activities would result in short- and long-term benefits to the sea turtles due to the protection from daily surveys of nests during the sea turtle nesting season, marking each nest found, and expanding closures when turtles are hatching. Additionally, there would be more consistent training and supervision of resource staff who conduct the surveys. This would result in a higher quality of monitoring for the species, resulting in beneficial impacts.

Relocating Nests—Similar to alternative A, relocating nests from areas prone to erosion or frequent flooding under alternative C would provide short- and long-term beneficial impacts. While inherent risks from relocating nests as described under alternative A and potential adverse effects from altering the natural sex ratio and other hatchling characteristics in relocated nests, also described under alternative A, would still occur, the benefits of having relocated nests successfully hatch would outweigh these potential adverse impacts.

Light Management—Light management activities under alternative C would be the same as under alternative A and would result in overall short- and long-term beneficial impacts. These would arise from erecting 2-foot high plywood barriers behind and to the sides of nests 10 days before the estimated hatch date for those nests in areas vulnerable to light pollution (i.e., in front of the cabins at Long Point and Great Island), prohibiting camping and beach fires in the turtle nest relocation areas, encouraging concessionaires and cabin users to minimize light use, and continuing use of the back route system which minimizes the number of vehicles driving up and down the ocean beach. Similar to alternative A, some adverse impacts (false crawls and disorientation of hatchlings) from light pollution produced by campers and campfires outside of the turtle relocation areas would still occur.

Predator Management—Predator management under alternative C would be the same as under alternative B. Predator enclosure cages would be used on all nests. There would be limited removal of nonnative mammalian predators that have the potential to adversely impact federally listed species or species of special concern and native mammalian predators (such as raccoons) would be removed on a limited basis when predation on federally listed or species of special concern is observed. Although predator enclosure cages have the small potential to damage eggs during placement or trap hatchling

during their emergence, these small adverse impacts are outweighed by the beneficial impacts of reducing both egg and hatchling predation that the predator management actions would have.

Education/Public Outreach—Education and public outreach measures under alternative C would be the same as for alternative B, including increases in staffing levels for interpretation positions and law enforcement positions, and would provide short- and long-term benefits. Benefits would arise from standardizing information and better educating ORV and other recreational users of the resource management measures of the Seashore as described in chapter 2 and better informing them about species protection.

ORV and Other Recreational Use

Management of ORV and other recreational use under alternative C would be similar to alternative B, except that alternative C would increase the amount of pedestrian-use only areas on Seashore by about 4 miles, would expand the restriction on night driving, and impose limits on the number of vehicle permits issued. These elements of alternative C would provide additional beneficial protection measures for nesting and hatching sea turtles as compared to both alternatives B and A.

ORV routes under alternative C would be the same as under alternative B with the exception that approximately 4 miles of pedestrian-only use areas would be added to the Seashore. During the summer season 3.1 miles of additional pedestrian-use only area would be added (0.35 miles at Long Point Cabin Camp, 1.9 miles at Great Island Cabin Camp, and 0.8 miles at Codd's Creek), while the year-round pedestrian-use only area at the lighthouse would be expanded by 0.7 miles. Taking into consideration annual recurring resource closures (e.g., turtle relocation areas and piping plover closures), this means that the amount of ocean beach available for ORV use, prior to temporary species and safety closures, would be approximately 74 percent (41 miles) during the summer turtle nesting season (as compared to 81 percent [45 miles] under alternatives A and B) and approximately 79 percent (44 miles) during the rest of the year when ORVs are allowed on the beach (ORVs are prohibited from January 1 through March 15). As described under alternative A, ORV resource and safety closures historically protect an additional approximately 10 miles (22 percent) of the Seashore during the summer and approximately 5.4 (12 percent) of the Seashore that would otherwise be open to ORVs and their impacts. Reducing the amount of beach available for ORV use increases the amount of area where nesting turtles and hatchlings would be free from the potential impacts of ORVs. This is especially important in the vicinity of the lighthouse, where on average the annual number of sea turtle nests is slightly higher than in other areas to the north on South Core Banks or on North Core Banks (see figure 15 under “Sea Turtles” in chapter 3).

Night-driving—Similar to alternative B, under alternative C, the Seashore would be closed to all ORV use from 9 p.m. to 6 a.m.; however, under alternative C the restriction would be from May 1 through September 14 (extending the end date beyond August 31, which is the end date under alternative B). This timeframe essentially covers all of the initial nesting activities at the Seashore, as it does under alternative B, but unlike alternative B, it would also essentially cover the entire end of the nesting season as well, since September 8 is the latest nesting activity ever recorded at the Seashore. As discussed under alternative B, turtle nesting and hatching occurs during nighttime hours, although on extremely rare occasions, they do occur during daytime hours (Altman pers. comm. 2010a). Similar to alternative B, the restrictions placed on night driving would provide short- and long-term beneficial impacts on nesting sea turtles. However, hatching events continue into October; since 1990, approximately 13 percent of all nests laid in areas open to ORV use (i.e., North Core and South Core Banks) have hatched after September 14 (NPS 1991, 1992, 1993b, 1994, 1995, 1996, 1997b, 1998c, 1999b, 2000d, 2001c, 2002c, 2003b, 2004d, 2005b, 2006g, 2007j, 2008d, 2009c, 2010c, 2010h, 2011c, 2012n). This means that for nests located in areas open to ORV use, hatchlings would be exposed to potential impacts from night driving after September 14. These impacts would be minimized though through the continued use of expanded buffers,

light barriers around the nests, and greater public compliance with closures and regulations resulting from Seashore law enforcement staff conducting night patrols.

Permit Requirements—Under alternative C, vehicle permit and ORV operator education certificate requirements would be implemented similar to alternative B. This would result in short- and long-term benefits through increased education about protected species, as well as likely greater compliance with Seashore rules and regulations through the threat of being able to revoke an operator's driving privileges on the Seashore.

In addition, in order to manage the number of vehicles on the Seashore at any one time, a limit on the number of annual and 10-day permits would be established based on historical use. Placing a limit on the number of permits issued for ORV use on the beach would prevent the level of ORV use from increasing, thus preventing increased amounts of adverse impacts, compared to historical levels, on turtles and their habitat from ORVs. This would result in long-term beneficial impacts. However, the beneficial impacts contributed from the limit on vehicles to the overall beneficial impacts to sea turtles and their habitat under this alternative would be relatively small. This is because the other management practices that would be in place under this alternative, namely turtle closures and restrictions on night driving, would already provide substantial short- and long-term beneficial impacts on sea turtles and their habitat.

Adaptive Management Strategy—Similar to alternative B, adaptive management strategy actions would be adopted under alternative C to ensure that resource protection measures are meeting their goals. The additional management actions that could be implemented would provide short- and long-term beneficial impacts on sea turtles and their habitat. Benefits would result from reducing closure violations through increased education and enforcement; reducing predation through fish scrap disposal and predator control measures; and reducing ORV impacts through route restrictions, increased buffer sizes, and limits on the number of vehicle permits issued, as well as managing the size of the vehicle storage lots.

Cumulative Impacts under Alternative C

The past, present, and future actions discussed under the cumulative impacts scenario for alternative A would be the same under alternative C. The cumulative impact of these past, present, and future actions, would likely be short- and long-term adverse, as well as long-term beneficial. These impacts when combined with the impacts of alternative C, would likely be short- and long-term adverse. While adverse effects on sea turtles from actions occurring in the region would still exist, actions under alternative C would provide additional protection that would be beneficial to the regional sea turtle population and would offset some of the adverse effects.

ALTERNATIVE D

Impacts of Alternative D

Resources Management Activities

Surveying and Monitoring—Under alternative D, surveying for sea turtle nests/crawls and monitoring for evidence of hatching, as well as protection measures such as installing buffers, and the impacts of these actions, would be the same as under alternative A. These measures would result in short- and long-term beneficial impacts on sea turtles from the protection provided by conducting daily surveys for nests during the sea turtle nesting season, marking each nest found, and expanding closures when turtles are hatching. Additionally, there would be more consistent training and supervision of resource staff who conduct the surveys. This would result in a higher quality of monitoring for the species, resulting in beneficial impacts.

Relocating Nests—Similar to alternative A, relocating nests from areas prone to erosion or frequent flooding under alternative D would provide short- and long-term beneficial impacts. While inherent risks from relocating nests, as described under alternative A, and potential adverse effects from altering the natural sex ratio and other hatchling characteristics in relocated nests, also described under alternative A, would still occur, the benefits of having relocated nests successfully hatch would outweigh these potential adverse impacts.

Light Management—Light management activities under alternative D would be the same as under alternative A and would result in overall short- and long-term beneficial impacts. These would arise from erecting 2-foot high plywood barriers behind and to the sides of nests 10 days before the estimated hatch date for those nests in areas vulnerable to light pollution (i.e., in front of the cabins at Long Point and Great Island), prohibiting camping and beach fires in the turtle nest relocation areas, encouraging concessionaires and cabin users to minimize light use, and continuing use of the back route system which minimizes the number of vehicles driving up and down the ocean beach. Similar to alternative A, some adverse impacts (false crawls and disorientation of hatchlings) from light pollution produced by campers and campfires outside of the turtle relocation areas would still occur.

Predator Management—Predator management under alternative D would be the same as alternative B. Predator enclosure cages would be used on all nests. There would be limited removal of nonnative mammalian predators that have the potential to adversely impact federally listed species or species of special concern. Native mammalian predators, such as raccoons, would be removed on a limited basis when predation on federally listed or species of special concern is observed. While predator enclosure cages have the small potential to damage eggs during placement or trap hatchling during their emergence, these small adverse impacts are outweighed by the beneficial impacts of reducing both egg and hatchling predation that the predator management actions would have.

Education/Public Outreach—Education and public outreach measures under alternative D would be the same as under alternative B, including increases in staffing levels for interpretation positions and law enforcement positions, and would provide short- and long-term benefits. Benefits would arise from standardizing information and better educating ORV and other recreational users of the resource management measures of the Seashore as described in chapter 2 and better informing them about species protection.

ORV and Other Recreational Use

Management of ORVs and other recreational uses under alternative D would be similar to alternative C, except the amount of pedestrian-only use areas at the Seashore would increase. When compared to alternative A, alternative D would add 10 miles of pedestrian-only use areas where as alternative C would only add 4 miles.

Under alternative D, ORV routes and pedestrian-only use areas would include those areas under alternative C except the closures at Long Point, Great Island, and Codd's Creek would be pedestrian-only use areas year-round instead of just during the summer, as under alternative C. Alternative D would also create about 0.5 miles of summertime pedestrian-only use area at Johnsons Creek, and the 3.6 miles of Middle Core Banks would be a pedestrian-only use area during the summer whether or not it is contiguous with North Core Banks (currently it is an island). The ocean beach from the Portsmouth Access Road north to the demarcation line at Ocracoke Inlet would also become a summer pedestrian-only use area. In addition, the year-round pedestrian-only use area in front of the lighthouse would be expanded approximately 0.9 miles to the south, for a total closure of approximately 1.6 miles, or 0.9 miles larger than under alternative A and 0.2 miles larger than under alternative C. Adding these pedestrian-only use areas would reduce the amount of Seashore beaches open to ORV use. About 63 percent (35

miles) of the beach, prior to temporary species and safety closures, would be open to ORV use during the majority of the sea turtle summer nesting season, while about 73 percent (41 miles) of the beach would be open to ORV use during the rest of the year when ORV use is permitted. As described under alternative A, ORV resource and safety closures on average historically protect an additional approximately 10 miles (22 percent) of the Seashore during the summer and approximately 5.4 (12 percent) of the Seashore that would otherwise be open to ORVs and their impacts. The additional pedestrian-only use areas under alternative D would provide additional protection for nesting and hatching sea turtles by removing potential impacts from ORVs in these areas. This is especially important in the vicinity of the lighthouse where on average the annual number of sea turtle nests is slightly higher than in other areas to the north on South Core Banks or on North Core Banks (see figure 15 under “Sea Turtles” in chapter 3).

Night-Driving—Under alternative D, restrictions on night driving would be the same as under alternative C and would provide the same short- and long-term beneficial impacts on nesting and emerging hatchling sea turtles as described under alternative C. These benefits include reducing the potential ORVs have to cause false crawls; to run over nesting turtles, nests laid that night, and hatchlings; the likelihood that crawl tracks would be run over and obscured prior to NPS staff finding them during their morning turtle patrols; to cause light pollution from headlights; and produce additional tire tracks after NPS staff have raked them smooth that hatchlings could become trapped in. However, similar to alternative C, hatchlings emerging after September 14 from nests located in areas open to ORVs (i.e., North Core and South Core Banks) would be subject to nighttime impacts from ORVs since nighttime driving restrictions end on that date. As noted under alternative C, this would affect approximately 13 percent of the nests laid on North Core and South Core Banks. Potential impacts would be minimized through the continued use of expanded buffers, light barriers around the nests, and greater public compliance with closures and regulations due to Seashore law enforcement staff conducting night patrols.

Permit Requirements—Under alternative D, vehicle permit and ORV operator education certificate requirements would be implemented similar to alternative B and would result in short- and long-term benefits through increased education about protected species, as well as likely greater compliance with Seashore rules and regulations through the threat of being able to revoke an operator’s driving privileges on the Seashore.

Similar to alternative C, a limit on the number of annual and 10-day vehicle permits would be established under alternative D. As discussed under alternative C, placing a limit on the number of vehicles that can access the beaches would provide long-term beneficial impacts, though the contribution to the overall beneficial impacts on sea turtles realized under this alternative would be relatively small. This is because other management actions which would provide substantial short- and long-term benefits, namely resource buffers and night driving restrictions. However, the beneficial impact that limits would have on sea turtles under alternative D would be slightly more than alternative C, since the limit would be slightly lower, further limiting the number of vehicles on the Seashore at any one time.

Adaptive Management Strategy—Similar to alternative B, adaptive management strategy actions would be adopted under alternative D to ensure that resource protection measures are meeting their goals. The additional management actions that could be implemented would provide short- and long-term beneficial impacts on sea turtles and their habitat. Benefits would result from reducing closure violations through increased education and enforcement; reducing predation through fish scrap disposal and predator control measures; and reducing ORV impacts through route restrictions, increased buffer sizes, and limits on the number of vehicle permits issued, as well as managing the size of the vehicle storage lots.

Cumulative Impacts under Alternative D

The past, present, and future actions discussed under the cumulative impacts scenario for alternative A would be the same under alternative D. The cumulative impact of these past, present, and future actions, would likely be short- and long-term adverse, as well as long-term beneficial. These impacts when combined with the impacts of alternative D, would likely be short- and long-term adverse. While adverse effects on sea turtles from actions occurring in the region would still exist, actions under alternative D would provide additional protection that would be beneficial to the regional sea turtle population and would offset some of the adverse effects.

ALTERNATIVE E

Impacts of Alternative E

Resources Management Activities

Surveying and Monitoring—Though public use of ORVs would be prohibited on the Seashore under alternative E, the NPS would still use ORVs to conduct resource management and resource and visitor protection activities. Surveying for and protecting sea turtle nests and hatchlings under alternative E would occur in the same manner as under alternative A. Therefore, surveying for sea turtle nests/crawls and monitoring for evidence of hatching, as well as establishing buffers around nests, and the impacts of these actions, would be the same as under alternative A and result in short- and long-term beneficial impacts on sea turtles. Impacts would result from the protection provided to sea turtles from daily surveys for nests during the sea turtle nesting season, marking each nest found, and expanding closures when turtles are hatching to protect nests and hatchlings from potential pedestrian impacts. However, with impacts from recreational ORVs eliminated and impacts from pedestrians reduced because of the more difficult access to areas further away from the arrival points with no recreational ORV use, surveying and monitoring protocols by NPS staff would be reviewed and may change.

Relocating Nests—Similar to alternative A, relocating nests from areas prone to erosion or frequent flooding under alternative E would provide short- and long-term beneficial impacts. While inherent risks from relocating nests as described under alternative A and potential adverse effects from altering the natural sex ratio and other hatchling characteristics in relocated nests, also described under alternative A, would still occur, the benefits of having relocated nests successfully hatch would outweigh these potential adverse impacts.

Light Management—Though light impacts from ORVs would be eliminated, light management activities would still be implemented under alternative E due to potential impacts from light pollution related to camping, campfires, and use of the cabins. As they relate to these activities, light management measures under alternative E would be the same as under alternative A and would result in overall short- and long-term beneficial impacts. These would arise from erecting 2-foot high plywood barriers behind and to the sides of nests 10 days before the estimated hatch date for those nests in areas vulnerable to light pollution (i.e., in front of the cabins at Long Point and Great Island), prohibiting camping and beach fires in the turtle nest relocation areas, and encouraging concessionaires and cabin users to minimize light use. Similar to alternative A, some adverse impacts (false crawls and disorientation of hatchlings) from light pollution produced by campers and campfires outside of the turtle relocation areas would still occur. However, with no ORV use to provide easy access to remote locations along the beach, the areas where camping and campfires would occur and could impact sea turtles through light pollution would be reduced.

Predator Management—Predator management under alternative E would be the same as under alternative A. While predator exclosures have the small potential to damage eggs during placement or trap hatchlings during their emergence, these small adverse impacts are outweighed by the short- and long-term beneficial impacts of reducing both egg and hatchling predation that the predator exclosures provide.

Education/Public Outreach—Education and public outreach measures under alternative E would be similar to those under alternative A, but would only focus on pedestrian use since ORV use would not be permitted at the Seashore. Short- and long-term beneficial impacts on sea turtles would result from educating the public about the species and the resource management measures of the Seashore to protect the species as described in chapter 2.

ORV and Other Recreational Use

Under alternative E the public use of ORVs would be prohibited on the entire Seashore (all 56 miles), not just Shackleford Banks. However, other recreation use on the ocean beach such as swimming, camping, beach fires, fishing, and the use of the cabins would still occur, though likely at a reduced rate and in general proximity to the ferry landing sites. With no public use of ORVs on the beach, the impacts on nesting sea turtles and hatchlings caused by ORVs, as discussed under alternative A, would not occur. ORVs would not compact the sand making it more difficult for turtles to dig their nest cavities, they would not contribute to erosion, nor would vehicle violations of closures occur, eliminating the potential that nests or hatchlings would be run over or that vehicle ruts would be left behind that could trap hatchlings on their way to the ocean. Any false crawls or disorientation of hatchlings caused by the presence of vehicles on the beach at night would be eliminated as well. Eliminating all of these potential impacts would result in short- and long-term beneficial impacts.

Prohibiting camping and beach fires in the nest relocation areas would help protect hatchlings and nesting turtles in those areas from artificial light pollution; however, throughout the rest of the Seashore these activities would not be prohibited and could contribute to false crawls in nesting adults or disorientation in hatchlings. However, because ORVs would not be allowed on the Seashore, the ability to carry wood and other supplies to remote areas of the ocean beach would be greatly reduced, likely limiting the areas impacted to those that are readily accessible by foot, such as areas in front of the cabins or the lighthouse, and possibly Power Squadron Spit, which is readily accessible by private boat. There would be no change in impacts on Shackleford Banks since ORVs are already prohibited on that island. Encouraging cabin users to minimize light use would help minimize light pollution on the beach in these areas. Some vandalism of turtle closures or nests by pedestrians might still occur. Such violations could result in direct impacts on nests as have occurred in the past, or could result in footprints left in the sand that could trap hatchlings as they try to make their way to the ocean. However, as discussed previously, incidences of vandalism are currently rare, and due to the limited access to the remote sections of the beach with the prohibition of ORVs under this alternative, they would likely become even more rare.

Adaptive Management Strategy—Under alternative E, an adaptive management strategy would be adopted similar to that under alternative B, to ensure that the goals of species protection are being met, providing short- and long-term beneficial impacts to sea turtles. With no public ORV use allowed on the Seashore under alternative E, American oystercatcher disturbance would be monitored as it relates to impacts from pedestrians and other recreational use and not from ORVs and only those non-ORV management actions indicated in chapter 2 would be implemented. The additional management actions that could be implemented include increased education and focused enforcement, which would help reduce closure violations that could impact sea turtles; additional trash management and fish scrap disposal, which would likely reduce the number of predators attracted to the beach that could prey upon sea turtle eggs and hatchlings; additional predator control, which would help protect nests and hatchlings from raccoons and other predators; and increased buffer sizes, would protect beach nesting habitat, as

well as sea turtle nests. If species indicators continue to be triggered due to visitor use impacts for two consecutive years after implementing the previously mentioned actions, increasing the size of species protection buffers could be implemented. This action would increase the distance visitors could approach nests providing some short- and long-term beneficial impacts to sea turtles, especially if closure violations occur.

Cumulative Impacts under Alternative E

Cumulative impacts on sea turtles under alternative E would be the same as those described for alternative A. The cumulative impact of these past, present, and future actions, would likely be short- and long-term adverse as well as long-term beneficial. These impacts when combined with the impacts of alternative E, would likely be short- and long-term beneficial with the added protection for sea turtles by prohibiting ORV use under alternative E offsetting some of the regional adverse effects.

DETERMINATION OF EFFECT

Alternative A

Under alternative A, resource management activities would result in substantial short- and long-term benefits to sea turtles. Benefits would be due to the protection provided to sea turtles from daily surveys for nests during the sea turtle nesting season (between May 1 and September 15), marking each nest found, expanding closures when turtles are hatching, and installing light barriers around nests vulnerable to light pollution (i.e., in front of the cabins located at Long Point and Great Island) 10 days prior to the estimated hatch date. Relocating nests from areas prone to erosion or frequent flooding, and prohibiting ORV use, as well as camping and campfires in the relocation areas, would also contribute to the beneficial effects. However, some adverse impacts from light pollution associated with camping and campfires outside of the relocation areas would cause some short- and long-term adverse impacts on nesting turtles and hatchlings.

ORV and other recreational use would have short- and long-term adverse impacts on sea turtles due to the amount of Seashore available for ORV use (approximately 81 percent [45 miles] prior to any subsequent resource or safety closures) and by allowing nighttime driving on the beach. ORV and other recreational uses would have impacts on sea turtles by affecting the beach profile and substrate characteristics in ways that reduce suitability for nesting and hatching success, likely continued closure violations and on rare occasion vandalism of turtle closures, and impacts caused by night driving and campfires. Under the ESA, these impacts would result in a finding of *may affect/are likely to adversely affect* sea turtles because the actions would result in direct or indirect impacts to the sea turtle species that are not discountable, insignificant, or beneficial. Though there would be beneficial impacts from resource management activities, the actions under alternative A would also likely cause adverse effects.

Alternative B

Under alternative B, resource management activities would result in substantial short- and long-term benefits. Benefits would be due to the protection provided to sea turtles from daily surveys for nests during the sea turtle nesting season, marking each nest found, expanding closures when turtles are hatching, and installing light barriers around nests vulnerable to light pollution (i.e., in front of the cabins located at Long Point and Great Island) 10 days prior to the estimated hatch date, removing mammalian predators, requiring ORV users to obtain a vehicle permit and an operator education certificate, and increasing compliance with rules and regulations through the threat of revoking a vehicle permit or ORV operator certificate as well as increased enforcement and education through increased staffing levels in law enforcement and interpretation positions, respectively. Relocating nests from areas prone to erosion

or frequent flooding, and prohibiting ORV use, as well as camping and campfires in the nest relocation areas would also contribute to the beneficial effects. However, some adverse impacts from light pollution associated with camping and campfires outside of the relocation areas would cause some short- and long-term adverse impacts on nesting turtles and hatchlings.

ORV and other recreational use under alternative B would have short- and long-term adverse impacts on sea turtles by affecting the beach profile and substrate characteristics in ways that reduce suitability for nesting and hatching success, impacts caused by camping and campfires, and likely continued closure violations and on rare occasion vandalism of turtle closures. However, increased staffing levels of law enforcement and interpretation positions would help reduce noncompliance through increased enforcement and education. Being able to revoke an ORV operator's education certificate or vehicle permit would also help reduce closure and other violations. Prohibiting ORV nighttime driving from 9 p.m. to 6 a.m. from May 1 through August 31, and conducting night patrols would substantially reduce ORV impacts on adult and hatchling turtles caused by night driving during this timeframe. However, hatchlings in nests in areas open to ORV use after August 31 (approximately 25 percent of nests laid on North Core and South Core Banks have hatched after August 31 since 1990) would still be subject to adverse night driving impacts. In addition, managing the number of vehicles on the beach and implementing additional protection measures under the adaptive management strategy if resource protection goals are not achieving the desired results would also enhance protection of sea turtles and provide beneficial impacts. Under the ESA, these impacts would result in a finding of *may affect/are likely to adversely affect* sea turtles because the actions would result in direct or indirect impacts to the sea turtle species that are not discountable, insignificant, or beneficial. Though there would be beneficial impacts from resource management activities and restrictions on ORV nighttime driving, the actions under alternative B would also likely cause adverse effects.

Alternative C

Alternative C resource management activities would result in substantial short- and long-term benefits due to the protection provided to sea turtles from daily surveys for nests during the sea turtle nesting season, marking each nest found, expanding closures when turtles are hatching, and installing light barriers around nests vulnerable to light pollution (i.e., in front of the cabins at Long Point and Great Island) 10 days prior to the estimated hatch date, removing mammalian predators, requiring ORV users to obtain a vehicle permit and an operator education certificate, and increasing compliance with rules and regulations through the threat of revoking a vehicle permit or ORV operator certificate as well as increased enforcement and education through increased staffing levels in law enforcement and interpretation positions, respectively. Relocating nests from areas prone to erosion or frequent flooding, and prohibiting ORV use, as well as camping and campfires in the relocation areas. However, some adverse impacts from light pollution associated with camping and campfires outside of the relocation areas would cause some short- and long-term adverse impacts on nesting turtles and hatchlings.

ORV and other recreational use under alternative C would have short- and long-term adverse impacts on sea turtles by affecting the beach profile and substrate characteristics in ways that reduce suitability for nesting and hatching success, impacts caused by campfires, and likely continued closure violations and on rare occasion vandalism of turtle closures. However, increased staffing levels of law enforcement and interpretation positions would help reduce noncompliance through increased enforcement and education. Being able to revoke an ORV operator's education certificate or vehicle permit would also help reduce closure and other violations. These adverse impacts would be reduced by increasing the amount of pedestrian-only use areas by about 4 miles and restricting public ORV nighttime driving from 9 p.m. to 6 a.m. from May 1 through September 14. However, hatchlings emerging from nests after September 14 in areas open to ORV use (approximately 13 percent of nests laid on North Core and South Core Banks have hatched after September 14 since 1990) would still be subject to adverse impacts from night driving.

Managing the number of vehicles on the beach and implementing additional protection measures under an adaptive management strategy if resource protection goals are not achieving the desired results would also enhance protection of sea turtles and provide beneficial impacts. Under the ESA, these impacts would result in a finding of *may affect/are likely to adversely affect* sea turtles because the actions would result in direct or indirect impacts to the sea turtle species that are not discountable, insignificant, or beneficial. Though there would be beneficial impacts from resource management activities, the use of vehicle permits, a limit on the number of vehicle permits issued, and restrictions on ORV nighttime driving, the actions under alternative C would also likely cause adverse effects.

Alternative D

Under alternative D, resource management activities would result in substantial short- and long-term benefits due to the protection provided to sea turtles from daily surveys for nests during the sea turtle nesting season, marking each nest found, expanding closures when turtles are hatching, and installing light barriers around nests vulnerable to light pollution (i.e., in front of the cabins at Long Point and Great Island) 10 days prior to the estimated hatch date, removing mammalian predators, requiring ORV users to obtain a vehicle permit and an operator education certificate, and increasing compliance with rules and regulations through the threat of revoking a vehicle permit or ORV operator certificate as well as increased enforcement and education through increased staffing levels in law enforcement and interpretation positions, respectively. Relocating nests from areas prone to erosion or frequent flooding, and prohibiting ORV use, as well as camping and campfires in the relocation areas. However, some adverse impacts from light pollution associated with camping and campfires outside of the relocation areas would cause some short- and long-term adverse impacts on nesting turtles and hatchlings with some small additional benefits by further limiting the number of vehicles on the Seashore at any one time.

ORV and other recreational use under alternative D would have short- and long-term adverse impacts on sea turtles by affecting the beach profile and substrate characteristics in ways that reduce suitability for nesting and hatching success, impacts from campfires, and likely continued closure violations and on rare occasion vandalism of turtle closures. However, increased staffing levels of law enforcement and interpretation positions would help reduce noncompliance through increased enforcement and education. Being able to revoke an ORV operator's education certificate or vehicle permit would also help reduce closure and other violations. Additionally, impacts would be reduced by increasing the amount of pedestrian-only use areas by 10 miles. Prohibiting public ORV nighttime driving from 9 p.m. to 6 a.m. from May 1 through September 14 would eliminate impacts on adult and hatchling turtles caused by night driving during this timeframe, though hatchlings in nests in areas open to ORV use after September 14 would still be subject to some adverse night driving impacts (approximately 13 percent of nests laid on North Core and South Core Banks have hatched after September 14 since 1990). Managing the number of vehicles on the beach and implementing additional protection measures under an adaptive management strategy if resource protection goals are not achieving the desired results would also enhance protection of sea turtles and provide beneficial impacts. Under the ESA, these impacts would result in a finding of *may affect/are likely to adversely affect* sea turtles because the actions would result in direct or indirect impacts to the sea turtle species that are not discountable, insignificant, or beneficial. Though there would be beneficial impacts from resource management activities, restrictions on ORV nighttime driving, the use of vehicle permits, a limit on the number of vehicle permits issued, the actions under alternative D would also likely cause adverse effects.

Alternative E

Under alternative E, resource management activities would result in short- and long-term benefits. Benefits would be due to the protection provided to sea turtles from daily surveys for nests during the sea turtle nesting season, marking each nest found, expanding closures when turtles are hatching, and

installing light barriers around nests vulnerable to light pollution (i.e., in front of the cabins at Long Point and Great Island) 10 days prior to the estimated hatch date. Relocating nests from areas prone to erosion or frequent flooding and prohibiting camping and campfires in the relocation areas would also contribute to the beneficial effects. However, some adverse impacts from light pollution associated with camping and campfires outside of the relocation areas would cause some short- and long-term adverse impacts on nesting turtles and hatchlings, though given the reduced access to the beach with no ORV use, these impacts would be reduced.

Prohibiting public ORV use throughout the entire Seashore, not just on Shackleford Banks would provide protection for sea turtles by eliminating adverse impacts from public ORV use. Though very rare, some pedestrian vandalism of resource closures would continue to occur causing some small amount of adverse impacts. However, the number of occurrences would likely become even rarer due to limited access to the ocean beach with no ORV use. Additionally, if species protection goals are not being met, the Seashore would implement additional intensive management actions under an adaptive management strategy, such as increased education and focused enforcement, additional trash management and fish scrap disposal, additional predator control, and increased buffer sizes. All of these measures would help mitigate/reduce the potential for long-term adverse impacts due to pedestrian use of the Seashore. Under the ESA, these impacts would result in a finding of *may affect/not likely to adversely affect* sea turtles because the actions would result in direct or indirect impacts to the sea turtle species that are discountable, insignificant, or beneficial.

COMPARISON OF ALTERNATIVES

Resource management activities proposed under alternative B would provide slightly more beneficial impacts to sea turtles than those proposed under alternative A (the no-action alternative) because there would be more consistent training and supervision of resource staff who conduct the surveys, the limited removal of native and nonnative mammalian predators, and the increased education and public outreach measures that would be implemented under alternative B. In comparison to alternative E (the no ORV alternative), the limited removal of native and nonnative mammalian predators under alternative B would provide slightly more beneficial impacts to sea turtles than alternative E. Adverse impacts from ORV use and other recreational uses under alternative B would be less than those incurred under alternative A. This is due to the night driving restrictions that would be put into place under alternative B from 9 p.m. to 6 a.m. from May 1 through August 31, the additional management measures that could be implemented under the adaptive management strategy if species indicators are triggered, the vehicle permit system, the ORV operator education certificate requirement, and the likely increased compliance with resource closures due to additional law enforcement and interpretative staffing positions. However, adverse impacts from ORV use and other recreational uses under alternative B would be greater than those under alternative E. This is because no ORV use would be allowed on the Seashore under alternative E, eliminating all impacts on sea turtles from ORV use and reducing impacts from other recreational uses due to the reduced access to the beaches without ORVs.

Resource management activities under alternative C would provide slightly more beneficial impacts on sea turtles than they would under alternative A (the no-action alternative). This is because there would be more consistent training and supervision of resource staff who conduct the surveys, limited removal of native and nonnative mammalian predators, and increased education and public outreach measures that would be implemented under alternative C. In comparison to alternative E (the no ORV alternative), the limited removal of native and nonnative mammalian predators under alternative C would provide slightly more beneficial impacts to sea turtles than alternative E. Adverse impacts from ORV use and other recreational uses under alternative C would be less than those incurred under alternative A. This is due to the expansion of pedestrian-only use areas by 4 miles, night time driving restrictions from 9 p.m. to 6 a.m. from May 1 through September 14, the additional management measures that could be implemented

under the adaptive management strategy if species indicators are triggered, the likely increased compliance with resource closures due to increased law enforcement and interpretative staffing positions, the vehicle permit system, the ORV operator education certificate requirement, and the limit on the number of vehicle permits that would be issued. However, adverse impacts from ORV use and other recreational uses under alternative C would be greater than those under alternative E. This is because no ORV use would be allowed on the Seashore under alternative E eliminating all impacts on sea turtles from ORV use and reducing impacts from other recreational uses due to the reduced access to the beaches without ORVs.

Resource management activities under alternative D would provide slightly more beneficial impacts on sea turtles than they would under alternative A (the no-action alternative). This is because there would be more consistent training and supervision of resource staff who conduct the surveys, limited removal of native and nonnative mammalian predators, and increased education and public outreach measures that would be implemented under alternative D. In comparison to alternative E (the no ORV alternative), the limited removal of native and nonnative mammalian predators under alternative C would provide slightly more beneficial impacts to sea turtles than alternative E. Adverse impacts from ORV use and other recreational uses under alternative D would be less than those incurred under alternative A. This is due to the expansion of pedestrian-only use areas by 10 miles, night time driving restrictions from 9 p.m. to 6 a.m. from May 1 through September 14, the additional management measures that could be implemented under the adaptive management strategy if species indicators are triggered, the likely increased compliance with resource closures due to increased law enforcement and interpretative staffing positions, the vehicle permit system, the ORV operator education certificate requirement, and the limit on the number of vehicle permits that would be issued. Compared to alternative E, adverse impacts from ORV use and other recreational uses under alternative D would be greater. This is because no ORV use would be allowed on the Seashore under alternative E eliminating all impacts on sea turtles from ORV use and reducing impacts from other recreational uses due to the reduced access to the beaches without ORVs.

The resource management activities proposed for alternative E (the no ORV alternative) are the same activities proposed for alternative A (the no-action alternative) and their impacts would be the same. However, unlike alternative A, under alternative E there would be no public ORV use on the Seashore and surveying and monitoring protocols would be reviewed and may change due to the elimination of impacts from recreational ORV use and a reduction in the amount of impacts from pedestrians. Under alternative A, the North and South Core Banks of the Seashore would remain open to ORV use in designated routes and areas (as documented in the Superintendent's Compendium), except where resource or safety closures are present. There would be no night driving restrictions under alternative A and no permitting system for ORV use at the Seashore. Therefore, when compared to alternative A, alternative E would provide more protection to sea turtles because there would be no impacts related to ORV use and impacts related to other recreational uses would be reduced due to limited access to the ocean front beaches with no ORV use.

CONCLUSION

Overall, impacts on sea turtles from ORVs and other recreational uses under alternatives A, B, C, and D, are expected to be long-term and adverse, although compared to the existing condition, the proposed changes under each alternative would be beneficial. Surveying for sea turtle nests/crawls and monitoring for evidence of hatching, as well as nest protection measures would be the same under all of the alternatives (alternatives A, B, C, D, and E) and would provide short- and long-term benefits. Benefits would be due to the protection provided to sea turtles from daily surveys for nests conducted during the sea turtle nesting season (between May 1 and September 15), marking each nest found, expanding closures when turtles are hatching, and installing light barriers to protect nests and hatchlings from light pollution 10 days prior to the estimated hatch date. Other actions to benefit turtle populations include

relocating nests from areas prone to erosion or frequent flooding, and prohibiting ORV use, camping, and campfires in the relocation areas. Selected removal of mammalian predators under alternatives B, C, and D would provide additional beneficial impacts compared to alternatives A and E.

Under alternatives B, C, and D, requiring vehicle permits and revocable ORV user education certificates would enhance compliance with Seashore rules and regulations providing additional beneficial impacts not realized under alternative A. The beneficial impacts from these resource management activities would not be as beneficial as alternative E, which would prohibit nonessential recreational ORV use and associated impacts altogether at the Seashore.

Alternatives C and D would provide slightly more long-term benefits to sea turtle populations through the use of vehicle capacity limits compared to alternative A, which alternative B would not provide. For alternatives B, C, and D, if species indicators are triggered under the adaptive management strategy (increased education and focused enforcement which would help reduce closure violations; fish scrap disposal, which would likely reduce the number of mammalian predators attracted to the beach; route restrictions; increased buffer sizes; and a limit on the number of vehicles) the additional management actions to be implemented would help protect sea turtle nests, hatchlings, and beach habitat.

Under alternatives A, B, C, and D, ORV use on the Seashore would be allowed, which would result in short- and long-term adverse impacts on sea turtles. Impacts would result from disturbing (i.e., causing false crawls or disorienting hatchling) or injuring adult nesting female sea turtles, hatchlings, and live stranded sea turtles due to ORV use and other activities (i.e., pedestrian and pet use). ORVs would affect the beach profile and substrate characteristics in ways that reduce suitability for nesting and hatching success. The ORV impacts under alternatives C and D would be less than alternatives A and B because there would be more pedestrian-only use areas (additional 4 miles under alternative C and additional 10 miles under alternative D).

Alternatives B, C, and D would provide short- and long-term beneficial impacts by restricting night driving. Although all three alternatives would restrict driving from 9 p.m. to 6 a.m., alternative B would do so from May 1 through August 31, whereas the restriction would be extended to September 14 under alternatives C and D; encompassing more of the hatching period. Adverse impacts that would be avoided with these restrictions include potential false crawls caused by ORVs, disorientation of hatchlings from vehicle headlights, the potential to run over adult nesting or hatchling turtles, leaving of tire ruts at night that hatchlings can get trapped in, and driving over nesting turtle crawls and obscuring them from detection – which could cause a nest to go unprotected. However, since hatching events continue until October, nests located in areas open to ORVs would still be subject to adverse impacts from night driving on hatchlings once the night driving restrictions are lifted.

By prohibiting nonessential recreational ORV use throughout the entire Seashore, alternative E would provide more protection for sea turtles than alternatives A, B, C, and D. Although it is expected some Seashore violations and vandalism of resource closures would continue to occur, the number of these occurrences would be reduced under alternative E, compared to all of the other alternatives, due to the limited access to the ocean beach with no ORV use.

Significance Discussion

The purpose of the Seashore is to preserve the outstanding natural, cultural, and recreational resources and values of a dynamic, intact, natural barrier island system where ecological processes dominate. The Seashore is one of the few remaining locations on the Atlantic Coast where visitors can experience and recreate in an undeveloped, remote barrier island environment that can be reached only by boat or ferry. Five of the seven sea turtle species existing in the world today occur in the coastal waters of North

Carolina and the Seashore, and all are listed as either federally threatened or endangered. Although five threatened or endangered sea turtle species occur in the waters of North Carolina, only three species, the loggerhead, green, and leatherback, are known to regularly nest at the Seashore. Therefore, this significance discussion only focuses on those three species. In 1978, the loggerhead turtle was federally listed as threatened throughout its range. Additionally, in March 2013, the USFWS proposed designating 739.3 miles of loggerhead sea turtle nesting beaches located in the coastal counties from North Carolina to Mississippi as critical habitat; however, the beaches of the Seashore are not included in this proposed designation. In 1978, the green turtle was federally listed as threatened along North Carolina waters, and the leatherback was listed as federally endangered in 1970. Since 1990, the number of sea turtle nests at the Seashore has averaged 135 nests, ranging from a low of 77 in 2004 to a peak of 242 in 1999. Within the Seashore, the greatest annual number of sea turtle nests are at South Core Banks (53 percent of the total nests); 34 percent of the sea turtle nests are at North Core Banks; and 13 percent of the sea turtle nests are at Shackleford Banks. The loggerhead sea turtle is the only species for which recovery criteria are designated for the state of North Carolina in its recovery plan. The greatest concern to sea turtles is the impacts to nests and hatchlings, in the form of light pollution, erosion, flooding, ORVs, and predators.

Sea turtles at the Seashore currently receive substantial protections, which continue under all alternatives. Adverse impacts to sea turtles across all the alternatives would overall be small, as described in the impacts analysis above. Although there may be occasional adverse impacts to individual species, under all alternatives the Seashore would conduct extensive monitoring for sea turtle crawls and nests from May 1 through November 15. Turtle nests are marked by NPS staff to improve visibility and to prevent being run over by ORVs. NPS staff also establish actual ORV closures around nests, or, if not practical, establish ramp-to-ramp ORV closures. These two measures protect nests from being run over and provide a large area undisturbed by tire tracks, which eliminate the potential for hatchlings to become trapped or disoriented as they make their way to the ocean. These measures result in substantial protections for all turtle nests detected during their critical periods of incubation and hatching. There are some overlap protections from buffer closures of other species, depending on buffer size, location, and duration, as well as resource closures that close the beach to ORVs. Historically, these closures have averaged between 5 and 14 miles in the summer season (May through August), and between 3.5 and 8 miles in the fall season (September through November). The Seashore also establishes six relocation areas on North Core and South Core Banks during the nesting period, which are closed to ORV traffic, camping, and campfires. Although a small number of documented closure violations have been noted since 2001, there has never been a recorded death of a nesting sea turtle at the Seashore due to being struck by an ORV. There would be no significant impacts to sea turtles under alternative A, as the impacts to sea turtles are generally minor, as described above. The current species protection measures are substantial, and the action simply formalizes ORV routes that exist under the current condition. Under alternatives B, C, and D, additional protections for sea turtles, above and beyond the no-action alternative and existing condition, include light pollution mitigation measures, a ban on night driving, focused predator management, a permit system that limits ORV numbers in alternatives C and D, ORV route restrictions and reductions, creation of additional pedestrian-only areas, ATV and UTV restrictions, and adaptive management strategies. These additional measures under alternatives B, C, and D would primarily result in increased protections and beneficial impacts to sea turtles, as described in detail in the impacts analysis above. Accordingly, there are no significant adverse impacts to sea turtles under alternatives B, C, and D because the impacts to sea turtles are generally minor, the current species protection measures are substantial, and the action simply formalizes existing ORV routes. Under alternative E, ORV use is not allowed, which eliminates the majority of potential adverse impacts to sea turtles from ORVs. This is a beneficial change for sea turtles compared to the existing condition, essentially eliminating adverse impacts from ORVs, and does not result in significant adverse impacts.

Under alternatives A, B, C, and D, designating legal routes for ORV use does not establish a precedent for future actions with significant effects, because ORV use has occurred at the Seashore since the 1930s and

continued since the establishment of the Seashore as a park unit in 1976, and the current and proposed species protection measures are substantial, resulting in a low overall level of impacts to sea turtles. ORV use is currently legally permitted in several other national seashores and recreation areas, and in this regard is not precedent-setting within the national park system. As described above, ORV use also does not cause significant impacts to sea turtles, in part because of the substantial resource protection and mitigation measures taken by the Seashore, as well as the adaptive management strategy in alternatives B, C, and D, which would further strengthen mitigation measures and even limit use if certain indicators are triggered. Alternative E, which prohibits ORV use, would not establish a precedent for future actions with significant effects to sea turtles because many other national park units do not allow ORV use.

There are a number of cumulative impacts to sea turtles, described in the impacts analysis above, which may be both short and long-term adverse as well as long-term beneficial. However, while adverse effects on sea turtles from past and on-going actions occurring in the region could be significant, actions under alternatives A, B, C, D, and E would provide additional protections that would be beneficial to the regional sea turtle population, and would mitigate any significant adverse cumulative impacts already occurring.

In conclusion, compared to the existing condition, additional impacts to sea turtles under alternatives A, B, C, D, and E would be small. The Seashore currently has in place substantial resource protection and mitigation measures that would continue and would be strengthened in the action alternatives. When compared to existing condition, in light of the significance criteria at 40 CFR 1508.27, there would be no significant adverse impacts to sea turtles from alternatives A, B, C, D, or E.

SEABEACH AMARANTH

SPECIES-SPECIFIC METHODOLOGY AND ASSUMPTIONS

Potential impacts on seabeach amaranth populations and habitat at the Seashore were evaluated based on the species life history, its past and present occurrence at the Seashore, as well as known effects on the species from activities relating to humans, pets, predators, and ORVs. Information about habitat and other existing data were acquired from staff at Cape Lookout National Seashore, the USFWS, and available literature.

The analysis focuses on impacts on seabeach amaranth from a variety of human, recreational and other activities, as well as impacts incurred as a result of surveying and management activities. Seabeach amaranth often grows in habitat areas used by other protected species within the Seashore such as piping plovers, oystercatchers, colonial waterbirds, and sea turtles. Therefore, any ORV-related closures established to protect the habitat or nests of these species would also benefit seabeach amaranth, although the extent of the benefit would depend upon the actual location, size, and duration of the closures. It is also assumed that increases in natural resource and law enforcement staffing at the Seashore would increase public compliance with closures and other Seashore regulations (e.g., leash laws) from that which currently exists.

Primary steps in assessing impacts on seabeach amaranth at the Seashore were to determine (1) occurrence and location of seabeach amaranth in areas likely to be affected by management actions described in the alternatives; (2) current and future use and distribution of ORV by alternative; (3) habitat impact or alteration caused by the alternatives; and (4) disturbance potential of the actions and the potential to directly or indirectly affect seabeach amaranth as a result of ORV use.

STUDY AREA

The study area for assessment of the various alternatives is the Seashore. The study area for the cumulative impacts analysis is the state of North Carolina.

ALTERNATIVE A

Impacts of Alternative A: No Action

Resource Management Activities

Seabeach amaranth is an annual whose seeds are viable for long periods and can be dispersed long distances by wind and water, allowing it to occupy newly created habitat. Seeds may also just accumulate around the base of a plant when it dies, allowing it to continue to occupy currently available habitat. Therefore, to protect and maintain this species, it is necessary to protect the plants and habitat where they now occur, potential habitat where plants might eventually occur, and unknown sites where seeds might be (Jolls, Sellars, and Wigent 2004). In the Carolinas, seabeach amaranth has historically been found most prevalent on south- and southeast-facing beaches, rather than north- or northeast facing beaches which experience greater erosion rates (USFWS 1996b). Within Cape Lookout National Seashore specifically, seabeach amaranth has historically been most prevalent on the south facing beaches of Shackleford Banks and from the point of Cape Lookout to Power Squadron Spit (NPS 2011d).

Under alternative A, during late July or early August, when plants are large enough to be easily detected and seed production has begun, an annual survey would be conducted of all potential seabeach amaranth habitat to locate and document plants as recommended in the seabeach amaranth recovery plan (USGS 1996b). When a seabeach amaranth plant is found outside of an existing closure (i.e., bird or turtle closure) staff would establish an ORV closure around the plant with the size of the closure based on best professional judgment, but at a minimum it would be a 30-foot by 30-foot closure as recommended by the U.S. Geological Survey Patuxent Wildlife Research Center (Cohen et al. n.d.). The closures would not be removed until the plants have died in late autumn or early winter. Providing a closure of this size until the plant dies would provide both short- and long-term benefits by helping to protect plants from being run over by ORVs or trampled by people, and from erosion caused by multiple passes of ORVs in high-use areas.

Beginning on June 1, prior to the annual survey in late July or early August, habitat outside of existing bird closures would be monitored 1–2 days per week for emerging plants. Seabeach amaranth seedlings are typically first visible beginning in June. Though it is difficult to readily see plants at this time of year due to their size (Lyons pers. comm. 2005), surveying for plants beginning June 1 would be beneficial by documenting and protecting plants found that might otherwise be destroyed by ORVs, pedestrians, or natural events (i.e., storm overwash) and go undocumented prior to the annual survey. Conducting periodic monitoring for seedlings is easily accomplished by incorporating it into bird monitoring efforts. Potentially protecting plants that are vulnerable to human impacts because they are outside other resource closures at the earliest possible stage in their growth, rather than waiting until they are larger and more readily visible, would enhance the chances that the seabeach amaranth population would increase within the Seashore. However, plants are often not found prior to the annual survey in late July or early August (NPS 2007l, 2008e, 2009d, 2010d, 2011d); minimizing the long-term benefits provided by periodic monitoring.

Under alternative A there would be no management specifically targeting seabeach amaranth habitat, although individual species would be protected by a 30-foot by 30-foot buffer, when found. However, two areas where the plant has historically been found in the greatest numbers, Shackleford Banks and Power

Squadron Spit, would continue to be closed to ORV traffic on an annual basis, affording protection to the plant from ORV use (see “ORV and Other Recreational Use” below) and providing short- and long-term beneficial impacts. Other areas permanently closed to ORV use that contain potential seabeach amaranth habitat where plants have been found in the past that would contribute to these beneficial impacts include Portsmouth Flats, the interior of the point of Cape Lookout, and the beach between mile markers 41a and 41b (NPS 2002d, 2004g, 2006j).

As noted in the seabeach amaranth recovery plan, throughout its entire range some of the largest seabeach amaranth populations are associated with nesting sites for the piping plover, Wilson’s plover, least tern or Caspian tern (USFWS 1996b). At the Seashore, seabeach amaranth habitat also closely corresponds with that preferred by the piping plover, American oystercatcher, other protected bird species, and sea turtles. Therefore, protection provided to these species would also provide short- and long-term beneficial impacts on seabeach amaranth by protecting additional habitat from potential ORV impacts, as discussed below under “ORV and Other Recreational Use.” The full amount of protection for seabeach amaranth from these other species closures would vary annually and depend upon the location, size, and duration of the species closures. However, some areas are known habitat that have consistently had full recreational closures from year to year that have also benefited seabeach amaranth. Under alternative A, full recreation closures in active, historical, and potential new nesting habitat for piping plover and active nesting areas from the previous breeding season for colonial waterbirds, as determined by a qualified staff biologist, would be established on April 1. These areas may be expanded in areas where piping plover are observed prospecting for territories outside of full recreational closure areas or where colonial waterbird nests or nests scrapes are found outside of full recreational closure areas. Some areas of active and historical piping plover nesting habitat include Portsmouth Flats, Kathryn-Jane Flats, Old Drum Inlet, New Drum Inlet, and Plover Inlet (mile 23.6) among others. Seabeach amaranth germinates from April through July and protecting these areas for bird species would also protect habitat and seabeach amaranth seedlings that germinate within these areas during the time of bird nesting activities, when seedlings might otherwise not be seen, resulting in short- and long-term beneficial impacts.

Under alternative A, there would also continue to be three turtle nest relocation areas established on each of North Core Banks and South Core Banks. These areas, some of which are up to 1 mile long, would be closed to ORV traffic beginning 50 days after the first turtle nest is relocated to the area and would not reopen until all relocated nests in the area have been excavated. While these turtle closures are located on eastern facing beaches and would not necessarily encompass the beginning of the germination period for seabeach amaranth, once closed, any plants that germinate within them would be protected from ORV impacts. Additionally, all resource closures (i.e., bird and turtle) would be surveyed for seabeach amaranth prior to reopening them to ORV traffic when closures are no longer required to protect nesting birds and their chicks or turtle nests and hatchlings. If any plants are detected, 30-foot by 30-foot buffers would be established around the plants while other areas of the closures where there are no plants would be reopened to ORV traffic.

Because seabeach amaranth must recruit annually and its seeds can be dispersed long distances via wind and water (Jolls, Sellars, and Wigent 2004), closures for other species that overlap seabeach amaranth habitat and the 30-foot by 30-foot buffers installed around plants would not likely protect all areas in the Seashore where seeds exist and could potentially germinate in areas of ORV traffic. Unprotected seedlings or plants in areas open to ORV use could be crushed and go completely undocumented, and seeds may be pulverized or buried beyond their germination depth (Cohen et al. 2010). Because ATVs and UTVs are used to conduct bird and turtle surveys and monitoring, there would also be a small probability of resource monitoring vehicle impacts on plants and seeds due to crushing and burial, respectively, causing some small amount of long-term adverse impacts.

Education/Public Outreach—Public outreach and education measures informing visitors about species, resource information, wise use, and ORV program information would continue to be provided under alternative A. These measures would be beneficial to seabeach amaranth by providing the public information as to the specific needs of all protected species found at the Seashore and alerting the public ahead of time to areas where they cannot go due to potential impacts on the species. These actions would help prevent resource closure violations and protect seabeach amaranth.

ORV and Other Recreational Use

ORV use can have both direct and indirect adverse impacts on seabeach amaranth. Stems of the plant are easily broken or crushed by tires; thus, even limited traffic can be detrimental during the growing season (Federal Register 1993). While ORV impacts to seabeach amaranth are most detrimental during the plant's growing season, some adverse impacts can occur during the plant's dormant season, because ORVs can pulverize seeds and bury them to depths beyond which they can germinate (Cohen et al. 2010). Under alternative A, approximately 81 percent (45 miles) of the Seashore would be available for ORV use from March 16 through December 31. In areas open to ORV traffic any unprotected plants, especially newly germinating and juvenile plants that are difficult to see and that could easily be missed and not protected during periodic monitoring in June or during the annual survey, could be potentially crushed by an ORV. However, the risk of direct impacts from ORVs is greatly reduced because the majority of habitat suitable for seabeach amaranth, and the areas where the majority of the plants have been found historically at the Seashore are protected from ORV impacts either through year-round closures (Shackleford Banks, Power Squadron Spit, the interior of the point of Cape Lookout, Portsmouth Flats, and on the beach between mile markers 41a and 41b) or through seasonal resource closures for other protected species during the plant's germination and growing season, as discussed above under "Resource Management Activities."

From January 1 through March 15 the Seashore would only be open for pedestrian use, with ORVs prohibited from using the Seashore during this time. This along with the year-round closures mentioned above (pedestrian-only areas), would minimize potential ORV impacts on seabeach amaranth during a majority of its dormant season (December through April) when ORV traffic could otherwise pulverize the plant's seeds or bury them to a depth beyond which they can germinate.

Under alternative A, ORV and pedestrians would continue to be prohibited from seabeach amaranth closures. In areas of the Seashore that are closed to ORV use year-round no additional buffers would be erected around any seabeach amaranth plants. While these ORV closed areas receive pedestrian traffic, not erecting closures around the plants would not create much of a hazard for the plants. Pedestrian use of beaches typically does not overlap heavily with the habitat of seabeach amaranth, as joggers prefer wet sand and sunbathers prefer to be closer to the water rather than the narrow niche of habitat between the high tide line and the toe of the primary dunes or overwash flats where seabeach amaranth is typically found (USFWS 1996b). Pedestrian traffic during the dormant season would be much less than during the growing season and would not likely have any impacts on the species. Even during the growing season, pedestrian traffic would generally have little effect on seabeach amaranth populations, as many beaches with daily use by thousands of sunbathers, joggers, and other recreation enthusiasts have substantial and apparently healthy populations of seabeach amaranth (USFWS 1996b). However, there would still be a slight risk that some undetected/unprotected seedlings/plants could be trampled by pedestrians and or their pets, specifically by those who tent camp near the toe of the dunes, resulting in some small amount of adverse impacts.

Overall, ORVs and other recreation uses at the Seashore would have some short-and long-term adverse impacts on seabeach amaranth; however, as detailed above, these impacts would be relatively small since

much of the habitat for seabeach amaranth is already protected through year-round and seasonal closures or does not generally overlap with pedestrian use of the beaches.

Permit Requirements—Under alternative A, there would be no permit requirements placed on ORV users at the Seashore. It is anticipated that visitation to the Seashore will slowly grow in the future, with an estimated annual increase of approximately 1.5 percent (NPS 2010j). With increased visitation, it is assumed that the number of ORVs on the beach at the Seashore would also increase slowly in the future. Although ORV use would continue to be prohibited in ORV or full recreational closures, the lack of a permit system could result in limited adverse impacts on seabeach amaranth because without a permit program, there would be less user education regarding these closures. Also, without a permit program, the number of ORVs on the Seashore would be allowed to grow unencumbered, which could result in a corresponding increase the amount of noncompliance (intentional or unintentional) with closures and other Seashore regulations that are in place to protect seabeach amaranth. As described under the alternatives where a permit system would be implemented, such a system would provide the Seashore with a means for providing additional education to ORV users regarding the importance of seabeach amaranth and its habitat at the Seashore, as well as additional methods (i.e., revoking permits) for dealing with noncompliance of Seashore regulations. As a result, the lack of a permit system under alternative A could result in an increased risk of mortality to seabeach amaranth from vehicle disturbances.

Adaptive Management Strategy—Under alternative A, there would be no adaptive management strategy at the Seashore. An adaptive management strategy would monitor disturbance to American oystercatcher (an indicator species), primarily related to impacts from ORVs, and management actions could be altered based on the results of that monitoring. The lack of an adaptive management strategy may result in an increased risk of mortality to seabeach amaranth from vehicle disturbances.

Cumulative Impacts under Alternative A

Other past, present, and future planned actions within and around the Seashore have the potential to impact seabeach amaranth. In the past, dredge material from the dredging of Beaufort Inlet has not been placed on any Seashore beaches. However, moving forward, as part of the Morehead City Harbor DMMP, NPS has agreed to allow consideration of disposal of restricted amounts of dredged material to on Shackleford Banks during the 20-year period beginning in 2015 and extending through 2034 (USACE 2013). Beach disposal of dredge material can have both adverse and beneficial impacts. The deposition of dredge material on beaches and use of heavy equipment at the dredge deposition site could either directly damage plants if activities take place during the plant's growing season or could pulverize or bury seeds if it occurs during the plant's dormant season causing long-term adverse impacts. However, placement of dredge material for beach replenishment projects also rebuilds habitat for seabeach amaranth and can have long-term beneficial impacts. At Wrightsville beach, after several beach replenishment projects in the 1980, the seabeach amaranth population increased from zero to several thousand (USFWS 1996b). For the Morehead City Harbor DMMP, as it relates to Shackleford Banks, if the NPS allows dredged material to be deposited on the beach, it would potentially occur every 3 to 4 years along a 3.65-mile-long stretch of Shackleford Banks, the dredged material would be compatible with the existing beaches (>90 percent sand), and the NPS would only allow it to be deposited on the beach from November 16 through March 30 in any year, which is outside of the growing season for seabeach amaranth. Other areas where disposal could take place are on all of the beaches in Fort Macon State Park, the majority of Atlantic beach, and Pine Knoll Shores if there is sufficient material. For Fort Macon State Park and Atlantic beach, beach disposal would occur during the colder months prior to germination of the plant. If there is sufficient material beach disposal on Pine Knoll Shores would occur during the warmer months within the beach disposal window. While beach disposal is expected to provide beneficial impacts to seabeach amaranth through the restoration of habitat, the biological assessment recognizes that disposal on a

portion of the beaches in the growing season may slow population recovery over the short term (USACE 2013).

Several NPS past, current, and future planning efforts can also affect seabeach amaranth. If seabeach amaranth becomes re-established at Cape Hatteras National Seashore, protection measures implemented under the past Cape Hatteras National Seashore Interim Protected Species Management Strategy/EA and the existing Cape Hatteras National Seashore ORV Management Plan/EIS could have long-term beneficial impacts on seabeach amaranth populations within Cape Lookout National Seashore and throughout the rest of the plant's habitat in North Carolina. Wind and water can disperse the plant's seeds over long distances; therefore, given the proximity of Cape Hatteras National Seashore seabeach amaranth seeds produced there could be a future potential seed source for suitable habitat in Cape Lookout National Seashore and other areas in North Carolina.

The Comprehensive Interpretation Plan articulates the Seashore's purpose, significance and themes. The plan is necessary to inform and guide the Seashore's interpretive and education programs, which includes information about threatened and endangered species within the Seashore, and would have long-term beneficial impacts on seabeach amaranth.

The Seashore has also prepared an Interim Off Road Management Report based in part on the action outlined in the *Cape Lookout National Seashore Interim Protected Species Management Plan/Environmental Assessment* and the Superintendent's Compendium. It details how ORV closures are established and would provide short-term beneficial impacts on seabeach amaranth until the long-term ORV plan is implanted by providing another measure of educating the visiting public about protecting seabeach amaranth and other species at the Seashore.

The 1996 recovery plan for seabeach amaranth discusses mechanisms that can be implemented to help achieve the recovery/delisting of the plant which is defined as "when the species exists again in at least six of the States within its historic range...and when a minimum of 75 percent of the sites with suitable habitat within each State are occupied by amaranth populations for 10 consecutive years." Identifying measures such as protecting existing populations and habitat; implementing management measures to protect long-term reproduction, establishment, maintenance, and vigor; developing cultivated sources of plants and seeds; enforcing laws protecting the species and/or habitat; and developing materials to educate the public about the status of the species and the recovery plan objectives would provide long-term benefits to the species in North Carolina.

The recovery plan notes that predation by webworms (caterpillars of small moths that feed on the leaves of seabeach amaranth), and if prolific enough, can defoliate the plants to the point of either killing them or reducing their seed production (USFWS 1996b). Even though some webworm predation has been observed in recent years at the Seashore (NPS 2008e, 2009d, 2010d), the Seashore does not treat for webworm, resulting in short- and long-term adverse impacts. Any adverse impacts would be relatively small, as the occurrences of webworms are fairly limited (Rikard pers. comm. 2013a).

Beach vitex, a nonnative species originally introduced to South Carolina from Korea, is a fast spreading plant that grows in similar habitats and out-competes seabeach amaranth. In North Carolina the Board of Agriculture and Consumer Services has listed beach vitex as a Class B State Noxious Weed (NCDA&CS 2011), which bans the sale, transport and possession of beach vitex by nurseries, garden shops, and private property owners and the plant has not been documented in the Seashore (Altman pers. comm. 2010b, 2012a). The protective measures taken by the State of North Carolina provide short- and long-term benefits to seabeach amaranth by helping to prevent the spread of beach vitex in the state.

The overall combined impacts of these past, present, and future actions on seabeach amaranth would be short- and long-term adverse as well as long-term beneficial. These impacts, combined with the impacts described under alternative A, would likely result in short- and long-term beneficial cumulative impacts. While adverse effects on seabeach amaranth from other actions occurring in the state would still exist, actions under alternative A would provide additional protection that would be beneficial to the state seabeach amaranth population and would offset some of the adverse effects.

ALTERNATIVE B

Impacts of Alternative B

Resource Management Activities

Surveys conducted for seabeach amaranth plants and protection measures implemented when plants are detected under alternative B would be the same as under alternative A, resulting in short- and long-term beneficial impacts on seabeach amaranth. Additionally, there would be more consistent training and supervision of resource staff who conduct the surveys. This would result in a higher quality of monitoring for the species, resulting in beneficial impacts.

Management activities under alternative B would be the same as described for alternative A except historical shorebird nesting areas would be posted prior to opening the beach to vehicles by March 16 (rather than posting habitat by April 1). Since seabeach amaranth habitat often overlaps shorebird nesting habitat, this measure would likely provide some additional protection to seabeach amaranth. As noted above, impacts from management activities described for alternative A would also occur under alternative B including beneficial impacts from erecting buffers around plants found during surveying, keeping areas such as Shackleford Banks, Power Squadron Spit, Portsmouth Flats, the interior of the point of Cape Lookout, and the beach between mile markers 41a and 41b as pedestrian-only use areas; and closing turtle relocation areas to ORV traffic. Some small amount of adverse impacts would also occur from essential vehicle use possibly crushing or burying seeds and from not having a plan in place for addressing the management of webworms or beach vitex.

Education/Public Outreach—Under alternative B, public education and outreach measures in addition to those under alternative A would enhance the protection of seabeach amaranth and its habitat. Under alternative B, staffing levels would increase for interpretation positions (to provide formal outreach and on-site ORV education on the subject of protected species management) and law enforcement (among other duties, law enforcement assists with public education). The Seashore would standardize and clarify their resource closure signs, and additional education materials about ORV regulations and species protection would be provided to the commercial service providers for distribution to visitors. Additional interpretive programs related to ORV use would be added at the Seashore and maps of closure areas would be regularly updated online and posted throughout the Seashore where possible. These additional measures would serve to better educate ORV operators to the resource management measures of the Seashore as described in chapter 2 and better inform them about species protection, providing short- and long-term beneficial impacts on seabeach amaranth.

ORV and Other Recreational Use

Under alternative B, the amount of Seashore open to ORV use and other recreational uses would be the same as under alternative A, approximately 81 percent of the beach. As a result the impacts would also be the same as under alternative A, short- and long-term adverse, with a few exceptions.

Under alternative B, the back route would be regularly maintained by the Seashore and re-established if impacted by a storm event. This would continue to allow the back route to be used by ORVs as a bypass when full beach closures occur for species protection or safety reasons. Additionally, if driving conditions on the back route deteriorate significantly vehicles are less likely to use it to traverse long distances along the Seashore and are more likely to drive on the beach. Regularly maintaining the back route and re-establishing it after impacts from storms would help encourage vehicles to use it instead of the beach, lessening potential vehicle impacts on seabeach amaranth plants and their seeds. Also under alternative B, there is the potential for small changes to the number and location of ramps as needed, and ramps may be moved or re-established after major storm events to restore access. While ramps would not be constructed in areas where seabeach amaranth plants exist, to the extent that new ramps are constructed or existing ramps are re-established in areas that might provide suitable habitat for seabeach amaranth, these activities would remove potential habitat for the plant species. However, the area impacted by any new or re-established ramps would be small compared to the overall habitat available to seabeach amaranth, minimizing any adverse impacts.

Permit Requirements—Alternative B would include an operator education certificate for those visitors wishing to operate an ORV on the Seashore. Having a certificate program would enhance the education of ORV users as to the resource management measures of the Seashore as described in chapter 2 and would provide some short- and long-term benefits to the protection of seabeach amaranth through this knowledge. The Seashore would also require a permit for the vehicle, and it along with the operator education certificate could be revoked for violation of applicable Seashore regulations or terms and conditions of the permit. Benefits would arise from the ability of the Seashore to revoke the operator certificate and vehicle permit. While most ORV users respect resource closures, violations do occur each year (NPS 1991, 1992, 1993b, 1994, 1995, 1996, 1997b, 1998c, 1999b, 2000d, 2001c, 2002d, 2003b, 2004d, 2005b, 2006g, 2007j, 2008d, 2009c, 2010c, 2010h, 2011c, 2012n), and vehicles driving through closures, especially bird closures, can run over seabeach amaranth plants that are growing in those closures. The potential deterrent of losing driving privileges on the Seashore would likely reduce the number of closure violations.

Adaptive Management Strategy—Under alternative B, an adaptive management strategy would be adopted to ensure that the goals of species protection are being met. While the American oystercatcher would be used as the indicator species to determine if levels of disturbance warrant implementing more intensive management actions, some of the additional management actions if implemented would provide both short- and long-term beneficial impacts for protecting seabeach amaranth. The additional management actions that could be implemented that could help protect seabeach amaranth include increased education and focused enforcement, which would help reduce closure violations that could impact seabeach amaranth; route restrictions and increased buffer sizes, both of which could protect beach habitat suitable for seabeach amaranth since its habitat overlaps that of the protected bird species; and a reduction in the number of vehicle permits issued, as well as managing the size of the vehicle storage lots, both of which would help reduce the number of vehicles driving on the beach and potentially lessen the amount of impacts caused by ORVs by a small amount. If species indicators continue to be triggered due to visitor use impacts for two consecutive years after implementing the previously mentioned actions, then reducing the number of vehicle permits issued and increasing the size of species protection buffers could be implemented. These actions would reduce the number of vehicles driving on the beach and increase the distance vehicles could approach plants, thus reducing the overall amount of potential impacts caused by ORVs, providing short- and long-term beneficial impacts to seabeach amaranth.

Cumulative Impacts under Alternative B

The past, present, and future actions discussed under the cumulative impacts scenario for alternative A would be the same under alternative B. The cumulative impact of these past, present, and future actions, would likely be short- and long-term adverse, as well as long-term beneficial. These impacts, when combined with the impacts of alternative B, would likely result in short- and long-term beneficial impacts. While adverse effects on seabeach amaranth from other actions occurring in the state would still exist, actions under alternative B would provide additional protection that would be beneficial to the state seabeach amaranth population and would offset some of the adverse effects.

ALTERNATIVE C

Impacts of Alternative C

Resource Management Activities

Surveys conducted for seabeach amaranth plants and protection measures implemented when plants are detected under alternative C would be the same as under alternative A, resulting in short- and long-term beneficial impacts on seabeach amaranth. Additionally, there would be more consistent training and supervision of resource staff who conduct the surveys. This would result in a higher quality of monitoring for the species, resulting in beneficial impacts.

Management activities under alternative C would be the same as under alternative B. Impacts would be short- and long-term beneficial from keeping areas such as Shackleford Banks, Power Squadron Spit, Portsmouth Flats, the interior of the point of Cape Lookout, and the beach between mile markers 41a and 41b as pedestrian-only use areas; closing turtle relocation areas to ORV traffic; and erecting bird closure areas, including historical bird nesting areas by March 16, especially in areas that overlap suitable seabeach amaranth habitat. Some small amount of adverse impacts would also occur from essential vehicle use possibly crushing or burying seeds and from not having a plan in place for addressing the management of webworms or beach vitex.

Education/Public Outreach—Education and public outreach measures under alternative C would be the same as under alternative B, including increases in staffing levels for interpretation positions and law enforcement positions, and would result in short- and long-term beneficial impacts from better educating the public and ORV operators to the resource management measures of the Seashore as described in chapter 2 and better informing them about species protection.

ORV and Other Recreational Use

Under alternative C, the impacts from ORV and other recreational use would be similar to alternative B; however, they would occur over a slightly smaller area due to an increase in the amount of pedestrian-only use area under alternative C. Additionally, creating new ramps and/or re-establishing ramps after storm events would cause some slight adverse impacts.

Under alternative C the amount of Seashore beach open to ORV use would decrease from that open to ORVs under alternative A because approximately 4 miles of additional pedestrian-only use areas would be designated. The amount of seashore open to ORVs during the summer season would be approximately 74 percent (as compared to 81 percent under alternative A) and approximately 79 percent during the rest of the year when ORVs are allowed on the beach (ORVs are prohibited from January 1 through March 15). The additional ORV restrictions would add slightly to the long-term benefits already provided to seabeach amaranth. Most of the areas where seabeach amaranth has historically occurred are already

protected by year-round closures or seasonal resource closures for other protected species during the plant's germinating and growing season.

Similar to alternative B, there is the potential for small changes to the number and location of ramps as needed, and ramps may be moved or re-established after major storm events to restore access to the beach. While ramps would not be constructed in areas where seabeach amaranth plants exist, to the extent that new ramps are constructed or existing ramps are re-established in areas that might provide suitable habitat for seabeach amaranth, these activities would remove potential habitat for the plant species. The area impacted by any new or re-established ramps would be small compared to the overall habitat available to seabeach amaranth, minimizing any potential adverse impacts.

Permit Requirements—Similar to alternative B, alternative C would include an operator education certificate for those visitors wishing to operate an ORV as well as a vehicle permit; both of which could be revoked for violation of applicable Seashore regulations or terms and conditions of the permit. Having a certificate program would enhance the education of ORV users as to the resource management measures of the Seashore as described in chapter 2 and would provide some short- and long-term benefits to the protection of seabeach amaranth through this knowledge. And similar to alternative B, the potential deterrent of losing driving privileges on the Seashore would likely reduce the number of closure violations, providing short- and long-term beneficial impacts.

To manage the number of vehicles on the Seashore at any one time, capacity limits based on historical ORV use would be established and administered through limiting the number of vehicle permits issued under alternative C. While some benefits to seabeach amaranth would be realized by limiting the number of vehicles on the beach, the added benefits would be small, especially during the spring and summer (March 16 through September 15) since most of the habitat suitable for seabeach amaranth is already protected through year-round closures or seasonal resource closures for other species, and limiting the number of vehicles on the beach would not alter this. During the fall (between September 16 and December 31) when many of the resource closures are removed, a limit on the number of vehicles on the beach would provide slightly more beneficial impacts by limiting the number of vehicles that can potentially alter suitable habitat or bury seeds below depths at which they can germinate.

Adaptive Management Strategy—Under alternative C, an adaptive management strategy would be adopted similar to that under alternative B and would result in both short- and long-term beneficial impacts on seabeach amaranth from the additional management actions that could be implemented. Additional management actions that could help provide additional protection to seabeach management include increased education and focused enforcement, which would help reduce closure violations that could impact seabeach amaranth; route restrictions and increased buffer sizes, both of which could protect beach habitat suitable for seabeach amaranth since its habitat overlaps that of the protected bird species; and a reduction in the number of vehicle permits issued and managing the size of the vehicle storage lots, both of which would reduce the number of vehicles driving on the beach and potentially the amount of impacts caused by ORVs by a small amount.

Cumulative Impacts under Alternative C

The past, present, and future actions discussed under the cumulative impacts scenario for alternative A would be the same under alternative C. The cumulative impact of these past, present, and future actions, would likely be short- and long-term adverse and long-term beneficial. These impacts, when combined with the impacts of alternative C, would likely result in short- and long-term beneficial impacts. While adverse effects on seabeach amaranth from other actions occurring in the state would still exist, actions under alternative C would provide additional protection that would be beneficial to the state seabeach amaranth population and would offset some of the adverse effects.

ALTERNATIVE D

Impacts of Alternative D

Resource Management Activities

Surveys conducted for seabeach amaranth plants and protection measures implemented when plants are detected under alternative D would be the same as under alternative A, resulting in short- and long-term beneficial impacts on seabeach amaranth. Additionally, there would be more consistent training and supervision of resource staff who conduct the surveys. This would result in a higher quality of monitoring for the species, resulting in beneficial impacts.

Management activities under alternative D would be the same as under alternative B. Impacts would be short- and long-term beneficial from keeping areas such as Shackleford Banks, Power Squadron Spit, Portsmouth Flats, the interior of the point of Cape Lookout, and the beach between mile markers 41a and 41b as pedestrian-only use areas; closing turtle relocation areas to ORV traffic; and erecting bird closure areas, including historical bird nesting areas by March 16, especially in areas that overlap suitable seabeach amaranth habitat. Some small amount of adverse impacts would also occur from essential vehicle use possibly crushing or burying seeds and from not having a plan in place for addressing the management of webworms or beach vitex.

Education/Public Outreach—Under alternative D, education and public outreach measures would be the same as under alternative B, including increases in staffing levels for interpretation positions and law enforcement positions. Short- and long-term beneficial impacts would result better educating ORV operators to the resource management measures of the Seashore as described in chapter 2 and better informing them about species protection.

ORV and Other Recreational Use

Under alternative D, the impacts from ORVs and other recreational uses would be similar to alternative A, however, they would occur over a slightly smaller area due to an increase in the amount of pedestrian-only use area under alternative D. Additionally, similar to alternative C, creating new ramps or re-establishing ramps after storm events would cause some slight adverse impacts.

Under alternative D, an additional 10 miles of Seashore would be designated as pedestrian-only areas. The amount of seashore open to ORVs during the summer season would be approximately 63 percent (as compared to 81 percent under alternative A) and approximately 73 percent during the rest of the year when ORVs are allowed on the beach (ORVs are prohibited from January 1 through March 15. Because the majority of habitat where seabeach amaranth has historically been found is already protected from ORV impacts through year-round closures and other seasonal resource closures, the reduction in where ORVs can drive on the beach on a seasonal or year-round basis would only provide a small increase in benefits to seabeach amaranth.

Similar to alternative B, the back route would be regularly maintained and re-established when impacted by storm events. This would continue to allow the back route to be used by ORVs as a bypass when full beach closures occur for species protection or safety reasons and would encourage use of the back route instead of the beach when traversing long distances along the Seashore. This would benefit seabeach amaranth through less driving on the beach. Although ramps would be re-established under alternative D to restore access after storm events, no new ramps would be added to the Seashore beach. Ramps would not be re-established in areas where seabeach amaranth plants exist, but to the extent that ramps are re-established after major storm events in areas that might provide suitable habitat for seabeach amaranth,

these activities would remove potential habitat for the plant species. The area impacted by any re-established ramps would be small compared to the overall habitat available to seabeach amaranth, minimizing the amount of potential adverse impacts.

Permit Requirements—Similar to alternative B, alternative D would include an operator education certificate for those visitors wishing to operate an ORV as well as a vehicle permit; both of which could be revoked for violation of applicable Seashore regulations or terms and conditions of the permit. Having a certificate program would enhance the education of ORV users as to the resource management measures of the Seashore as described in chapter 2 and would provide some short- and long-term benefits to the protection of seabeach amaranth through this knowledge. And similar to alternative B, the potential deterrent of losing driving privileges on the Seashore would likely reduce the number of closure violations, providing short- and long-term beneficial impacts.

Similar to alternative C, to manage the number of vehicles on the Seashore at any one time, capacity limits based on current average ORV use would be established and administered through limiting the number of vehicle permits issued under alternative D. However, under alternative D the limit on the number of permits issued would be slightly less than under alternative C. While some benefits to seabeach amaranth would be realized by limiting the number of vehicles on the beach, the added benefits would be small, especially during the spring and summer (between March 16 and September 15) since most of the habitat suitable for seabeach amaranth is already protected through year-round closures or seasonal resource closures for other species, and limiting the number of vehicles on the beach would not alter this. During the fall (between September 16 and December 31) when many of the resource closures are removed, a limit on the number of vehicles on the beach would provide slightly more beneficial impacts by limiting the number of vehicles that can potentially alter suitable habitat or bury seeds below depths at which they can germinate.

Adaptive Management Strategy—Under alternative D, an adaptive management strategy would be adopted similar to that under alternative B and would result in both short- and long-term beneficial impacts on seabeach amaranth from the additional management actions that could be implemented. Additional management actions that could help provide additional protection to seabeach amaranth include increased education and focused enforcement, which would help reduce closure violations that could impact seabeach amaranth; route restrictions and increased buffer sizes, both of which could protect beach habitat suitable for seabeach amaranth since its habitat overlaps that of the protected bird species; and a reduction in the number of vehicle permits issued and managing the size of the vehicle storage lots, both of which would reduce the number of vehicles driving on the beach and potentially the amount of impacts caused by ORVs.

Cumulative Impacts under Alternative D

The past, present, and future actions discussed under the cumulative impacts scenario for alternative A would be the same under alternative D. The cumulative impact of these past, present, and future actions, would likely be short- and long-term adverse and long-term beneficial. These impacts, when combined with the impacts of alternative D, would likely be short- and long-term beneficial. While adverse effects on seabeach amaranth from other actions occurring in the state would still exist, actions under alternative D would provide additional protection that would be beneficial to the state seabeach amaranth population and would offset some of the adverse effects.

ALTERNATIVE E

Impacts of Alternative E

Resource Management Activities

Though public use of ORVs would be prohibited on the Seashore under alternative E, the NPS would still use ORVs to conduct resource management activities. Surveying for and protecting seabeach amaranth under alternative E, including erecting buffers and surveying for plants prior to reopening bird or turtle resource closures, would occur in the same manner as under alternative A and would result in short- and long-term beneficial impacts. Some small amount of adverse impacts would also occur from essential vehicle use possibly crushing or burying seeds. However, with impacts from recreational ORV use eliminated and pedestrian impacts reduced and likely to only occur near arrival points due to the lack of recreational ORV use, surveying and monitoring protocols conducted by NPS staff would be reviewed and may change.

Education/Public Outreach—Education and public outreach measures under alternative E would be similar to those employed under alternative A, but would focus on non-ORV recreational uses and would result in both short- and long-term beneficial impacts on seabeach amaranth from better educating the public about the Seashore rules and regulations and better informing them about species protection.

ORV and Other Recreational Use

Under alternative E, public ORV use on the beach throughout the entire Seashore, not just on Shackleford Banks, would be prohibited, eliminating all potential adverse impacts from public ORV use on seabeach amaranth, including the potential to run over undetected plants outside of resource closures and pulverizing seeds or burying them to depths beyond which they can germinate. As noted under alternative A, in North Carolina the majority of seabeach amaranth plants are found on south- and southeast- facing beaches rather than north- or northeast- facing beaches (USFWS 1996b). At Cape Lookout this includes Shackleford Banks and from the point of Cape Lookout to Power Squadron Spit on South Core Banks, and these are the two areas where most of the seabeach amaranth plants are historically found within the Seashore (NPS 2011d). The majority of these beaches (all of Shackleford Banks and Power Squadron Spit) are already closed to ORVs year-round and other portions of the Seashore are also currently closed year-round to ORVs. So while closing the entire Seashore to ORV use would be beneficial to seabeach amaranth, the added protection would not be substantially more than what is already provided for the plant.

While public use of ORVs on the beach would be prohibited under alternative E, other recreation use on the ocean beach such as swimming, camping, beach fires, fishing, and the use of the cabins would still occur. Without ORVs to access the more remote portions of the Seashore, pedestrian use would likely be reduced and restricted to areas that are readily accessible to the ferry landing areas, such as in front of the cabins and the lighthouse, as well as Power Squadron Spit where private boats are able to safely access the beach. Impacts on Shackleford Banks would remain the same as ORVs are already prohibited from that island. Pedestrian use of beaches typically does not overlap heavily with the habitat of seabeach amaranth, and many beaches with daily use by thousands of sunbathers, joggers, and other recreation enthusiasts have substantial and apparently healthy populations of seabeach amaranth (USFWS 1996b). Joggers prefer wet sand and sunbathers prefer to be closer to the water, areas where seabeach amaranth does not grow (USFWS 1996b). Thus, prior to the Seashore's survey for seabeach amaranth in late July or early August, any germinating plants outside of other resource closures would not likely be impacted by pedestrians. However, there would still be a slight risk that some undetected/unprotected seedlings/plants could be trampled by pedestrians and or their pets, specifically by those who tent camp

near the toe of the dunes resulting in a small amount of short- and long-term adverse impacts. Pedestrian traffic during the dormant season would be much less than during the growing season and would not likely have any impacts on the species.

Permit Requirements—Under alternative E, there would be no permit requirements placed on ORV users at the Seashore, since public recreational ORV use would be prohibited.

Adaptive Management Strategy—Under alternative E, an adaptive management strategy would be adopted similar to that under alternative B, though with no public ORV use allowed on the Seashore under alternative E, American oystercatcher disturbance would be monitored as it relates to impacts from pedestrians and other recreational use and not from ORVs, and only those non-ORV management actions indicated in chapter 2 would be implemented. The additional management actions that could be implemented that would help protect seabeach amaranth include increased education and focused enforcement, which would help reduce closure violations that could impact seabeach amaranth; and increased buffer sizes, which could protect beach habitat suitable for seabeach amaranth since its habitat overlaps that of the protected bird species. If species indicators continue to be triggered due to visitor use impacts for two consecutive years after implementing the previously mentioned actions, then increasing the size of species protection buffers could be implemented. This action would increase the distance that visitors could approach seabeach amaranth plants, thus providing short- and long-term beneficial impacts by reducing the likelihood of visitors trampling the plant, especially if there is a closure violation.

Cumulative Impacts under Alternative E

The past, present, and future actions discussed under the cumulative impacts scenario for alternative A would be the same under alternative E. The cumulative impact of these past, present, and future actions, would likely be short- and long-term adverse as well as long-term beneficial. These impacts, when combined with the impacts of alternative E, would likely be short- and long-term beneficial. While adverse effects on seabeach amaranth from other actions occurring in the state would still exist, actions under alternative E would provide additional protection that would be beneficial to the state seabeach amaranth population and would offset some of the adverse effects.

DETERMINATION OF EFFECT

Alternative A

Under alternative A, resource management activities would result in long-term beneficial impacts on seabeach amaranth. Benefits would be due to the protection provided by not allowing ORV use in areas where seabeach amaranth has historically been found in the Seashore (Shackleford Banks and Power Squadron Spit), installing closures around plants that are detected, surveying for plants periodically beginning in June when plants first begin to germinate and conducting an intensive annual survey in late July or early August when plants are readily visible, installing pre-nesting and other closures for nesting bird species that overlap seabeach amaranth habitat, and surveying bird and turtle closures for plants prior to reopening these closures to ORV and other recreation use. Some long-term adverse impacts would occur though from the lack of management practices regarding removal of webworms which predate on seabeach amaranth and have been found in the Seashore, and the lack of a management plan for beach vitex, which if it spreads to the Seashore, would have adverse impacts on seabeach amaranth by outcompeting it for similar habitat. Some small amount of adverse impacts may also occur from essential vehicles running over seeds and either pulverizing them or burying them to depths beyond which they can germinate.

ORV and other recreational use would have long-term adverse impacts on seabeach amaranth. Impacts from ORVs would occur along the approximately 81 percent of the Seashore that is open to ORV use. Plants may go undetected and therefore unprotected from recreational use of the Seashore, potentially resulting in plants being run over by ORVs or trampled by pedestrians, particularly those that camp near the toe of the dunes. Additionally, during the dormant season of the seabeach amaranth, more areas of the Seashore are open to ORV use. While there would be no plants to be impacted, seeds of the plant could either be pulverized or buried by ORVs driving over them. Under ESA, these impacts would result in a finding of *may affect/are likely to adversely affect* seabeach amaranth because the actions would result in direct or indirect impacts to the species that are not discountable, insignificant, or beneficial. Though there would be beneficial impacts from resource management activities, the actions under alternative A would also likely cause adverse effects.

Alternative B

Under alternative B, resources management activities would result in long-term beneficial impacts on seabeach amaranth. The same benefits discussed under alternative A above would also occur under alternative B, as well as additional benefits due to increased education about the biological resources and the resource management measures at the Seashore for recreational users as described in chapter 2. Some long-term adverse impacts would occur though from the lack of management practices regarding removal of webworms which predate on seabeach amaranth and have been found in the Seashore, and the lack of a management plan for beach vitex, which if it spreads to the Seashore, would have adverse impacts on seabeach amaranth by outcompeting it for similar habitat. Some small amount of adverse impacts may also occur from essential vehicles running over seeds and either pulverizing them or burying them to depths beyond which they can germinate.

ORV and other recreational use would have long-term adverse impacts on seabeach amaranth. With approximately 81 percent of the Seashore open to ORV use, the same amount as under alternative A, those impacts described under alternative A above would also occur under alternative B. Alternative B would also result in additional long-term adverse impacts from habitat loss if new ramps are constructed or existing ramps are re-established after a storm in habitat that would otherwise be suitable for seabeach amaranth. Some beneficial impacts would occur by deterring violations of Seashore rules and regulations through the possible revocation of operator certificates and vehicle permits as well as increased enforcement and education through increased staffing levels for law enforcement and interpretation positions, respectively. Benefits would also arise from maintaining the back route, which would encourage vehicle operators to use it instead of the ocean beach where the seabeach amaranth habitat is, and potentially implementing additional management actions under the adaptive management strategy such as increased education and testing, focused enforcement, route restrictions, increased buffer sizes, and potentially limiting the number of vehicle permits issued. Under ESA, these impacts would result in a finding of *may affect/are likely to adversely affect* seabeach amaranth because the actions would result in direct or indirect impacts to the species that are not discountable, insignificant, or beneficial. Though there would be beneficial impacts from resource management activities, the actions under alternative B would also likely cause adverse effects.

Alternative C

Under alternative C, resource management activities would result in long-term beneficial impacts on seabeach amaranth. The same benefits, discussed under alternative A above would also occur under alternative C, as well as additional benefits due to increased education about the biological resources and the resource management measures at the Seashore for recreational users as described in chapter 2. Some long-term adverse impacts would occur though from the lack of management practices regarding removal of webworms which predate on seabeach amaranth and have been found in the Seashore, and the lack of a

management plan for beach vitex, which if it spreads to the Seashore, would have adverse impacts on seabeach amaranth by outcompeting it for similar habitat. Some small amount of adverse impacts may also occur from essential vehicles running over seeds and either pulverizing them or burying them to depths beyond which they can germinate.

ORV and other recreational use would have long-term adverse impacts on seabeach amaranth. Those impacts described under alternative A above would also occur under alternative C for those portions of the Seashore open to ORV use (approximately 74 percent during the summer and 79 percent during the rest of the year except from January 1 through March 15 when ORV use is prohibited on the Seashore.) Alternative C would also result in additional long-term adverse impacts from habitat loss if new ramps are constructed or existing ramps are re-established after a storm in habitat that would otherwise be suitable for seabeach amaranth. Short- and long-term beneficial impacts would result from deterring violations of Seashore rules and regulations through the possible revocation of operator certificates and vehicle permits as well as increased enforcement and education through increased staffing levels for law enforcement and interpretation positions respectively. Benefits would also arise from maintaining the back route, which would encourage vehicle operators to use it instead of the ocean beach where the seabeach amaranth habitat is. Limiting the number of vehicles on the beach at any one time by capping the number of vehicle permits issued and potential management activities (increased education and testing, focused enforcement, route restrictions, increased buffer sizes, and further reduced vehicle limits) if triggered under the adaptive management strategy would also provide some small beneficial impacts. Under ESA, these impacts would result in a finding of *may affect/are likely to adversely affect* seabeach amaranth because the actions would result in direct or indirect impacts to the species that are not discountable, insignificant, or beneficial. Though there would be beneficial impacts from resource management activities, the actions under alternative C would also likely cause adverse effects.

Alternative D

Under alternative D, resource management activities would result in long-term beneficial impacts on seabeach amaranth. The same benefits discussed under alternative A above would also occur under alternative D, with additional benefits due to increased education about the biological resources and the resource management measures at the Seashore for recreational users as described in chapter 2. Some long-term adverse impacts would occur though from the lack of management practices regarding removal of webworms, which predate on seabeach amaranth and have been found in the Seashore, and the lack of a management plan for beach vitex, which if it spreads to the Seashore, would have adverse impacts on seabeach amaranth by outcompeting it for similar habitat. Some small amount of adverse impacts may also occur from essential vehicles running over seeds and either pulverizing them or burying them to depths beyond which they can germinate.

ORV and other recreational use would have long-term adverse impacts on seabeach amaranth. Those impacts described under alternative A above would also occur under alternative D for those portions of the Seashore open to ORV use (approximately 63 percent during the summer and 73 percent during the rest of the year except from January 1 through March 15 when ORV use is prohibited on the Seashore). Alternative D would also result in additional long-term adverse impacts from habitat loss if existing ramps are re-established after a storm in habitat that would otherwise be suitable for seabeach amaranth. Short- and long-term beneficial impacts would result from deterring violations of Seashore rules and regulations through the possible revocation of operator certificates and vehicle permits as well as increased enforcement and education through increased staffing levels for law enforcement and interpretation positions, respectively. Benefits would also arise from maintaining the back route, which would encourage vehicle operators to use it instead of the ocean beach where the seabeach amaranth habitat is. Limiting the number of vehicles on the beach at any one time through limits on the number of vehicle permits issued and potential management activities (increased education and testing, focused

enforcement, route restrictions, increased buffer sizes, and further reduced vehicle limits) if triggered under the adaptive management strategy would also provide some small beneficial impacts. Under ESA, these impacts would result in a finding of *may affect/are likely to adversely affect* seabeach amaranth because the actions would result in direct or indirect impacts to the species that are not discountable, insignificant, or beneficial. Though there would be beneficial impacts from resource management activities, the actions under alternative D would also likely cause adverse effects.

Alternative E

Under alternative E, resource management activities would result in short- and long-term benefits to seabeach amaranth, similar to alternative A. Benefits would be due to the protection provided by installing closures around plants that are detected, surveying for plants periodically beginning in June when plants first begin to germinate and conducting an intensive annual survey in late July or early August when plants are readily visible, installing pre-nesting and other closures for nesting bird species that overlap seabeach amaranth habitat, and surveying bird and turtle closures for plants prior to reopening these closures to other recreation use. Some long-term adverse impacts would occur though from the lack of management practices regarding removal of webworms which predate on seabeach amaranth and have been found in the Seashore, and the lack of a management plan for beach vitex, which if it spreads to the Seashore, would have adverse impacts on seabeach amaranth by outcompeting it for similar habitat. Some small amount of adverse impacts may also occur from essential vehicles running over seeds and either pulverizing them or burying them to depths beyond which they can germinate.

Prohibiting ORV use on the Seashore would eliminate their potential adverse impacts on the plant. It would also likely limit the amount of pedestrian use of the Seashore, as well as likely restricting most of the pedestrian use to areas that are easily accessible from the ferry landings. Since pedestrian use does not typically overlap seabeach amaranth habitat and overall use of the Seashore would likely decrease due to the prohibition of ORV use, adverse impacts from pedestrian use would be reduced, though there would still be a slight risk that some undetected/unprotected seedlings/plants could be trampled by pedestrians and or their pets, specifically by those who tent camp near the toe of the dunes. Under ESA, these impacts would result in a finding of *may affect/are not likely to adversely affect* seabeach amaranth because the actions would result in direct or indirect impacts to the species that are discountable, insignificant, or beneficial. Though there would be beneficial impacts from resource management activities and prohibiting public ORV use throughout the Seashore, the actions under alternative E would also likely cause some small adverse effects.

COMPARISON OF ALTERNATIVES

Resource management activities proposed under alternative B would provide slightly more beneficial impacts to seabeach amaranth than those proposed under alternative A (the no-action alternative) and alternative E (the no ORV alternative) because there would be more consistent training and supervision of resource staff who conduct the surveys, closures for historical bird nesting areas would be erected by March 16 (rather than April 1), providing earlier protection of potential seabeach amaranth habitat and possibly seeds that could germinate if the habitat overlaps that of seabeach amaranth. Additional benefits would also result from increased education and public outreach measures that would be implemented under alternative B. Adverse impacts from ORV use and other recreational uses under alternative B would be less than those incurred under alternative A. This is due to regular maintenance of the back route which would encourage its use rather than the ocean beach, the additional management measures that could be implemented under the adaptive management strategy if species indicators are triggered, the vehicle permit system, the ORV operator education certificate requirement, and the likely increased compliance with resource closures due to increased law enforcement and interpretative staffing positions. Some adverse impacts that would occur under alternative B that would not occur under alternative A

would result from the loss of habitat if construction of new ramps or the re-establishment of existing ramps after storms occur in areas of suitable habitat for the plant. Adverse impacts from ORV use and other recreational uses under alternative B would be greater than those under alternative E because no public ORV use would be allowed on the Seashore under alternative E, eliminating all impacts on seabeach amaranth from public ORV use and reducing impacts from other recreational uses, especially camping near the toe of the primary dunes, due to the reduced access to the beaches without ORVs.

Resource management activities proposed under alternative C would provide slightly more beneficial impacts to seabeach amaranth than those proposed under alternative A (the no-action alternative) and alternative E (the no ORV alternative) because there would be more consistent training and supervision of resource staff who conduct the surveys and because closures for historical bird nesting areas would be erected by March 16 (rather than April 1), providing earlier protection of potential seabeach amaranth habitat and possibly seeds that could germinate if the habitat overlaps that of seabeach amaranth. Additional benefits would also result from increased education and public outreach measures that would be implemented under alternative C. Adverse impacts from ORV use and other recreational uses under alternative C would be less than those incurred under alternative A. This is due to the expansion of pedestrian-only use areas by 4 miles, the additional management measures that could be implemented under the adaptive management strategy if species indicators are triggered, the vehicle permit system, the ORV operator education certificate requirement, the limit on the number of vehicle permits that would be issued, and the likely increased compliance with resource closures due to increased law enforcement and interpretative staffing positions. Some adverse impacts that would occur under alternative C that would not occur under alternative A would result from the loss of habitat if construction of new ramps or the re-establishment of existing ramps after storms occurs in areas of suitable habitat for the plant. Compared to alternative E, alternative C would provide less protection for seabeach amaranth because ORV access would be permitted under alternative C whereas no impacts from recreational ORVs would occur under alternative E and potential impacts from other recreational uses, especially camping near the toe of the primary dunes, would be lessened due to reduced access to the beaches without ORVs.

Resource management activities proposed under alternative D would provide slightly more beneficial impacts to seabeach amaranth than those proposed under alternative A (the no-action alternative) and alternative E (the no ORV alternative) because there would be more consistent training and supervision of resource staff who conduct the surveys and closures for historical bird nesting areas would be erected by March 16 (rather than April 1), providing earlier protection of potential seabeach amaranth habitat and possibly seeds that could germinate if the habitat overlaps that of seabeach amaranth. Additional benefits would also result from increased education and public outreach measures that would be implemented under alternative D. Impacts from ORV use and other recreational uses under alternative D would be reduced when compared to alternative A. This is due to the expansion of pedestrian-use only areas by 10 miles. Additional benefits would occur from additional management measures that could be implemented under the adaptive management strategy if species indicators are triggered, the vehicle permit system, the ORV operator education certificate requirement, the limit on the number of vehicle permits that would be issued, and the likely increased compliance with resource closures due to increased law enforcement and interpretative staffing positions. Some adverse impacts that would occur under alternative D that would not occur under alternative A would result from the loss of habitat if the re-establishment of existing ramps after storms occurs in areas of suitable habitat for the plant. Compared to alternative E, alternative D would provide less protection for seabeach amaranth because ORV access would be permitted under alternative D whereas no impacts from ORVs would occur under alternative E and potential impacts from other recreational uses, especially camping near the toe of the primary dunes, would be lessened due to reduced access to the beaches without ORVs.

The resource management activities proposed for alternative E (the no ORV alternative) are the same activities proposed for alternative A (the no-action alternative) and their impacts would be the same.

However, under alternative E there would be no public use of ORVs on the Seashore and surveying and monitoring protocols would be reviewed and may change due to the elimination of impacts from recreational ORV use and a reduction in the amount of impacts from pedestrians. Under alternative A, the North and South Core Banks of the Seashore would remain open to ORV use in designated routes and areas (as documented in the Superintendent's Compendium), except where resource or safety closures are present. When compared to alternative A, alternative E would provide more protection to seabeach amaranth because there would be no impacts related to ORV use and impacts related to other recreational uses would be reduced due to limited access to the ocean front beaches with no ORV use.

CONCLUSION

Surveying and monitoring for seabeach amaranth, as well as implementing protection measures for detected plants would be the same under all of the alternatives (alternatives A, B, C, D, and E) and would provide short- and long-term benefits, as well as some small potential for long-term adverse effects. Benefits would be due to the protection provided to seabeach amaranth habitat, seeds, and any germinating plants from erecting pre-nesting and other resource closures for birds and sea turtles that would overlap seabeach amaranth habitat, monitoring habitat outside of bird closures for plants beginning on June 1 when they are typically first visible, conducting an annual survey in late July or early August when plants are readily visible and have begun their seed set, and erecting at a minimum a 30-foot by 30-foot buffer around any detected plants. Alternatives B, C, and D would provide slightly more benefits than alternative A because pre-nesting closures would be posted prior to opening the Seashore to ORVs by March 16 (rather than April 1). Some long-term adverse impacts from NPS staff using ORVs to conduct species surveys and monitoring would occur under all alternatives due to the possibility of running over plant seeds and either pulverizing them or potentially burying them to depths beyond which they can germinate.

Education and public outreach measures to inform the public and ORV users about the rules and regulations of the Seashore and about the protected species would provide short- and long-term beneficial impacts on seabeach amaranth under all alternatives, though under alternative E these measure would just focus on pedestrian use since ORVs would be prohibited from the Seashore under alternative E. Standardizing resource closure signs, providing additional education materials about ORV regulations and species protection to commercial service providers for distribution to visitors, and adding interpretive programs related to ORV use at the Seashore and maps of closure areas online under alternatives B, C, and D would add to the beneficial impacts.

Under alternatives A, B, C, and D, ORV use on the Seashore would be allowed resulting in short- and long-term adverse impacts on seabeach amaranth. Impacts would result from running over plants and either pulverizing seeds or burying them beyond the depth at which they can germinate. Throughout North Carolina, seabeach amaranth is usually found on south and southeast facing beaches, and at the Seashore this corresponds to areas that are year-round pedestrian-only use areas: Shackleford Banks and Power Squadron Spit. Other year-round pedestrian-only use areas that support, or have supported seabeach amaranth plants in the past, include Portsmouth Flats, the interior of the point of Cape Lookout, and the beach between mile markers 41a and 41b. These areas that are closed year-round to ORV use and historically support the majority of the plants found at the Seashore provide short- and long-term beneficial impacts to the plant. Though these pedestrian-only use areas would occur under all of the alternatives, alternatives C and D would have additional pedestrian-only use areas (additional 4 miles under alternative C and additional 10 miles under alternative B) resulting in fewer adverse impacts than alternatives A and B.

Maintenance of the back route under alternatives B, C, and D would likely encourage vehicles to use it rather than the ocean beach, providing some beneficial impacts to seabeach amaranth. However, re-

establishing ramps from the back route to the ocean beach after storm events may result in long-term adverse impacts if the location of the re-established ramp is in an area of suitable habitat for seabeach amaranth. In addition, alternatives B and C would construct some new ramps, which also could result in a loss of seabeach amaranth habitat. However, given the small areas of the ramps and the overall habitat available throughout the Seashore, any adverse impacts from re-establishing or creating new ramps would be relatively small.

Under alternatives B, C, and D, requiring vehicle permits and ORV user education certificates that could be revoked would enhance compliance with Seashore rules and regulations providing beneficial impacts not realized under alternative A. The beneficial impacts from these resource management activities would not be as beneficial as alternative E, which would prohibit nonessential recreational ORV use, and their impacts, altogether at the Seashore.

For alternatives B, C, and D, the additional management actions to be implemented if species indicators are triggered under the adaptive management strategy (increased education and focused enforcement; route restrictions, increased buffer sizes, and a limit on the number of vehicles) would help protect seabeach amaranth habitat and plants as well, to the degree that seabeach amaranth is present, since the majority of its habitat occurs on the south and southeast facing beaches where ORV use is not permitted.

Through the use of vehicle capacity limits, alternatives C and D would provide some small additional long-term benefits compared to alternatives A and B. However, the vehicle capacity limits under alternatives C and D would not have too much of an effect on seabeach amaranth because during the spring and summer (March 16 through September 15) most of the habitat suitable for seabeach amaranth would already be protected through year-round or seasonal closures for other species and limiting the number of vehicles on the beach would not alter this. Some additional benefits would arise during the fall and winter (between September 16 and December 31) when many of the resource closures are removed by limiting the number of vehicles that can potentially alter suitable habitat, pulverize seeds, or bury seeds below depths where they can germinate.

By prohibiting nonessential recreational ORV use throughout the entire Seashore, alternative E would provide more protection for seabeach amaranth than alternative A or alternatives B, C, and D. Potential impacts from other recreational uses, especially camping at the toe of the primary dunes, would be lessened due to the reduced access to remote areas of the beach with no ORV use.

Significance Discussion

The purpose of the Seashore is to preserve the outstanding natural, cultural, and recreational resources and values of a dynamic, intact, natural barrier island system where ecological processes dominate. The Seashore is one of the few remaining locations on the Atlantic Coast where visitors can experience and recreate in an undeveloped, remote barrier island environment that can be reached only by boat or ferry. The seabeach amaranth is a low-growing annual plant, endemic to barrier island beaches along the U.S. Atlantic Coast, including those beaches within the Seashore. Historically, seabeach amaranth was found in nine states, from Massachusetts to South Carolina. However, the greatest concern for this species is the destruction or alteration of suitable habitat, primarily because of beach stabilization efforts and storm-related erosion, which caused this species to be eliminated from two-thirds of its historical range. Therefore, the USFWS and the state of North Carolina listed the seabeach amaranth as a threatened plant species. Since its federal listing, the seabeach amaranth has reappeared in several states, but it remains highly vulnerable to the previously mentioned threats, plus impacts associated with beach grooming (and some forms of “soft” beach stabilization, such as sand fencing and planting of beach-grasses), vehicular traffic (which can easily break or crush the fleshy plant and bury seeds below depths from which they can

germinate), herbivory/predation by webworms (caterpillars of small moths) and nutria, and competition from beach vitex (an aggressive, invasive woody plant).

Throughout North Carolina, seabeach amaranth is usually found on south and southeast facing beaches, and at the Seashore this corresponds to areas that are year-round pedestrian-only use areas: Shackleford Banks and Power Squadron Spit. Beaches facing other directions that support (or have supported) seabeach amaranth plants are year-round pedestrian-only use areas that include Portsmouth Flats, the interior of the point of Cape Lookout, and the beach between mile markers 41a and 41b. These areas are closed year-round to ORV use and historically support the majority of the plants found at the Seashore, and provide short- and long-term beneficial impacts to the plant. Though these pedestrian-only use areas would occur under all of the alternatives, alternatives C and D would have additional pedestrian-only use areas (additional 4 miles under alternative C and additional 10 miles under alternative B) resulting in fewer adverse impacts than alternatives A and B. Maintenance of the back route under alternatives B, C, and D would likely encourage vehicles to use it rather than the ocean beach, which would provide some beneficial impacts to the preferred habitat of the seabeach amaranth. However, re-establishing ramps from the back route to the ocean beach after storm events may result in long-term adverse impacts if the location of the re-established ramp is in an area of suitable habitat for seabeach amaranth. In addition, alternatives B and C would construct some new ramps which also could result in a loss of seabeach amaranth habitat. Given the small areas of the ramps and the overall habitat available throughout the Seashore, any adverse impacts from re-establishing or creating new ramps would be relatively small. Under alternatives B, C, and D, requiring vehicle permits and ORV user education certificates that could be revoked would enhance compliance with Seashore rules and regulations providing beneficial impacts not realized under alternative A. The beneficial impacts from these resource management activities would not be as beneficial as alternative E, which would prohibit nonessential recreational ORV use, and their impacts, altogether at the Seashore. For alternatives B, C, and D, the additional management actions to be implemented if species indicators are triggered under the adaptive management strategy (increased education and focused enforcement; route restrictions, increased buffer sizes, and a limit on the number of vehicles) would also help protect seabeach amaranth habitat and plants. Through the use of vehicle capacity limits, alternatives C and D would provide some small additional long-term benefits compared to alternatives A and B. However, the vehicle capacity limits under alternatives C and D would not have too much of an effect on seabeach amaranth because during the spring and summer (March 16 through September 15) most of the habitat suitable for seabeach amaranth would already be protected through year-round or seasonal closures for other species or pedestrian-only areas, and limiting the number of vehicles on the beach would not alter this. Any remaining impacts to seabeach amaranth from ORVs under alternative E would be further reduced, since this alternative prohibits recreational ORV use. Because impacts to seabeach amaranth from ORVs are already limited due to the majority of its habitat being in pedestrian only areas on south and southeast facing beaches, in addition to resource management measures, impacts to seabeach amaranth from ORVs are not likely to be significant under any alternative.

Under alternatives A, B, C, and D, designating legal routes for ORV use does not establish a precedent for future actions with significant effects, as ORV use has occurred at the Seashore since the 1930s and continued since the establishment of the Seashore as a park unit in 1976, and the current and proposed species protection measures are substantial, and the areas designated for ORVs are primarily outside of seabeach amaranth habitat, resulting in a low overall level of impacts to this species. ORV use is also currently legally permitted in several other national seashores and recreation areas, and in this regard is not precedent-setting within the national park system. Alternative E, which prohibits ORV use, would also not establish a precedent for future actions with significant effects to seabeach amaranth, as many other national park units do not allow ORV use.

There are a number of cumulative impacts to seabeach amaranth, described in the impacts analysis above, which may be short- and long-term, limited, and adverse, as well as long-term beneficial. Adverse

impacts could also occur under all alternatives from not having a management plan in place to manage webworms which have been found in the Seashore and predate on seabeach amaranth or for the invasive beach vitex, which if eventually found in the Seashore out competes seabeach habitat for the same habitat. However, while adverse effects on seabeach amaranth from other actions occurring in the region would still exist, actions under alternatives A, B, C, D, and E would not designate ORV routes in seabeach amaranth habitat, or would not designate routes at all (alternative E), and would provide additional protections that would be beneficial to the regional population of this species and would mitigate any significant adverse cumulative impacts already occurring.

In conclusion, compared to the existing condition, additional impacts to seabeach amaranth under alternatives A, B, C, D, and E would be small. The Seashore currently has not designated ORV routes in areas of prime seabeach amaranth habitat, but has implemented resource protection and mitigation measures that would directly and indirectly benefit seabeach amaranth. When compared to the existing condition, in light of the significance criteria at 40 CFR 1508.27, there would be no significant adverse impacts to seabeach amaranth from alternatives A, B, C, D, or E.

STATE-LISTED AND SPECIAL-STATUS SPECIES

GUIDING REGULATIONS AND POLICIES

The NPS *Management Policies 2006* state that NPS will inventory, monitor, and manage state and locally listed species in a manner similar to its treatment of federally listed species to the greatest extent possible. In addition, the NPS will inventory other native species that are of special management concern to parks (such as rare, declining, sensitive, or unique species and their habitat) and will manage them to maintain their natural distribution and abundance (NPS 2006d, section 4.4.2.3). As a result, the NPS is obligated to manage access to important habitat for such species. In addition, one of the Seashore's management goals is to provide protection for species that occur within the Seashore and that suffer population reductions or require special management. Therefore, an analysis of the potential impacts on state-listed species and certain Seashore sensitive species is included in this section.

METHODOLOGY AND ASSUMPTIONS

The following information was used to assess impacts on state-listed species:

- Species found in areas likely to be affected by management actions described in the alternatives.
- Habitat loss or alteration caused by the alternatives.
- Displacement and disturbance potential of the actions and the species' potential to be affected by the activities.

Potential impacts on state-listed species populations and habitat were evaluated based on available data on the species' past and present occurrence at the Seashore, as well as the species' association with humans, pets, predators, and ORVs. Information on habitat and other existing data were acquired from staff at the Seashore, the USFWS, and available literature. The U.S. Shorebird Conservation Plan identifies American oystercatchers and Wilson's plovers as species of high concern. American oystercatchers and Wilson's plovers are listed as species of special concern in North Carolina. The colonial waterbird species addressed in this analysis are state-listed threatened (gull-billed tern) and species of special concern (common tern, least tern, and black skimmer).

The analysis focuses on effects on state-listed species from a variety of human recreational activities (including ORV use), as well as impacts incurred as a result of surveying and management activities.

Although the action alternatives involve the construction of ramps, parking areas, and interdunal roads, construction activities would occur outside of the bird breeding season, during daylight hours, and outside of any key breeding or foraging habitat. In the unlikely event that state-listed species are found in a construction area, the area would be under a resource closure and no construction would occur. Therefore, impacts from construction were assumed to be negligible.

Under all alternatives, the Seashore establishes resource closures and buffers designed to protect state-listed and special-status species as well as other protected species such as piping plovers, sea turtles, and seabeach amaranth. The Seashore also conducts routine law enforcement patrols of the beach areas to enforce the closures, respond to violations, conduct investigations, and assist in public education. Although most public users of the Seashore respect the closures and buffers, noncompliance does occur (NPS 2012t, 2011a, 2010b, 2009a, 2008c, 2007i) and can adversely impact piping plovers. Studies have shown that increasing enforcement of regulations increases future compliance by not only the violator, but also of people other than the violator (Shimshack 2010; Shimshack and Ward 2005; Van Houten et al. 2013). Thus, under the alternatives that increase law enforcement and resource management staffing levels, it is assumed that increased enforcement would result in increased compliance with the closures and other rules and regulations of the Seashore.

STUDY AREA

The geographic study area for state-listed species is defined as Cape Lookout National Seashore in its entirety for the analysis of the impacts of the alternatives. The geographic study area for the cumulative impacts analysis is the state of North Carolina.

ALTERNATIVE A

Impacts of Alternative A: No Action

Resource Management Activities

Surveying and Monitoring—Under alternative A, NPS staff would perform surveys of recent breeding areas for protected species and would also continue to monitor breeding, nesting, and fledging activities throughout the breeding season. Beginning in mid-April, all of the beaches on North Core Banks and South Core Banks would be surveyed for American oystercatcher activity two times per week and active colonial waterbird nesting areas would be surveyed three days per week during piping plover surveys. There would be prenesting surveying for Wilson's plovers. During nesting and hatching, American oystercatcher and colonial waterbird nests would be checked every two days on North Core Banks and South Core Banks. In areas where piping plover occur, American oystercatchers and colonial waterbirds would also be surveyed every day. Wilson's plover nests and broods would be observed incidental to piping plover monitoring. For all state-listed and special-status species that breed at the Seashore, when broods are mobile, more frequent observations would be provided along with enforcement presence. Monitoring would end when all chicks have fledged.

Surveying for state-listed and special-status species would provide long-term benefits from data collected, as it would allow the Seashore to better manage the species. However, surveying would cause some adverse impacts by bringing NPS staff and/or essential vehicles into direct short-term contact with state-listed and special-status species and their habitat, and these activities themselves are known risk factors (McGowan 2004; Sabine 2005; Nol and Humphrey 1994; Simons and Schulte 2008; Corbat and

Bergstrom 2000). All state-listed and special-status species are highly vulnerable to disturbance and are known to abandon habitat when they are impacted by pedestrians, vehicles, pets, and even resource managers in or near their nesting habitat (Sabine 2005; Corbat and Bergstrom 2000). Therefore, the presence of NPS staff and/or their vehicles has the potential to lead to flushing responses, which in turn could have the potential to negatively impact feeding, reproduction, resting, or other factors (McGowan 2004; Sabine 2005; Nol and Humphrey 1994; Simons and Schulte 2008; Corbat and Bergstrom 2000). NPS staff driving ORVs can also cause mortality of birds as occurred in 2012 when a fledgling American oystercatcher just learning to fly on South Core Banks flew into the headlights of a Park Ranger ORV, was struck and fatally wounded (NPS 2012p). To minimize adverse impacts, NPS staff would use best professional judgment and take precautions to minimize disturbance during surveying, such as observing incubating birds with optical equipment from appropriate distances and maintaining slow speeds while using ORVs in or near state-listed species habitat.

The only surveying for Wilson's plovers would be a census during the annual piping plover census (first week of June); however, it is common for the Wilson's plover to use the same nesting sites as the piping plover and American oystercatcher (NPS 2006e). Therefore, the impacts of surveying and monitoring on the Wilson's plover are expected to be the same as the American oystercatcher and colonial waterbirds, overall long-term beneficial with intermittent adverse impacts from potential disturbance resulting in flushing.

Establishment of Prenesting Closures—Under alternative A, specific full recreational prenesting closures would not be established for American oystercatchers or Wilson's plovers. For colonial waterbirds, full recreational prenesting closures would be established on April 1 in active colonial waterbird nesting areas, while ORV closures would be established in historical least tern and black skimmer nesting areas and any potential new habitat where, from site inspection, a qualified staff biologist determines that nesting may be likely to occur. The closures would also be expanded as necessary when nests or nest scrapes are found in new areas. These closures would protect nesting birds from adverse impacts caused by disturbance from ORVs and pedestrians, resulting in long-term beneficial impacts. American oystercatchers begin nesting at the Seashore in April (NPS 2012p, 2011e, 2010e, 2009e, 2008h, 2007n, 2006c, 2005c, 2004b), and with no specific prenesting closures for this species they would be subject to disturbance from ORVs and pedestrians, resulting in long-term adverse impacts. However, prenesting closures for piping plovers and colonial waterbirds established on April 1 would be available for use by American oystercatchers, and provide long-term beneficial impacts by protecting species that nest in these closures from ORV and pedestrian disturbance. Wilson's plovers are often found nesting in the same areas as piping plovers and American oystercatchers (NPS 2006e), and their peak nesting period is from late April through late May (Bergstrom 1982); therefore, piping plover prenesting closures beginning on April 1 would also provide protection to Wilson's plovers. However, Wilson's plovers begin establishing territories in mid-March through early April (Tomkins 1944; Bergstrom 1988), so those birds beginning to establish territories prior to April 1 would not be protected from ORV and pedestrian disturbances, resulting in long-term adverse impacts.

Buffer/Closure Establishment—Oystercatchers need large, undisturbed beach areas for successful nesting. Research has shown that disturbance by pedestrians, kayakers, vehicles, and unleashed pets can cause the abandonment of nest habitat as well as direct loss of eggs and chicks (Cohen et al. 2010; Sabine, Schweitzer, and Meyers 2006, 2008; Toland 1999; Hodgson, Paul, and Rachal 2008; Meyers 2005). To help prevent these adverse impacts, under alternative A, a 10-square-foot full recreational closure would be established around American oystercatcher nests in areas subject to ORV or pedestrian traffic, and a ramp to ramp ORV closure would be established three days prior to the expected hatch date. The ramp to ramp ORV closure would remain in place once the chicks hatch unless there is no back route present, then ORVs would be allowed to pass through the area, without stopping, at 15 mph. As chicks move, a minimum 300-foot ORV closure would be maintained around the brood. For nests that occur on the ocean

beach, a 300-foot buffer would be established around the nest and vehicles would be allowed to pass through the area only, no stopping would be allowed. Providing buffers and closures around nests and chicks would reduce impacts caused by vehicles and pedestrians, resulting in short- and long-term beneficial impacts. However, in some instances adverse effects could still occur. While establishing buffers around nesting and fledging areas and the use of symbolic fencing can provide a deterrent to the entry of people, pets, and ORVs into sensitive habitat, first-time breeders are less tolerant to disturbance than are older, established breeders (Nol and Humphrey 1994); therefore, buffers for first-time breeders may not provide sufficient protection. Also, as noted above, in areas where there is no back route present, ORVs would be allowed to pass through closures at reduced speeds. Although signs would be posted warning operators of flightless chicks in the area, it is possible that noise disturbance (which can interfere with nesting and foraging behavior) and injury/mortality would occur for individuals. For example, in 2008 in an area where there was no back route, signs were posted on the beach warning drivers of the presence of American oystercatcher chicks on the beach, however one chick was found dead in a tire track (NPS 2008h). In adjusting ORV closures to provide a minimum 300-foot buffer around broods, observations of chick movements may not be sufficient (frequent enough) to properly adjust buffers so that they protect chicks from ORV and pedestrian disturbance. For example, if observations are made during times of low chick mobility, buffers would adjust to 300 feet and result in leaving chicks that move greater than 300 feet at another time (after the observation is complete) unprotected.

Ground-nesting colonial waterbirds are particularly vulnerable to impacts from human activities undertaken by ORV riders, pedestrians, photographers, wildlife managers, scientists, and even poachers because of the birds' usually high colony density and co-occurrence with human recreation (Erwin 1980, 2005; Rodgers and Smith 1995; Rodgers and Schwikert 2002). Disturbances affect the animals' ability to feed, rest, and breed by evoking a flush response (Rodgers and Smith 1995; Rodgers and Schwikert 2002). Even modest disturbances early in the spring, when the birds are first arriving and prospecting for breeding sites, can be highly disruptive to colonial species (Buckley and Buckley 1976). To help prevent these adverse impacts, under alternative A, a full recreational closure of 150 feet would be established around all colonial waterbird nests, resulting in long-term benefits for nesting colonial waterbirds by protecting nests from pedestrians and vehicles. Observations and resultant management would be responsive to individual bird behavior when determining adequate size of closure zones around nests. Colonial waterbird closures would be expanded as necessary where species are observed with nests or where nest scrapes are found. Providing buffers and closures around nests and chicks would reduce the impacts caused by vehicles and pedestrians, providing short- and long-term beneficial impacts.

Similar to American oystercatchers and colonial waterbirds, Wilson's plovers are subject to disturbance by vehicles and pedestrians. Additionally, when they leave their nests as a result of being disturbed they are extremely reluctant to return when intruders are anywhere near; a practice that exposes eggs to predation and overheating (Corbat and Bergstrom 2000). Although closures and buffers would not be established specifically for Wilson's plovers, the birds are typically found nesting in the same area as piping plovers and American oystercatchers (NPS 2006e); therefore, buffers for these species would also protect Wilson's plovers. Additionally, Wilson's plover nests, scrapes, and chicks found outside of existing closures would be posted which would help to notify ORV users and pedestrians of their presence and help lessen potential impacts from disturbance given the lack of species-specific buffers for Wilson's plovers.

There would be long-term benefits to American oystercatchers, colonial waterbirds, and Wilson's plovers from the ORV and full recreational closures and frequency of observations that adjust in response to chick behavior, which would allow NPS staff to change buffer sizes and locations in response to highly mobile broods, such as occurred successfully in 2010 at the point of Cape Lookout where a buffer was frequently adjusted to accommodate frequent movements between the tip of the point and the dunes (NPS 2010e). Basing buffer size on chick behavior and adjusting these buffers in response to brood movements may

result in some long-term adverse impacts since frequent adjustment of the buffers could result in additional disturbance to American oystercatchers, colonial waterbirds, and Wilson's plovers by NPS staff (Anderson and Keith 1980; Ellison and Cleary 1978; Tremblay and Ellison 1979; Hand 1980). However, the potential adverse impacts resulting from disturbance by NPS staff while adjusting the buffers would be outweighed by the beneficial impacts provided to the plovers by protecting them from ORV and pedestrian impacts through the timely adjustment of the buffers during the critical reproductive stage.

Under alternative A, if staff is available, a limited escort program may be used around bird closures to maintain access to Portsmouth Village. If implemented, a limited escort program would benefit state-listed and special-status bird species by increasing protection and reducing the potential for birds to be disturbed or killed by ORVs. For example, in 2008, after an American oystercatcher chick had been run over by an ORV in an area where there was no back route, NPS staff, to prevent a similar occurrence at mile 8.96 on North Core Banks, successfully escorted vehicles past American oystercatcher chicks on the beach where there was no back route (NPS 2008h).

In addition to buffers and closures implemented for bird species, six nest relocation areas (three each on North Core and South Core Banks) would be designated for sea turtle nests each year and would be closed to ORV traffic beginning 50 days after the first nest is relocated to the area. The nest relocation areas would reopen to ORV traffic when the last nest in the area has been excavated. These ORV closures would be ramp to ramp closures, and would generally be 0.5 to 1.0 mile long. Additionally, camping and campfires would be prohibited in these areas. These areas would not generally act as prenesting closures for shorebirds as shorebirds have generally established their nests prior to mid-June, however, these areas would protect approximately 3.0 to 6.0 miles of beach from ORV impacts that could be used by shorebirds for foraging or resting. Also, if birds renest in these areas after losing their original nest due to predation or human disturbance they would be protected from ORV impacts.

Management of Wintering and Nonbreeding Birds—Under alternative A, there would be no surveys conducted for wintering or nonbreeding American oystercatchers (colonial waterbirds and Wilson's plovers do not winter at the Seashore), and there would be no ORV or full recreational closures established specifically targeting wintering and nonbreeding birds. However, the Seashore would be closed to public ORV use from January 1 through March 15. This would result in long-term benefits, providing habitat for wintering American oystercatchers and allowing the beach profile to recover from heavy fall fishing use. Outside of the January 1 through March 15 timeframe, no closures would be specifically implemented for wintering and nonbreeding shorebird protection which could result in disturbance of individuals, leading to displacement and altered foraging behavior (Burger 1991; Zonick 2000; McAtee and Drawe 1981). However, impacts would be minimized through permanent ORV closures which include all of Shackleford Banks, Portsmouth Flats, the interior of the point of Cape Lookout, the ocean beach between mile markers 41a and 41b, and Power Squadron Spit.

While the closure of the Seashore to vehicles from January 1 through March 15 would help protect wintering species, no closures would be established for pedestrians, which could result in disturbance of birds and habitat from pedestrian use, leading to displacement and altered foraging behavior. However, adverse impacts would be largely imperceptible because many passenger ferries stop operating in the winter, the amount of pedestrian use during the winter months is very low, and without a means of transportation on the beach, most visitor use would be confined to areas in the immediate vicinity of the ferry landings.

Though winter surveys would not occur for American oystercatchers, surveying of wintering piping plovers would occur once per month between August 1 and March 31. Surveying activities for nonbreeding plovers could cause some disturbance to American oystercatchers on the beach through the

presence of NPS staff and vehicles causing flushing behavior. However, any potential impacts would be minimal because surveys for nonbreeding plovers only occur once per month, and wintering American oystercatchers appear to use soundside habitat more than the ocean beach. During winter flock counts in 2008, 2009, and 2010 American oystercatchers were only found on the soundside of Shackleford Banks and on the soundside mud flats of Ophelia Inlet on South Core Banks (NPS 2010e, 2009e, 2008h).

Predator Management—Predation continues to be a major factor affecting the reproductive success of shorebirds across their range and at the Seashore. Typical predators for American oystercatcher include mammalian species such as raccoon, red fox, feral cats, rats, and dogs, as well as avian species such as American crow and gulls (Cohen et al. 2010). At the Seashore, 38 percent of the American oystercatcher nests lost in 2012 was attributed to predation (NPS 2012p). For colonial waterbirds, predators include raccoons, red fox, rats, feral cats, muskrat, skunk, opossum and ghost crabs, as well as avian species such as gulls, peregrine falcons, and owls (Buckley and Buckley 1976; Erwin, Truitt, and Jimenez 2001; Cohen et al. 2010). Under alternative A, no nest protection measures would be put in place to protect shorebird nests from predators which would allow continued predation of nests and birds to occur, resulting in long-term adverse impacts.

An indirect impact from recreational use is the attraction of mammalian and bird predators to trash associated with recreational use (NPS 2006e; USFWS 1996a). The Seashore would enforce proper trash disposal and anti-wildlife feeding regulations to reduce the attraction of predators to the area providing short- and long-term beneficial impacts to state-listed and special-status species.

Education/Public Outreach—Under alternative A, the public would continue to receive information at the visitor centers about state-listed and special-status species and their ecology, as well as the measures the Seashore is taking to protect these species. Annual protected species reports would continue to be published on the Seashore's website regarding the previous breeding season. The public would continue to be notified about closures that would limit ORV or pedestrian traffic, as well as when these closures reopen. Education and outreach materials would be provided regarding the impacts of trash disposal, wildlife feeding, and pets on sensitive species at the Seashore. Such public outreach is beneficial to state-listed and special-status species as it educates the public on the specific needs of the species and alerts the public ahead of time to areas where they cannot go due to potential impacts on the species.

Research/Monitoring—Ongoing research at the Seashore under alternative A would include monitoring American oystercatcher nesting and chick survival and success and document causes of chick mortality. In the future, there would likely be other research to study wildlife at the Seashore. Research efforts have the potential to negatively impact feeding and resting behavior of shorebirds over the long-term due to the increased human presence and use of ORVs (Anderson and Keith 1980; Ellison and Cleary 1978; Hand 1980; Tremblay and Ellison 1979). However, the research directed towards the American oystercatcher, and any future research directed towards state-listed and special-status species would result in long-term beneficial impacts for the species because it is likely that results from the research would lead to a greater understanding of the species and could inform future protection and management of the species.

ORV and Other Recreational Use

ORVs and Pedestrian Access—Studies of the effects of humans and vehicles on American oystercatchers have indicated lower nest survival and higher chick mortality in places with higher levels of disturbance (McGowan 2004; Sabine 2005; Simons and Schulte 2008). Studies in Europe on the European oystercatchers (*Haematopus ostralegus*), in the same genus as American oystercatcher and closely related, have shown reduced foraging efficiency and lower rates of chick feeding in disturbed versus undisturbed habitats (Verhulst, Oosterbeek, and Ens 2001). In addition to direct impacts or mortality, reasons for lower reproductive success in areas of high disturbance may include reduced time

spent foraging (Sabine et al. 2008; Verhulst, Oosterbeek, and Ens 2001; Stillman and Goss-Custard 2002), thermal stress to eggs caused by a lack of incubation when reacting to disturbance (Sabine, Schweitzer, and Meyers 2006; Verhulst, Oosterbeek, and Ens 2001), and expenditure of energy reserves during flushing or defensive displays (Toland 1999; Nudds and Bryant 2000; Stillman and Goss-Custard 2002).

Ground-nesting colonial waterbirds are particularly vulnerable to impacts from human activities undertaken by ORV riders, pedestrians, photographers, wildlife managers, scientists, and even poachers because of the birds' usually high colony density and co-occurrence with human recreation (Erwin 1980, 2005; Rodgers and Smith 1995; Rodgers and Schwikert 2002). Disturbances affect the animals' ability to feed, rest, and breed by evoking a flush response (Rodgers and Smith 1995; Rodgers and Schwikert 2002). Human activities which have indirect effects include the presence of domestic and feral animals and leaving garbage that subsequently attracts bird and mammal predators. Even modest disturbances early in the spring, when the birds are first arriving and prospecting for breeding sites, can be highly disruptive to colonial species (Buckley and Buckley 1976).

Similar to American oystercatchers and colonial waterbirds, Wilson's plovers are subject to disturbance by vehicles and pedestrians. Additionally, when they leave their nests as a result of being disturbed they are extremely reluctant to return when intruders are anywhere near; a practice that exposes eggs to predation and overheating (Corbat and Bergstrom 2000).

Under alternative A, approximately 81 percent (approximately 45 miles) of the Seashore beaches would be open to public ORV use, including ATVs and UTVs, in designated routes and areas (as documented in the Superintendent's Compendium) from March 16 through December 31. As described above under "Buffer/Closure Establishment," the Seashore establishes resource closures state-listed and special-status species as well as other protected species at the Seashore. The Seashore also establishes safety closures when certain areas of the beach become too hazardous for safe public use. Based on data from 2008 to 2013, the total amount of ORV resource and safety closures at the Seashore averages approximately 10 miles during the summer months and approximately 5.4 miles during the fall. These closures protect approximately 22 percent more of the Seashore that would otherwise be open to ORV impacts during the summer months, and approximately 12 percent more of the Seashore during the fall months. Although these closures are not exclusively put in place for the protection of state-listed and special-status species, and all of closures may not encompass habitat frequently used by all of the species, they do provide beneficial impacts by protecting habitat and birds from the adverse impacts caused by ORV use.

ORV and other recreational activities that occur in the months when state-listed bird and special-status species are in residence on Seashore beaches (April through August) have the potential to disrupt resting and foraging birds from the noise associated with vehicle use and the presence of pedestrians. Of particular concern is when these disturbance factors result in birds being forced to fly while they are foraging, known as frequent escape flight. Frequent escape flights result in a reduction in time foraging and an increase in the time spent flying (Tarr 2008). Because foraging is replaced with flying, birds would not be able to add the body fat they need for migration, resulting in long-term adverse impacts including increased risk of predation, and reduced reproduction. In addition, continued vehicle use would put birds at risk of injury and/or direct mortality from collisions.

ORV use can modify coastal habitat by affecting the beach profile and substrate characteristics in ways that reduce the suitability for nesting and hatching success. Vehicle traffic on beaches displaces large amounts of sand (Schlacher and Thompson 2008) and can contribute to erosion, especially during high tides or on narrow beaches where driving is concentrated higher on the beach. Anders and Leatherman (1987) found that ORV traffic displaces sand seaward and changes the compaction of the sand in the vicinity of the track. They found that it compacts the sand at depth while loosening the sand at the surface

making it more susceptible to erosion, which may lead to steeper dune profiles. All of these changes can make habitat less desirable for nesting or foraging.

ORV traffic can also adversely impact beach invertebrates, which are a food source for American oystercatchers, some colonial waterbirds species, and Wilson's plovers. In Australia, Schlacher and Thompson (2008) found that ORV impacted beaches had significantly fewer species at reduced densities than non-ORV beaches, and although these impacts were detectable throughout the year, the impacts increased during the summer when ORV traffic was greater. At Cape Cod National Seashore, Leatherman and Godfrey (1979) found that in the soft sands of intertidal sand flats amphipods (*Talorshestia*) numbered fewer where ORV driving occurred than where it did not occur. They also found that polychaete worm (clam worm) populations and soft-shell clam (*Mya arenaria*) populations were totally decimated when applying 50 vehicle passes per day over 20 days to experimental plots. However, not all invertebrates are susceptible to impacts from ORVs, especially those species that burrow into the sand in the intertidal zone when the tide is out because ORVs only sink into the firm sand one tenth of an inch or so (Wolcott and Wolcott 1984). Wolcott and Wolcott (1984) found that in the intertidal zone coquina clams and mole crabs, both of which reside below the sand surface when the tide is out, are immune to ORV damage, whereas Vande Merwe and Vander Merwe (1991) found in a study in South Africa that the gastropod *Bullia rhodostoma*, the clams *Donax serra* and *Donax sordidus*, and the benthic mysid (*Gastrosaccus psammodytes*) showed a high tolerance for ORV traffic.

In addition to impacting some invertebrates living in the sand, access to the intertidal zone often requires vehicles to cross over the wrack line, an area of high concentrations of invertebrates. Driving over the wrack line would crush and scatter seaweed, shells, and macroinvertebrates, causing damage and dispersal to an important source of food and habitat for many beach invertebrates (Kluft and Ginsberg 2009; Stephenson 1999). Although no information could be found in the literature regarding the recovery/recolonization of macroinvertebrates in a disturbed wrack line once the disturbance is removed, the closing of the ocean beach to ORVs in areas for foraging piping plover chicks and the sea turtle nest relocation areas would allow a new wrack line to develop undisturbed with subsequent tidal cycles, providing new forage habitat, reducing the overall impact state-listed and special-status species from ORVs disturbing the wrack line.

Although ATVs and UTVs are considered to be a type of ORV, and all ORV use has the potential to disturb bird nesting behavior, ATV use, and to some extent UTV use, may impact these behaviors differently than other types of ORVs (e.g., passenger vehicles and trucks). At Cape Lookout and Cape Hatteras National Seashores, McGowan and Simons (2006) found that while increases in ATV traffic increased the rate of trips to and away from the nest and reduced the percent of time spent incubating for American oystercatchers, other ORVs (i.e., four-wheel drive passenger vehicles) and pedestrian traffic had little measured effect on incubation. ATVs are louder and faster than other ORVs and pedestrians, which may be why birds are affected more by ATV traffic (McGowan and Simons 2006). Other types of ORVs and pedestrians also tend to stay closer to the water's edge where the sand is packed firm, thus generally traveling farther away from nesting areas than ATVs (McGowan and Simons 2006).

In another study, Simons and Borneman (2012) found that American oystercatchers were on their nests significantly less during all types of ORV (passenger vehicles, ATVs – single passenger, and UTVs – all-terrain vehicles with side-by-side passengers) and pedestrian events than before those events occurred, with the most significant decline in percentage of observations on the nest attributable to ATVs followed by UTVs. Based on the authors' graphical display of the data, American oystercatchers were on their nests approximately 85 percent of the time 20 minutes prior to all observances of human activities (e.g., passing of ORVs, ATVs, and UTVs). During the passing of an ORV (i.e., passenger vehicle), American oystercatchers were on their nests approximately 80 percent of the time, while during the passing of UTVs and ATVs they were observed on their nests approximately 62 percent and 33 percent of the time,

respectively. However, in the same study Simons and Borneman (2012) found that the average heart rate of 36 incubating oystercatchers during all types of human activity (pedestrians, ORVs, ATVs, and UTVs) was not significantly higher than the heart rate from birds 20 minutes before a human activity event occurred. Therefore, while the physiological response of American oystercatchers seems to indicate habituation to disturbance, their behavioral response does not indicate a habituation to disturbance. Therefore, even with buffers and other ORV or full recreational closures, ATV and UTV use as allowed under this alternative could adversely affect American oystercatchers at the Seashore more than other types of ORVs because of the disturbance and noise associated with their use.

As part of a study looking at impacts from military overflights at the Seashore on nesting Wilson's plover and colonial waterbirds (least tern, common tern, gull-billed tern, and black skimmer) during the 2010 and 2011 nesting season, DeRose-Wilson et al. (no date) recorded data regarding other human disturbances, namely ORV traffic and pedestrians, though sample sizes were small for some species. Although the authors did not find any clear trends associated with ORV vehicle traffic and incubating bird behavior, they did find that black skimmers appeared to spend significantly less time incubating their nests following the passing of an ATV than other types of ORVs, although they did note the finding may have been an artifact of a small sample size. While this study provides no clear conclusions about the potential impacts of ATVs and UTVs compared to other types of ORVs, given the potential impact of ATVs and UTVs on other shorebird species, it is likely that even with existing buffers and closures that some short-term and possibly-long term adverse impacts on state-listed and special-status species would occur more so from ATVs and UTVs than other types of ORVs under this alternative.

As described above under "Management of Wintering and Nonbreeding Birds," closing the Seashore to vehicles from January 1 through March 15 every year under alternative A would protect wintering American oystercatchers from the impacts of ORV use and allow the beach profile to recover from heavy fall fishing use. While passenger ferries would continue to enable pedestrians to access the Seashore during this time, any potential adverse impacts to wintering American oystercatchers, such as temporary displacement, reduced foraging success, and increased susceptibility to predators would be minimal due to reduced use of the Seashore by pedestrians during the winter months, and the fact that without a means of transportation on the beach, most visitor use would be confined to areas in the immediate vicinity of the ferry landings.

Under alternative A, pedestrian-only use areas would include Shackleford Banks, the lighthouse beach as defined between mile markers 41a and 41b; and Power Squadron Spit from mile marker 46.2 west to the end of the spit. Although ORVs would not be permitted in these areas, which would reduce the threat of motorized vehicle use on state-listed and special-status birds that occur in those areas, the presence of pedestrians and continued occurrence of non-ORV recreational activities could result in short-term adverse impacts, depending on the time of year and life stage of the bird. One such non-ORV recreation activity that could adversely impact state-listed and special-status bird species is kite flying. The USFWS recognizes that piping plovers are highly disturbed by kites, and it is believed this may be because plovers perceive kites as potential avian predators (USFWS 1996a). Because other shorebirds such as the American oystercatchers, colonial waterbirds, and Wilson's plovers are also preyed upon by avian predators similar to piping plovers, it is also likely that they are highly disturbed by flying kites as well. To lessen the potential impact on piping plovers, the Piping Plover Recovery Plan recommends a 200-meter buffer (approximately 656 feet) around nesting or territorial adults and unfledged juvenile piping plovers between April 1 and August 31 (USFWS 1996a), though no similar recommendations for buffer sizes have been found for American oystercatchers, colonial waterbirds, or Wilson's plovers. While kite flying is allowed at the Seashore, no large full recreational closures are provided around state-listed and special-status bird species except a 150-foot full recreational buffer around nesting colonial waterbirds; however, given the recommended distance for piping plovers, the 150-foot closure may not be large enough to provide protection from disturbances caused by kite flying. As a result, some adverse impacts

from kite flying could occur. However, kite flying at the Seashore is rare (Rikard pers. comm. 2013b), so the potential for adverse impacts due to kite flying would be minimal.

Buffers established under alternative A are designed to protect state-listed and special-status bird species. However, noncompliance with buffers and closures does occur as documented in annual piping plover reports (NPS 2012t, 2011a, 2010b, 2009a, 2008c, 2007i) and American oystercatcher reports (NPS 2012p, 2011e, 2010e, 2009e, 2008h). From 2010 to 2012 an average of six citations for pedestrians in bird nesting areas and five citations for vehicles in bird nesting areas were issued by Seashore law enforcement, while an average of 195 citations or warnings were given for dogs off leash (NPS 2012t, 2011a, 2010b). These numbers, however, do not reflect all of the violations that occur; just ones where law enforcement was present when they did. For example, in 2009, 53 pedestrian violations and 20 vehicle violations were documented (foot prints or vehicle tracks found within closures), but only one pedestrian and 6 vehicle citations were issued, while in 2008 42 pedestrian and 55 vehicle violations were documented, but only 1 pedestrian and 7 vehicle citations were issued (NPS 2009a and 2008c).

Noncompliance with buffers and closures results in vehicles, people, and/or pets entering protected bird habitat and coming in close proximity to the birds. This can lead to flushing responses or other behavioral changes in birds, which in turn could have the potential to negatively impact feeding, reproduction, resting, or other activities (Burger 1991; Flemming et al. 1988; Melvin et al. 1994; Patterson et al. 1991; Patterson, Fraser, and Roggenbuck 1990; Zonick 2000). As an example at the Seashore, in 2012, pedestrians were issued a citation for violating a closure and causing an American oystercatcher nest to be abandoned on Shackleford Banks (NPS 2012p). Closure violations can all result in mortality of protected birds as well. In 2008, a protected American oystercatcher nest at the toe of the dunes on South Core Banks was run over and destroyed by a truck(s) as apparently a high tide forced vehicles to drive higher on the beach (NPS 2008 j). While regular patrols of areas by law enforcement rangers, trained observers, and field biologists help to deter closure and leash violations, with continued ORV and pedestrian access at the Seashore and no planned increases in law enforcement or resource protection staffing under alternative A, it is anticipated that noncompliance (either intentional or unintentional) with regulations and closures would continue to occur. These violations would adversely impact state-listed and special-status bird species by bringing vehicles, pedestrians, and possibly pets in close proximity to birds, causing short term adverse impacts at the location of the violation and could result in long-term adverse impacts from decreased reproductive output if there is a chronic lack of compliance (Burger 1991; Culbert 2004; Flemming et al. 1988; Melvin et al. 1994; Patterson et al. 1991; Patterson, Fraser, and Roggenbuck 1990; USFWS 2010; Zonick 2000).

Although pedestrian access would be prohibited through American oystercatcher buffers, ORVs would be permitted to pass through the buffer area. Stopping a vehicle within this area would not be permitted; however, temporary displacement could occur for nesting and foraging American oystercatchers and other state-listed and special-status birds from vehicle passbys. Mortality may occur as well, such as happened in 2008. In an area where no back route existed at the time on North Core Banks, signs were posted reducing the speed limit to 15 miles per hour and warning drivers to look out for American oyster chicks. After observing three chicks in tire ruts near the tide line on May 27, on May 30, one chick was found dead in a tire rut and the other two chicks were not seen (NPS 2008h). Therefore, allowing ORVs to pass through American oystercatcher buffers would likely result in short-term adverse impacts including disturbance, temporary flushing from nests, increased risk of nest predation while adults are flushed from their nests, as well as mortality.

Night-Driving—Under alternative A, night driving would continue to be allowed without any limitations. American oystercatchers and Wilson's plovers are known to be active at night (Simons and Schulte 2008; Morrier and McNeil 1991) and would be subject to noise and habitat disturbance, as well as the potential for injury and/or mortality, from the presence of vehicles and pedestrians at night. This disturbance can

impact their foraging behavior and has been shown to result in disorientation and even abandonment of oystercatcher chicks (Simons and Schulte 2008). Allowing night driving under alternative A would result in long-term adverse impacts on birds that forage at night.

Permit Requirements—Under alternative A, there would be no permitting requirements (except for long-term parking) for public ORV use at the Seashore. As described under the alternatives where a permit system would be implemented, such a system would provide the Seashore with a means for providing additional education to ORV users regarding protected species and important habitat at the Seashore, as well as additional methods (i.e., revoking permits) for dealing with noncompliance of Seashore regulations. The lack of a permit system could result in limited adverse impacts on state-listed and special-status bird species because without a permit program, there would be less user education regarding protected species. It is anticipated that visitation to the Seashore will slowly grow in the future, with an estimated annual increase of approximately 1.5 percent (NPS 2010j). With increased visitation, it is assumed that the number of ORVs on the beach at the Seashore would also slowly grow in the future, which could also lead to greater noncompliance (unintentional or intentional) with buffers and closures. Although ORV and full recreation closures would be established for the American oystercatcher and colonial waterbirds, to help protect them from ORV impacts, the lack of a permit system that limits the number of vehicles on the Seashore at any one time would have long-term adverse impacts on most state-listed and special-status species that nest on Seashore beaches because unrestricted numbers of ORVs would be allowed during the breeding season and the additional enforcement mechanism of a revocable permit would not be in place.

Camping—Under alternative A, camping and campfires would be permitted on all beaches of the Seashore that are not otherwise closed by the Superintendent's Compendium, closed for safety, or closed for species protection (i.e., full recreational closures and the six sea turtle nest relocation areas). Camping activities can cause adult birds to flush from their nests, potentially resulting in loss of eggs or chicks, complete abandonment of the nest, and increased susceptibility to predation (Elliot-Smith and Haig 2004; Cohen, Houghton, and Fraser 2009; Burger 1987; Boettcher et al. 2007; Lauro and Tanacredi 2002; Patterson, Fraser, and Roggenbuck 1990). Prohibiting camping and campfires in full recreational closures would benefit state-listed and special-status bird species by removing the potential impacts of the activities, providing short- and long-term beneficial impacts to state-listed and special-status bird species.

Cumulative Impacts under Alternative A

Other past, present, and future planned actions within the Seashore have the potential to impact state-listed and special-status species. The following assessment applies to all the state-listed and special-status bird species addressed in this section, since so many of the cumulative effects are applied similarly to all of these species.

Various dredging has occurred and will continue to occur in the vicinity of the Seashore. Following Hurricane Irene, the Long Point ferry basin received dredging in 2011 (NPS 2011). However, dredging activities at the Seashore are generally minor causing temporary short-term adverse impacts from disturbances created on the soundside of the Seashore. In addition, the Beaufort Inlet has been dredged and would continue to be dredged on an annual basis as long as funding is available to the Army Corps of Engineers. In addition, the Beaufort Inlet has been dredged and would continue to be dredged on an annual basis as long as funding is available. In the past, dredge material from the dredging of Beaufort Inlet has not been placed on any Seashore beaches. In the past, dredge material from the dredging of Beaufort Inlet has not been placed on any Seashore beaches. However, moving forward, as part of the Morehead City Harbor DMMP, NPS has agreed to allow consideration for the deposition of restricted amounts of dredged material on Shackleford Banks during the 20-year period beginning in 2015 and extending through 2034 (USACE 2013). As it relates to Shackleford Banks, if the NPS allows dredged

material to be deposited on the beach, placement of material would potentially occur every 3 to 4 years along a 3.65-mile-long stretch of the beach, dredged material would be compatible with the existing beach (>90 percent sand), and in any year that the NPS allows beach disposal to occur, the NPS would only permit it to occur from November 16 through March 30. If it occurs, disposal of material on the beach would occur from the base of the existing frontal dune to the -24 foot depth. This would potentially add up to 33 acres of new ocean beach as often as every 3 years about 1 mile east of the Shackleford Spit off Beaufort Inlet (USACE 2013). While disposal activities could temporarily disturb wintering American oystercatchers that occur on Shackleford Banks, causing short-term adverse impacts, long-term beneficial impacts would result from the increase in acres of beach habitat on Shackleford Banks. Colonial waterbirds and Wilson's plovers do not winter at the Seashore, so they would not be affected by beach disposal activities.

Oregon Inlet has been dredged in the past and would continue to be dredged in the future. Due to the presence of nesting sea turtles, dredging activities do not take place during the spring or summer, which is also when state-listed and special-status species are present at the Seashore; only American oystercatchers winter at the Seashore as most colonial waterbirds and the Wilson's plovers leave the Seashore after breeding is done in July through September timeframe, so there would be no direct impacts to state-listed and special-status species during this timeframe. The dredging of inlets can affect spit formation adjacent to inlets, which over time could result in the loss of potential prime ocean shoreline foraging habitat for state-listed and special-status species shorebirds, resulting in long-term adverse impacts. Dredging operations can also result in long-term beneficial impacts to state-listed and special-status species shorebirds. Sand from dredging operations is often used for onshore beach nourishment which can help to curtail erosion and expand ocean beach habitat where these species nest and forage, though wintering American oystercatchers may be temporarily disturbed during the beach nourishment activities.

Several past, present, and future plans and actions at the Seashore address visitation and improvement of visitor amenities and, therefore, could impact state-listed and special-status bird species at the Seashore. The *Commercial Services Plan / Environmental Assessment / Assessment of Effect* (NPS 2007m) guides the Seashore in improving the management and operation of commercial visitor services, while providing both self-directed and facilitated visitor opportunities. Visitor services that are offered and could continue to be offered at the Seashore include land transportation services, sale of limited food and sundry supplies, and ferry transportation. Very little new facility construction to support projected visitor demands for transportation, rental services, and sales of supplies is proposed as part of the Commercial Services Plan, and what little construction is proposed would occur at the current arrival locations on the islands. Since these areas are already developed and do not provide habitat for state-listed and special-status species, there would be no impact from any of the limited construction activities.

Land transportation services which include a beach shuttle service originating in the lighthouse area and traveling to points on South Core Banks, limited UTV tours at the northern end of North Core Banks, and limited vehicle transportation service from the Long Point and Great Island concession areas could have adverse impacts on state-listed and special-status species and their habitat, similar to those previously described for public ORV use. However, any adverse impacts would be relatively small given the size of the operations and because their vehicles would continue to use established transportation routes including the back route, and would adhere to all buffers/closures and other Seashore regulations. While the sale of food could increase trash at the Seashore and attract predators, sales are limited and confined to developed areas of the Seashore, so impacts would be negligible. Ferry operations occur on the soundside of South Core and North Core Banks, and while these activities could cause some disturbance to species, any impacts would be small as they occur in fixed areas with relatively small footprints compared to all of the available habitat for state-listed and special-status species.

Currently, the BOEM is analyzing the issuance of leases for developing offshore commercial wind energy. BOEM in cooperation with the State of North Carolina has established a task force, comprised of relevant federal agencies, state government officials, and local and Tribal elected government officials, in the planning and decision-making process in identifying a wind energy area off the coast of North Carolina. Although the planning process includes a thorough analysis of reasonable alternatives and cumulative impacts on sensitive resources, including migrating birds, the development of off-shore wind turbines could adversely impact migrating state-listed and special-status species birds in the region (including those that may use the Seashore). However, if they impact state-listed and special-status species would depend on how far offshore the wind turbines are located, and if they are within the migratory path of the state-listed and special-status species. Adverse impacts associated with wind turbines include direct mortality from collisions with turbine blades and/or turbine avoidance, which can reduce fitness by exclusion from key foraging habitat or by energetic costs of inducing longer flight paths (especially for migrating shorebirds and ducks (BOEM n. d.)).

The U.S. Navy and Marine Corps conduct flight operations in the area of the Seashore. These operations include recent actions taken by the military to lower the ceiling (or altitude) above which planes may fly up to the speed of sound from 10,000 feet to 3,000 feet, and increased capabilities of offshore training. In addition, the Marine Corps Cherry Point Air Station is located approximately 30 miles northwest of the Seashore. The air station and its associated support locations occupy more than 29,000 acres (U.S. Marine Corps n.d.).

A 2012 report on the effects of military overflights on American oystercatchers at the Seashore (Simmons and Borneman, 2012), concluded that at their peak sound level, military overflights contributed to a 72.5 dBA (A-weighted decibel) sound level, which is comparable to walking along the oceanside of the point of Cape Lookout (see “Soundscapes/Acoustic Environment”). Thus, the report concluded that there is no noteworthy evidence that military overflights affect the behavioral responses of American oystercatchers, including low-altitude flyovers (Simmons and Borneman 2012). A separate study (Derose-Wilson et al. n.d.) looked at the potential impacts of the military flights on Wilson’s plover and colonial waterbirds (least terns, common terns, gull-billed terns, and black skimmers). Derose-Wilson et al. (n.d.) found that Wilson’s plovers did not exhibit any behavior changes to the military overflights whereas least terns incubated their nests more after an overflight, but only during overflights in sound exposure levels greater than 90 dBA, which was the top 10 percent of sound exposure levels for all military overflights. Although sample sizes were small for other nesting colonial waterbirds, the authors found no indication that their responses would be different than those of the least tern. The authors of both studies concluded that the lower altitude flights did not have an appreciable effect on the behavior of any of the birds in question, indicating that these operations are likely to create minimal impacts to shorebirds at the Seashore.

Many past, present, and future actions, plans, and programs at the Seashore provide benefits for state-listed species and special-status species. The *Cape Lookout National Seashore Interim Protected Species Management Plan/Environmental Assessment* states that the NPS will meet its obligations under the NPS Organic Act and the ESA to both proactively conserve listed species and prevent detrimental effects on these species. To meet these obligations, the Service will “manage designated critical habitat, essential habitat, and recovery areas to maintain and enhance their value for the recovery of threatened and endangered species.” In addition, the Service will take on active management programs to inventory, monitor, restore, and maintain listed species’ habitats, control detrimental nonnative species, control detrimental visitor access, and re-establish extirpated populations as necessary (NPS 2006a). Although the plan permits continued ORV access, which has the potential to impact state-listed species and special-status species at the Seashore, the plan is beneficial for state-listed species and special-status species, because it includes measures to educate visitors about resources at the Seashore and management measures, including buffers and closures for species. In addition, the plan includes future ongoing

monitoring and staff resource protection activities, which have the potential to benefit the species by providing additional information to drive future management decisions. The education aspect of the plan provides long-term benefits to state-listed species and special-status species because it helps to educate visitors about the conservation needs of the species at the Seashore and the protection measures that are put in place to help protect it.

Cape Hatteras National Seashore also previously implemented an Interim Protected Species Management Strategy/EA and more recently implemented a long-term ORV management plan/EIS; both of which include protection measures for state-listed and special-status bird species to minimize potential adverse impacts from ORVs, pedestrians, and pets. Because Cape Hatteras National Seashore is in such close proximity to Cape Lookout National Seashore, the benefits to state-listed and special-status bird species at Cape Hatteras from these two plans also provide benefits to state-listed and special-status bird species at Cape Lookout through the long term protection of the entire regional population.

The USFWS recovery plan and designation of critical habitat for the piping plover at the Seashore also provides protection indirectly to state-listed and special-status bird species inhabiting the same areas. Designated critical habitat for the piping plover at the Seashore includes all the inlets on the Seashore, Portsmouth Flats, Kathryn-Jane Flats, and the point of Cape Lookout. The habitat includes ocean beach, mud flats, sand flats, and soundside beach used as foraging areas and sparsely vegetated low dunes. All piping-plover breeding sites (and thereby, indirectly, but not officially, those of Wilson's plover) at the Seashore were designated as critical habitat for wintering birds. Colonial waterbirds and American oystercatcher often use these areas for nesting and foraging habitat as well. Therefore, the critical habitat designation at the Seashore for piping plovers would result in long-term beneficial impacts on Wilson's plovers, as well as other state-listed and special-status bird species that share the same foraging and breeding habitat. An American Oystercatcher Conservation Plan exists as well, which focuses on the East and Gulf coast populations, including American oystercatchers occurring at the Seashore. The plan would result in long-term beneficial impacts on the American oystercatcher, because the plan addresses threats to the health of the species and outlines recommended conservation activities to remedy these threats. Because American oystercatchers share habitat with other coastal shorebirds, conservation efforts for oystercatchers would also likely result in long-term benefits for other state-listed and special-status birds at the Seashore (Schulte et al. 2007).

A population of culturally important wild horses exists at the Seashore on Shackleford Banks. The population of approximately 109 wild horses is legislatively protected (NPS 2012b) and is maintained through a horse management plan that defines how the population is cooperatively managed by both the NPS and the foundation of Shackleford Horses (NPS 2007h). The horses are generally found on the dunes, in the swales between the dunes, on the marsh or in the forest. Because they are generally not found on the ocean shoreline where special-status bird species forage, management of the horses under the horse management plan would have no impacts on special-status species.

The Seashore is implementing a long-range interpretive plan (NPS 2011k) that further articulates the purpose, significance, and themes of the Seashore. The long-range interpretive plan informs and guides the Seashore's interpretive and education programs, which includes information about threatened and endangered species within the Seashore. Such education programs, if implemented, would provide long-term benefits to state-listed and special-status birds as they would help educate visitors about the conservation needs of the birds that inhabit the Seashore and the protection measures that are put in place to help protect them.

The *Foundation Document* (NPS 2012s) for the Seashore identifies the following projects that may impact state-listed or special-status species at the Seashore to some degree: Harkers Island Master Plan, Great Island and Long Point Master Plan, Resource stewardship strategy, Comprehensive Sign Plan,

nonnative species and predator management plan, and the sustainability plan/green plan. These planning efforts would establish development patterns at the Seashore, taking into consideration the location of sensitive species, especially their breeding locations, and plan to avoid or minimize impacts to these habitats. A comprehensive sign plan would allow the NPS to more effectively communicate messages to visitors, including those regarding the importance of species management at the Seashore. A nonnative species and predator management plan would provide for additional protection of state-listed and special-status birds by reducing the number of mammalian predators on the Seashore. All of these planned efforts would have some measure of beneficial impacts on state-listed and special-status bird species at the Seashore.

Finally, the Seashore conducted a predator study to evaluate if predator removal is an effective means to alleviate predator threats to threatened and endangered species at the Seashore. A three-year research study (2007–2009) evaluated the response of both predator (raccoon) and prey populations to raccoon removal. The NPS decided to implement the preferred alternative (Experimental Reduction of Raccoon Population to Evaluate Removal as an Option for Protected Species Management) outlined in the predator study/EA. Although the preferred alternative of the predatory study would result in direct removal of raccoons and reduction in the raccoon population at the Seashore, the overall impact would provide long-term benefits to state-listed and special-status bird species by helping to control mammalian predators, such as raccoon and fox, which prey upon eggs, young, and adult birds. Predator trapping might result in short-term disturbance to nests and young, or result in loss of nests or hatchlings if trappers are not cognizant of nest locations. However, overall predator management actions would likely be highly beneficial for state-listed and special-status bird species by reducing the predation pressure on these species.

The overall combined impacts of these past, current, and future actions on state-listed birds would be short- and long-term, and adverse (from disturbance to foraging and nesting birds from visitor/ORV use, dredging activities, visitor amenity improvements, and military overflights), as well as long-term beneficial (from the protection afforded to species and their habitat by species monitoring, species buffers, habitat protection, visitor protection patrols, visitor education programs, control of the wild horse population, future planning efforts under the Foundation Plan, and predator management). While adverse effects on state-listed and special-status bird species from other actions occurring in the region would still exist, actions under alternative A would provide additional protection that would be beneficial to the regional populations of these species and would offset some of the adverse effects.

ALTERNATIVE B

Impacts of Alternative B

Resource Management Activities

Surveying and Monitoring—Surveying and monitoring for state-listed and special-status bird species and their habitat under alternative B and the impacts from these actions would be the same as described under alternative A. NPS staff would perform surveys of recent breeding areas for protected species and would also continue to monitor breeding, nesting, and fledging activities throughout the breeding season. Surveying and monitoring would provide long-term benefits to state-listed and special-status birds because it allows the Seashore to collect data and better manage the species. While overall, surveying and monitoring activities would provide beneficial impacts, they could also cause some adverse impacts by bringing staff and/or essential vehicles into direct short-term contact with state-listed and special-status species and their habitat, and these activities themselves are a known risk factor (McGowan 2004; Sabine 2005; Nol and Humphrey 1994; Simons and Schulte 2008; Corbat and Bergstrom 2000). However, to minimize any adverse impacts, NPS staff would use best professional judgment and take precautions to

minimize disturbance during surveying, such as observing incubating birds with optical equipment from appropriate distances and maintaining slow speeds while using ORVs in or near protected species habitat. Additionally, to help minimize any adverse impacts from monitoring and surveying activities, under alternative B there would be more consistent training and supervision of resource staff who conduct the surveys. This would result in a higher quality of monitoring for shorebird species, resulting in beneficial impacts.

Establishment of Prenesting Closures—Under alternative B, establishing prenesting closures would be established the same as alternative A, and would result in the same except historical shorebird nesting areas would be posted by March 16, prior to the opening of the Seashore to public ORV use. This action would result in short- and long-term benefits for state-listed and special-status birds by protecting their habitat, as well as any birds when they first arrive at the Seashore. Wilson’s plovers begin establishing territories in mid-March through early April (Tomkins 1944; Bergstrom 1988), and typically are found nesting in piping plover habitat, so the establishment of piping plover prenesting closures by March 16 would protect nesting Wilson’s plovers. While most colonial waterbirds begin arriving at the Seashore in April and May, the least tern begins arriving in late March, so establishing prenesting closures for colonial waterbirds by March 16 would also help protect them from ORV and pedestrian disturbances.

Buffer/Closure Establishment—Under alternative B, establishing ORV and full recreation closures for protected bird species, as well as turtle relocation areas under alternative B would be the same as under alternative A. Establishing the buffers and closures, including ramp to ramp ORV closures for American oystercatchers, and adjusting them for the movement of chicks would result in short- and long-term benefits by reducing the potential contact between ORVs and birds. While frequent adjustment of the buffers by NPS staff may result in additional disturbance to the shorebirds, (Anderson and Keith 1980; Ellison and Cleary 1978; Hand 1980; Tremblay and Ellison 1979), any potential adverse effects would be outweighed by the benefits to the chicks from adjusting the buffers to protect them from disturbance due to ORVs. Closing each of the six turtle nest relocation areas to ORVs 50 days after the first nest is relocated to the area would eliminate impacts from ORVs on any shorebirds using these areas for foraging and resting. As noted under alternative A, due to the timeframes of when the turtle nest relocation areas are closed to ORV traffic, they generally would not act as prenesting closures; however, they could be used by birds renesting if their first nests are lost due to predation or human disturbance.

Management of Wintering and Nonbreeding Birds—Similar to alternative A, there would be no surveys conducted for wintering or nonbreeding American oystercatchers (colonial waterbirds and Wilson’s plovers do not winter at the Seashore) under alternative B, and there would be no ORV or full recreational closures established specifically targeting wintering and nonbreeding birds. However, like alternative A, the Seashore would be closed to public ORV use from January 1 through March 15. This would result in long-term benefits, providing habitat for wintering American oystercatchers and allowing the beach profile to recover from heavy fall fishing use. Outside of the January 1 through March 15 timeframe, no closures would be specifically implemented for wintering and nonbreeding shorebird protection which could result in disturbance of individuals, leading to displacement and altered foraging behavior (Burger 1991; Zonick 2000; McAtee and Drawe 1981). Impacts would be minimized, though, through permanent ORV closures which include all of Shackleford Banks, Portsmouth Flats, the interior of the point of Cape Lookout, the ocean beach between mile markers 41a and 41b, and Power Squadron Spit.

While the closure of the Seashore to vehicles from January 1 through March 15 would help protect wintering species, no closures would be established for pedestrians, which could result in disturbance of birds and habitat from pedestrian use, leading to displacement and altered foraging behavior. However, adverse impacts would be largely imperceptible because many passenger ferries stop operating in the winter, the amount of pedestrian use during the winter months is very low, and without a means of

transportation on the beach, most visitor use would be confined to areas in the immediate vicinity of the ferry landings.

Though winter surveys would not occur for American oystercatchers, surveying of wintering piping plovers would occur once per month between August 1 and March 31. Surveying activities for nonbreeding plovers could cause some disturbance to American oystercatchers on the beach through the presence of NPS staff and vehicles causing flushing behavior. Any potential impacts would be minimal though, because surveys for nonbreeding plovers only occur once per month, and wintering American oystercatchers appear to use soundside habitat more than the ocean beach (NPS 2010e, 2009e, 2008h).

Predator Management—As noted under alternative A, predation continues to be a major factor affecting the reproductive success of shorebirds across their ranges and at the Seashore. While no specific nest protection measures would be put in place to protect nests of state-listed and special-status species, alternative B would include the limited removal of mammalian predators when predation is observed that impacts sensitive species. Predator removal is considered more effective than nest exclosures in increasing reproductive output, likely due to increased chick survival (Cohen, Houghton, and Fraser 2009). A predator removal study conducted on South Core Banks found a decrease in piping plover nest predation (down from 27.6 percent in 2008 to 5.6 percent in 2009) one year after removal and euthanasia of half of the raccoon population (Waldstein 2010). The study also found increased piping plover productivity one year after the raccoon removal (up to 0.64 fledglings per pair in 2009 from 0.23 fledglings per pair in 2008), but the increase was not statistically significant (Waldstein 2010). While the study focused on piping plovers, it is likely that the productivity of the American oystercatcher, colonial waterbird, and Wilson's plover would also increase. By helping to reduce predation pressure and potentially resulting in increased nesting and fledging success, the limited removal of mammalian predators under alternative B would result in short- and long-term beneficial impacts for state-listed and special-status bird species.

The Seashore would also continue to enforce proper trash disposal and anti-wildlife feeding regulations to reduce the attraction of predators to the area. By helping to reduce predation pressure, this too would result in short- and long-term beneficial impacts to state-listed and special-status species.

Education/Public Outreach—In addition to the outreach and education measures that would be implemented under alternative A, under alternative B staffing levels would increase for interpretation positions (to provide formal outreach and on-site ORV education on the subject of protected species management) and law enforcement (among other duties, law enforcement assists with public education). Also, educational materials would be provided to Seashore users through an operator education certificate, which would be required for all ORV operators and would be valid for one year. Under alternative B, the Seashore would work with vehicle ferry operators to coordinate distribution of education materials regarding ORV rules and regulations. In addition, a uniform system of resource closure signage would be provided, as well as regularly updated maps of closures, which would also be available online. Such public outreach is beneficial to state-listed and special-status species as it further educates the public to the specific needs of the species and alerts the public ahead of time to areas where they cannot go due to potential impacts on the species. Therefore, public outreach under alternative B as part of species management would have long-term beneficial impacts on state-listed and special-status bird species.

Research/Monitoring—Research and monitoring under alternative B would be the same as alternative A, except that visitor compliance would be monitored to determine the success of specific regulations or the need to re-focus enforcement and education efforts. Visitor use studies would also be conducted to identify use patterns. In the future, there would likely be other research to study wildlife at the Seashore. Research efforts have the potential to negatively impact feeding, reproduction, resting, or other state-

listed and special-status species behavior over the long term due to the increased human presence and use of ORVs (Anderson and Keith 1980; Ellison and Cleary 1978; Tremblay and Ellison 1979; Hand 1980). However the research, including the additional elements under alternative B, would contribute to the long-term beneficial impacts of research and monitoring on state-listed and special-status species because it is likely that results from the research would lead to a greater understanding of the various species which could inform future protection and management of the species.

ORV and Other Recreational Use

ORVs and Pedestrian Access—The same amount of beach area (approximately 81 percent or 45 miles) would be open to public ORV use from March 16 through December 31 under alternative B as it would be under alternative A. Therefore, management of ORVs and other recreational use under alternative B would be similar to alternative A with a few exceptions that would result in additional protection of American oystercatchers, colonial waterbirds, and Wilson’s plovers and their habitat.

On sections of Core Banks where no ferry landing access is available (e.g., Middle Core Banks and Ophelia Banks or future areas that may become cut off during storm events) designated ORV routes would be closed. These areas would reopen to ORV use if they become rejoined to an area with ferry access. During times when areas are cut off from ferry access, impacts from ORVs would be eliminated in those areas, providing short- and potentially long-term beneficial impacts.

The back route from mile marker 44 to mile marker 45, which is normally closed to ORV traffic, would be open to ORV traffic when the point of Cape Lookout is closed to ORV through-traffic for resource protection or safety reasons. As discussed under alternative A, most ORV users respect ORV closure, however, some noncompliance has occurred in the past (NPS 2012t, 2011a, 2010b, 2009a, 2008c, 2007i) and would be expected to continue to occur in the future. The point of Cape Lookout is a popular visitor destination and when it is closed it also prevents access on the beach to the west. Allowing use of the back route from mile marker 44 to 45 when the point of Cape Lookout is closed would allow ORV users to continue to easily access the beach area to the west of the point of Cape Lookout. This would likely help reduce visitor frustration with the closure of the point of Cape Lookout, and may help prevent any potential noncompliance with the closure, thus providing some short-term beneficial impacts to American oystercatchers, colonial waterbirds, and Wilson’s plovers and their habitat.

Although all ORV use has the potential to disturb bird nesting behavior, as discussed under alternative A, based on studies by McGowan and Simons (2006) and Simons and Borneman (2012), it appears that ATV use, and to some extent UTV use, impacts shorebirds to a greater extent than other types of ORVs (e.g., four-wheel drive passenger vehicles) likely due to the fact that they are louder and faster. The studies do not differentiate between different types of ATVs and/or UTVs because high-performance sport-model ATVs and UTVs, as well as two-stroke models are designed for racing, jumping, and moving at high rates of speed; however, these models likely could cause more impacts to shorebirds than utility-model ATVs and UTVs that are designed to be used in a utilitarian way. The speed and noise of high-performance sport-model and two-stroke ATVs and UTVs may be perceived by shorebirds as a greater threat, causing shorebirds to alter their behavior. Because of this, all high-performance sport-model and two-stroke ATVs and UTVs would be prohibited at the Seashore under alternative B after a five-year grace period. Eliminating these vehicles and their potential impacts from the Seashore would provide short- and long-term benefits to American oystercatchers. If ATV and UTV traffic has a greater effect on American oystercatchers nesting on the beach, they likely have the same effect on other shorebirds, thus eliminating the vehicles and their potential impacts would likely provide some measure of short- and long-term beneficial impacts to all state-listed and special-status species.

Alternative B would involve regular maintenance of the back route and pull-outs along the back route would be provided. Additionally, the back route would be extended to allow vehicles to bypass bird closures at the Cape. Construction and regular maintenance activities associated with the back route could disrupt (i.e., noise) and displace state-listed and special-status species, especially those using habitat along the back routes (i.e., salt marsh, grassland, and shrub/thicket habitats). However, any adverse impacts that would result are expected to be short-term and limited, as suitable habitat exists in other areas of the Seashore, prenesting closures would be available for state-listed and special-status species, and activities would be coordinated with resource management staff to ensure they are not occurring in sensitive resource areas during sensitive life stages of state-listed and special-status species. Extension of the back route would benefit state-listed and special-status species by providing a route around species closures and offering further protection.

Pedestrian access on the Seashore would be the same as described for alternative A, potentially resulting in disturbance and potential displacement of American oystercatchers, colonial waterbirds, and Wilson's plovers, depending on visitor density and the timing of disturbance (e.g., during critical periods of reproduction). Disturbance as a result of pedestrian and ORV access during the most critical periods of reproduction and within key habitats could occur. Such disturbance could result in abandonment of nests, loss of habitat, or potentially direct mortality if closure compliance is lacking or if the breach of the closure occurs during the earlier life stages (Melvin et al. 1994; Patterson et al. 1991; Flemming et al. 1988; Patterson, Fraser, and Roggenbuck 1990; Zonick 2000; Burger 1991; Culbert 2004; USFWS 2010).

Night-Driving—Under alternative B, night driving would be prohibited at the Seashore between the hours of 9 p.m. and 6 a.m. from May 1 through August 31, except in the Great Island and Long Point cabin areas. American oystercatchers and Wilson's plovers are known to be active at night (Simons and Schulte 2008; Morrier and McNeil 1991) and would be subject to noise and habitat disturbance, as well as the potential for injury and/or mortality, from the presence of vehicles and pedestrians at night. This disturbance can impact their foraging behavior and has been shown to result in disorientation and even abandonment of oystercatcher chicks (Simons and Schulte 2008). Prohibiting night driving at night from May 1 through August 31 would provide long-term benefits to American oystercatchers and Wilson's plovers by reducing potential impacts (including direct injury and/or mortality from collision with vehicles) to chicks and foraging birds at night. However, outside of the May 1 through August 31 timeframe when night driving is permitted American oystercatchers and Wilson's plovers would still be subject to impacts from night driving which could include interrupting foraging behavior, injury, or mortality from collisions with vehicles.

Permit Requirements—Under alternative B, long-term (annual) and short-term (10-day) vehicle permits would be instituted to better manage vehicles at the Seashore, though it would not limit the number of vehicles that could operate on the Seashore at any one time. Additionally, each licensed driver would be required to obtain an ORV operator education certificate to operate a vehicle at the Seashore. Both the permit and operator education certificate could be revoked for violation of applicable Seashore regulations or terms and conditions of the permit. The permit would be fee-based and fees collected from the permitting system could be used by the Seashore to put towards among other things species management and protection, as well as education measures which would benefit American oystercatchers, colonial waterbirds, and Wilson's plovers. Educational information provided with the permit and operator education certificate would benefit American oystercatchers, colonial waterbirds, and Wilson's plovers by making ORV users more aware of the need for and benefit of ORV and full recreational closures for resource protection and of the regulations in place to protect this species. This, along with the deterrent of potentially losing driving privileges would likely result in a higher level of compliance with buffers, closures, and other Seashore regulations, resulting in short- and long-term beneficial impacts to American oystercatchers, colonial waterbirds, and Wilson's plovers. Although the permit system would result in benefits to the species, it would not limit the number of vehicles on the Seashore. An unrestricted growth

of ORVs on the Seashore could increase the potential for disturbance (e.g., temporary displacement, frequent escape flights) of nesting and foraging birds. For American oystercatchers that regularly forage on the ocean shoreline and on the soundside outside of resource closures, the potential for disturbance is greater as they often forage in the same areas used by ORVs – the firm sand along the water’s edge (McGowan and Simons 2006).

Camping—Under alternative B, camping and campfire activities along the ocean beach would be permitted in areas similar to alternative A (on all beaches of the Seashore that are not otherwise closed by the Superintendent’s Compendium, closed for safety, or closed for species protection, that is, full recreational closures and the six sea turtle nest relocation areas.). As described under alternative A, prohibiting camping and campfires within areas closed for resource protection would provide short- and long-term beneficial impacts to American oystercatchers, colonial waterbirds, and Wilson’s plovers by greatly reducing the impacts from these activities which could otherwise cause adult American oystercatchers, colonial waterbirds, and Wilson’s plovers to flush from nests, resulting in loss of eggs or chicks, complete abandonment of the nest, and increased susceptibility to predation (Elliot-Smith and Haig 2004; Cohen, Houghton, and Fraser 2009; Burger 1987; Boettcher et al. 2007; Lauro and Tanacredi 2002; Patterson, Fraser, and Roggenbuck 1990).

Additionally, alternative B would also establish campsites designated for emergency camping in areas along the back route. However, these areas do not provide habitat for state-listed or special-status bird species and would result in no effects on these species.

Adaptive Management Strategy—Under alternative B, an adaptive management strategy would be implemented to ensure that the goals of species protection are being met. Although the adaptive management strategy depends on the American oystercatcher as the indicator species to determine if levels of disturbance warrant implementing more intensive management actions, the additional management actions, if implemented, would provide both short- and long-term beneficial impacts to all state-listed and special-status bird species. If levels of disturbance to the American oystercatcher from ORVs are triggered (see chapter 2 for the trigger thresholds) the additional management actions that could be implemented would potentially include increased education and focused enforcement, which would help reduce closure violations that could impact American oystercatchers, colonial waterbirds, and Wilson’s plovers; additional focused trash management and fish scrap disposal, which would likely reduce the number of predators attracted to the beach that could prey upon American oystercatchers, colonial waterbirds, and Wilson’s plovers; additional predator control, which would help protect American oystercatchers, colonial waterbirds, and Wilson’s plovers, their nests, and fledglings from raccoons and other mammalian predators; route restrictions and increased buffer sizes, both of which would protect American oystercatcher, colonial waterbird, and Wilson’s plover habitat, as well as the birds themselves and their nests; and a reduction in the number of vehicle permits issued along with managing the size of the vehicle storage lots, both of which would help reduce the number of vehicles driving on the beach and the amount of impacts caused by ORVs. If species indicators continue to be triggered by visitor use impacts for two consecutive years after implementing the previously mentioned actions, then reducing the number of vehicle permits issued and increasing the size of species protection buffers could be implemented. These actions would reduce the number of vehicles driving on the beach and increase the distance vehicles could approach birds and nests, thereby reducing amount of potential impacts caused by ORVs, providing short- and long-term beneficial impacts to American oystercatchers, colonial waterbirds, and Wilson’s plovers.

Cumulative Impacts under Alternative B

Past, present and reasonably foreseeable future actions under alternative B would be the same as those described under alternative A. The overall combined impacts of these past, present, and future actions on

state-listed and special-status bird species would be short- and long-term, and adverse (from disturbance to foraging and nesting birds from visitor/ORV use, dredging activities, shoreline stabilization, visitor amenity improvements, and military overflights), as well as long-term beneficial (from the protection afforded to species and their habitat by species monitoring, species buffers, habitat protection, visitor protection patrols, visitor education programs, control of the wild horse population, future planning efforts under the Foundation Plan, and predator management). While adverse effects on state-listed and special-status bird species from other actions occurring in the region would still exist, actions under alternative B would provide additional protection that would be beneficial to the regional populations of these species and would offset some of the adverse effects.

ALTERNATIVE C

Impacts of Alternative C

Resource Management Activities

Surveying and Monitoring—Surveying and monitoring for state-listed and special-status bird species and their habitat, and the impacts from the actions under alternative C would be the same as described for alternative A. As described under alternative A, surveying and monitoring for state-listed and special-status bird species and their habitat provides long-term beneficial impacts to the species because it allows the Seashore to better manage American oystercatchers, colonial waterbirds, and Wilson’s plovers, which may lead to increased reproductive success of the species at the Seashore. While overall surveying activities would provide beneficial impacts, they could also cause some short-term adverse impacts by negatively impacting feeding, reproduction, resting, or other shorebird behavior (Burger 1991, 1994). However, NPS staff would use best professional judgment and take precautions to minimize disturbance during surveying, such as observing incubating birds with optical equipment from appropriate distances and maintaining slow speeds while using ORVs in or near American oystercatcher, colonial waterbird, and Wilson’s plover habitat. Additionally, to help minimize any adverse impacts from monitoring and surveying activities, under alternative C there would be more consistent training and supervision of resource staff who conduct the surveys. This would result in a higher quality of monitoring for shorebird species, resulting in beneficial impacts.

Establishment of Prenesting Closures—Under alternative C, establishing full recreational closures for prenesting habitat, and the impacts from these actions would be the same as under alternative B. Short- and long-term beneficial impacts would result from establishing full recreational closures in historical shorebird nesting areas prior to opening the beach to vehicles on March 16. This would protect bird habitat, as well as any birds when they first arrive at the Seashore and begin courtship and mating behaviors. Wilson’s plovers begin establishing territories in mid-March through early April (Tomkins 1944; Bergstrom 1988), and typically are found nesting in piping plover habitat. Thus, even though no prenesting closures specifically address Wilson’s plovers, the establishment of piping plover prenesting closures by March 16 would protect nesting Wilson’s plovers. While most colonial waterbirds begin arriving at the Seashore in April and May, the least tern begins arriving in late March, so establishing prenesting closures for colonial waterbirds by March 16 would also help protect them from ORV and pedestrian disturbances.

Buffer/Closure Establishment—Under alternative C, the establishment of ORV and full recreational closures would be the same as described for alternative A. For nests, this includes ramp to ramp ORV closures for American oystercatcher nests three days before chicks hatch, and the 150-foot ORV closures established at the point of Cape Lookout beach around colonial waterbird nests. For chicks, it includes ramp to ramp ORV closures for American oystercatcher chicks, 150-foot buffers (ORV closures) around colonial waterbird broods on the point of Cape Lookout beach, and posting areas where Wilson’s plover

chicks are found outside existing closures on North Core and South Core Banks. These measures would help protect state-listed and special-status bird species from potential ORV impacts; though since these are just ORV closures, species would still be subject to disturbance by pedestrians and/or their pets. Foraging and resting state-listed and special-status bird species would also benefit from the six turtle nest relocation areas (each 0.5 to 1.0 miles in length) when those areas are closed to ORV traffic.

Since piping plover chicks also forage on the ocean shoreline, the 600-foot ORV closure around piping plover broods, and the 2-mile ORV closure at the north end of South Core Banks for piping plover chicks would also benefit any American oystercatcher, colonial waterbird, or Wilson's plover chicks and adults foraging or resting in the same areas. Establishing ORV closures around birds and adjusting them based on chick behavior would result in short- and long-term benefits by reducing the potential for contact between Seashore visitors and birds. While frequent adjustment of buffers by NPS staff may result in additional disturbance to shorebirds, (Anderson and Keith 1980; Ellison and Cleary 1978; Hand 1980; Tremblay and Ellison 1979), any potential adverse effects would be outweighed by the benefits to the chicks from adjusting the buffers to protect them from disturbance due to pedestrians and ORVs. State-listed and special-status bird species would also be afforded protection by the permanent closure to ORVs of Shackleford Banks, Portsmouth Flats, the interior of the point of Cape Lookout, the beach between mile markers 41a and 41b, and Power Squadron Spit.

Management of Wintering and Nonbreeding Birds—Similar to alternative A, there would be no surveys conducted for wintering or nonbreeding American oystercatchers (colonial waterbirds and Wilson's plovers do not winter at the Seashore) under alternative C, and there would be no ORV or full recreational closures established specifically targeting wintering and nonbreeding birds. However, under alternative C, the beginning date of the winter closure of the Seashore to public ORV use would be extended to December 16, meaning that the Seashore would be closed to public ORV use from December 16 through March 15. This would provide an additional two weeks of long-term beneficial impacts to wintering American oystercatchers by eliminating all potential impacts from public ORV use and allowing the beach profile a greater opportunity recover from heavy fall fishing use. Outside of the December 16 through March 15 timeframe, no closures would be specifically implemented for wintering and nonbreeding shorebird protection which could result in disturbance of individuals, leading to displacement and altered foraging behavior (Burger 1991; Zonick 2000; McAtee and Drawe 1981). This would only affect American oystercatchers though, as colonial waterbirds and Wilson's plovers leave the Seashore in the July through September timeframe and do not winter at the Seashore. Impacts to wintering American oystercatchers would be minimized through permanent ORV closures which include all of Shackleford Banks, Portsmouth Flats, the interior of the point of Cape Lookout, the ocean beach between mile markers 41a and 41b, and Power Squadron Spit.

While the closure of the Seashore to vehicles from December 16 through March 15 would help protect wintering American oystercatchers, no closures would be established for pedestrians, which could result in disturbance of birds and habitat from pedestrian use, leading to displacement and altered foraging behavior. However, adverse impacts would be largely imperceptible because many passenger ferries stop operating in the winter, the amount of pedestrian use during the winter months is very low, and without a means of transportation on the beach, most visitor use would be confined to areas in the immediate vicinity of the ferry landings.

Though winter surveys would not occur for American oystercatchers, surveying of wintering piping plovers would occur once per month between August 1 and March 31. Surveying activities for nonbreeding plovers could cause some disturbance to American oystercatchers on the beach through the presence of NPS staff and vehicles causing flushing behavior. Any potential impacts would be minimal though, because surveys for nonbreeding plovers only occur once per month, and wintering American oystercatchers appear to use soundside habitat more than the ocean beach (NPS 2010e, 2009e, 2008h).

Predator Management—Under alternative C, predator management activities would be the same as for alternative B and result in short- and long-term beneficial impacts. The limited removal of mammalian predators would help reduce predation pressure and likely result in increased reproductive success, while the continued enforcement of proper trash disposal and anti-wildlife feeding regulations would help reduce the attraction of predators to the beach by removing trash as a potential food source.

Education/Public Outreach—Education and public outreach measures under alternative C would be the same as for alternative B, including increases in staffing levels for interpretation positions and law enforcement positions, and would provide short- and long term benefits. Benefits would occur because the public would receive education about the specific needs of the species and alerts ahead of time about closures due to the potential for species or habitat disturbance and injury.

Research/Monitoring—Research and monitoring under alternative C would be the same as alternative B. While research efforts have the potential to negatively impact feeding, reproduction, resting, or other American oystercatcher, colonial waterbird, and Wilson’s plover behavior over the long term due to the increased human presence and use of ORVs (Anderson and Keith 1980; Ellison and Cleary 1978; Tremblay and Ellison 1979; Hand 1980), the research to be conducted would provide long-term beneficial impacts by increasing knowledge about the species that would help inform future management actions.

ORV and Other Recreational Use

ORVs and Pedestrian Access—ORV routes under alternative C would be the same as under alternative B, with the exception that approximately 4 miles of pedestrian-only use areas would be added to the Seashore. During the summer season 3.1 miles of additional pedestrian-use only area would be added (0.35 miles at Long Point Cabin Camp, 1.9 miles at Great Island Cabin Camp, and 0.8 miles at Codds Creek), while the year-round pedestrian-use only area at the lighthouse would be expanded by 0.7 miles.

Adding 4 miles of pedestrian-only use areas means that the amount of ocean beach available for ORV use, prior to other possible temporary ORV or full recreational closures for species protection and safety, would be approximately 74 percent (41 miles) from the Friday preceding Memorial Day through Labor Day (as compared to 81 percent [45 miles] under alternatives A and B) and approximately 79 percent (44 miles) during the rest of the year (from March 16 through the Thursday preceding Memorial Day and from Labor Day through December 15) when ORVs are allowed on the beach (ORVs are prohibited from December 16 through March 15). As described under alternative A, ORV resource and safety closures on average historically protect an additional approximately 10 miles (22 percent) of the Seashore during the summer and approximately 5.4 (12 percent) of the Seashore that would otherwise be open to ORVs and their impacts. Reducing the amount of beach available for ORV use increases the amount of area where American oystercatchers, colonial waterbirds, and Wilson’s plovers would be free from potential impacts of ORVs. For example, the increase in pedestrian-only use areas under this alternative would be in a nesting area for least tern and American oystercatcher and would expected to provide benefits to these species by limiting ORV-related disturbance in the nesting areas (Rikard 2013a). Under alternative C, public ORV use would be kept at historical levels, so reducing the amount of Seashore available for public ORV access could result in an increased ORV density where ORVs are permitted which could increase the potential for impacts due to the higher ORV densities. However, any increase in density, and resultant impacts from that, would be extremely slight given the relatively small increase in the amount of pedestrian-only use areas compared to the overall amount of Seashore available to ORVs and where the increases are occurring.

Similar to alternative B, ORV use would be discontinued in areas on Core Banks that are cut off from ferry access, though it would be restored if/when the areas rejoin an area with ferry access. During the time that ORV use is discontinued there would be no potential adverse impacts from vehicles which

would result in both short- and long-term beneficial impacts on American oystercatchers, colonial waterbirds, and Wilson's plovers. Also similar to alternative B, the back route between mile marker 44 and mile marker 45 would be opened to ORV use when the point of Cape Lookout is closed to through-traffic. This would provide access to the beach area to the west of the point of Cape Lookout that would otherwise be inaccessible by ORVs without traversing Cape Village and would potentially help prevent closure violations on the point of Cape Lookout by likely reducing visitor frustration due to the closure.

Under alternative C all high-performance sport-model and two-stroke ATVs and UTVs would be prohibited at the Seashore after a five-year grace period. Additionally, utility-model ATVs and UTVs would be permitted only from September 15 through December 15 at the Seashore. As discussed under alternative A, based on studies by McGowan and Simons (2006) and Simons and Borneman (2012), it appears that ATV use, and to some extent UTV use, impacts shorebirds to a greater extent than other types of ORVs (e.g., four-wheel drive passenger vehicles) likely due to the fact that they are louder and faster. The studies do not differentiate between different types of ATVs and/or UTVs because high-performance sport-model ATVs and UTVs, as well as two-stroke models are designed for racing, jumping, and moving at high rates of speed; however, these models likely could cause more impacts to shorebirds than utility-model ATVs and UTVs that are designed to be used in a utilitarian way. The speed and noise of high-performance sport-model and two-stroke ATVs and UTVs may be perceived by shorebirds as a greater threat, causing the shorebirds to alter their behavior. Eliminating these vehicles and their potential impacts from the Seashore after a five-year grace period would provide short- and long-term benefits to American oystercatchers and likely to all other state-listed and special-status species. Additionally, limiting utility-model ATV and UTV use during the majority of the nesting season and removing their adverse impacts would provide short- and long-term beneficial impacts.

Like alternative B, regular maintenance of the back route would occur under alternative C. Although the potential for habitat disturbance exists, activities would be coordinated with resource management staff to ensure they are not occurring in sensitive resource areas or during sensitive times in the species life stages. In addition, activities associated with back route maintenance would occur in previously disturbed areas. Therefore, activities associated with back route maintenance would likely result in limited, short-term adverse impacts on state-listed and special-status species at the Seashore.

Night-Driving—Under alternative C, all recreational ORV use on the ocean beach and back route would be prohibited from 9 p.m. to 6 a.m. from May 1 through September 14, extending the end date beyond August 31, which is the end date under alternative B. Restrictions on night driving under alternative C would reduce potential impacts at night on chicks and foraging adults of state-listed and special-status bird species, which include disturbance of nesting and foraging behaviors and injury or mortality from collisions with a vehicle. This would result in short- and long-term beneficial impacts. The longer range of dates under alternative C would account for late nesters, further contributing to the long-term benefits of night driving restrictions.

Permit Requirements—Under alternative C, and similar to alternative B, long-term (annual) and short-term (10-day) vehicle permits and an ORV operator education certificate would be required to operate an ORV on the Seashore. In addition, to manage the number of vehicles operating on the Seashore at any one time, a limit would be established on the number of annual and 10-day permits issued each year, with the limit being based on the historical average use on each island. Although public ORV use would not be allowed in ORV or full recreational closures, placing a limit on the number of permits issued for ORV use would prevent future unlimited growth of ORV use on the beach. This would likely prevent increased amounts of adverse impacts outside of closures, compared to historical levels, on American oystercatchers, colonial waterbirds, and Wilson's plovers and their habitat from ORVs; resulting in short- and long-term beneficial impacts.

As described for alternative B, fees collected from the permitting system would be used toward species management and protection, which would benefit American oystercatchers, colonial waterbirds, and Wilson's plovers. Educational information provided by the permit and education requirement would benefit these species because ORV users would be more aware of the regulations in place to protect them. ORV users would also be more likely to comply with buffers and closures for other species that overlap the habitat for state-listed and special-status species, as well as other Seashore regulations due to the potential threat of losing their individual driving privileges through the revocation of their vehicle permit or ORV operator education certificate if violations occur.

Camping—Under alternative C, camping and campfire activities along the ocean beach would be permitted in areas similar to alternative B (on all beaches of the Seashore that are not otherwise closed by the Superintendent's Compendium, closed for safety, or closed for species protection, that is, full recreational closures and the six sea turtle nest relocation areas) and result in short- and long-term beneficial impacts by greatly reducing the impacts on American oystercatchers, colonial waterbirds, and Wilson's plovers from these activities. These activities can bring both vehicles and pedestrians into close proximity to shorebirds and result in birds being flushed from nests, resulting in loss of eggs or chicks, complete abandonment of the nest, and increased susceptibility to predation (Elliot-Smith and Haig 2004; Cohen, Houghton, and Fraser 2009; Burger 1987; Boettcher et al. 2007; Lauro and Tanacredi 2002; Patterson, Fraser, and Roggenbuck 1990). Although alternative C would also establish designated campsites for emergency camping in areas along the back route, these areas do not provide habitat for state-listed or special-status bird species and would result in no effects on these species.

Adaptive Management Strategy—Under alternative C, an adaptive management strategy would be implemented, the same as under alternative B, to ensure that the goals of species protection are being met. The additional management actions that could be implemented would provide short- and long-term beneficial impacts to American oystercatchers, colonial waterbirds, Wilson's plovers, and their habitat. Benefits would result from reducing closure violations through increased education and focused enforcement; reducing predation through trash management and fish scrap disposal; and reducing ORV impacts through route restrictions, increased buffer sizes, and limits on the number of vehicle permits issued, as well as managing the size of vehicle storage lots.

Cumulative Impacts under Alternative C

Past, present and reasonably foreseeable future actions under alternative C would be the same as those described under alternative A. The overall combined impacts of these past, present, and future actions on state-listed and special-status bird species would be short- and long-term, and adverse (from disturbance to foraging and nesting birds from visitor/ORV use, dredging activities, visitor amenity improvements, and military overflights), as well as long-term beneficial (from the protection afforded to species and their habitat by species monitoring, species buffers, habitat protection, visitor protection patrols, visitor education programs, control of the wild horse population, future planning efforts under the Foundation Plan, and predator management). While adverse effects on state-listed and special-status bird species from other actions occurring in the region would still exist, actions under alternative C would provide additional protection that would be beneficial to the regional populations of these species and would offset some of the adverse effects.

ALTERNATIVE D

Impacts of Alternative D

Resource Management Activities

Surveying and Monitoring—Surveying and monitoring for state-listed and special-status bird species and their habitat, and the impacts from the actions under alternative D would be the same as described for alternative A. As described under alternative A, surveying and monitoring for state-listed and special-status bird species and their habitat provides long-term beneficial impacts to the species because it allows the Seashore to better manage American oystercatchers, colonial waterbirds, and Wilson’s plovers, which may lead to increased reproductive success of the species at the Seashore. While overall surveying activities would provide beneficial impacts, they could also cause some short-term adverse impacts by negatively impacting feeding, reproduction, resting, or other shorebird behavior (Burger 1991, 1994). However, NPS staff would use best professional judgment and take precautions to minimize disturbance during surveying, such as observing incubating birds with optical equipment from appropriate distances and maintaining slow speeds while using ORVs in or near American oystercatcher, colonial waterbird, and Wilson plover habitat. Additionally, to help minimize any adverse impacts from monitoring and surveying activities, under alternative D there would be more consistent training and supervision of resource staff who conduct the surveys. This would result in a higher quality of monitoring for shorebird species, resulting in beneficial impacts.

Establishment of Prenesting Closures—Under alternative D, establishing full recreational closures for prenesting habitat, and the impacts from these actions would be the same as under alternative B. Short- and long-term beneficial impacts would result from establishing full recreational closures in historical shorebird nesting areas prior to opening the beach to vehicles on March 16. This would protect bird habitat, as well as any birds when they first arrive at the Seashore and begin courtship and mating behaviors. Wilson’s plovers begin establishing territories in mid-March through early April (Tomkins 1944; Bergstrom 1988), and typically are found nesting in piping plover habitat. Thus, even though no prenesting closures specifically address Wilson’s plovers, the establishment of piping plover prenesting closures by March 16 would protect nesting Wilson’s plovers. While most colonial waterbirds begin arriving at the Seashore in April and May, the least tern begins arriving in late March, so establishing prenesting closures for colonial waterbirds by March 16 would also help protect them from ORV and pedestrian disturbances.

Buffer/Closure Establishment—Under alternative D, buffers around state-listed and special-status bird species exhibiting courtship and mating behavior would increase, as would buffers around nests and unfledged chicks. For the American oystercatcher, buffers around birds exhibiting courtship and mating behavior, as well as around nests, would be established at 450-feet, which would provide additional protection to mating pairs and nests. Also, where American oystercatcher nests are present, vehicles would be routed around nests or chicks where the back route is available during the nesting season. Prohibiting vehicles from passing through American oystercatcher buffers (when the back route is available) would likely provide additional protection to mating pairs and nests by removing a potential source of disturbance, resulting in long-term beneficial impacts. For unfledged chicks, colonial waterbird and American oystercatcher buffers would increase by 600 feet under alternative D. This measure would provide additional protection for unfledged chicks, potentially resulting in increased fledging success. For colonial waterbirds, buffers for courting and mating behavior, as well as for nesting, would be established at 600-feet. These increased buffer sizes would provide additional protection to mating and nesting birds as well as provide additional protection to chicks, resulting in short- and long-term beneficial impacts.

In addition to increases in buffers for state-listed and special-status bird species, under alternative D, based on one set of recommendations in the Piping Plover Recovery Plan (USFWS 1996a), unless data from previous years show that broods at a site forage close to their nests, ORV closures would extend at least 650 feet on each side of the nest site during the first week following hatching; this is an increase of 50 feet from alternatives A, B, and C. The size and location of the ORV closure would also be adjusted in response to the observed mobility of the brood, but in no case would it be reduced to less than 650 feet on each side, and in some cases, highly mobile broods may require buffers up to 3,250 feet, even when intensively monitored. Because of the narrow width of most of North Core and South Core Banks, such buffers would likely extend from the oceanside low water line to the soundside low water line or the farthest extent of dune habitat. If needed, a buffer of this size (i.e., 3,250 feet), depending on where it needs to be established could close approximately 3 miles of Portsmouth Flats, 7 miles of Kathryn-Jane Flats (if chicks are present), or the tip (approximately 2.5 miles) of Old Drum Inlet (unless the inlet fills in). Though the ORV closures would be established for piping plovers, they could also be used by state-listed and special-status species, providing short- and long-term beneficial impacts to those species as well.

Increases in closures and buffers for state-listed and special-status species under alternative D represent substantial increases over the closures established under the other alternatives (except for alternative E where public ORV use would be prohibited on the Seashore year-round). The closures and buffers would likely result in considerable beneficial impacts on breeding state-listed and special-status bird species by reducing the potential for disturbance and injury associated with pedestrian and vehicle access near breeding pairs and young; thus, likely increasing nesting and fledging success for state-listed and special-status bird species at the Seashore. Additionally, sea turtle nest relocation areas would be established in the same manner as under alternative A and would provide protection from ORV impacts for state-listed and special-status bird species using that habitat.

Management of Wintering and Nonbreeding Birds—Under alternative D, management of wintering and nonbreeding birds would be the same as described for alternative C, resulting in limited short-term disturbance from activities associated with piping plover surveys, and pedestrian disturbance in areas within close proximity to the ferry landings, as well as long-term beneficial impacts (i.e., protection and habitat recovery) from the closure of the Seashore to vehicles from December 16 through March 15.

Predator Management—Under alternative D, predator management activities would be the same as for alternative B and result in short- and long-term beneficial impacts. The limited removal of mammalian predators would help reduce predation pressure and likely result in increased reproductive success, while the continued enforcement of proper trash disposal and anti-wildlife feeding regulations would help reduce the attraction of predators to the beach by removing trash as a potential food source.

Education/Public Outreach—Education and public outreach measures under alternative D would be the same as for alternative B, including increases in staffing levels for interpretation positions and law enforcement positions, and would provide short- and long term benefits. Benefits would occur because the public would receive education about the specific needs of the species and alerts ahead of time about closures due to the potential for species or habitat disturbance and injury.

Research/Monitoring—Research and monitoring under alternative D would be the same as alternative B. While research efforts have the potential to negatively impact feeding, reproduction, resting, or other American oystercatcher, colonial waterbird, and Wilson's plover behavior over the long term due to the increased human presence and use of ORVs (Anderson and Keith 1980; Ellison and Cleary 1978; Tremblay and Ellison 1979; Hand 1980), the research to be conducted would provide long-term beneficial impacts by increasing knowledge about the species that would help inform future management actions.

ORV and Other Recreational Use

ORVs and Pedestrian Access—Under alternative D, ORV routes and pedestrian-only use areas would include those areas under alternative C except the closures at Long Point, Great Island, and Codd's Creek would be pedestrian-only use areas year-round instead of just during the summer, as under alternative C. Additionally, the total amount of total amount of pedestrian-only use areas would increase by approximately 8 percent (from 2 to 10 miles).

Under alternative D about 0.5 miles of summertime pedestrian-only use area would be created at Johnsons Creek, and the 3.6 miles of Middle Core Banks would be a pedestrian-only use area during the summer whether or not it is contiguous with North Core Banks (currently it is an island). The ocean beach from the Portsmouth Access Road north to the demarcation line at Ocracoke Inlet would also become a summer pedestrian-only use area. In addition, the year-round pedestrian-only use area in front of the lighthouse would be expanded approximately 0.9 miles to the south, for a total closure of approximately 1.6 miles, or 0.9 miles larger than under alternative A and 0.2 miles larger than under alternative C. Adding these pedestrian-only use areas would reduce the amount of Seashore beaches open to ORV use.

About 63 percent (35 miles) of the beach, would be open to ORV use from the Friday preceding Memorial Day through Labor Day, not considering any temporary ORV resource or safety closures, which as described under alternative A have historically averaged approximately 10 miles during the summer months. About 73 percent (41 miles) of the beach would be open to ORV use during the rest of the year (from March 16 through the Thursday preceding Memorial Day and from Labor Day through December 15) when ORVs are allowed on the beach (ORVs are prohibited from December 16 through March 15). As described under alternative A, temporary ORV resource and safety closures historically protect an average of approximately an additional 5.4 miles of Seashore during the fall months. Impacts to American oystercatchers, colonial waterbirds, and Wilson's plovers from ORV use would be eliminated in these new pedestrian-only use areas and would result in short- and long-term beneficial impacts. For example, the increase in pedestrian-only areas under this alternative would be in a nesting area for least tern and American oystercatcher and would expected to provide additional benefits to these species (Rikard 2013a). Reducing the amount of area open to ORV use could have the potential to increase the density of ORVs in areas that remain open to ORVs, potentially resulting in some increased impacts to American oystercatchers, colonial waterbirds, and Wilson's plovers and their habitat in those areas. However, to offset this potential, the Seashore would reduce the number of permits issued by 8 percent (see "Permit Requirements" below).

ORV access (related to species closures) under alternative D would be similar to alternative B. On sections of Core Banks where no ferry landing access is available (i.e., Middle Core Banks and Ophelia Banks), designated ORV routes would be closed, which could provide further protection for American oystercatchers, colonial waterbirds, and Wilson's plovers at the Seashore by reducing the amount of Seashore available to ORV access. This would limit the potential for species contact with vehicles and vehicle operators/passengers.

Under alternative D, all ATVs and high-performance sport-model and two-stroke UTVs would be prohibited year-round after a five-year grace period. Additionally, utility-model UTVs would be permitted only between September 15 and December 15. As discussed under alternative A, based on studies by McGowan and Simons (2006) and Simons and Borneman (2012), it appears that ATV use, and to some extent UTV use, impacts American oystercatchers to a greater extent than other types of ORVs (e.g., four-wheel drive passenger vehicles) likely due to the fact that they are louder and faster. The studies do not differentiate between different types of ATVs and/or UTVs because high-performance sport-model ATVs and UTVs, as well as two-stroke models are designed for racing, jumping, and moving

at high rates of speed; however, these models likely could cause more impacts to shorebirds than utility-model ATVs and UTVs that are designed to be used in a utilitarian way. The speed and noise of high-performance sport-model and two-stroke ATVs and UTVs may be perceived by the shorebirds as a greater threat and alter their behavior. Eliminating all ATVs (which Simons and Borneman (2012) showed has a greater impact on birds than UTVs) as well as their potential impacts from the Seashore after a five-year grace period would provide short- and long-term benefits to American oystercatchers and likely all other state-listed and special-status species at the Seashore. Additionally, limiting utility-model UTV use to only the non-nesting season for these species and removing their adverse impacts would also provide both short- and long-term beneficial impact.

Unlike alternatives B and C, regular maintenance of the back route would not occur under alternative D. However, for resource protection and safety, the back route would be re-established when impacted by a storm event, and there would be no net loss of ramps (locations may change after storm events). In the case of extreme high tides or other emergencies, the area of the former long-term vehicle storage and parking lots (which would be closed under alternative D) would be open to temporary overnight use, for the duration of the extreme condition. Like alternatives B and C, the potential for habitat disturbance exists, but activities would be coordinated with resource management staff to ensure they are not occurring in sensitive resource areas or during sensitive times. These activities would not be a regular occurrence and any impact is expected to be short-term. Additionally, the area impacted by any re-established ramps would be small compared to the overall habitat available to American oystercatchers, colonial waterbirds, and Wilson's plovers, minimizing any adverse impacts. Therefore, activities associated with replacement of the back route and ramps would likely result in limited, short-term adverse impacts on state-listed and special-status species at the Seashore.

Night-Driving—Under alternative D, night driving would be prohibited at the Seashore on the ocean beach and the back route during the same timeframe as described for alternative C, between 9 p.m. and 6 a.m. from May 1 through September 14. This would result in short- and long-term beneficial impacts on American oystercatchers and Wilson's plovers, which are known to be active at night (Simons and Schulte 2008; Morrier and McNeil 1991), by eliminating potential disturbances from ORVs on individual of these species that may be foraging at night.

However, this timeframe would not encompass the month of April, which is during the peak of the migration when over 1,000 birds are generally at the Seashore (NPS 2006c, 2007n, 2008h, 2009e, 2009g, 2010e, 2010g, 2011e, 2011g, 2012p, 2012r). It would also not protect state-listed or special-status species that may be at the Seashore from September 15 through December 15.

Permit Requirements—Under alternative D, vehicle permit and ORV operator education certificate requirements would be similar to alternative C, except that the number of vehicle permits issued would be reduced by 8 percent. The reduction of permits by 8 percent compared to alternative C is based on the percentage increase of pedestrian-only use areas under alternative D, and is intended to reduce the number of vehicles on the beach to keep the average vehicle density similar to current average use despite there being less Seashore open to public ORV use. This would help prevent increases in ORV impacts due to potentially higher densities of vehicles in areas where public ORV use is allowed. Although public ORV use would not be allowed in resource protection areas, placing a limit on the number of permits issued for ORV use on the beach would prevent future unlimited growth of public ORV use on the beach, thus preventing likely increased amounts of adverse impacts, compared to historical levels, on American oystercatchers, colonial waterbirds, and Wilson's plovers. This would result in short- and long-term beneficial impacts.

As described for alternative B, fees collected from a permitting program would be used toward species management and protection, which would benefit American oystercatchers, colonial waterbirds, and Wilson's plovers. Educational information provided by the permit and education requirement would benefit American oystercatchers, colonial waterbirds, and Wilson's plovers because ORV users would be more aware of the regulations in place to protect this species and would be more likely to comply with buffers, closures, and other Seashore regulations due to the potential threat of losing their individual driving privileges through the revocation of their vehicle permit or ORV operator education certificate if violations occur.

Camping—Under alternative D, camping and campfire activities along the ocean beach would be permitted in areas similar to alternative B (on all beaches of the Seashore that are not otherwise closed by the Superintendent's Compendium, closed for safety, or closed for species protection, that is, full recreational closures and the six sea turtle nest relocation areas) and result in short- and long-term beneficial impacts by greatly reducing the impacts on American oystercatchers, colonial waterbirds, and Wilson's plovers from these activities. These activities can bring both vehicles and pedestrians into close proximity to shorebirds and result in birds being flushed from nests, resulting in loss of eggs or chicks, complete abandonment of the nest, and increased susceptibility to predation (Elliot-Smith and Haig 2004; Cohen, Houghton, and Fraser 2009; Burger 1987; Boettcher et al. 2007; Lauro and Tanacredi 2002; Patterson, Fraser, and Roggenbuck 1990). Although alternative D would also establish designated campsites for emergency camping in portions of the existing long-term parking lots, these areas do not provide habitat for state-listed or special-status bird species and would result in no effects on these species.

Adaptive Management Strategy—Under alternative D, an adaptive management strategy would be implemented, the same as under alternative B, to ensure that the goals of species protection are being met. The additional management actions that could be implemented would provide short- and long-term beneficial impacts to American oystercatchers, colonial waterbirds, and Wilson's plovers and their habitat. Benefits would result from reducing closure violations through increased education and focused enforcement; reducing predation through trash management and fish scrap disposal; and reducing ORV impacts through route restrictions, increased buffer sizes, and limits on the number of vehicle permits issued, as well as managing the size of vehicle storage lots.

Cumulative Impacts under Alternative D

Past, present and reasonably foreseeable future actions under alternative D would be the same as those described under alternative A. The overall combined impacts of these past, present, and future actions on state-listed and special-status bird species would be short- and long-term, and adverse (from disturbance to foraging and nesting birds from visitor/ORV use, dredging activities, visitor amenity improvements, and military overflights), as well as long-term beneficial (from the protection afforded to species and their habitat by species monitoring, species buffers, habitat protection, visitor protection patrols, visitor education programs, control of the wild horse population, future planning efforts under the Foundation Plan, and predator management). While adverse effects on state-listed and special-status bird species from other actions occurring in the region would still exist, actions under alternative D would provide additional protection that would be beneficial to the regional populations of these species and would offset some of the adverse effects.

ALTERNATIVE E

Impacts of Alternative E

Resource Management Activities

Surveying and Monitoring—Though public use of ORVs on the Seashore would be prohibited under alternative E, the NPS would still use ORVs to conduct resource management and resource and visitor protection activities. Surveying for and protecting state-listed and special-status bird species and their habitat under alternative E would occur in the same manner as under alternative A. However, given the prohibition of ORVs on the Seashore, the likely lower pedestrian presence resulting from this, and the fact that with no public ORV access, pedestrian use would likely be centered around the ferry landing areas, the cabins, and Power Squadron Spit where visitors can easily access the beach by their own boats, surveying and monitoring protocols would be reviewed and may change. Overall, surveying activities would provide long-term beneficial impacts to American oystercatchers, colonial waterbirds, and Wilson’s plovers by allowing the Seashore to better manage the species, which may lead to increased reproductive success of the species at the Seashore. Some short-term adverse impacts could still occur by staff and/or vehicle presence negatively impacting feeding, reproduction, resting, or other shorebird behavior; however, NPS staff would use best professional judgment and take precautions to minimize disturbance during surveying, such as observing incubating birds with optical equipment from appropriate distances and maintaining slow speeds while using ORVs in or near state-listed and special-status bird species habitat.

Establishment of Prenesting Closures—To protect state-listed and special-status bird species and their habitat, full recreational closures for prenesting colonial waterbird habitat would be established, similar to alternative A, by April 1 in all active (where birds are presently nesting or nested the previous breeding season), nesting habitat as determined appropriate by a qualified staff biologist, and the closures would also be expanded as necessary when nests or nest scrapes are found in new areas. However, since public use of ORVs would be prohibited on the Seashore under alternative E, the closures would be applicable to pedestrians only. As described for alternative A, these closures would protect nesting birds from adverse impacts caused by disturbance from pedestrians and pets, resulting in long-term beneficial impacts. American oystercatchers begin nesting at the Seashore in April (NPS 2012p, 2011e, 2010e, 2009e, 2008h, 2007n, 2006c, 2005c, 2004b), and with no specific prenesting closures for this species they would be subject to disturbance from pedestrians and pets, resulting in long-term adverse impacts. However, prenesting closures for piping plovers and colonial waterbirds established on April 1 would be available for use by these species, and provide long-term beneficial impacts by protecting species that nest in these closures from pedestrian and pet disturbance. Wilson’s plovers are often found nesting in the same areas as piping plovers and American oystercatchers (NPS 2006e), and their peak nesting period is from late April through late May (Bergstrom 1982); therefore, piping plover prenesting closures beginning on April 1 would provide protection to Wilson’s plovers as well. However, Wilson’s plovers begin establishing territories in mid-March through early April (Tomkins 1944; Bergstrom 1988), so those birds beginning to establish territories prior to April 1 would not be protected from pedestrian and pet disturbances, resulting in long-term adverse impacts. Overall though, any impacts from pedestrians and or their pets would be reduced, because with no ORV use on the beach, pedestrian use would likely occur mostly around the ferry landings, limiting the amount of shorebird habitat potentially impacted by them.

Buffer/Closure Establishment—Under alternative E, establishing buffers and closures would be the same as described for alternative A, except that no recreational ORV-specific closures would be established because public use of ORVs would not be permitted on the Seashore under this alternative. Any disturbance to American oystercatchers, colonial waterbirds, and Wilson’s plovers would be limited to that by monitoring and emergency response vehicles. Establishing buffers and full recreation closures

outside of prenesting closures, would result in short- and long-term benefits for state-listed and special-status species by protecting adults, nests, and unfledged chicks from potential impacts caused by pedestrians and pets.

Management of Wintering and Nonbreeding Birds—Similar to alternative A, there would be no surveys conducted for wintering or nonbreeding American oystercatchers (colonial waterbirds and Wilson’s plovers do not winter at the Seashore) under alternative E. Surveys for wintering piping plovers would still occur once per month from August 1 through March 31 each year. While surveying activities for wintering piping plovers could result in some noise and habitat disturbance (potentially causing temporary displacement) of American oystercatcher from the presence of resource staff and essential vehicles, impacts would be largely imperceptible because the surveys would occur only once per month.

Not allowing public ORV use at the Seashore during any time of year would eliminate all impacts from ORVs on wintering American oystercatchers, resulting in long-term beneficial impacts. During the winter months pedestrians would still have access to the Seashore and there would be no full recreational closures established to protect wintering shorebird populations. However, any impacts from disturbance by pedestrians would be largely imperceptible because many passenger ferries stop operating in the winter, the amount of pedestrian use during the winter months is very low, and without a means of transportation on the beach, most visitor use would be confined to areas in the immediate vicinity of the ferry landings.

Predator Management—Under alternative E, predator management would be the same as alternative A. No nest protection measures would be put in place to protect shorebird nests from predators and no removal of predators would occur, which would allow continued predation of nests and birds to occur, resulting in long-term adverse impacts. With no public ORV use allowed under alternative E, and the Seashore continuing to enforce proper trash disposal and anti-wildlife feeding regulations, the amount of trash at the Seashore would likely be reduced substantially, especially in areas more remote from the ferry landing areas since they would not be as easily accessed by pedestrians without ORVs. Trash often attracts predators, so a reduction of trash may correlate to a reduction in the number of predators and predation of state-listed and special-status bird species, resulting in long-term beneficial impacts.

Education/Public Outreach—Under alternative E, education and outreach would be the same as described under alternative A; however, all efforts would be directed toward pedestrian use as public ORV use would not be permitted at the Seashore. Such public outreach would provide short- and long-term beneficial impacts for state-listed and special-status species as it educates the public to the specific needs of protected species.

Research/Monitoring—Research and monitoring under alternative E would be the same as alternative A. While research efforts have the potential to negatively impact feeding, reproduction, resting, or other state-listed and special-status bird species behavior over the long term due to the increased human presence and use of ORVs (Anderson and Keith 1980; Ellison and Cleary 1978; Tremblay and Ellison 1979; Hand 1980), the research to be conducted would provide long-term beneficial impacts by increasing knowledge about the species that would help inform future management actions.

ORV and Other Recreational Use

ORVs and Pedestrian Access—Under alternative E, the public use of ORVs would be prohibited along the entire Core Banks and Shackleford Banks. However, other recreational use on the ocean beach such as swimming, camping, beach fires, fishing, and the use of the cabins would still occur, though likely at a reduced rate and in general proximity to the ferry landing sites. With no public use of ORVs on the beach, impacts on American oystercatchers, colonial waterbirds, and Wilson’s plovers and their habitat from

public ORV use as described under alternative A would not occur, resulting in short- and long-term beneficial impacts. In addition, the use of vehicles by NPS staff for law enforcement purposes would likely be reduced from current levels because staff would only be dealing with pedestrians, and management of recreational use would be simplified compared with the other alternatives.

Adverse impacts (e.g., noise disturbance and short-term displacement) to state-listed and special-status species would continue from the presence of pedestrians and pets at the Seashore. However, impacts would be minimized because without ORVs to provide easy access to the more remote areas of the Seashore, pedestrian uses would likely be confined to the areas around the ferry landings.

Night-Driving—Under alternative E, there would be no night driving on the Seashore because all public ORV use would be prohibited on the Seashore year-round. This would eliminate all potential impacts from ORVs at night on American oystercatchers, colonial waterbirds, and Wilson’s plovers, resulting in short- and long-term beneficial impacts.

Permit Requirements—Under alternative E, there would be no vehicle permit requirements because public ORV use would not be allowed at the Seashore. Therefore, there would be no effects on state-listed and special-status bird species.

Camping—Under alternative E, camping and campfire activities along the ocean beach would be permitted in areas similar to alternative A (on all beaches of the Seashore that are not otherwise closed by the Superintendent’s Compendium, closed for safety, or closed for species protection, that is, full recreational closures and the six sea turtle nest relocation areas). Camping and campfires can disturb nesting, resting, and foraging adult shorebirds and their chicks, causing short- and long-term adverse impacts; however, prohibiting these activities in full recreational closures and the sea turtle nest relocation areas would provide beneficial impacts to all shorebirds using these areas. Additionally, with no public ORV use allowed on the Seashore under this alternative, any adverse impacts would be reduced and likely limited to those areas readily accessible by foot, such as in front of the cabins, by the lighthouse, and possibly Power Squadron Spit which is accessible by private boat.

Adaptive Management Strategy—Under alternative E, an adaptive management strategy would be adopted similar to that under alternative B to ensure that the goals of species protection are being met, providing short- and long-term beneficial impacts to all state-listed and special-status bird species. With no public ORV use allowed on the Seashore under alternative E, American oystercatcher disturbance would be monitored as it relates to impacts from pedestrians and other recreational use and not from ORVs, and only those non-ORV management actions indicated in chapter 2 would be implemented. The additional management actions that could be implemented would include increased education and focused enforcement, which would help reduce closure violations that could impact American oystercatchers, colonial waterbirds, and Wilson’s plovers; additional focused trash management and fish scrap disposal, which would likely reduce the number of predators attracted to the beach that could prey upon American oystercatchers, colonial waterbirds, and Wilson’s plovers; additional predator control, which would help protect American oystercatchers, colonial waterbirds, and Wilson’s plovers, their nests, and fledglings from raccoons and other mammalian predators; and increased buffer sizes, which would protect American oystercatcher, colonial waterbird, and Wilson’s plover habitat, as well as the birds themselves and their nests. If species indicators continue to be triggered by visitor use impacts for two consecutive years after implementing the previously mentioned actions, then increasing the size of species protection buffers could be implemented. This would increase the distance vehicles could approach birds and nests, thereby reducing amount of potential impacts caused by ORVs, providing short- and long-term beneficial impacts to American oystercatchers, colonial waterbirds, and Wilson’s plovers.

Cumulative Impacts under Alternative E

Past, present and reasonably foreseeable future actions under alternative E would be the same as those described under alternative A. The overall combined impacts of these past, present, and future actions on state-listed and special-status bird species would be short- and long-term, and adverse (from disturbance to foraging and nesting birds from visitor/ORV use, dredging activities, visitor amenity improvements, and military overflights), as well as long-term beneficial (from the protection afforded to species and their habitat by species monitoring, species buffers, habitat protection, visitor protection patrols, visitor education programs, control of the wild horse population, future planning efforts under the Foundation Plan, and predator management). While adverse effects on state-listed and special-status birds from other actions occurring in the region would still exist, actions under alternative E would provide additional protection that would be beneficial to the regional populations of these species and would offset some of the adverse effects.

COMPARISON OF ALTERNATIVES

Under alternative B, impacts on state-listed and special-status bird species from resource management activities would be slightly less than impacts under alternatives A (the no-action alternative) and E (the no-ORV alternative) because there would be more consistent training and supervision of resource staff who conduct the surveys, the limited predator removal in alternative B, establishing pre-nesting closures by March 16 (15 days earlier than under alternative A, not applicable to alternative E), and the increased education and research programs. ORV and other recreational use would result in long-term adverse impacts on state-listed and special-status bird species under alternative B. Allowing continued ORV access on approximately 81 percent (45 miles) of the Seashore would contribute to these long-term impacts, including noise disturbance, temporary displacement, and possibly injury/mortality of individuals. However, impacts under alternative B would be less than impacts incurred under alternative A (the no-action alternative) due to increased education and outreach, the closing of ORV routes where no ferry access is available, the prohibition on all high-performance sport-model and two-stroke ATVs and UTVs at the Seashore, prohibiting night driving from May 1 through August 31, the ORV permitting system, the likely increased compliance with resource closures due to increased law enforcement and interpretative staffing positions, and the more intensive management actions that could be implemented under the adaptive management strategy. However, the impacts on state-listed and special-status bird species from ORV and other recreational uses under alternative B would be greater than those incurred under alternative E because no public ORV access would be allowed at the Seashore under alternative E.

Impacts on state-listed and special-status bird species from resource management activities under alternative C would be slightly less than for alternatives A (the no-action alternative) and E (the no ORV alternative). This is due to more consistent training and supervision of resource staff who conduct the surveys, the limited predator removal under alternative C, increased educational and research efforts, and the winter vehicle closure from December 16 through March 15 (not applicable to alternative E). Under alternative C, ORV and other recreational use would result in long-term adverse impacts on state-listed birds from noise disturbance, temporary displacement, and possibly injury/mortality of individuals. However, these impacts would be less than those incurred under alternative A, due to a seasonal prohibition on night driving from May 1 through September 14, the increase in the amount of pedestrian-only use areas by 4 miles, the closing of ORV routes where no ferry access is available, the prohibition on all high-performance sport-model and two-stroke ATVs and UTVs at the Seashore, shortening the timeframe that non-sport ATVs and UTVs would be permitted within the Seashore each year (reducing the March 16 through December 31 time under alternative A to September 15 through December 15), the reduction in the amount of Seashore open for ORV use, the fee-based ORV permitting system that would also limit the number of vehicles on the Seashore, the likely increased compliance with resource closures due to increased law enforcement and interpretative staffing positions, and the more intensive

management actions that could be implemented under the adaptive management strategy. Compared to alternative E, the amount of impacts on state-listed and special-status bird species under alternative C would be greater due to public ORV use being allowed under alternative C whereas it would be prohibited under alternative E.

Under alternative D, impacts on state-listed and special-status bird species from resource management activities would be less than those under alternatives A (the no-action alternative) and E (the no ORV alternative). This is due to more consistent training and supervision of resource staff who conduct the surveys, the limited predator removal, expanded buffers around American oystercatchers, colonial waterbirds, and least terns, the expansion of brood buffers based on the mobility of the brood, and the increased education and monitoring efforts. ORV and other recreational use would result in long-term adverse impacts on state-listed birds under alternative D from noise disturbance, temporary displacement, and possibly injury/mortality of individuals. However, these impacts would be less than those incurred under alternative A. This is due to the expansion of pedestrian-use only areas by 10 miles; the prohibition on night time driving from May 1 through September 14, the closing of ORV routes where no ferry access is available, the prohibition of all ATVs, as well as all high-performance sport-model and two-stroke UTVs at the Seashore, shortening the time frame that utility-model UTVs would be permitted within the Seashore each year (reducing the March 16 through December 31 time under alternative A to September 15 through December 15), the reduction in the amount of Seashore open for ORV use, the fee-based ORV permitting system with a limit on the number of vehicles allowed which would reduce the number of public ORVs allowed on the Seashore by 8 percent in order to keep the average vehicle density similar to historical use, the likely increased compliance with resource closures due to increased law enforcement and interpretative staffing positions, and the more intensive management actions that could be implemented under the adaptive management strategy. Compared to alternative E, the amount of impacts on state-listed and special-status bird species under alternative D would be greater due to public ORV use being allowed under alternative D whereas it would be prohibited under alternative E.

The resource management activities proposed for alternative E (the no ORV alternative) are essentially the same activities proposed for alternative A (the no-action alternative) except that no recreational ORV-specific closures would be established, and surveying and monitoring protocols would be reviewed and may change given the prohibition of ORVs on the Seashore, the likely lower pedestrian presence resulting from this, and the fact that with no ORV access, pedestrian use would likely be centered around the ferry landing areas, the cabins, and Power Squadron Spit where visitors can easily access the beach by their own boats. Under alternative A, the North and South Core Banks of the Seashore would remain open to ORV use in designated routes and areas (as documented in the Superintendent's Compendium), except where resource or safety closures are present. There would be no night driving restrictions under alternative A and no restrictions on the number of vehicles allowed on the Seashore either. Therefore, when compared to alternative A, alternative E would provide more protection to state-listed and special-status bird species because there would be no impacts related to public ORV use, and impacts related to other recreational uses would be reduced due to limited access to the ocean front beaches due to no public ORV use.

CONCLUSION

Impacts on state-listed birds from ORV and other recreational use under alternatives A, B, C, and D are expected to be long term and adverse. Allowing ORVs access to North and South Core Banks under alternative B would contribute to these adverse impacts, including noise disturbance, temporary displacement, and increased frequent escape flights. However, increased education and outreach; the use of additional species management measures, such as seasonal restriction on night driving; and restricting ATV and UTV use under alternatives B, C, and D would likely help mitigate the long-term adverse impacts of ORV use on state-listed birds by reducing vehicular contact with individual species and

educating visitors about the importance of resource protection. Additional benefits would result under alternative B because posting of nesting areas for shorebirds would occur 15 days earlier in the season (potentially catching early nesters) and a minimum 300-foot buffer for American oystercatchers would be provided once breeding behavior occurs. Benefits may result under alternative C because piping plover closures would increase to 300 feet for unfledged chicks on the beach and a minimum 300-foot buffer for American oystercatchers would be provided once breeding behavior occurs, potentially providing additional habitat for state-listed and special-status species. However, compliance with closures may not be absolute, resulting in continued disturbance of breeding habitat and potential mortality of individuals if noncompliance occurs. Under alternative D, species buffers/closures would increase considerably to account for unfledged chicks and nests that may occur near or outside of current closure boundaries, providing additional protection. Impacts on state-listed birds from essential vehicle use and pedestrian access under alternative E would likely be slight, short-term and adverse due to limited noise disturbance and temporary species displacement. Prohibiting ORV access at the Seashore under alternative E would remove a source of disturbance for all state-listed and special-status species, resulting in long-term beneficial impacts, which could eventually reduce the need for special management of and mitigation for state-listed and special-status species.

Significance Discussion

The purpose of the Seashore is to preserve the outstanding natural, cultural, and recreational resources and values of a dynamic, intact, natural barrier island system where ecological processes dominate. The Seashore is one of the few remaining locations on the Atlantic Coast where visitors can experience and recreate in an undeveloped, remote barrier island environment that can be reached only by boat or ferry. The Seashore plays a vital role in the survival of several state-listed and special-status species, as it provides many important and unique habitats, such as marshes, tidal flats, and riparian areas. Six state-listed and special-status species occur at the Seashore, including one state-listed threatened species (gull-billed tern) and five state-listed species of special concern (American oystercatcher, black skimmer, common tern, least tern, and Wilson's plover). Most of these state-listed and special-status species have been known to occur along the Atlantic Coast beaches (including the Seashore) since the 1800s (Molina, Parnell, and Erwin 2009; Nol and Humphrey 2012; Corbat and Bergstrom 2000). Gull-billed terns, common terns, least terns, and black skimmers prefer relatively undisturbed islands for nesting, which typically includes barrier island beaches. The greatest concerns for these species are coastal development and associated increases in human disturbance, and predation by overabundant species. In 2011, the North Carolina coast supported 192 breeding pairs of American oystercatchers, of which 33 percent lived within the Seashore. American oystercatchers are considered a shorebird indicator species because they are one of the most sensitive bird species to disturbance at the Seashore, are highly vulnerable to disturbances, and are known to abandon habitat when they are impacted by pedestrians, vehicles, pets, and even resource managers in or near their nesting habitat. In 2004, the Seashore produced 61 nesting pairs of Wilson's plover, which represents 26 percent of North Carolina's population. The Wilson's plover prefers beach areas that include salt flats, coastal lagoons, sand dunes, and overwash areas. The greatest concern to Wilson's plover at the Seashore is disturbances associated with beachgoers, pets, and ORV traffic on beaches.

These six avian species currently receive indirect protection at the Seashore, as they can breed in areas protected for federally listed species (e.g., piping plover). These protections would increase in varying degrees under alternatives A, B, C, and D. These protections would further increase under alternatives C and D, which limit ORVs to historical numbers, and would dramatically increase under alternative E, since the elimination of ORVs may cause an increase in the fledging success of these six avian species. Adverse impacts to these species across all alternatives would be small, as described in the analysis above. Although there may be occasional adverse impacts to individual birds, under all alternatives the Seashore would continue to conduct indirect monitoring and other species buffers and closures. A

decrease in recreational uses during seasonal closures, as discussed in the alternatives, would help protect wintering individuals of these species along the Seashore. Under alternatives B, C, and D, additional protections for piping plovers (ban on night driving, etc.) would indirectly benefit these species. These measures would be a beneficial change for these six avian species, compared to the existing condition, greatly reducing (and in some cases eliminating) impacts from ORVs, and would not result in significant adverse impacts.

Under alternatives A, B, C, and D, designating legal routes for ORV use does not establish a precedent for future actions with significant effects, as ORV use has occurred at the Seashore since the 1930s and continued since the establishment of the Seashore as a park unit in 1976, and the current and proposed species protection measures are substantial, and the areas designated for ORVs are primarily outside of state-listed and special-status species habitat, resulting in a low overall level of impacts to this species. ORV use is also currently legally permitted in several other national seashores and recreation areas, and in this regard is not precedent-setting within the national park system. Alternative E, which prohibits ORV use, would also not establish a precedent for future actions with significant effects to state-listed and special-status species, as many other national park units do not allow ORV use.

There are a number of cumulative impacts to state-listed and special-status species, described in the impacts analysis above, which may be short- and long-term, limited, and adverse, as well as long-term beneficial. However, while adverse effects on state-listed and special-status species from other actions occurring in the region would still exist, actions under alternatives A, B, C, D, and E would provide additional protection that would be beneficial to the regional population of these state-listed and special-status species, and would mitigate any significant adverse cumulative impacts already occurring.

In conclusion, compared to the existing condition, additional impacts to state-listed and special-status species under alternatives A, B, C, D, and E would be small. The Seashore currently has in place substantial resource protection and mitigation measures that would continue and would be strengthened in the action alternatives. When compared to the existing condition, in light of the significance criteria at 40 CFR 1508.27, there would be no significant adverse impacts to state-listed and special-status species from alternatives A, B, C, D, or E.

OTHER WILDLIFE AND WILDLIFE HABITAT

GUIDING REGULATIONS AND POLICIES

The Seashore's GMP (NPS 1983) identifies the following natural resource-related goals to provide direction for future management of the Seashore:

- Protect native wildlife and ensure its perpetuation, to the extent possible, especially those on the federal endangered and threatened species lists.
- Designate transportation corridors for minimizing damage by motorized vehicles to dunes, wildlife, and vegetation.

These goals were further developed for the *Foundation Document* (NPS 2012s), as stated at the beginning of this chapter. NPS regulations and policies, including the NPS Organic Act of 1916, NPS *Management Policies 2006* (NPS 2006d), and the NPS Natural Resource Management Reference Manual 77, also direct national parks to provide for the protection of Seashore resources. The Organic Act directs national parks to conserve wildlife unimpaired for future generations and is interpreted to mean that native animal life is to be protected and perpetuated as part of the natural ecosystem of a park unit. Parks rely on natural

processes to control populations of native species to the greatest extent possible; otherwise, they are protected from harvest, harassment, or harm by human activities.

The NPS *Management Policies 2006* state that the NPS “will maintain as parts of the natural ecosystems of parks all plants and animals native to park ecosystems. The term “plants and animals” refers to all five of the commonly recognized kingdoms of living things and includes such groups as flowering plants, ferns, mosses, lichens, algae, fungi, bacteria, mammals, birds, reptiles, amphibians, fishes, insects, worms, crustaceans, and microscopic plants or animals.” The NPS will achieve this by

- Preserving and restoring the natural abundances, diversities, dynamics, distributions, habitats, and behaviors of native plant and animal populations and the 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; and
- Minimizing human impacts on native plants, animals, populations, communities, and ecosystems, and the processes that sustain them (NPS 2006d).

Section 4.1 of NPS *Management Policies 2006* states that “natural resources will be managed to preserve fundamental physical and biological processes, as well as individual species, features, and plant and animal communities. The Service will not attempt to solely preserve individual species (except threatened or endangered species) or individual natural processes; rather, it will try to maintain all the components and processes of naturally evolving park ecosystems, including the natural abundance, diversity, and genetic and ecological integrity of the plant and animal species native to those ecosystems” (NPS 2006d). According to section 8.2.2.1 of the NPS *Management Policies 2006*, “Superintendents will develop and implement visitor use management plans and take action, as appropriate, to ensure that recreational uses and activities in the park are consistent with its authorizing legislation or proclamation and do not cause unacceptable impacts on park resources or values” (NPS 2006d).

Seashore wildlife has evolved in a barrier island ecosystem, which is dependent on the continuation of natural shoreline processes. Barrier islands are highly dynamic with changes in sea level, wave and wind action, and ocean currents continuously creating and altering habitat for wildlife through the processes of erosion and accretion of shorelines and sand dunes, overwash across the islands, and the formation, migration, and closure of inlets. To protect coastal barrier processes, the NPS *Management Policies 2006* direct that natural shoreline processes such as erosion, deposition, dune formation, overwash, inlet formation, and shoreline migration will be allowed to continue without interference (NPS 2006d, section 4.8.1.1). The policies further state, “[w]here human activities or structures have altered the nature or rate of natural shoreline processes, the Service will, in consultation with appropriate state and federal agencies, investigate alternatives for mitigating the effects of such activities or structures and for restoring natural conditions.”

METHODOLOGY AND ASSUMPTIONS

The following describes the methodology used to evaluate the impacts of the proposed alternatives on general wildlife and wildlife habitat at the Seashore. This discussion focuses on those species that may potentially be impacted by the actions described in the proposed alternatives and is, therefore, directed toward specific wildlife, including invertebrates, “other” bird species (those not state or federally protected or species of special concern), mammals, and reptiles and amphibians. The analysis is organized according to those four wildlife types. Although a number of studies have investigated ORV impacts on invertebrates found on sandy beaches, the studies have focused on a relatively small number of species, and only a few of the studies have occurred on southeastern U.S. beaches that would have similar species

to the beaches of Cape Lookout National Seashore (Wolcott and Wolcott 1984, Landry 2004; Zaremba et al. 1973). There have also not been any comprehensive studies within the Seashore to determine the species composition and abundance of invertebrates within bird foraging habitat. As a result, sufficient information is not available to provide a site-specific assessment of impacts of ORVs on all of the invertebrate species inhabiting the wrack, intertidal sand flats, island spits, and the high-energy intertidal zone at the Seashore. Therefore, impacts on invertebrates are discussed in general terms based on existing studies and, where possible, impacts on species specific to the Seashore are discussed.

The discussion of potential impacts on other bird species and their associated habitat focuses on shorebirds that would likely be using the same habitats as the protected species addressed in this draft plan/EIS. Information about habitat and other existing data were acquired from staff at the Seashore, the USFWS, and available literature (refer to appendix B). A comprehensive list of other bird species can be found in chapter 3. Although the action alternatives involve the potential relocation of ramps, parking areas and interdunal roads, construction activities would occur outside of the bird breeding season, during daylight hours and outside of any key breeding or foraging habitat. Therefore, impacts from construction were assumed to result in minimal disturbance to these species.

The discussion of potential impacts on mammals, reptiles and amphibians focuses on those species likely to occur in habitat where ORV use is permitted. Because ORV use is not permitted on Shackleford Banks, this draft plan/EIS would have no effect on the herd of horses at the Seashore. Therefore, impacts on horses are not analyzed below. In addition to discussing the impacts of ORV use, the discussion of potential impacts on mammalian predators focuses on whether predators would be removed under each alternative. Information about habitat and other existing data were acquired from staff at the Seashore and available literature.

For each alternative, potential impacts on wildlife and wildlife habitat were evaluated based on the pattern of proposed ORV use at the Seashore, resulting from what areas are open to ORV and other recreational uses and for what duration, the nature of habitats and species present, and the nature of coastal barrier processes that create and alter habitat. Primary steps in assessing impacts on wildlife and wildlife habitat were to determine the following: (1) the potential for species to occur in habitats likely to be affected by management actions described in the alternatives; (2) current and future use and distribution of ORVs by alternative; (3) habitat impact or alteration caused by the alternatives; and (4) disturbance potential of the action and the potential to directly or indirectly affect wildlife or wildlife habitat as a result of ORV activities. The information contained in this analysis was obtained through best professional judgment of the NPS staff and experts in the field and by reviewing applicable scientific literature.

STUDY AREA

The study area for assessment of the various alternatives, as well as the cumulative impacts, is Cape Lookout National Seashore.

ALTERNATIVE A

Impacts of Alternative A: No Action

Resource Management Activities

Surveying and Monitoring—Under alternative A NPS staff would perform surveys of recent breeding areas for protected species and would also continue to monitor breeding, nesting, and fledging activities throughout the breeding season. Surveying and monitoring activities would bring staff and/or vehicles into contact with other wildlife species (especially invertebrates and birds), increasing the potential for

disturbance and likely resulting in temporary displacement. However, there are several other bird species that are not at the Seashore during their breeding cycle, and the impacts of disturbance from resource management staff to these species are less than those species breeding at the Seashore under all alternatives. Because resource protection staff would also take proper measures to minimize any disturbance to these species, such as using binoculars to observe birds from greater distances, thereby limiting the amount of noise disturbances to habitat areas, surveying activities associated with all alternatives would likely result in limited adverse impacts on other bird species.

The use of vehicles for surveying and monitoring could result in mortality of individual invertebrates caused by compaction of the species under vehicle tires (Wolcott and Wolcott 1984). This would also be the case for certain reptile and amphibian species in the area. NPS staff would continue to use ATVs and UTVs and occasionally ORVs to conduct bird and turtle surveys and also to establish resource closures as required based on species behavior under all alternatives. Driving in the wrack line would be avoided because studies have shown that areas closed to ORV use have higher densities of invertebrates in these areas (Landry 2004; Kluft and Ginsberg 2009; Moss and McPhee 2006). Due to the low number of vehicles used by staff and the fact that such use would occur predominantly during the day, adverse impacts on beach invertebrates (and potentially reptiles and amphibians) from resources management activities would be limited across all alternatives.

Predator Management—An indirect impact from ORV and recreational use is the attraction of mammalian and bird predators to the waste stream (scraps of food, fish bait and other trash) associated with recreational use (NPS 2006e; USFWS 1996a). Although the Seashore would enforce proper trash disposal and anti-wildlife feeding regulations, recreational use would continue to have indirect impacts on other bird species through the attraction of predators, which would result in mortality of the predated species. These predators are a well-known factor in nest failure for ground nesting birds within the Seashore (McGowan and Simons 2006; NPS 2012s). Other bird species that do not breed at the Seashore would not be subject to predation pressures during this life cycle stage. However, under alternative A, predators could still take some adults of migratory bird species through opportunistic predation at times when these species are present at the Seashore.

Full Recreational or ORV Closures—Alternative A includes the establishment of full recreational closures for prenesting at recent piping plover breeding areas, and nesting buffers and closures around established territories and nests of colonial waterbirds and American oystercatchers. These closures would use symbolic fencing, which typically consists of bird usage signs to delineate areas where pedestrians and vehicles should not enter. The symbolic fencing would deter the entry of people and ORVs into these habitats. These closures would indirectly benefit other wildlife species, especially other bird species, by protecting potentially shared habitat. Other wildlife species would also benefit from the management measures for federally or state-listed or sensitive species under all of the alternatives. For example, other bird species present at the Seashore may take advantage of prenesting closures established for piping plover or other breeding bird species. Therefore, prenesting closures would likely result in benefits for those bird species.

The establishment of full recreational closures for prenesting could bring NPS staff in direct contact with wildlife (especially birds) and associated habitat, likely resulting in temporary displacement. Although essential vehicles used could crush invertebrates or collide with other wildlife species, resource protection staff would take appropriate measures such as employing slow speeds and internal communication with wildlife resource specialists to minimize any disturbance to these species.

ORV and Other Recreational Use

Invertebrates

Wildlife potentially affected by alternative A would include invertebrate species that inhabit the intertidal sand flats, wrack line, and moist substrate habitat at the Seashore. Under alternative A, ORV routes would include the entire ocean beach including the wrack line or intertidal zone that would be open to ORV use unless closed by protected species closures. Although ORVs generally drive above the high tide line on the upper beach or hard packed sand along the shoreline, ORVs may also drive into the intertidal zone. Driving on the sands of the intertidal zone would likely have adverse impacts on invertebrates due to mortality of individual species caused by compaction under vehicle tires (Wolcott and Wolcott 1984). Access to the intertidal zone often requires vehicles to cross over the wrack line, an area of high concentrations of invertebrates. Driving over the wrack line would crush and scatter seaweed, shells, and macroinvertebrates, causing damage and dispersal to an important source of food and habitat for many beach invertebrates (Kluft and Ginsberg 2009; Stephenson 1999).

In 2008, Schlacher and others studied four beaches: two beaches with no ORV use and two beaches with heavy ORV use (an average of 727 ORV crossings per day, which is much lower than the average number of ORVs at Cape Lookout National Seashore), to study the differences in how intertidal beach invertebrate populations are affected by ORVs. Schlacher and others (2008) observed ORV-impacted beaches had significantly fewer species at substantially reduced densities (Schlacher, Richardson, McLean 2008). The result in macrobenthic populations were marked shifts in community composition and structure, and these population shifts were strongest in the middle and upper shore, where ORV traffic was concentrated (Schlacher, Richardson, McLean 2008). Also, strong effects from ORVs were detectable during all seasons, but increased during the summer, correlated with an increase in ORV traffic (Schlacher, Richardson, McLean 2008). Even though the Schlacher 2008 study was conducted on southeast Queensland, Australia beaches, this study is applicable to the Seashore because both beaches allow ORV use, particularly in the summer months. Since high-energy, intertidal beaches in the southeastern United States generally support 20–30 invertebrate species, many of which are primary food sources for many of the sensitive bird species including the piping plover and red knot, adverse ORV impacts on invertebrates resulting from ORV use could adversely affect invertebrate populations, which may indirectly adversely affect sensitive bird species populations by decreasing available food sources.

Impacts on ghost crab populations from night driving at the Seashore, which is permitted under alternative A, would also occur. As demonstrated by Wolcott and Wolcott (1984), as few as 20–50 vehicles driving at night could impact (by direct crushing) ghost crab populations, at the Seashore. As unlimited night driving would continue under alternative A, it can be expected that this level of traffic would have adverse impacts on the ghost crab population that are detectable. Conversely, the corresponding reduction in predation of sea turtle and shorebird eggs and hatchlings would result in beneficial impacts to those species through potentially increased survival rates.

Other Bird Species

Under alternative A, North and South Core Banks would remain open to ORV use in designated routes/areas (as documented in the Superintendent's Compendium) from March 16 through December 31, except where resource or safety closures are present. ORV and other recreational activities that occur in the months when other bird species are in residence on Seashore beaches have the potential to impact resting and foraging birds from vehicle use, as well as the associated noise and presence of people associated with vehicles. Of particular concern is when these disturbance factors result in birds being forced to fly while they are foraging, known as frequent escape flight. Frequent escape flights result in a reduction in time foraging and an increase in the time spent flying (Tarr 2008). Because foraging is

replaced with flying, birds would not be able to add the body fat they need for migration, resulting in an adverse impact. Because this alternative would not limit the number of vehicles and pedestrians to access most areas of North and South Core Banks 24 hours a day, there is the potential for frequent disturbance to bird species. Although buffers would be established for protected species habitat, which could be used by other birds, it is likely that other birds found outside of full recreational or ORV closures for species protection would be disturbed by ORV use and other recreational activities, as vehicle disturbance can affect nonbreeding birds (Tarr 2008). Disturbance could be limited to noise and short-term displacement or it could be more considerable such as injury or mortality due to vehicle collisions. See the piping plover and red knot portions of the “State-listed and Special-status Species” section for a more thorough discussion of potential disturbance related impacts to birds.

The Seashore would take certain steps to minimize the associated effects of disturbance on bird species and their associated habitat. For example, the closure of the Seashore to ORV use from January 1 through March 15 would continue to act as a de facto ORV closure for wintering/nonbreeding birds, and would protect habitat for these species during this time. These management efforts would likely benefit other bird species over the long term and help mitigate the adverse impacts of ORV use on other birds within the Seashore.

Mammals

Continued ORV use under alternative A would likely result in noise disturbance and species displacement for mammals in the area of analysis (e.g., raccoon, nutria, cottontail), which can disrupt foraging and/or breeding behavior and increase energy expenditure (Switalski and Jones 2010). More considerable impacts of ORV use on mammals include direct injury or mortality of individual species. Mammalian predators are more likely to be affected by ORV use at the shoreline than other mammal species, as they are attracted to bird nests/species closures and trash associated with fishing and other recreational activities. For other mammals, however, adverse impacts would likely be more noticeable at the existing back route than along the beach, because the soundside back route is located in preferred habitat (i.e., salt marsh, grassland, and shrub/thicket).

Reptiles and Amphibians

Implementation of alternative A would likely result in noise disturbance for certain reptile and amphibian species in the area of analysis (e.g., snakes, lizards), which can lead to increased stress, loss of hearing, and/or habitat avoidance (Switalski and Jones 2010). The use of vehicles under alternative A could also result in direct injury and mortality of individual species from species being crushed by vehicles. Similar to mammals, adverse impacts would likely be more noticeable at existing back route locations, which are located in grassland, and shrub/thicket habitats.

Cumulative Impacts under Alternative A

Other past, present, and reasonably foreseeable future actions within the Seashore have the potential to impact other wildlife and wildlife habitat. While bird species considered in this section may arrive at the Seashore at different times, other wildlife inhabits the Seashore year-round. In general the below actions would occur year-round and have the potential to impact many of these species.

Dredging activities have occurred in the vicinity of the Seashore, and these activities are expected to continue into the foreseeable future. Following Hurricane Irene, the Long Point ferry basin was dredged in 2011 (NPS 2011i). However, dredging activities at the Seashore are generally minor and do not affect the ocean beach, where many wildlife species, including other bird species, use habitat. In addition, the Federal channel in Beaufort Inlet has been dredged and would continue to be dredged on an annual basis

as long as funding is available to the U.S. Corps of Engineers. In the past, dredge material from the dredging of Beaufort Inlet has not been placed on any Seashore beaches. However, moving forward, as part of the Morehead City Harbor DMMP, NPS has agreed to allow consideration within the EIS of deposition of restricted amounts of dredged material on Shackleford Banks during the 20-year period beginning in 2015 and extending through 2034 (USACE 2013). For the Morehead City Harbor DMMP, dredged material would be compatible with the existing beaches (>90 percent sand); beach disposal would occur only from November 16 through March 30 in any year; and disposal would occur along a 3.65-mile-long stretch of Shackleford Banks. Disposal of material on the beach would occur from the base of the existing frontal dune to the -24 foot depth, adding up to 33 acres of new ocean beach every 3 years about 1 mile east of the Shackleford Spit off Beaufort Inlet (USACE 2013). While disposal activities could temporarily disturb Seashore wildlife, causing short-term adverse impacts, long-term beneficial impacts would result from the increase in acres of beach habitat on Shackleford Banks.

While the dredging operations would impact benthic invertebrates within the channel, it would not directly impact invertebrates within the sandy beach habitat of the Seashore, unless the dredge spoil was deposited on the beach, as it was at Long Point in 2011. However, during the dredging operations some heavy construction equipment may be used at the deposition site. Depending on the size and weight of the equipment and the timing and duration of the operations, there could be localized, short-term adverse impacts on some of the invertebrate species on the beach due to crushing and compaction of the sand (Kluft and Ginsberg 2009). However, given the total available spit habitat within the Seashore, the overall impact on the Seashore would be minimal. The type and locational placement of the dredged material, as well as the timing and frequency of placement, may also have adverse impacts on invertebrates in the area of analysis. Deposition of dredged material has direct adverse impacts on invertebrates in the area where the material is deposited, due to crushing under the weight of the material, changes in the sediment characteristics of the beach, and increases in turbidity. While populations of most beach invertebrates can recover fairly quickly from a single beach disposal event, annual sand placements could keep beach fauna in a long-term state of disturbance at reduced levels (Garza and Whitman n.d.). Large-scale or maintenance dredging can occur when many bird species are using the Seashore and could result in short-term adverse impacts due to disturbance. Similar impacts would be expected for mammals, and reptiles and amphibians; however, impacts are expected to be slight. Impacts would depend on the timing and duration of the maintenance dredging as well as the type and placement of the dredge spoils. Dredging occurs infrequently at the Seashore. Since 2000, Long Point and Long Point have each been dredged no more than four times and the lighthouse area once.

The Seashore recently completed historic structure protection activities at the Cape Lookout lighthouse area, which included adding sand to the shoreline for protection of historic structures. Due to the dynamic environment and constant changes in the shoreline of the Seashore, projects other than dredging but involving structure stabilization may be required in the future for the protection of historic structures. The stabilization of historic structures could have short-term impacts on wildlife, especially if it takes place during the breeding season. If this were the case, short-term impacts on nesting success could result that would be localized and observable. Conversely, stabilization of historic structures is unlikely to result in the creation of new bird nesting habitat. The degree to which this activity is beneficial or adverse is a function of the extent, timing, and location of the activity itself relative to bird nesting and the degree to which the activity results in the creation or maintenance of high-quality habitat for birds.

Beach re-nourishment projects have occurred at the Seashore, but these events are infrequent. During beach re-nourishment, invertebrate species are impacted in the short-term by burial under sand. Most species found in the intertidal zone, such as the mole crabs and coquina clams, would recover quickly if nourishment activity ends before the spring (USFWS 2000). For ghost crabs the recovery period would be longer. If the sediment used is dissimilar to that of the existing beach, long-term adverse impacts on species recovery would occur (Peterson, Hickerson, and Johnson 2000). Additionally, considerable long-

term adverse impacts would occur if maintenance frequency were shorter than the recovery period of the invertebrate species affected. The area of the proposed project is fairly small, and the overall long-term effect on beach invertebrate populations across the Seashore would be adverse and limited or beneficial depending upon the timing, extent, and frequency of the re-nourishment, as well as the sediment characteristics.

Several past, present, and future plans and actions at the Seashore address visitation and improvement of visitor amenities and, therefore, could impact wildlife and wildlife habitat at the Seashore. The *Commercial Services Plan / Environmental Assessment / Assessment of Effect* guides the Seashore in improving the management and operation of commercial visitor services, while providing both self-directed and facilitated visitor opportunities. Visitor services which are offered and could continue to be offered at the Seashore include land transportation services, sale of limited food and sundry supplies, and ferry transportation.

Land transportation services which include a beach shuttle service originating in the lighthouse area and traveling to points on South Core Banks, limited UTV tours at the northern end of North Core Banks, and limited vehicle transportation service from the Long Point and Great Island concession areas could have adverse impacts on Seashore wildlife and their habitat similar to those previously described for public ORV use. However, any adverse impacts would be relatively small given the size of the operations and because their vehicles would continue to use established transportation routes including the back route and would adhere to all buffers/closures and other Seashore regulations. While the sale of food could increase trash at the Seashore and attract predators, sales are limited and confined to developed areas of the Seashore, so impacts would be small. Ferry operations occur on the soundside of South Core and North Core Banks where existing development is related to visitor arrival points on the soundside. These areas contain comparably limited wildlife habitat. Therefore, the overall impact on wildlife and wildlife habitat is expected to be adverse and limited.

Currently, three vehicle/passenger ferries enable the public to transport their vehicles to both South Core Banks and North Core Banks. From the late 1980s until about 1993, a concession passenger ferry service operated from the Shell Point area on Harkers Island to the Cape Lookout lighthouse area. The *Commercial Services Plan / Environmental Assessment / Assessment of Effect* (NPS 2007m) calls for a return to this type of operation through establishment of a passenger ferry departure gateway and a concession-operated ferry departing from Shell Point. These services, and future development of these services, provide access to the Seashore for both day and overnight use and increase the amount of recreational use that occurs at the Seashore. Recreation use has resulted and would continue to result in adverse impacts that are both short- and long-term on wildlife (e.g., invertebrates) inhabiting the wrack and the moist sand of the island spits and intertidal zone of the Seashore. The impacts of recreational use are addressed above under alternative A and include crushing animals, disturbing/dispersing the wrack line, and disrupting foraging/breeding habitat. The *Interim Off-road Vehicle Management Plan and Evaluation of Existing ORV Use at Cape Lookout National Seashore* is based on the actions outlined in the *Cape Lookout National Seashore Interim Protected Species Management Plan/Environmental Assessment* and the Superintendent's Compendium, and details how ORV closures are established. Although the plan permits continued ORV access, which threatens wildlife and wildlife habitat at the Seashore, the plan is beneficial for other birds and invertebrates especially, because it includes measures to educate visitors about resources at the Seashore and management measures to protect those resources. In addition, the plan discusses future monitoring and staff resource protection activities.

Many past, present and future actions, plans, and programs at the Seashore provide benefits for all wildlife at the Seashore. The *Cape Lookout National Seashore Interim Protected Species Management Plan/Environmental Assessment* states that the NPS will meet its obligations under the NPS Organic Act and the ESA to both proactively conserve listed species and prevent detrimental effects on these species.

To meet these obligations, the Service will “manage designated critical habitat, essential habitat, and recovery areas to maintain and enhance their value for the recovery of threatened and endangered species.” In addition, the Service will take on active management programs to inventory, monitor, restore, and maintain listed species’ habitats, control detrimental nonnative species, control detrimental visitor access, and re-establish extirpated populations as necessary (NPS 2006a). Although the plan permits continued ORV access, which has the potential to impact all wildlife, including other bird species, at the Seashore, the plan is beneficial for other birds and wildlife, because it includes measures to educate visitors about resources at the Seashore and management measures, including buffers and closures for other species along the ocean shoreline. In addition, the plan includes future ongoing monitoring and staff resource protection activities, which have the potential to benefit the species by providing additional information to drive future management decisions. The education aspect of the plan provides long-term benefits to all wildlife at the Seashore because it helps to educate visitors about the conservation needs of the species at the Seashore and the protection measures that are put in place to help protect it.

Cape Hatteras National Seashore also previously implemented an Interim Protected Species Management Strategy/EA and more recently implemented a long-term ORV management plan/EIS; both of which include protection measures for special-status species to minimize potential adverse impacts from ORVs, pedestrians, and pets. Though measures are not specifically targeted towards other wildlife species, other species would benefit from them, as many of the measures protect other species using the ocean shoreline for foraging. Because Cape Hatteras National Seashore is in such close proximity to Cape Lookout National Seashore, the benefits to other bird species at Cape Hatteras from these two plans also prove benefits to other bird species at Cape Lookout through the long term protection of the entire regional population.

The Special Use Permit program at the Seashore authorizes activities that provide benefit to an individual, group or organization, rather than the public at large. Examples include parking, special events, commercial filming/still photography, weddings, scattering of ashes, group camping, and First Amendment activities (NPS 2012g). Special use permits are granted for specific periods of time and specific locations. Special park uses can have adverse effects on park natural resources (including wildlife and wildlife habitat). In some instances, such as a minor, one-time activity (for instance a wedding), the effects would be slight. In other cases where activities are permitted over a longer time period, impacts could be more considerable. For instance, the use of duck blinds, temporary structures left in place for the purpose of facilitating hunting activities, require special use permits and may have the potential to result in adverse impacts to wildlife. Duck blinds may be placed in position as early as September 7 and must be completely removed no later than March 31. Special use permits require written authorization and some management control in order to protect park resources and the public interest (NPS 2007m). In the case of duck blinds, a maximum of two blinds are allowed per permit, and blind locations must be a minimum of 500 yards apart. The park resource manager recommends permit conditions aimed at eliminating or at least mitigating threats to the resource, health and safety issues, or other managerial concerns, which would benefit other wildlife at the Seashore.

There are several current and future U.S. Navy and Marine Corps operations in the area of the Seashore that would likely result in adverse impacts on wildlife at the Seashore. These operations include recent actions taken by the military to lower the ceiling (or altitude) above which planes may fly up to the speed of sound from 10,000 feet to 3,000 feet, and increased capabilities of offshore training. In addition, Marine Corps Cherry Point Air Station is located approximately 30 miles northwest of the Seashore. The air station and its associated support locations occupy more than 29,000 acres, (U.S. Marine Corps n.d.). Depending on the duration and magnitude of local U.S. Navy and Marine Corps operations, some short-term species disturbance and/or displacement could result for wildlife at the Seashore. A 2012 report on the effects of military overflights on American oystercatchers at the Seashore (Simmons and Borneman, 2012), concluded that at their peak sound level, military overflights contributed to a 72.5 dBA sound

level, which is comparable to walking along the Oceanside of the point of Cape Lookout (see “Soundscapes/Acoustic Environment”). Thus, the report concluded that there is no noteworthy evidence that military overflights affect the behavioral responses of American oystercatchers, including low-altitude flyovers (Simmons and Borneman 2012), further indicating that these operations are likely to create minimal impact to bird behavior at the Seashore.

Currently, the BOEM is analyzing the issuance of leases for developing offshore commercial wind energy. BOEM in cooperation with the State of North Carolina has established a task force, comprised of relevant federal agencies, state government officials, and local and Tribal elected government officials, in the planning and decision-making process in identifying a wind energy area off the coast of North Carolina. It is unlikely that the development of off-shore wind stations would adversely impact wildlife species at the Seashore. However, adverse impacts to pelagic, or oceanic, bird species may occur. These impacts would be associated with wind turbines and include direct mortality of birds from collisions with turbine blades and/or turbine avoidance, which can reduce fitness by inducing longer flight paths, resulting in higher energetic costs (BOEM n. d.).

Many past, present, and future actions, plans, and programs at the Seashore provide benefits for wildlife and wildlife habitat. The *Cape Lookout National Seashore Interim Protected Species Management Plan/Environmental Assessment* states that the NPS will meet its obligations under the NPS Organic Act and the ESA to both proactively conserve listed species and prevent detrimental effects on these species. To meet these obligations, the Service will “manage designated critical habitat, essential habitat, and recovery areas to maintain and enhance their value for the recovery of threatened and endangered species.” In addition, the Service will take on active management programs to inventory, monitor, restore, and maintain listed species’ habitats, control detrimental nonnative species, control detrimental visitor access, and re-establish extirpated populations as necessary (NPS 2006a). These management programs indirectly benefit other wildlife species by protecting habitat that is shared between protected and unprotected species.

The USFWS designation of critical habitat and recovery plans for several federally listed species at the Seashore provide protection to other bird species inhabiting the same areas as other wildlife at the Seashore. Critical habitat designation for the piping plover includes beaches adjacent to all the inlets in the Seashore, Portsmouth Flats, Kathryn-Jane Flats, and the point of Cape Lookout. The habitat includes ocean beach, mud flats, sand flats, and soundside beach used as foraging areas and sparsely vegetated low dunes. All piping-plover breeding sites (and thereby indirectly, but not officially, those of Wilson’s plovers) at the Seashore were designated by the USFWS as critical habitat for wintering birds in 2008. While not officially protected, other bird species that share the same foraging and breeding habitat as the piping plover and Wilson’s plover benefit over the long term by the protections extended to the piping plover and Wilson’s plover under the existing critical habitat designations at the Seashore.

A population of culturally important wild horses exists at the Seashore on Shackleford Banks. The population of approximately 109 wild horses is legislatively protected (NPS 2012b) that defines how the population is cooperatively managed by both the NPS and the foundation of Shackleford Horses (NPS 2007h). The horses are generally found on the dunes, in the swales between the dunes, on the marsh or in the forest. Control of the horse population could result in long-term benefits to other species, including birds and invertebrates, and other mammals that inhabit the Shackleford Banks by indirectly protecting potential habitat from overuse by feral horses.

The *Foundation Document* (NPS 2012s) for the Seashore identifies the following projects that may impact wildlife at the Seashore to some degree: Harkers Island Master Plan, Great Island and Long Point Master Plan, Resource stewardship strategy, Comprehensive Sign Plan, nonnative species and predator management plan, and the sustainability plan/green plan. These planning efforts would establish

development patterns at the Seashore, taking into consideration the location of wildlife species, especially their breeding and other sensitive locations, and plan to avoid or minimize impacts to these habitats. A comprehensive sign plan would allow the NPS to more effectively communicate messages to visitors, including those regarding the importance of species management at the Seashore. A nonnative species and predator management plan would provide for additional protection of wildlife species by helping to reduce disturbance from mammalian predators. Conversely, it could result in the removal of some mammalian predators, resulting in adverse impacts to those species. All of these planned efforts would have some measure of beneficial impacts on most of the wildlife species at the Seashore to the extent that they provide beneficial impacts or along the ocean shoreline where these species can be found.

Finally, the Seashore has conducted a predator study to evaluate ways to alleviate threats to threatened and endangered species at the Seashore. This three-year research study (2007-2009) evaluated the response of both predator (raccoon) and prey populations to raccoon removal. The NPS decided to implement the preferred alternative (Experimental Reduction of Raccoon Population to Evaluate Removal as an Option for Protected Species Management) outlined in the predator study/EA. Approximately 50 percent of the raccoon population was removed from South Core Banks in late 2008. Although the preferred alternative resulted in direct removal of raccoons, the general impact was short-term and limited because enough animals remained following the removal to sustain raccoon populations in the future regardless of future management policies. As a result of the overall reduction in the raccoon population on South Core Banks, long-term beneficial impacts for other bird species inhabiting that area of the Seashore accrued due to reduced predation pressure.

The impact of these past, present, and future actions on invertebrates would likely be short- and long-term adverse (from crushing and compaction during dredging activities, short-term burial during beach re-nourishment, and increased recreational use following implementation of the *Commercial Services Plan / Environmental Assessment / Assessment of Effect*) and beneficial (from resource protection and education measures in the *Interim Off-road Vehicle Management Plan and Evaluation of Existing ORV Use at Cape Lookout National Seashore*). When combined with the long-term adverse and beneficial impacts of alternative A, these impacts would likely result in long-term, detectable adverse and beneficial cumulative impacts to invertebrates, depending upon the individual species. Cumulative impacts on other bird species would likely be short- and long-term adverse (from temporary displacement caused by aircraft overflights and direct mortality of pelagic birds from collisions with turbine blades following development of off-shore wind stations) and long-term beneficial (from creating new bird nesting habitat through stabilization of historic structures and measures to reduce predation and provide protection to bird species inhabiting areas designated under critical habitat and recovery plans). These impacts, combined with the extensive long-term adverse and beneficial impacts under alternative A, would likely result in observable long-term adverse and beneficial cumulative impacts to other bird species. While adverse effects on these wildlife species from other actions occurring in the region would still exist, ongoing resource management activities and *de facto* closures under alternative A would result in protections that would be beneficial to wildlife populations and would offset some of the adverse effects.

ALTERNATIVE B

Impacts of Alternative B

Resource Management Activities

Surveying and Monitoring—Under alternative B, as under alternative A, NPS staff would perform surveys of recent breeding areas for protected species and would also continue to monitor breeding, nesting, and fledging activities throughout the breeding season. Surveying activities would likely result in limited adverse impacts from noise disturbances and other potential damage from the use of vehicles. As

described under alternative A, due to the limited amount of vehicles used by staff and the fact that such use would occur predominantly during the day, adverse impacts on beach invertebrates (and potentially reptiles and amphibians) from resources management activities would be limited across all alternatives.

Predator Management—Under alternative B, the Seashore would perform limited removal of mammalian predators, when predation of protected species is observed. The limited removal of mammalian predators would benefit other birds at the Seashore by potentially reducing predation pressure and disruption of breeding habitat. Under alternative B, the Seashore would perform limited removal of mammalian predators when predation of protected species is observed. This would adversely impact certain mammals at the Seashore (primarily raccoons) from the direct removal of these species. However, impacts would likely be slight as they would not be observed at the population level. Additionally, following guidelines set forth by the American Society of Mammalogists (ASM n.d.) and the American Veterinary Medical Association (AVMA 2007), efforts would be made during removal of the predators to ensure that management actions are conducted as humanely as possible to minimize the suffering of the animals.

As under alternative A, recreational use under alternative B would continue to have indirect impacts on other bird species through the attraction of predators, which would result in mortality of the preyed species. Under alternative B, the Seashore would continue to use predator exclosures, but would also perform limited removal of mammalian predators when predation is observed that impacts sensitive species. Predator removal would likely reduce predation pressure and disruption of breeding habitat, potentially increasing nest and fledging success for all bird species breeding at the Seashore, resulting in long-term beneficial impacts. Predator removal is considered more effective than nest exclosures in increasing reproductive output, likely due to increased chick survival (Cohen, Houghton, and Fraser 2009). A predator removal study conducted on the South Core Banks found a decrease in piping plover nest predation (down from 27.6 percent in 2008 to 5.6 percent in 2009) one year after removal and euthanasia of half of the raccoon population (Waldstein 2010). The study also found increased piping plover productivity one year after the raccoon removal (up to 0.64 fledglings per pair in 2009 from 0.23 fledglings per pair in 2008), but the increase was not statistically significant (Waldstein 2010). Predator removal efforts may also reduce the incidence of predation on adult birds.

Full Recreational or ORV Closures—Under alternative B, as under alternative A, the provision of full recreational closures for prenesting and nesting protected bird species would indirectly benefit other bird species, resulting in benefits for those species.

ORV and Other Recreational Use

Invertebrates

Similar to alternative A, ORV routes and other recreational uses under alternative B would continue to adversely impact invertebrate species that inhabit the intertidal sand flats, wrack lines, and moist substrate habitats at the Seashore. As shown in the below study, ORVs can alter or damage invertebrate habitat and foraging opportunities, and crush individuals under vehicle tires. Schlacher and others (2008) studied four beaches—two beaches with no ORV use and two beaches with heavy ORV use—for differences in how intertidal beach invertebrate populations are affected by ORVs. Schlacher and others (2008) observed ORV-impacted beaches had significantly fewer species at substantially reduced densities (Schlacher, Richardson, and McLean 2008). The results in macrobenthic populations were marked shifts in community composition and structure, and these population shifts were strongest in the middle and upper shore, where ORV traffic was concentrated (Schlacher, Richardson, and McLean 2008). Strong effects from ORVs were detectable during all seasons, but increased during the summer, correlated with an increase in ORV traffic (Schlacher, Richardson, and McLean 2008). Even though this study was

conducted on southeast Queensland, Australia beaches, the study is applicable to Cape Lookout because both beaches have recreational ORV users throughout the year, particularly in the summer months.

However, under alternative B, the phasing out of sport-model and two-stroke ATVs/UTVs over a five-year period and the exclusion of ORV routes where ferry landings do not exist, could help mitigate some of the adverse impacts of ORVs on invertebrates at the Seashore by limiting contact between vehicles and invertebrates that inhabit the intertidal sand flats, wrack line, and moist substrate areas. Schlacher and others (2007) studied an eastern Australian beach (North Stradbroke) that also has ghost crabs. During the study, the researchers observed that crab densities were significantly lower in areas subjected to heavy beach traffic, which suggested crabs were directly crushed by ORVs. They also observed that 100 percent of crabs were killed in shallow (5 cm; 2 in.) burrows, and 10-30 percent are killed in deep (20 cm; 7.9 in.) burrows, and none were killed in deeper (at least 30 cm; 11.8 in.) burrows. In addition, the authors observed that populations of dusk-emerging ghost crabs were killed in large numbers on the beach surface (Schlacher, Thompson, and Price 2007). Because a seasonal restriction on night driving would be implemented under alternative B (at night is the time when ghost crabs are most active) long-term benefits would likely result for the ghost crab population, as the amount of time ORVs spend in ghost crab habitat would be limited and the potential for direct mortality from direct crushing would be reduced. Also under alternative B, an education operator certificate would be required to operate a vehicle at the Seashore, which could indirectly benefit invertebrate species by providing Seashore visitors with current information regarding sensitive Seashore resources, seasonal closures, and ORV rules and regulations. Since high-energy, intertidal beaches in the southeastern United States generally support 20–30 invertebrate species, many of which are primary food sources for many of the sensitive bird species including the piping plover and red knot, adverse ORV impacts on invertebrates resulting from this alternative could adversely affect invertebrate populations, which may indirectly adversely affect sensitive bird species populations by decreasing available food sources.

Other Bird Species

Under alternative B, as described under alternative A, the North and South Core Banks of the Seashore would remain open to ORV use in designated routes/areas, except where resource or safety closures are present. ORV and other recreational activities that occur in the months when other bird species are in residence at Seashore beaches have the potential to impact resting and foraging birds by increasing the potential for frequent escape flights and nest abandonment as a result of noise and presence of people. Because this alternative would allow an unlimited number of vehicles and pedestrians to access most areas of the Seashore at North and South Core Banks, there is the potential for frequent disturbance to other bird species, including the potential for species injury and mortality. Even though buffers would be established for protected species (which could be used by other bird species), it is likely that some birds would continue to be disturbed by pedestrian and ORV use outside of closures.

However, unlike alternative A, where there is no ferry landing access provided (i.e., the former Middle Core Banks and Ophelia Banks), no ORV routes would be designated under alternative B. In addition, all high-performance sport-model and two-stroke ATVs and UTVs would be prohibited within the Seashore (after a five-year grace period), and restrictions on night driving (from May 1 through August 31) would be implemented. These actions under alternative B would likely help mitigate some of the adverse impacts of ORV use on other bird species due to a reduced potential for reduced contact with ORV users and vehicles.

As mentioned under alternative A, the Seashore takes certain actions which result in minimizing the effects of disturbance on bird species and their associated habitat, including a seasonal closure to ORV use from January 1 through March 15 at the Seashore. However, benefits would likely be limited because an escort program would only be used on a case-by-case basis. As described for invertebrates, the

Seashore would implement additional education and outreach under alternative B, which would include an operator education requirement for all ORV drivers. The new educational materials and programs could result in indirect, long-term benefits to other bird species at the Seashore by educating the public on resource closures and driving restrictions.

Unlike alternative A, alternative B would involve regular maintenance of the back route and the provision of pull-outs along the back route. Additionally, the back route would be extended to allow vehicles to bypass bird closures at the Cape. Construction and regular maintenance activities associated with the back route could disrupt (i.e., noise) and displace certain birds, especially those using habitat along the back routes (i.e., salt marsh, grassland, and shrub/thicket habitats). However, any adverse impacts that would result are expected to be short-term and limited, as suitable habitat exists in other areas of the Seashore, and activities would be coordinated with resource management staff to ensure they are not occurring in sensitive resource areas. Extension of the back route could indirectly benefit other birds by providing an alternative route around species closures and offering further protection, which may be used by other bird species.

In addition to increased education and outreach, as well as additional species management measures, alternative B would include an adaptive management strategy that would be based on species disturbance. American oystercatcher disturbance would be monitored in relation to impacts from ORVs, and necessary actions would take place if species indicators are triggered. The use of an adaptive management strategy could result in long-term benefits to other bird species due to the potential for increased management and species protection if significant disturbance is observed.

Mammals

As described for alternative A, continued ORV use under alternative B would likely result in noise disturbance and species displacement for mammals in the area of analysis (e.g., raccoon, nutria, cottontail), which can disrupt foraging and/or breeding behavior and increase energy expenditure (Switalski and Jones 2010). More considerable impacts of ORV use on mammals include direct injury or mortality of individual species. However, the phasing out of high-performance sport-model and two-stroke ATVs and UTVs, the exclusion of ORV routes where ferry landings do not exist, and a seasonal restriction on night driving would help mitigate some of the adverse impacts of ORV use on mammals at the Seashore by limiting the potential for contact between vehicles and individual species.

Under alternative B, noise occurring from construction and regular maintenance activities associated with the back route would likely disrupt and displace certain mammals. However, any adverse impacts that would result are expected to be short-term and limited, as suitable habitat exists in other areas of the Seashore and activities associated with back route maintenance would occur in previously disturbed areas.

Reptiles and Amphibians

As described for alternative A, continued ORV use under alternative B would likely result in noise disturbance for certain reptile and amphibian species in the area of analysis (e.g., snakes and lizards), which can lead to increased stress, loss of hearing, and/or habitat avoidance (Switalski and Jones 2010). The use of vehicles under alternative B could also result in direct injury and mortality of individual species from species being crushed by vehicles. Similar to mammals, adverse impacts would likely be more noticeable at existing back route locations, which are located in salt marsh, grassland, and shrub/thicket habitats. However, the phasing out of high-performance sport-model and two-stroke ATVs and UTVs, the exclusion of ORV routes where ferry landings do not exist, and a seasonal restriction on night driving would help mitigate some of the adverse impacts of ORV use on reptiles and amphibians at the Seashore by limiting the potential for contact between vehicles and individual species.

Construction and regular maintenance activities associated with the back route would likely disrupt and displace certain reptile and amphibian species that use the salt marsh, grassland, and shrub/thicket habitats near the back routes. However, any adverse impacts that would result are expected to be short-term and limited, as suitable habitat exists in other areas of the Seashore and activities associated with back route maintenance would occur in previously disturbed areas.

Cumulative Impacts under Alternative B

The past, present, and future actions discussed under the cumulative impact scenario for alternative A would be the same under alternative B, which would be adverse (from crushing and compaction during dredging activities, short-term burial during beach re-nourishment, increased recreational use following implementation of the *Commercial Services Plan / Environmental Assessment / Assessment of Effect*, temporary displacement caused by aircraft overflights, and direct mortality of pelagic birds from collisions with turbine blades following development of off-shore wind stations), as well as beneficial (from resource protection and education measures in the *Interim Off-road Vehicle Management Plan and Evaluation of Existing ORV Use at Cape Lookout National Seashore* and from creating new bird nesting habitat through stabilization of historic structures and measures to reduce predation and provide protection to bird species inhabiting areas designated under critical habitat and recovery plans). These impacts, combined with the extensive long-term adverse impacts under alternative B, would likely result in long-term adverse cumulative impacts to other bird species. While adverse effects on these wildlife species from other actions occurring in the region would still exist, expanded measures providing greater resource protection under alternative B, such as operator education requirements and the exclusion of ORV routes where ferry landings do not exist, would result in protections that would be beneficial to wildlife populations and would offset some of the adverse effects.

ALTERNATIVE C

Impacts of Alternative C

Resource Management Activities

Surveying and Monitoring—Under alternative C, as under alternative A, NPS staff would perform surveys of recent breeding areas for protected species and would also continue to monitor breeding, nesting, and fledging activities throughout the breeding season. Surveying activities would likely result in limited adverse impacts on other bird species. Due to the limited amount of vehicles used by staff and the fact that such use would occur predominantly during the day, adverse impacts on beach invertebrates (and potentially reptiles and amphibians) from resources management activities would be limited across all alternatives.

As described for alternative B, alternative C would include an adaptive management strategy based on American oystercatcher disturbance, which could result in long-term benefits to other bird species due to the potential for increased management and species protection if significant disturbance is observed.

Predator Management—As under alternative A, recreational use under alternative C would continue to have indirect impacts on other bird species through the attraction of predators, which would result in mortality of the preyed species. Like alternative B, the limited removal of mammalian predators under alternative C, when predation of protected species is observed, would adversely impact certain mammals at the Seashore (primarily raccoons) from the direct removal of these species. The limited removal of mammalian predators would likely benefit other birds in the long term by potentially reducing predation pressure. However, impacts would likely be short-term and slight, as they would not be observed at the

population level, and efforts would be made during removal of predators to ensure that management actions are conducted as humanely as possible to minimize the suffering of the animals.

Full Recreational or ORV Closures—Under alternative C, as under alternative A, the provision of full recreational or ORV closures for prenesting and nesting protected bird species would indirectly benefit wildlife species, resulting in benefits for those bird species.

ORV and Other Recreational Use

Invertebrates

Similar to alternative A, ORV routes and other recreational use under alternative C would continue to adversely impact (primarily by crushing) invertebrate species that inhabit the intertidal sand flats, wrack line, and moist substrate habitat at the Seashore by damaging habitat and foraging opportunities, and crushing individual species under vehicle tires. However, the prohibition of ATVs and high-performance sport-model and two-stroke UTVs (with five-year grace period), as well as the exclusion of ORV routes where ferry landings do not exist, could help mitigate some of the adverse impacts of ORV use on all invertebrates at the Seashore by limiting contact between vehicles and invertebrates that inhabit the intertidal sand flats, wrack line, and moist substrate areas. Additionally, pedestrian-only use areas would expand by four miles under alternative C, slightly reducing the percentage of Seashore available for ORV use and reducing contact between vehicles and invertebrate species. Like alternative B, night driving would be limited under alternative C, which would likely further reduce the chance of ghost crabs being crushed, as night is the time when ghost crabs are most active. Also similar to alternative B, the requirement of an education operator certificate could indirectly benefit invertebrate species by providing park visitors with current information regarding park resources, closures, and ORV rules and regulations. Therefore, the implementation of alternative C would likely result in long-term limited adverse impacts on invertebrate species at the Seashore.

Alternative C would limit the number of vehicle permits issued annually, based on historical average use. Placing a limit on the number of permits issued for ORV use on the beach (after year 3 of the plan) would prevent the level of ORV use from increasing, thus preventing likely increased amounts of adverse impacts, compared to historical levels, on invertebrates and their habitat. This would result in short- and long-term beneficial impacts to invertebrates. However, it should be noted that during years 1–3 of the plan, ORV density could slightly increase due to the reduction in the areas available for ORV use, and the lack of a limitation on the number of permits issued.

Other Bird Species

Under alternative C, as described under alternative A, the North and South Core Banks of the Seashore would remain open to ORV use in designated routes/areas, except where resource or safety closures are present. ORV and other recreational activities that occur in the months when other bird species are in residence on Seashore beaches have the potential to impact resting and foraging birds from vehicle use, as well as the associated noise and presence of people, by increasing the potential for frequent escape flights and nest abandonment. However, the designation of new pedestrian-only areas, the seasonal prohibition on ATVs and UTVs, the elimination of high-performance sport-model and two-stroke ATVs and UTVs, and the exclusion of ORV routes where ferry landings do not exist, would likely reduce the potential for disruption of other birds by ORV users due to the potential for reduced contact with ORV users and vehicles.

Similar to alternative B, night driving restrictions would be implemented under alternative C; however, under alternative C the night driving restriction would be extended two weeks (from May 1 through

September 14) compared to alternative B. The longer prohibition period would help protect late nesters. Restrictions on night driving under alternative C would provide long-term benefits to other bird species that forage at night.

Like alternative B, regular maintenance of the back route would occur under alternative C. Although the potential for habitat disturbance exists, activities would be coordinated with resource management staff to ensure they are not occurring in sensitive resource areas. In addition, activities associated with back route maintenance would occur in previously disturbed areas. Therefore, activities associated with back route maintenance would likely result in limited, short-term adverse impacts on other bird species at the Seashore.

As described for invertebrates, alternative C would include a daily vehicle permit system, which would include a limit on the number of ORVs at the Seashore at any one time. Because this alternative would limit the number of vehicles allowed at the Seashore, the potential for frequent disturbance to other bird species could be reduced.

As mentioned under alternative A, the Seashore takes certain actions which result in minimizing the effects of disturbance on bird species and their associated habitat, including a seasonal closure of the Seashore to ORV use from January 1 through March 15. As described for alternative B, the Seashore would implement additional education and outreach under alternative C, which would include an operator education certificate for all ORV drivers. The new educational materials and programs could result in indirect long-term benefits to other bird species at the Seashore by educating the public on resource closures and driving restrictions.

Mammals

As described for alternative A, continued ORV use under alternative C would likely result in noise disturbance and species displacement for mammals in the area of analysis (e.g., raccoon, nutria, cottontail) and could result in direct injury or mortality of individual species. However, the designation of new pedestrian-only areas, the seasonal prohibition on ATVs and UTVs, and elimination of high-performance sport-model and two-stroke ATVs and UTVs, the exclusion of ORV routes where ferry landings do not exist, and a seasonal restriction on night driving would help mitigate some of the adverse impacts of ORV use on mammals at the Seashore by limiting the potential for contact between vehicles and individual species.

Like alternative B, alternative C would involve regular maintenance of the back route and pull-outs along the back route would be provided. Noise occurring from construction and regular maintenance activities associated with the back route would likely disrupt and displace certain mammals. However, any adverse impacts that could result are expected to be short-term and limited, as suitable habitat exists in other areas of the Seashore and areas that would receive maintenance contain previously disturbed habitat.

Reptiles and Amphibians

As described for alternative A, continued ORV use under alternative C would likely result in noise disturbance for certain reptile and amphibian species in the area of analysis (e.g., snakes and lizards), which can lead to increased stress, loss of hearing, and/or habitat avoidance (Switalski and Jones 2010). The use of vehicles under alternative C could also result in direct injury and mortality of individual species from species being crushed by vehicles. However, the designation of new pedestrian-only areas, the seasonal prohibition on ATVs and UTVs, the elimination of high-performance sport-model and two-stroke ATVs and UTVs, the exclusion of ORV routes where ferry landings do not exist, and a seasonal

restriction on night driving would help mitigate some of the adverse impacts of ORV use on reptiles and amphibians at the Seashore by limiting the potential for contact between vehicles and individual species.

Like alternative B, noise occurring from regular maintenance activities associated with the back route would likely disrupt and displace certain reptile and amphibian species that use the salt marsh, grassland, and shrub/thicket habitats near the back routes. However, any adverse impacts that would result are expected to be short-term and limited, as suitable habitat exists in other areas of the Seashore and activities associated with back route maintenance would occur in previously disturbed areas.

Cumulative Impacts under Alternative C

The past, present, and future actions discussed under the cumulative impact scenario for alternative A would be the same under alternative C, which would be adverse (from crushing and compaction during dredging activities, short-term burial during beach re-nourishment, and increased recreational use following implementation of the *Commercial Services Plan / Environmental Assessment / Assessment of Effect*, temporary displacement caused by aircraft overflights and direct mortality of pelagic birds from collisions with turbine blades following development of off-shore wind stations), as well as beneficial (from resource protection and education measures in the *Interim Off-road Vehicle Management Plan and Evaluation of Existing ORV Use at Cape Lookout National Seashore* and from creating new bird nesting habitat through stabilization of historic structures and measures to reduce predation and provide protection to bird species inhabiting areas designated under critical habitat and recovery plans). These impacts, combined with the extensive long-term adverse impacts under alternative C, would likely result in long-term adverse cumulative impacts. While adverse effects on wildlife from other actions occurring in the region would still exist, expanded measures providing greater resource protection under alternative C, such as a seasonal prohibition of ATVs and UTVs, elimination of high-performance sport-model and two-stroke ATVs and UTVs, and the exclusion of ORV routes where ferry landings do not exist, would result in protections that would be beneficial to wildlife populations and would offset some of the adverse effects.

ALTERNATIVE D

Impacts of Alternative D

Resource Management Activities

Surveying and Monitoring—Under alternative D, as under alternative A, NPS staff would perform surveys of recent breeding areas for protected species and would also continue to monitor breeding, nesting, and fledging activities throughout the breeding season. Surveying activities would likely result in limited adverse impacts on other bird species. As described for alternative B, alternative D would include an adaptive management strategy based on American oystercatcher disturbance, which could result in long-term benefits to other bird species due to the potential for increased management and species protection if significant disturbance is observed. Due to the limited amount of vehicles used by staff and the fact that such use would occur predominantly during the day, adverse impacts on beach invertebrates (and potentially reptiles and amphibians) from resources management activities would be limited across all alternatives.

Predator Management—As under alternative A, recreational use under alternative D would continue to have indirect impacts on other bird species through the attraction of predators, which would result in mortality of the preyed species. As described for alternative B, the Seashore would perform limited removal of mammalian predators under alternative D when predation of protected species is observed.

The limited removal of mammalian predators would likely benefit birds and other species in the long term by potentially reducing predation pressure.

Full Recreational or ORV Closures—Under alternative D, as under alternative A, the provision of full recreational or ORV closures for prenesting and nesting protected bird species would indirectly benefit wildlife species, resulting in benefits for those bird species.

ORV and Other Recreational Use

Invertebrates

Similar to alternative A, ORV routes and other recreational use under alternative D would continue to adversely impact invertebrate species that inhabit the intertidal sand flats, wrack line, and moist substrate habitat at the Seashore by damaging habitat and foraging opportunities, and crushing individual species under vehicle tires. However, the seasonal restriction on UTV use, combined with the year-round prohibition of ATVs, ORV trailers, and high-performance sport-model and two-stroke UTVs, as well as the exclusion of ORV routes where ferry landings do not exist, would all help to mitigate some of the adverse impacts of ORV use on all invertebrates at the Seashore by limiting vehicular contact with individual species. Additionally, pedestrian-only use areas would expand by ten miles under alternative D, reducing the percentage of Seashore available for ORV use and the likelihood of impact. Like alternative B, night driving would be limited under alternative D, which would likely further reduce the adverse impacts of ORV use on ghost crabs, as night is the time when ghost crabs are most active. Also similar to alternative B, the requirement of an education operator certificate under alternative D could indirectly benefit invertebrate species by providing Seashore visitors with current information regarding Seashore resources, closures, and ORV rules and regulations. Therefore, the implementation of alternative D would likely result in long-term limited adverse impacts on invertebrate species at the Seashore.

Similar to alternative C, alternative D would limit the number of vehicle permits issued annually. However, under alternative D, the limit on the number of vehicle permits available would be eight percent less than the average number of permits issued per island in years 1–3 of the ORV plan. An eight percent reduction in annual permits would potentially reduce daily ORV use by a similar amount, which could reduce the potential for disturbance to invertebrate species, thereby resulting in direct long-term beneficial impacts to these species.

Other Bird Species

Under alternative D, as described under alternative A, the North and South Core Banks of the Seashore would remain open to ORV use in designated routes/areas, except where resource or safety closures are present, likely resulting in disturbance of resting and foraging birds by increasing the potential for frequent escape flights and nest abandonment. However, the designation of new pedestrian-only areas, the seasonal restriction of UTVs, the year-round prohibition of ATVs, ORV trailers, and high-performance sport-model and two-stroke UTVs, and the exclusion of ORV routes where ferry landings do not exist would likely reduce the potential for disruption of other birds by ORV users by limiting contact between vehicles and individual species.

Under alternative D, night driving restrictions would be the same as described for alternative C. The longer prohibition period (to September 14) would help protect late nesters, resulting in long-term benefits to other bird species that forage at night.

As described for invertebrates, alternative D would include a vehicle permit system, which would include a limit on the number of ORVs at the Seashore annually. This limit would be eight percent less than

historical average use on each island. An eight percent reduction in annual permits would potentially reduce daily ORV use by a similar amount, which could reduce the potential for disturbance to other bird species.

As mentioned under alternative A, the Seashore takes certain actions which result in minimizing the effects of disturbance on bird species and their associated habitat, including a seasonal closure of the Seashore to ORV use from January 1 through March 15. As described for alternative B, the Seashore would implement additional education and outreach under alternative D, including an operator education certificate for all ORV drivers, which could result in indirect long-term benefits to other bird species at the Seashore by educating the public on resource closures and driving restrictions.

Unlike alternatives B and C, regular maintenance of the back route would not occur under alternative D. However, for resource protection and safety, the back route would be re-established when impacted by a storm event, and there would be no net loss of ramps (although locations may change after storm events). In the case of extreme high tides or other emergencies, the area of the former long-term vehicle storage and parking lots would be open to temporary overnight use for the duration of the extreme condition. Like alternatives B and C, the potential for habitat disturbance exists, but activities would be coordinated with resource management staff to ensure they are not occurring in sensitive resource areas or during sensitive times. These activities would not be a regular occurrence and any impact is expected to be short-term. Therefore, activities associated with replacement of the back route and ramps would likely result in limited, short-term adverse impacts on other bird species at the Seashore.

Mammals

As described for alternative A, continued ORV use under alternative D would likely result in noise disturbance and species displacement for mammals in the area of analysis (e.g., raccoon, nutria, cottontail), which can disrupt foraging and/or breeding behavior and increase energy expenditure (Switalski and Jones 2010). More considerable impacts of ORV use on mammals include direct injury or mortality of individual species. Many of these species are crepuscular to nocturnal feeders and are not active during the day when most ORV use occurs. However, they may inhabit shallow depressions or areas of vegetative cover while at rest. The designation of new pedestrian-only areas, the seasonal restriction on UTV use, the year-round prohibition of ATVs, ORV trailers, and high-performance sport-model and two-stroke UTVs, the exclusion of ORV routes where ferry landings do not exist, and a seasonal restriction on night driving would help mitigate some of the adverse impacts of ORV use on mammals at the Seashore by limiting the potential for contact between vehicles and individual species.

Like alternative B, the limited removal of mammalian predators under alternative D, when predation of protected species is observed, would adversely impact certain mammals at the Seashore (primarily raccoons) from the direct removal of these species. However, impacts would likely be slight, as they would not be observed at the population level, and efforts would be made during removal of the predators to ensure that management actions are conducted as humanely as possible to minimize the suffering of the animals.

Reptiles and Amphibians

As described for alternative A, continued ORV use under alternative D would likely result in noise disturbance for certain reptile and amphibian species in the area of analysis (e.g., snakes and lizards), which can lead to increased stress, loss of hearing, and/or habitat avoidance (Switalski and Jones 2010). The use of vehicles under alternative D could also result in direct injury and mortality of individual species from species being crushed by vehicles. However, the designation of new pedestrian-only areas, the seasonal restriction on UTV use, the year-round prohibition of ATVs, ORV trailers, and high-

performance sport-model and two-stroke UTVs, the exclusion of ORV routes where ferry landings do not exist, and a seasonal restriction on night driving would help mitigate some of the adverse impacts of ORV use on reptiles and amphibians at the Seashore by limiting the potential for contact between vehicles and individual species.

Cumulative Impacts under Alternative D

The past, present, and future actions discussed under the cumulative impact scenario for alternative A would be the same under alternative D, which would be adverse (from crushing and compaction during dredging activities, short-term burial during beach re-nourishment, increased recreational use following implementation of the *Commercial Services Plan / Environmental Assessment / Assessment of Effect*, temporary displacement caused by aircraft overflights, and direct mortality of pelagic birds from collisions with turbine blades following development of off-shore wind stations), as well as beneficial (from resource protection and education measures in the *Interim Off-road Vehicle Management Plan and Evaluation of Existing ORV Use at Cape Lookout National Seashore* and from creating new bird nesting habitat through stabilization of historic structures and measures to reduce predation and provide protection to bird species inhabiting areas designated under critical habitat and recovery plans). These impacts, combined with the long-term adverse impacts under alternative D, would likely result in long-term adverse cumulative impacts. While adverse effects on wildlife from other actions occurring in the region would still exist, measures providing greater resource protection under alternative D, such as expanded pedestrian-only use areas and a vehicle permit limits set at eight percent less than historical average use on each island, would result in protections that would be beneficial to wildlife populations and would offset some of the adverse effects.

ALTERNATIVE E

Impacts of Alternative E

Resource Management Activities

Surveying and Monitoring—Under alternative E, as under alternative A, NPS staff would perform surveys of historical nesting areas for protected species and would also continue to monitor breeding, nesting, and fledging activities throughout the breeding season. Surveying activities would likely result in limited adverse impacts on other bird species. Due to the limited amount of vehicles used by staff and the fact that such use would occur predominantly during the day, adverse impacts on beach invertebrates (and potentially reptiles and amphibians) from resources management activities would be limited across all alternatives.

Predator Management—As under alternative A, recreational use under alternative E would continue to have indirect impacts on other bird species through the attraction of predators, which would result in mortality of the predated species.

Full Recreational or ORV Closures—Under alternative E, as under alternative A, the provision of full recreational closures (ORV closures would not be applicable under alternative E) for prenesting and nesting protected bird species would indirectly benefit wildlife species, resulting in benefits for those bird species.

ORV and Other Recreational Use

Invertebrates

The closure of the Seashore to ORV access and use would remove a source of disturbance and mortality for invertebrate species, resulting in long-term benefits. Although ORV access and use would be prohibited, essential vehicles would continue to use routes as designated in alternative A. Any adverse impacts that could result from essential vehicle use would likely be slight because use would be limited.

Although pedestrians would still be allowed to access the Seashore, any disturbance that could result would be slight compared to the effects of vehicle use on invertebrate species. Pedestrian-related impacts to invertebrates may occur as a result of either trampling of invertebrate habitat or direct mortality through crushing underfoot. However, because pedestrians travel at slower speeds than vehicles, they are able to respond more quickly to the visible presence of invertebrates and readily avoid disturbances to invertebrates at the Seashore (Lucrezi and Schlacher 2009).

Other Bird Species

As described for invertebrates, the closure of the Seashore to ORV access and use would remove a source of disturbance and mortality for other bird species. Any adverse impacts that could result from essential vehicle use would likely be slight because use would be limited and NPS staff would take the necessary measures to avoid disturbance of nesting and foraging birds. The continued presence of pedestrians would remain as a source of disturbance, resulting in temporary displacement of individual species. However, any adverse impacts that would result are expected to be limited compared to the impacts of ORV use on nesting and foraging birds.

Mammals

The closure of the Seashore to ORV access and use would remove a source of noise and habitat disturbance for mammals, resulting in long-term benefits.

Any adverse impacts that could result from essential vehicle use would likely be slight because use would be limited and NPS staff would take the necessary measures to avoid disturbance of preferred habitat. The continued presence of pedestrians would likely remain as a source of noise disturbance, potentially resulting in temporary displacement of individual species. However, any adverse impacts that would result are expected to be limited compared to the potential impacts associated with ORV use (e.g., species injury and destruction of habitat).

Reptiles and Amphibians

The closure of the Seashore to ORV access and use would remove a source of disturbance (e.g., noise, species displacement) and mortality for certain reptile and amphibian species, resulting in long-term benefits. Although essential vehicle use would continue and pedestrians would still have access to the Seashore, adverse impacts would likely be short-term and slight compared to the potential impacts (i.e., injury and/or direct mortality) of ORV use on individual species.

Cumulative Impacts under Alternative E

The past, present, and future actions discussed under the cumulative impact scenario for alternative A would be the same under alternative E, which would be adverse (from crushing and compaction during dredging activities, short-term burial during beach re-nourishment, increased recreational use following

implementation of the *Commercial Services Plan / Environmental Assessment / Assessment of Effect*, temporary displacement caused by aircraft overflights, and direct mortality of pelagic birds from collisions with turbine blades following development of off-shore wind stations), as well as beneficial (from resource protection and education measures in the *Interim Off-road Vehicle Management Plan and Evaluation of Existing ORV Use at Cape Lookout National Seashore* and from creating new bird nesting habitat through stabilization of historic structures and measures to reduce predation and provide protection to bird species inhabiting areas designated under critical habitat and recovery plans). These impacts, combined with the extensive long-term adverse impacts under alternative E, would likely result in long-term adverse cumulative impacts. While adverse effects on wildlife from other actions occurring in the region would still exist, prohibition of ORV access and use would result in protections that would be beneficial to wildlife populations and would offset some of the adverse effects.

COMPARISON OF ALTERNATIVES

Alternative E would provide the highest level of protection and result in fewer adverse impacts compared to alternatives A, B, C, or D. Under alternative E, although continued pedestrian access would likely result in short-term disturbance (e.g., noise, temporary disturbance) of wildlife and wildlife habitat, long-term beneficial impacts would result from prohibiting ORV access at the Seashore as native habitat would have the opportunity to recover from heavy vehicle use and a considerable source of disturbance would be removed.

Impacts of ORV and other recreational use would result in long-term adverse impacts on wildlife and wildlife habitat under alternative B. Allowing continued ORV access along approximately 81 percent (45 miles) of the Seashore would contribute to these long-term impacts, including noise disturbance, temporary displacement, and potentially injury/mortality of individuals. However, impacts would be reduced when compared to alternative A (the no-action alternative) due to increased education and outreach; the use of additional species management measures, such as a seasonal restriction on night driving from May 1 through August 31; and the prohibition on all high-performance sport-model and two-stroke ATVs and UTVs. Compared to alternative E, impacts on wildlife and wildlife habitat would be greater under alternative B, because alternative E prohibits public ORV use on the Seashore, eliminating this source of adverse impact to wildlife and wildlife habitat. Further, alternative E reduces the impact from pedestrians, who without transportation opportunities to more remote areas of the Seashore would likely be limited to areas in general proximity to the ferry landing areas.

Under alternative C, the impacts of ORV and other recreational use would result in long-term adverse impacts on wildlife and wildlife habitat from noise disturbance, temporary displacement, and potentially injury/mortality of individuals. However, impacts would be reduced when compared to alternative A (the no-action alternative), due to increased education and outreach; the use of additional species management measures, such as a seasonal restriction on night driving from May 1 through September 14; the increase in the amount of pedestrian-only use areas by 4 miles; the closing of ORV routes where no ferry access is available; the prohibition of all high-performance sport-model and two-stroke ATVs and UTVs at the Seashore; shorting the timeframe that non-sport ATVs and UTVs would be permitted within the Seashore each year (reducing the March 16 through December time under alternative A to September 15 through December 15); the reduction in the amount of Seashore open to public ORV use; and the fee-based ORV permitting system that would also limit the number of vehicles on the Seashore. Compared to alternative E, the severity of impacts on wildlife and wildlife habitat under alternative C would be greater due to public ORV use being allowed under alternative C, whereas it would be prohibited under alternative E. The prohibition of public ORV use under alternative E would also reduce the amount of impacts from pedestrians, because without ORVs to access remote areas of the Seashore, pedestrians would likely be limited to areas in general proximity to the ferry landing areas.

Alternative D would also result in long-term adverse impacts on wildlife and wildlife habitat from disturbance, temporary displacement, and potentially injury/mortality of individuals. However, impacts would be reduced when compared to alternative A (the no-action alternative), due to increased education and outreach; the use of additional species management measures, such as a seasonal restriction on night driving from May 1 through September 14; the closing of ORV routes where no ferry access is available; the reduction in the amount of Seashore open to public ORV use; the implementation of a vehicle permit program and the reduction in the number of public ORVs allowed on the Seashore by 8 percent; the prohibition of all ATVs, as well as all high-performance sport-model and two-stroke UTVs at the Seashore; and the shortening of the timeframe that non-sport UTVs would be permitted within the Seashore each year (reducing the March 16 through December 31 timeframe under alternative A to September 15 through December 15). Compared to alternative E, impacts on wildlife and wildlife habitat under alternative D would be greater due to public ORV use being allowed under alternative D, whereas it would be prohibited under alternative E. The prohibition of public ORV use under alternative E would also reduce the amount of impacts from pedestrians, because without ORVs to access remote areas of the Seashore, pedestrians would likely be limited to areas in general proximity to the ferry landing areas.

Under alternative E, prohibiting public ORV use at the Seashore would provide long-term beneficial impacts to wildlife and wildlife habitat compared to alternative A, under which public ORV use would be allowed along approximately 81 percent of the Seashore. While continued pedestrian access under alternative E could result in some short- and long-term disturbance (e.g., noise, temporary displacement, etc.) of wildlife, these impacts would be reduced compared to alternative A because without the use of ORVs, pedestrian use under alternative E would likely be limited to areas in the general proximity to the ferry landing areas. As a result, alternative E would provide more protection and result in fewer adverse impacts to wildlife and wildlife habitat compared to alternative A.

CONCLUSION

Overall, impacts on non-listed wildlife species from ORVs and other recreational use under alternatives A, B, C, and D are expected to be long-term and adverse. The continued use of ORVs at the Seashore under these alternatives would result in direct adverse impacts on invertebrate species primarily due to injury and/or mortality from compaction by, or collision with, vehicles arising from unrestricted driving in the intertidal and wrack areas. However, as discussed above in the Schlacher and others (2008) study, the number of ORVs at the Seashore would have been a noticeable source of impact on invertebrates. Allowing continued ORV access and access for visitors to the Seashore would contribute to these adverse impacts through noise, disturbance, temporary displacement, and increased frequent escape flights. However, restrictions on night driving under alternative B would help mitigate some of these adverse impacts of vehicle use on invertebrates. Under alternative C, increased education and outreach, the use of additional species management measures such as a seasonal restriction on night driving, and additional restrictions on ATV and UTV use would likely help mitigate the long-term adverse impacts of ORV use on wildlife species by reducing vehicular contact with individual species and educating visitors on the importance of resource protection. Under alternative D, impacts would be reduced when compared to alternative A due to the reduction of ORV use areas as well as increased education and outreach and the use of additional species management measures and ATV and UTV use restrictions. Under alternative E, considerable, long-term beneficial impacts would result from prohibiting ORV access at the Seashore as native habitat would have the opportunity to recover from heavy vehicle use, and a considerable source of disturbance would be removed. Prohibiting ORV access at the Seashore would remove a source of disturbance and mortality for invertebrates, resulting in long-term beneficial impacts that may cause positive changes in species abundance and ecosystem diversity at the Seashore. Although continued pedestrian access would likely result in short-term disturbance (e.g., noise, temporary disturbance) of wildlife and wildlife habitat under alternative E, adverse impacts on invertebrates are expected to be slight and short-term from potential noise disturbance related to continued pedestrian access.

Significance Discussion

The purpose of the Seashore is to preserve the outstanding natural, cultural, and recreational resources and values of a dynamic, intact, natural barrier island system where ecological processes dominate. The Seashore is one of the few remaining locations on the Atlantic Coast where visitors can experience and recreate in an undeveloped, remote barrier island environment that can be reached only by boat or ferry. The Seashore is mandated to maintain parts of the natural ecosystems of all plants and animals native to park ecosystems. While there are many species located at the Seashore, this discussion of potential impacts on mammals, reptiles, amphibians and invertebrates focuses on those non-listed species likely to occur in habitat where ORV use is permitted. The greatest concerns related to these species are impacts associated with ORV use.

These non-listed species currently receive indirect protection at the Seashore, as they can occur and breed in areas with federally listed species (e.g., piping plover). These protections would increase in varying degrees under alternatives A, B, C, and D. These protections would further increase under alternatives C and D, which limit ORVs to historical limits, and would dramatically increase under alternative E, since the elimination of ORVs may cause an increase in the reproductive success of these non-listed species. Adverse impacts to these species across all alternatives would be small, as described in the analysis above. While there may be occasional adverse impacts to individual birds, under all alternatives the Seashore would continue to conduct indirect monitoring and other species buffers and closures. A decrease in recreational uses during seasonal closures, as discussed in the alternatives, help protect wintering individuals of these species along the Seashore. Under alternatives B, C, and D, additional protections for piping plovers (ban on night driving, etc.) would indirectly benefit these species. These measures would be a beneficial change for these nonlisted species, compared to the existing condition, greatly reducing, and in some cases eliminating impacts from ORVs, and would not result in significant adverse impacts.

Under alternatives A, B, C, and D, designating legal routes for ORV use does not establish a precedent for future actions with significant effects, as ORV use has occurred at the Seashore since the 1930s and continued since the establishment of the Seashore as a park unit in 1976, and the current and proposed species protection measures are substantial, resulting in a low overall level of impacts to non-listed species. ORV use is also currently legally permitted in several other national seashores and recreation areas, and in this regard is not precedent-setting within the national park system. As described above, ORV use does not cause significant impacts to non-listed species, in part because of the substantial resource protection and mitigation measures taken by the Seashore, as well as the adaptive management strategy in alternatives B, C, and D, which would further strengthen mitigation measures and even limit use if certain indicators are met. Alternative E, which prohibits ORV use, would not establish a precedent for future actions with significant effects to non-listed, as many other national park units do not allow ORV use.

There are a number of cumulative impacts to non-listed species, described in the impacts analysis above, which may be short- and long-term, limited, and adverse, as well as long-term beneficial. However, while adverse effects on non-listed species from other actions occurring in the region would still exist, actions under alternatives A, B, C, D, and E would provide additional protections that would be beneficial to the regional population of these species and would mitigate any significant adverse cumulative impacts already occurring.

In conclusion, compared to the existing condition, additional impacts to non-listed species under alternatives A, B, C, D, and E would be minimal. The Seashore has in place substantial resource protection and mitigation measures which would continue and would be strengthened in the action alternatives. When compared to the existing condition, in light of the significance criteria at 40 CFR

1508.27, there would be no significant adverse impacts to non-listed species from alternatives A, B, C, D, or E.

SOUNDSCAPES/ACOUSTIC ENVIRONMENT

GUIDING REGULATIONS AND POLICIES

An intact natural soundscape enhances visitor experience and allows for natural functioning of wildlife communication. Regarding general park soundscape management, NPS *Management Policies 2006*, section 4.9 “Soundscape Management,” requires that the NPS “preserve, to the greatest extent possible, the natural soundscapes of parks.” Additionally, the NPS “will restore to the natural condition wherever possible those park soundscapes that have become degraded by the unnatural sounds (noise), and will protect natural soundscapes from unacceptable impacts” (NPS 2006d). Director’s Order 47: Soundscape Preservation and Management, was developed to emphasize NPS policies “that will require, to the fullest extent practicable, the protection, maintenance, or restoration of the natural soundscape resource in a condition unimpaired by inappropriate or excessive noise sources.” This Director’s Order also directs park managers to measure acoustic conditions, differentiate existing or proposed human-made sounds that are consistent with park purposes, set acoustic goals based on the sounds deemed consistent with the park purpose, and determine which noise sources are impacting the parks (NPS 2000f).

METHODOLOGY AND ASSUMPTIONS

Two metrics were used to assess soundscape impacts: $L_{eq}(h)$ and L_{max} . $L_{eq}(h)$ is the one-hour energy-equivalent sound level. L_{eq} is a way of summarizing variable sound levels into a single numerical value that reflects the cumulative acoustical energy measured over time (in this case one hour). The $L_{eq}(h)$ metric takes into account the number of ORV passbys and the times in between passbys when there is no ORV noise. More specifically, the change in $L_{eq}(h)$ during the hour with the most ORV activity was used to identify the areas where ambient sound levels would increase by 3 dBA or more due to motorized vehicles. Similarly, the areas experiencing a 3 dBA change in ambient sound levels during an ORV passby was assessed using the L_{max} metric. L_{max} is the loudest sound that would occur during a given period of time. The rationale for the 3 dBA change criterion for assessing impacts is explained below, followed by further details on the modeling methodology.

Background Information on Reduction in Listening Area

An increase in the ambient noise level affects the ability of humans and animals to perceive other sounds within a certain distance. In general, the higher the ambient noise level, the shorter the distance from which other sounds (for example those of a songbird) can be heard. This concept is expressed in terms of listening area and alerting distance. In terms of impact metrics, a 3 dBA increase in the natural ambient is an important indicator of potential impact because it results in a 50 percent reduction in listening area for humans and animals and a 30 percent reduction in alerting distance, as described below (NPS 2010a).

Listening Area—The largest area around a person or animal where a sound is still audible.

Alerting distance—Longest linear distance between a person or animal and a sound source where the sound source is still audible.

Reduction in listening area quantifies the loss of hearing ability to humans and animals as a result of an increase in ambient noise level. Under natural ambient conditions a sound is audible within a certain area around a visitor or animal. If the ambient level is increased due to a noise event, the area in which the

sound is audible decreases. Table 52 and figure 27 illustrate the relationship between increased ambient and listening area reduction.

TABLE 52: REDUCTION IN LISTENING AREA AND ALERTING DISTANCE DUE TO INCREASES IN AMBIENT LEVELS

dBA Ambient Increase	3	6	10	20
Percent Reduction in Listening Area	50%	75%	90%	99%
Percent Reduction in Alerting Distance	30%	50%	70%	90%

For example, under natural ambient conditions, an owl perched in a tree may be able to hear a mouse scurrying through the brush anywhere within an area of 100-square-meters of the perch. If a noise event increases the ambient level by 3 dBA, the area in which the owl can hear a mouse would decrease by 50 percent to approximately 50 square meters.

Reduction in alerting distance is closely related to reduction in listening area. The residual alerting distance is equal to the square root of the residual listening area. Instead of addressing losses in terms of an area, reduction in alerting distance expresses the reduction as a linear distance from a source. For example, under natural ambient conditions, a hiker may be alerted to the sound of a flash flood at a distance of 1 mile. If a noise such as an ORV increases the ambient level by 6 dBA, the distance at which the flood could be detected would decrease by 50 percent to approximately 1/2 mile or 2,640 feet (NPS 2010a).

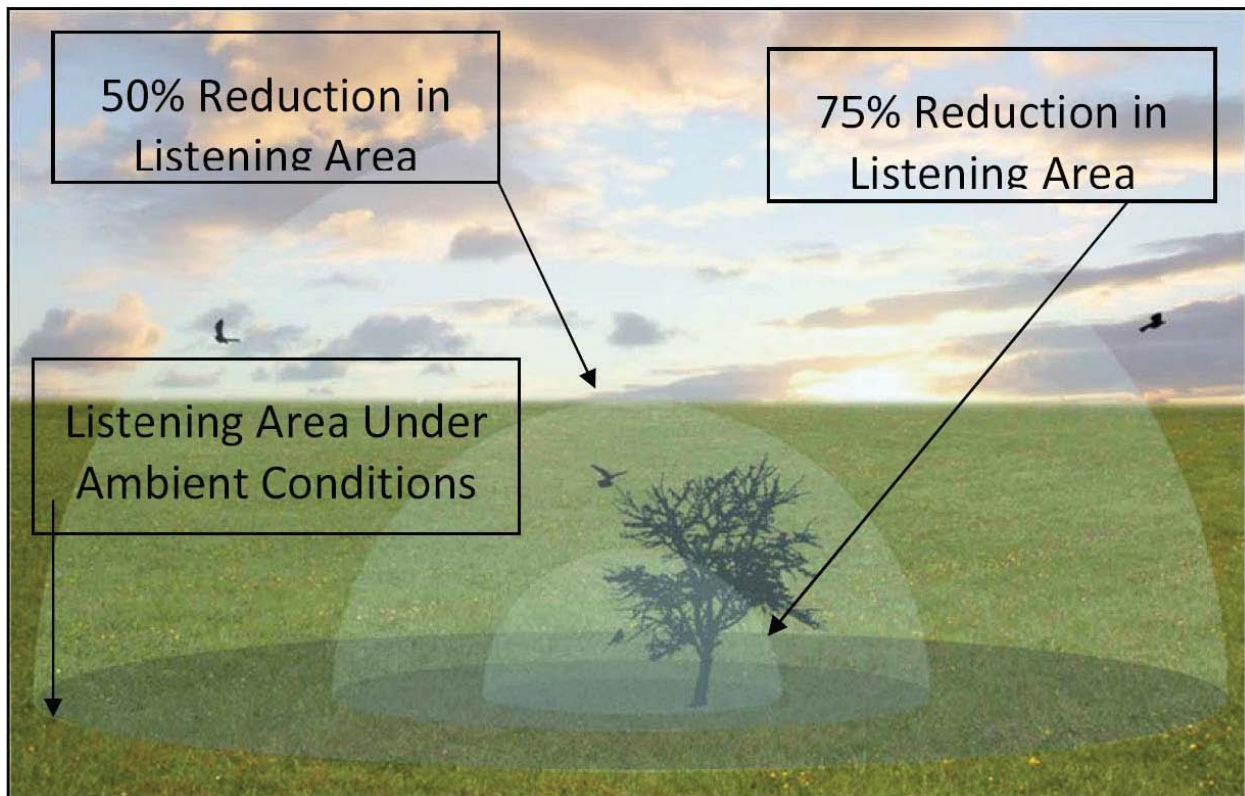


FIGURE 27: REDUCTION IN LISTENING AREA

Visitors and wildlife are impacted by their failure to hear natural sounds that would have been audible in the absence of noise: a bird misses the sound of a worm, a mouse misses the footfall of a coyote, a visitor misses the sound of a distant waterfall. Reductions in listening area and alerting distance capture these types of impacts.

Estimated Natural Ambient Methodology

Soundscapes monitoring at Portsmouth Island (on North Core Banks) was conducted between May 6, 2008, and June 3, 2008 (NPS 2013j). The monitoring site was located approximately 1,500 feet from the surf and was shielded from the surf by intervening sand dunes. A detailed analysis of the natural ambient sound level at the monitoring site was not available, but was assumed to be approximately equal to the L_{90} sound level (e.g., sound level exceeded 90 percent of the time), consistent with the recommendations of Director's Order 47 for determining background sound levels. The L_{90} sound level was 35.9 dBA during the day and 42.9 dBA at night. The daytime L_{90} level was used for impact assessment purposes because the majority of ORV activity occurs during the daytime.

L_{90} —The sound level that is exceeded 90 percent of the time. In other words, sounds were louder than the L_{90} level only 10 percent of the time in the analysis period. L_{90} is useful as an indicator of the background ambient sound level.

With monitoring results available for only one location, it was necessary to estimate natural ambient levels in other portions of the Seashore for incorporation in the impact assessment. The natural ambient sound levels at the Seashore vary substantially in different areas. On the oceanside of the islands, the surf and wind are the dominant sounds. The sound level at 50 feet from the surf was estimated based on the monitoring at Portsmouth Island, correcting for attenuation over soft cover (4.5 dBA per doubling of distance).² An additional 5 dBA shielding correction was applied in the calculation of the surf sound level at 50 feet because the height of the dunes blocked line-of-sight between the monitor location and surf (FHWA 2000).³ The ground elevation at the monitor site (based on Light Detection and Ranging data) was 4.9 feet and the microphone was placed 1 meter above the ground, for a total elevation of 8.2 feet. The elevation of the top of the intervening dunes varied between 10 feet and 14 feet. The resulting estimate of the surf plus wind natural ambient was 63 dBA at 50 feet from the surf line. Table 53 summarizes the natural ambient assumed for the impact analysis as a function of distance from the surf line. Note that the location of the dunes in the modeling area (peak dune elevation at 300 feet from surf) differs from the monitored area (peak dune elevation at 1,000 feet from surf), but the modeled area dune conditions are considered representative of a greater length of the Seashore than the monitored site.

² Due to linear nature, the surf was treated as a "line source."

³ 5 dBA is a general insertion loss for a noise barrier that just blocks line-of-sight.

TABLE 53: ESTIMATED NATURAL AMBIENT AT VARIOUS DISTANCES FROM SURF

Distance from Surf (feet)	Natural Ambient (dBA) ^a	Landmarks/Notes
50	63	Reference distance for surf
150	55.8	Assumed travel location for ORVs on beach
200	54.0	Approximate dune line in modeling area(varies)
300	46.3	Approximate highpoint of dunes in modeling area (varies)- 5 dBA shielding correction begins to apply
500	43.0	Approximate location of interior road (varies)
800	39.9	Soundside marsh
1,000	38.5	
1,500	35.8	Distance to surf for soundscapes monitoring site
2,000	34.0	
4,000	29.5	Distant soundside islands (such as Cowpen Island)

^a Surf noise assumed to attenuate at 4.5 dBA per doubling of distance. 5 dBA shielding correction for dunes applied at distances 300 feet and greater from surf.

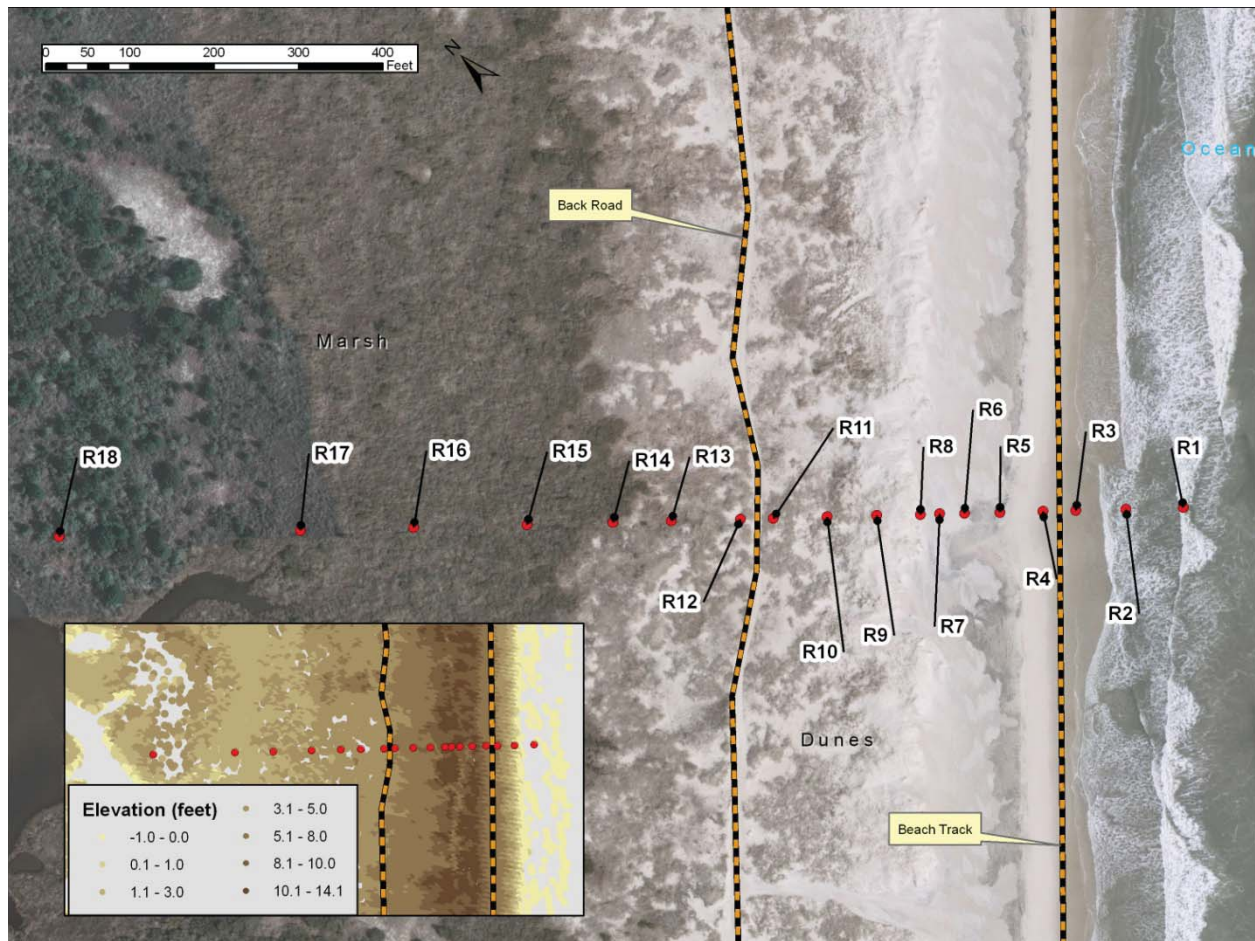
ORV L_{eq} Modeling Methodology

The Federal Highway Administration Traffic Noise Model Version 2.5 (TNM2.5) was used to model the $L_{eq}(h)$ attributable to ORVs along a typical section of the Seashore. The TNM2.5 modeling takes into account the key factors influencing ORV sound levels at the Seashore, including terrain (a highpoint occurs on the dunes, providing some shielding from ORV noise travelling from one side of the island to another in most areas), ground cover type (sand, vegetated areas, open water) and vehicle types (automobiles and ATVs), and the effect of speed (25 mph limit in most areas). Motorcycles are not permitted to operate at the Seashore, but were used as a proxy for ATV noise emissions for the TNM2.5 modeling (ATVs were not included in the Federal Highway Administration data collection supporting TNM development).⁴

Rather than modeling the entire Seashore, a typical area was selected for modeling considered generally representative of many areas along both the North Core and South Core Banks. Thus the results of the modeling of the typical area can be used to draw conclusions about soundscapes impacts across the Seashore. Figure 28 provides an overview of the modeling area, which is located on North Core Banks, 6.2 miles north of the Long Point cabins and ferry landing. A total of 18 receptor points (locations where sound levels are calculated) were placed in a line across the island to provide information on $L_{eq}(h)$ at different distances from the beach and interior back route. Vehicles on the beach were assumed to operate

⁴ ATVs were not included in TNM development because the focus of the model was on-road noise analysis. ATV and motorcycle sound levels vary from vehicle model to vehicle model and the specifics of the test procedure utilized. However, the general similarity of ATV and motorcycle sound levels is supported by the data reported in California Off-Highway Vehicle Noise Study (Wyle 2005). Under the SAE J-1287 test procedure, ATV sound levels were 80–95 dBA, compared to 84–104 dBA for motorcycles (at one-half of rated engine speed). Based on this data use of motorcycle data as a proxy for ATVs may over predict ATV noise impacts, but it should be noted that data comparing ATVs and motorcycles under conditions similar to operating conditions at the Seashore is not available (low speed (25 mph max) and on sand).

approximately 150 feet from the surf.⁵ Table 54 summarizes the receptor locations relative to the surf, beach ORV track and the interior back route. Receptors were modeled using a height of approximately five feet above ground level.



Source: <http://www.nconemap.com/>.

Note: Location is on the North Core Banks, 6.2 miles north of the Long Point cabins and ferry landing

FIGURE 28: ORV NOISE MODELING LOCATION AND RECEPTORS

⁵ ORVs are allowed to operate on the open beach between the dunes and the tide line. Therefore, the exact location of ORV operation on the beach is varies. However, the distance from the surf selected (150 feet) is conservative—vehicles travelling closer to the surf (to take advantage of firmer sand for example) would generate less impact on soundscapes than vehicles traveling at 150 feet from the surf.

TABLE 54: NOISE MODELING RECEPTORS

Location	Receptor ID	Elevation (feet)	Distance to Surf (feet)	Distance to Beach Track (feet)	Distance to Interior Track (feet)
Beach	R1	-2.19	0	147	506
	R2	0.2	68	79	438
	R3	6.16	128	19	378
	R4	7.48	167	20	339
Dunes	R5	9.27	218	71	288
	R6	10.58	260	113	246
	R7	13.25	289	142	217
	R8	9.27	312	165	194
	R9	7.84	364	217	142
	R10	6.61	423	276	83
	R11	6.12	487	340	19
	R12	4.69	526	379	20
	R13	4.04	608	461	102
Marsh	R14	3.07	677	530	171
	R15	3.67	779	632	273
	R16	3.16	914	767	408
	R17	2.54	1,048	901	542
	R18	3.47	1,335	1,188	829

When terrain lines break line of sight between a noise source and a receptor, noise levels are reduced because the sound waves are forced to diffract over the protrusion. Terrain lines were used to reflect the typical topographic patterns of the island. Elevation information for all TNM inputs was obtained from bare earth Light Detection and Ranging data.⁶

As sound waves propagate away from a source they interact with the ground. Noise levels decrease most rapidly when traveling low over soft ground such as sand or grass, less rapidly over hard surfaces such as pavement. The beach and sand dune areas were modeled as the “loose soil” ground cover type to approximate sand. The ocean was modeled as “water” and vegetated areas associated with the Core Sound marsh lands as “field grass.”

All ORVs were assumed to be cruising at the Seashore speed limit of 25 mph.

Different numbers of ORVs were modeled to characterize the variation in ORV activity that occurs over the year and the potential effects of the action alternatives on the number of ORV visitors to the Seashore. Table 55 summarizes the modeled ORV volume scenarios. For modeling of the existing condition and the anticipated condition under alternative A, 2007-2012 NPS data on the estimated number of ORVs on the

⁶ Light Detection and Ranging data distributed by <http://www.ncfloodmaps.com/>.

beach at Great Island was used to determine the average and peak daily volumes. The Great Island data was used because Great Island has higher annual ORV volumes than Long Point. The peak volume typically occurs during the fall fishing season.

TABLE 55: ORV USE LEVELS FOR NOISE MODELING (L_{eq})

	Existing Conditions/ Alternative A		10% Reduction in ORV Visitation - Alternatives B, C, and D		30% Reduction in ORV Visitation - Alternatives B, C, and D		100% Reduction in ORV Visitation- Alternative E	
	Average Use Level (March- December)	Peak Use Level	Average Use Level (March- December)	Peak Use Level	Average Use Level (March- December)	Peak Use Level	Average Use Level (March- December)	Peak Use Level
ORVs on beach and/or back route (Daily)	56	187	50	168	39	131	0	0
ORVs Passing in Peak Hour (assumed half of daily as worst case)	28	94	25	84	20	65	0	0
Number of Autos (87% of total ORVs), rounded	24	81	22	73	17	57	0	0
Number of ATVs (13% of total ORVs), rounded	4	12	3*	11*	3*	9*	0	0

* Number of ATVs shown primarily applicable to alternative B. ATVs would be eliminated all year under alternative D and eliminated part of the year under alternative C. The soundscapes impact of this change was modeled separately using 100% auto volumes.

Alternatives B, C, and D would implement ORV management measures such as permits/fees that could reduce ORV visitors compared to the existing condition. As discussed in the “Socioeconomics Resources” section, these alternatives could reduce ORV visitors on the order of 10 to 30 percent. There is a large degree of uncertainty in predicting visitor response to alternatives B, C, and D. Nevertheless, a 10 percent and a 30 percent reduction in ORV volumes (compared to the 2007-2012 averages) was modeled to provide information on the range of possible soundscape changes due to reduced ORV visitors. Alternative E was not modeled as ORV use by visitors would be eliminated.

NPS administrative ORV trips were assumed to be on average less than 10 a day in the summer and fall. In the winter, administrative trips would be on average less than three a day. Therefore, these low numbers of administrative trips would be adequately represented by the ORV use scenarios discussed above.

The daily ORV use levels discussed above were converted to peak hourly volumes under the conservative assumption that up to half of the total number of vehicles on the beach would pass the same point within one hour. In reality, ORV use would be more dispersed throughout the day and vehicles would spend a

significant amount of time parked in one location while people engage in fishing or other recreational activities. Detailed information on ORV routing to specific areas of the Seashore is not available.

Information on the number of ATVs on the beach at any one time is not available. However, 2007-2012 NPS data on ATVs transported by ferry is available and indicates that on average ATVs consist of 13 percent of vehicles arriving on ferries. The percentage varies substantially day to day, some days there are zero ATVs and other days the number of ATVs is greater than the other vehicle types. For alternatives A and B, ATVs were assumed to comprise 13 percent of the total number of ORVs (modeled as motorcycle vehicle type) and automobiles (including light trucks) were modeled as 87 percent of the total. ATVs would be eliminated all year under alternative D and part of the year under alternative C—this condition was analyzed using 100 percent auto volumes.

Two sets of model runs were conducted using the volumes shown in table 55. One set of model runs covered the typical condition of all the ORVs operating on the beach. A second set of model runs were conducted to analyze noise levels when all ORVs are traveling on the back route (such as when a particular beach area is closed to ORVs and the back route is used to bypass the affected area).

ORV L_{\max} Modeling Methodology

To convey information about the intensity of individual ORV passbys, an analysis using the L_{\max} metric was performed. L_{\max} is the loudest sound that would occur during an ORV pass by and does not take into account how often the sound is occurring. An advantage of the L_{\max} metric in comparison to L_{eq} is that it can be easier for people to relate to because it can be directly experienced during a vehicle passby (as opposed to the more abstract energy average level reflected by L_{eq} metrics).

For the L_{\max} analysis, passby noise levels for automobiles and motorcycles were obtained from the vehicle testing conducted for the development of Federal Highway Administration Traffic Noise Model. Motorcycles are not permitted to operate at the Seashore, but served as a proxy for ATV noise emissions (refer to “ORV L_{eq} Modeling Methodology” and the related footnote above). At a reference distance of 50 feet from the source and a speed of 25 mph (maximum permitted), cruise mode L_{\max} noise levels are as follows:

- Automobiles—60 dBA
- Motorcycles (ATV proxy)—68 dBA.

The reference noise levels are based on “average pavement,” not beach driving conditions. Reference L_{\max} levels for off-road conditions are not reported in the TNM technical manual (FHWA 1998). However, given the low speeds involved, the dominant noise source would be the vehicle engine itself, not the noise from tire-pavement interaction. Therefore, using the Federal Highway Administration noise emissions data was considered reasonable for this project.

ORV L_{\max} levels were adjusted for attenuation over soft cover (4.5 dBA per doubling of distance) and shielding provided by the dunes (where appropriate). The increase in the total sound level during an ORV passby was then compared to the natural ambient for each receptor location.

Non-ORV Noise Sources

The focus of the quantitative analysis was ORV noise because an ORV regulation is the subject of this ORV management plan/EIS and ORVs are the most common cause of human-related noise at the Seashore (Simons and Borneman 2012). Military overflights and other noise sources are considered in the

evaluation of cumulative impacts, but are not explicitly accounted for in the ORV modeling. Pedestrians and pets are not considered to be a major source of disturbance to natural soundscapes at the Seashore. Evidence for the low level of pedestrian-related noise is the number of human activity types recorded at American Oystercatcher nests in 2010 and 2011. There were less than 200 observations of pedestrians (through video and audio recording), compared to over 2,000 observations of passenger vehicles and over 1,000 observations of ATVs (Simons and Borneman 2012).⁷

ALTERNATIVE A

Impacts of Alternative A: No Action

Under alternative A, ORV use by visitors and by NPS for administrative purposes would continue at the Seashore similar to existing conditions. From March 16 through December 31, approximately 81 percent of Seashore beaches would be open to ORV use. Outside of this season (e.g., from January 1 through March 15), no ORV use would occur and there would be no impacts on soundscapes from that specific use. During the season when ORVs are allowed, the geographic extent and intensity of impacts would vary substantially day-to-day. Impacts on the more heavily visited South Core Banks would generally be higher than on the North Core Banks (refer to the “Visitor Use and Experience” section for detailed information on visitor numbers).

ATVs would be allowed at the Seashore under alternative A. Although expected to comprise a small proportion of the overall ORV total ⁸, ATV pass bys would be more noticeable than automobile passbys. For example, at full throttle, ATV sound levels at 50 feet can be between 75 and 90 dBA (L_{max}) depending on the specific model.⁹ However, full throttle conditions would be relatively rare given the 25 mph speed limit. Under cruise conditions, ATV L_{max} at 50 feet is 68 dBA or perceived almost twice as loud as a typical passenger car pass by at the same speed (60 dBA).¹⁰

In the near term, alternative A is not expected to change ORV use levels from existing conditions. For much of the season, ORV passbys would be an infrequent event (e.g., 56 per day under average use level) and would not be a prominent element of the beach-side soundscape. Because no limit on the number of ORVs visiting the Seashore would be established under alternative A, it is possible that ORV use and impacts on soundscapes could gradually increase over time. The extent to which ORV use would increase under alternative A is not known and cannot be reasonably projected.

No ORV-related soundscape impacts would occur in the designated pedestrian areas (19 percent of Seashore beaches (11 of 56 miles) year-round).

⁷ The military overflight study data suggests a higher percentage of ATVs operating on the beach compared to the NPS ferry data on ATVs being transported to the Seashore. The soundscapes modeling relied on the ferry data because the ferry data represents the entire year, compared to the military overflight studies that are focused on specific bird breeding seasons and at select nest locations.

⁸ 13 percent assumed for this analysis, see the methodology section for discussion of available data

⁹ EPA F-76a test method. <http://ohv.parks.ca.gov/pages/1140/files/ca%20ohv%20noise%20report%20wr%2004-31-06.pdf>

¹⁰ Based on assumption motorcycle noise measurements are representative of ATVs. http://www.fhwa.dot.gov/environment/noise/traffic_noise_model/old_versions/tnm_version_10/tech_manual/tnm02.cfm#tnm21

Alternative A would not restrict night-driving at the Seashore, potentially contributing to adverse impacts on soundscapes (the precise extent of night driving at the Seashore is not known). In general, humans are more sensitive to noise during the nighttime hours than the same noise occurring during the day (FTA 2006).

Detailed discussion of the modeling results for ORVs operating on the beach and back route is provided below, followed by discussion of cumulative impacts.

Impact of ORV Travel on Beach

Table 56 summarizes the modeling results for ORVs traveling on the beach. The impact of ORVs on $L_{eq}(h)$ during the March through December average use levels is low—the maximum increase over natural ambient at a distance of 20 feet from the ORV is 1.2 dBA. For reference, a 3 dBA change in sound levels is generally considered a barely perceptible change for humans. Impacts on L_{eq} at more distant receptors would be less than 1 dBA under average ORV use levels. The increase over natural ambient is smaller to the east (towards the ocean) because the surf noise quickly becomes dominant. Note that the ORV $L_{eq}(h)$ is less than the natural ambient at all locations. An increase over natural ambient would still occur because L_{eq} is a measure of total acoustic energy.

TABLE 56: ALTERNATIVE A L_{eq} MODELING RESULTS—IMPACT OF BEACH ORV USE

Receptor ID	Natural Ambient (dBA)	Average Use			Peak Use		
		Modeled ORV $L_{eq}(h)$ dBA	Total $L_{eq}(h)$ dBA	Change from Natural Ambient (dBA)	Modeled ORV $L_{eq}(h)$ dBA	Total $L_{eq}(h)$ dBA	Change from Natural Ambient (dBA)
R1	73.5	37.3	73.5	0.0	42.3	73.5	0.0
R2	60.8	42.2	60.9	0.1	47.2	61.0	0.2
R3	56.8	50.2	57.7	0.9	55.3	59.1	2.3
R4	55.0	50.2	56.2	1.2	55.2	58.1	3.1
R5	53.3	43.0	53.7	0.4	48.1	54.4	1.1
R6	52.3	39.4	52.5	0.2	44.4	53.0	0.7
R7	51.5	37.9	51.7	0.2	42.9	52.1	0.6
R8	46.1	36.2	46.5	0.4	41.2	47.3	1.2
R9	45.1	33.5	45.4	0.3	38.5	46.0	0.9
R10	44.1	31.4	44.3	0.2	36.4	44.8	0.7
R11	43.1	30.4	43.3	0.2	35.4	43.8	0.7
R12	42.6	29.0	42.8	0.2	33.9	43.1	0.5
R13	41.7	27.7	41.9	0.2	32.6	42.2	0.5
R14	41.0	26.9	41.2	0.2	31.9	41.5	0.5
R15	40.1	25.7	40.3	0.2	30.6	40.6	0.5
R16	39.0	24.1	39.1	0.1	29.1	39.4	0.4
R17	38.2	22.6	38.3	0.1	27.6	38.6	0.4
R18	36.6	20.4	36.7	0.1	25.4	36.9	0.3

Peak ORV use levels would result in a 2.3 to 3.1 dBA increase in $L_{eq}(h)$ over natural ambient at a distance of 20 feet from the ORVs. Increases over natural ambient would be less than 1.3 dBA at locations greater than 20 feet from the ORV path under the peak use scenario.

Table 57 provides the maximum instantaneous sound level that would occur due to a single ORV passby on the beach. This does not represent a sound level that would be continuously experienced by visitors and wildlife, but is a useful supplemental indicator for intermittent sound level that would be experienced by visitors and wildlife. An auto passby would result in an increase of up to 11.4 dBA over the natural ambient at 20 feet from the vehicle path. Increases of 3 dBA or greater would extend to R10 during an auto passby, 276 feet away in the dunes. An ATV passby would result in an increase over natural ambient of up to 19.1 dBA. Increases of 6 dBA or greater would extend past the most distant analysis location (R18) during an ATV passby, 1,188 feet away in the marsh. For reference, a 6 dBA increase corresponds to a 75 percent reduction in listening area (see table 52). A 10 dBA increase is sometimes perceived by humans as being twice as loud; while a 3 dBA increase is a barely perceptible change. A 10 dBA increase is equivalent to a 90 percent reduction in listening area, compared to a 50 percent reduction with a 3 dBA increase.

TABLE 57: ALTERNATIVE A L_{max} RESULTS—IMPACT OF BEACH ORV USE

Receptor ID	Natural Ambient (dBA)	Auto- On Beach			ATV- On Beach		
		ORV L_{max} dBA	Total dBA	Change from Natural Ambient (dBA)	ORV L_{max} dBA	Total dBA	Change from Natural Ambient (dBA)
R1	73.5	53.0	73.5	0.0	61.0	73.7	0.2
R2	60.8	57.0	62.3	1.5	65.0	66.4	5.6
R3	56.8	66.1	66.6	9.8	74.1	74.2	17.4
R4	55.0	66.0	66.4	11.4	74.0	74.1	19.1
R5	53.3	57.7	59.1	5.8	65.7	66.0	12.7
R6	52.3	54.7	56.7	4.4	62.7	63.1	10.8
R7	51.5	53.2	55.4	3.9	61.2	61.6	10.1
R8	46.1	47.2	49.7	3.6	55.2	55.7	9.6
R9	45.1	45.4	48.3	3.2	53.4	54.0	8.9
R10	44.1	43.9	47.0	2.9	51.9	52.5	8.4
R11	43.1	42.5	45.8	2.7	50.5	51.2	8.1
R12	42.6	41.8	45.2	2.6	49.8	50.6	8.0
R13	41.7	40.5	44.2	2.5	48.5	49.4	7.7
R14	41.0	39.6	43.4	2.4	47.6	48.5	7.5
R15	40.1	38.5	42.4	2.3	46.5	47.4	7.3
R16	39.0	37.2	41.2	2.2	45.2	46.1	7.1
R17	38.2	36.2	40.3	2.1	44.2	45.1	6.9
R18	36.6	34.4	38.6	2.0	42.4	43.4	6.8

The L_{max} results show ORV passbys would be distinctly perceptible events, even when the effect on the overall acoustic energy level (L_{eq}) is low due to the relatively low numbers of ORVs and the masking effect of the surf and wind.

Impact of ORV Travel on Back Route

Table 58 summarizes the modeling results for the three scenarios involving ORV travel on the back route. In general, the increases over natural ambient from ORV travel on the back route are much higher than the same number of ORVs on the beach because the natural ambient on the soundside of the islands is quieter than the oceanside.

TABLE 58: ALTERNATIVE A L_{eq} MODELING RESULTS—IMPACT OF BACK ROUTE ORV USE

Receptor ID	Natural Ambient (dBA)	Average Use			Peak Use		
		Modeled ORV $L_{eq}(h)$ dBA	Total $L_{eq}(h)$ dBA	Change from Natural Ambient (dBA)	Modeled ORV $L_{eq}(h)$ dBA	Total $L_{eq}(h)$ dBA	Change from Natural Ambient (dBA)
R1	73.5	24.4	73.5	0.0	29.4	73.5	0.0
R2	60.8	25.5	60.8	0.0	30.5	60.8	0.0
R3	56.8	30.2	56.8	0.0	35.1	56.8	0.0
R4	55.0	30.2	55.0	0.0	35.2	55.0	0.0
R5	53.3	32.0	53.3	0.0	37	53.4	0.1
R6	52.3	33.2	52.4	0.1	38.1	52.5	0.2
R7	51.5	34.5	51.6	0.1	39.5	51.8	0.3
R8	46.1	35.1	46.4	0.3	40.1	47.1	1.0
R9	45.1	37.4	45.8	0.7	42.4	47.0	1.9
R10	44.1	41.8	46.1	2.0	46.8	48.7	4.6
R11	43.1	50.2	51.0	7.9	55.2	55.5	12.4
R12	42.6	50.1	50.8	8.2	55.1	55.3	12.7
R13	41.7	40.6	44.2	2.5	45.6	47.1	5.4
R14	41.0	36.6	42.3	1.3	41.6	44.3	3.3
R15	40.1	33.1	40.9	0.8	38	42.2	2.1
R16	39.0	29.6	39.5	0.5	34.6	40.3	1.3
R17	38.2	27.3	38.5	0.3	32.3	39.2	1.0
R18	36.6	24.0	36.8	0.2	29	37.3	0.7

Under average use levels, the 3 dBA increase over ambient criterion would be exceeded within 20 feet of the road (R11 and R12). Under peak use, the 3 dBA increase would be exceeded out to R10 (83 feet away towards the dunes) and R14 (171 feet away towards the marsh). Under peak use, the impact at a distance of 20 feet is an over 12 dBA increase over natural ambient. For reference, a 10 dBA increase is sometimes perceived by humans as being twice as loud; while a 3 dBA increase is a barely perceptible change. A 10 dBA increase is equivalent to a 90 percent reduction in listening area, compared to a 50 percent reduction with a 3 dBA increase.

Table 59 provides the maximum instantaneous sound level that would occur due to a single ORV passby on the back route. As with the L_{eq} modeling results, the soundscapes impact of ORVs on L_{max} is greater when operating on the back route. An auto passby would result in an increase over the natural ambient of 6 dBA or greater between R8 (194 feet away in the dunes) and R18 (829 feet away in the marsh). These increases would be over 10 dBA with an ATV passby.

TABLE 59: ALTERNATIVE A L_{MAX} RESULTS—IMPACT OF BACK ROUTE ORV USE

Receptor ID	Natural Ambient (dBA)	Auto- Back route			ATV- Back route		
		ORV L _{max} dBA	Total dBA	Change from Natural Ambient (dBA)	ORV L _{max} dBA	Total dBA	Change from Natural Ambient (dBA)
R1	73.5	39.9	73.5	0.0	47.9	73.5	0.0
R2	60.8	40.9	60.8	0.0	48.9	61.1	0.3
R3	56.8	41.8	56.9	0.1	49.8	57.6	0.8
R4	55.0	42.5	55.2	0.2	50.5	56.3	1.3
R5	53.3	43.6	53.7	0.4	51.6	55.5	2.2
R6	52.3	44.6	53.0	0.7	52.6	55.5	3.2
R7	51.5	50.4	54.0	2.5	58.4	59.2	7.7
R8	46.1	51.2	52.4	6.3	59.2	59.4	13.3
R9	45.1	53.2	53.8	8.7	61.2	61.3	16.2
R10	44.1	56.7	56.9	12.8	64.7	64.7	20.6
R11	43.1	66.3	66.3	23.2	74.3	74.3	31.2
R12	42.6	66.0	66.0	23.4	74.0	74.0	31.4
R13	41.7	55.4	55.5	13.8	63.4	63.4	21.7
R14	41.0	52.0	52.3	11.3	60.0	60.0	19.0
R15	40.1	48.9	49.5	9.4	56.9	57.0	16.9
R16	39.0	46.3	47.1	8.1	54.3	54.5	15.5
R17	38.2	44.5	45.4	7.2	52.5	52.6	14.4
R18	36.6	41.7	42.9	6.3	49.7	49.9	13.3

Cumulative Impacts under Alternative A

Other than ORVs, other sources of manmade sounds at the Seashore include the following:

- Marine engines, including ferries, private motorboats and commercial fisheries traveling to or near the island would have long-term adverse impacts on soundscapes. Land-based soundscapes impacts with these activities are concentrated near the designated docking areas (areas where the noise is compatible with the use and visitor expectations for the ferry landing areas). Marine engines are limited to a maximum of 82 dBA at a distance of 82 feet. Marine engine noise exposure patterns could change in the future as a result of the establishment of a concession contracted passenger ferry service from Harkers Island and the Town of Beaufort to Shackleford Banks and the Cape Lookout lighthouse on South Core Banks through the use of somewhat larger vessels, as called for in the *Commercial Services Plan / Environmental Assessment / Assessment of Effect* (NPS 2007m) and the Passenger Ferry Departure Site EA (NPS 2013a). However, any change in soundscapes within the park itself would be minor, as evidenced by the dismissal of soundscapes as a topic for analysis in the Passenger Ferry Departure Site EA.
- Personal watercraft, the use of which is limited to 10 designated areas (which include the Long Point and Great Island ferry landing areas and along portions of the soundside of Shackleford Banks) would have long-term adverse impacts on soundscapes. Maximum personal watercraft

noise levels at 50 feet ranged from 68 to 76 dBA (NPS 2004a). Personal watercraft noise levels at Cape Lookout would be 73 dBA when operating 50-feet from the shoreline, decreasing to 68 dBA 100 feet from the shoreline, and 63 dBA 200 feet from the shoreline (assuming personal watercraft are operating at normal speed and obeying regulations). All personal watercraft operating within Cape Lookout are required to operate at flat-wake speed.

- Hunting, which can generate high-intensity sound levels from weapons firing (130 dBA +) would have long-term adverse impacts on soundscapes. Hunting is permitted at Cape Lookout in designated areas in accordance with state and federal regulations (NPS 2013b).
- Diesel electricity generators at some of the cabins and the Light Station Visitor Center would have long-term adverse impacts within a localized area near the cabins. The long-range interpretive plan recommends replacement of the generators at the visitor center with an alternative/cleaner power source (NPS 2011k).
- Small aircraft and military aircraft. United States Marine Corps conducts training flights in the Core Military Operations Area, which covers the North Core Banks and all but the southernmost portion of the South Core Banks. During the Wilson's plover and colonial waterbird nesting seasons from April through August in 2010 and April through August in 2011 there were 249 military aircraft flights in the Core Military Operations Area (Virginia Tech 2012). In 2008, NPS and United States Marine Corps agreed to lower the minimum altitude for tactical speed of the Core Military Operation Area from 10,000 feet to 3,000 feet above ground level. Soundscapes monitoring conducted in conjunction with a study of potential impacts on birds found that for 29 flights below 10,000 feet, the L_{max} was 67.7. For eight flights near 3,000 feet above ground level, the L_{max} was 79.7 dBA. Aircraft overflights are expected to continue to have long-term adverse impacts on soundscapes in the future.

Past, present and future construction actions such as dredging Beaufort Inlet and the rehabilitation of historic structures have short-term and intermittent adverse impacts on soundscapes. Dredging involves extensive marine engine use (discussed above) and other heavy-duty equipment; while rehabilitation of historic structures primarily involves hand power tools and trucks to transport building materials (creating impacts similar to those analyzed for ORV passbys).

A past action that continues to influence soundscapes is the *Finding of No Significant Impact for the Cape Lookout National Seashore Interim Protected Species Management Plan/Environmental Assessment* (2007r), which prohibited ORVs from driving between mile markers 41a and 41b, Power Squadron Spit, the interior of the point of Cape Lookout, and on Portsmouth Flats. Interim management measures to protect special-status species such as the piping plover and sea turtle also affect soundscapes by rerouting ORV traffic to the back route, thereby reducing human-caused sound intrusion on the beach, but increasing it on the bay side and through the use of ATVs by NPS staff for implementation of resource protection measures.

The Cape Lookout GMP was established in 1982. The 1982 GMP provided the framework that allowed existing ferry service and ORV travel on the islands to continue, as well as improvements to visitor and administrative facilities. Additional visitor accommodations were constructed at Great Island and Long Point as a result of the 2001 GMP amendment, increasing the maximum potential overnight visitors and increasing potential human-caused sound, such as ORVs. The 2001 amendment also resulted in temporary construction noise disturbance from building demolition, but subsequently returned to normal levels. In 2012, the Seashore completed their *Foundation Document* (NPS 2012s), which details priority projects and planning needs. To the extent that the priority planning efforts detailed *Foundation Document* allows for future development, impacts to soundscape would include temporary noise from

construction projects, and increased noise levels from visitation in newly developed areas, should that occur.

The overall combined impacts of these past, current, and future actions on soundscapes would be long-term adverse. However, the geographic and temporal extent of soundscapes impacts would be greatly variable across the Seashore. Human-caused sounds would be most prevalent near the ferry landing sites and cabin camps where they are consistent with the use of these areas. In more remote areas along the beach or back route, human-caused sounds would be rare and undisturbed natural soundscapes would be the predominant condition. Aircraft overflights would be the predominant human-caused sound during the winter season when visitor centers and other services are not open. Marine engine noise would be the main contributor to cumulative impacts at ferry landings between April and November. ORV noise would be main contributor to cumulative impacts away from the ferry landings. These impacts, combined with the long-term adverse impacts under alternative A, would likely result in long-term adverse cumulative impacts. Alternative A would not offset the adverse impacts of these other impacts because ORV use would continue similar to existing conditions (including night time use, use of ATVs, and no limit on total use level).

ALTERNATIVE B

Impacts of Alternative B

Under alternative B, ORV use (by visitors and by NPS for administrative purposes) would continue at the Seashore and the general patterns (geographic and seasonal) and intensity of ORV use would be similar to the description of the impacts of alternative A. As with alternative A, up to 81 percent of the Seashore beaches would be available for ORV use from March 16 through December 31 under alternative B. However, alternative B includes restrictions on certain types of ATVs and UTVs, night driving restrictions, back route improvements and a permit system that would slightly reduce ORV impacts on soundscapes relative to alternative A, as discussed below.

Under alternative B, all high-performance sport-model and two-stroke ATVs and UTVs (as defined by the manufacturer) would be prohibited after a five-year grace period. This provision would eliminate the noisiest vehicle types¹¹ from the Seashore and would likely have a long-term beneficial impact on soundscapes. However, the specific number of high-performance sport-model and two-stroke ATVs being used at the Seashore is not known, therefore it is not possible to determine the extent to which motorized intrusions on natural soundscapes would be reduced relative to existing conditions as a result of this requirement. There is also insufficient data available to characterize the L_{max} level of the ATVs eliminated by this requirement in comparison to those that would be allowed. ATV noise levels vary model to model and depend on numerous design and operation characteristics. No data were located identifying sound levels specific to high-performance or sport-model ATVs. Therefore, it is not possible to make a conclusive comparison between typical ATVs and high-performance sport-model ATVs.

¹¹ No studies specifically addressing two-stroke and high-performance ATV noise characteristics compared to other types of ATVs were located in a literature search. However, two-stroke engines tend to generate higher noise levels than four-stroke engines in other types of vehicles that have been studied in detail, including snowmobiles (*Yellowstone National Park Winter Use Plan/Supplemental Environmental Impact Statement*). Therefore, it is reasonable to conclude two-stroke ATVs generate higher noise levels than four-stroke ATVs. In general, high performance engines are capable of generating higher maximum noise levels than typical engines for a given type of vehicle.

Under alternative B, night driving would be prohibited from 9 p.m. to 6 a.m. from May 1 through August 31. There would be no impact on soundscapes during the night hours when the prohibition is in effect (no change in listening area/alerting distance/visitor experience). This is a beneficial effect on soundscapes because overnight visitors may be especially sensitive to motorized sounds occurring at night.

The back route would be retained under alternative B. Regular maintenance of the back route would occur and pull-outs along the back route would be provided for opposing vehicles to pass each other and designated campsites would be established along the back route for emergency camping. As a result of these changes to the back route, it is possible that ORV travel on the back route could increase slightly relative to alternative A.

The permit system (with fees) established under alternative B could result in reduced ORV use relative to alternative A (depending on the sensitivity of visitors to price) and result in long-term beneficial impacts on soundscapes. As discussed in the “Socioeconomics Resources” section, the precise effect of this change is uncertain, but is anticipated to be in the range of 10 to 30 percent decrease in ORV visitors. Table 60 shows the range of L_{eq} sound level changes associated with a 10 to 30 percent reduction in ORV volumes on the beach. The difference between a 10 percent reduction and a 30 percent reduction in ORVs in terms of L_{eq} is negligible. Because of the logarithmic nature of decibels (dBs), it would take a doubling or halving of the number of ORVs to result in a 3 dBA change in L_{eq} (all other factors held constant). The 3 dBA criterion would not be exceeded at the modeled receptors under either the 10 percent or 30 percent ORV volume reduction scenarios.

Table 61 compares the change from natural ambient under alternative A with the change from natural ambient with the reduced ORV volumes on the beach under alternative B. Overall, the differences are minor. In terms of average use, the difference is 0.3 dBA or less. The difference is greater under peak use, with the hypothetical 30 percent reduction in ORV volumes under alternative B resulting in up to 0.7 dBA less change in the natural ambient than alternative A.

As shown in table 62, a 10 percent to 30 percent reduction in ORV volumes would also slightly reduce soundscape impacts of ORV operations on the back route.

Pedestrian-only areas would be same as alternative A.

Cumulative Impacts under Alternative B

The past, present, and future actions discussed under the cumulative impact scenario for alternative A would be the same under alternative B and would result in long-term and adverse impacts to soundscapes. These impacts, combined with the long-term beneficial impacts under alternative B, would likely result in long-term adverse and beneficial cumulative impacts. While adverse effects on soundscapes from other actions occurring at the Seashore would still exist, actions under alternative B (such as prohibition of high-performance sport-model ATVs, limitations on night driving and the permit system) would offset some of the adverse effects.

TABLE 60: ALTERNATIVE B L_{eq} MODELING RESULTS—IMPACT OF BEACH ORV USE

Receptor ID	Natural Ambient (dBA)	Average Use- 10% Reduction in ORVs			Peak Use- 10% Reduction in ORVs			Average Use- 30% Reduction in ORVs			Peak Use- 30% Reduction in ORVs		
		Modeled ORV L _{eq} (h) dBA	Total L _{eq} (h) dBA	Change from Natural Ambient (dBA)	Modeled ORV L _{eq} (h) dBA	Total L _{eq} (h) dBA	Change from Natural Ambient (dBA)	Modeled ORV L _{eq} (h) dBA	Total L _{eq} (h) dBA	Change from Natural Ambient (dBA)	Modeled ORV L _{eq} (h) dBA	Total L _{eq} (h) dBA	Change from Natural Ambient (dBA)
R1	73.5	36.5	73.5	0.0	41.9	73.5	0.0	36	73.5	0.0	41	73.5	0.0
R2	60.8	41.4	60.8	0.0	46.8	61.0	0.2	40.8	60.8	0.0	45.8	60.9	0.1
R3	56.8	49.4	57.5	0.7	54.8	58.9	2.1	48.9	57.5	0.7	53.9	58.6	1.8
R4	55.0	49.3	56.0	1.0	54.8	57.9	2.9	48.8	55.9	0.9	53.8	57.5	2.5
R5	53.3	42.2	53.6	0.3	47.6	54.3	1.0	41.7	53.6	0.3	46.7	54.2	0.9
R6	52.3	38.6	52.5	0.2	44	52.9	0.6	38.1	52.5	0.2	43.1	52.8	0.5
R7	51.5	37.0	51.7	0.2	42.4	52.0	0.5	36.5	51.6	0.1	41.5	51.9	0.4
R8	46.1	35.3	46.4	0.3	40.8	47.2	1.1	34.9	46.4	0.3	39.9	47.0	0.9
R9	45.1	32.6	45.3	0.2	38.1	45.9	0.8	32.2	45.3	0.2	37.1	45.7	0.6
R10	44.1	30.5	44.3	0.2	36	44.7	0.6	30.1	44.3	0.2	35	44.6	0.5
R11	43.1	29.5	43.3	0.2	35	43.7	0.6	29.1	43.3	0.2	34	43.6	0.5
R12	42.6	28.0	42.7	0.1	33.5	43.1	0.5	27.6	42.7	0.1	32.6	43.0	0.4
R13	41.7	26.7	41.8	0.1	32.2	42.2	0.5	26.3	41.8	0.1	31.3	42.1	0.4
R14	41.0	26.0	41.1	0.1	31.5	41.5	0.5	25.6	41.1	0.1	30.5	41.4	0.4
R15	40.1	24.8	40.2	0.1	30.2	40.5	0.4	24.4	40.2	0.1	29.3	40.4	0.3
R16	39.0	23.2	39.1	0.1	28.7	39.4	0.4	22.8	39.1	0.1	27.7	39.3	0.3
R17	38.2	21.7	38.3	0.1	27.2	38.5	0.3	21.3	38.3	0.1	26.2	38.5	0.3
R18	36.6	19.5	36.7	0.1	24.9	36.9	0.3	19	36.7	0.1	24	36.8	0.2

TABLE 61: COMPARISON OF IMPACT OF BEACH ORV USE, ALTERNATIVE A VERSUS ALTERNATIVE B

Receptor ID	Natural Ambient (dBA)	Average Use- Change From Natural Ambient			Peak Use- Change From Natural Ambient		
		Alternative A	Alternative B 30% Reduction	Difference	Alternative A	Alternative B 30% Reduction	Difference
R1	73.5	0.0	0.0	0.0	0.0	0.0	0.0
R2	60.8	0.1	0.0	0.0	0.2	0.1	-0.1
R3	56.8	0.9	0.7	-0.2	2.3	1.8	-0.5
R4	55.0	1.2	0.9	-0.3	3.1	2.5	-0.7
R5	53.3	0.4	0.3	-0.1	1.1	0.9	-0.3
R6	52.3	0.2	0.2	-0.1	0.7	0.5	-0.2
R7	51.5	0.2	0.1	-0.1	0.6	0.4	-0.1
R8	46.1	0.4	0.3	-0.1	1.2	0.9	-0.3
R9	45.1	0.3	0.2	-0.1	0.9	0.6	-0.2
R10	44.1	0.2	0.2	-0.1	0.7	0.5	-0.2
R11	43.1	0.2	0.2	-0.1	0.7	0.5	-0.2
R12	42.6	0.2	0.1	-0.1	0.5	0.4	-0.1
R13	41.7	0.2	0.1	0.0	0.5	0.4	-0.1
R14	41.0	0.2	0.1	0.0	0.5	0.4	-0.1
R15	40.1	0.2	0.1	0.0	0.5	0.3	-0.1
R16	39.0	0.1	0.1	0.0	0.4	0.3	-0.1
R17	38.2	0.1	0.1	0.0	0.4	0.3	-0.1
R18	36.6	0.1	0.1	0.0	0.3	0.2	-0.1

TABLE 62: ALTERNATIVE B L_{eq} MODELING RESULTS—IMPACT OF BACK ROUTE ORV USE

Receptor ID	Natural Ambient (dBA)	Average Use- 10% Reduction in ORVs			Peak Use- 10% Reduction in ORVs			Average Use- 30% Reduction in ORVs			Peak Use- 30% Reduction in ORVs		
		Modeled ORV L _{eq} (h) dBA	Total L _{eq} (h) dBA	Change from Natural Ambient (dBA)	Modeled ORV L _{eq} (h) dBA	Total L _{eq} (h) dBA	Change from Natural Ambient (dBA)	Modeled ORV L _{eq} (h) dBA	Total L _{eq} (h) dBA	Change from Natural Ambient (dBA)	Modeled ORV L _{eq} (h) dBA	Total L _{eq} (h) dBA	Change from Natural Ambient (dBA)
R1	73.5	23.5	73.5	0.0	29	73.5	0.0	23.1	73.5	0.0	28	73.5	0.0
R2	60.8	24.6	60.8	0.0	30.1	60.8	0.0	24.2	60.8	0.0	29.1	60.8	0.0
R3	56.8	29.2	56.8	0.0	34.7	56.8	0.0	28.8	56.8	0.0	33.8	56.8	0.0
R4	55.0	29.3	55.0	0.0	34.8	55.0	0.0	28.9	55.0	0.0	33.8	55.0	0.0
R5	53.3	31.1	53.3	0.0	36.6	53.4	0.1	30.7	53.3	0.0	35.6	53.4	0.1
R6	52.3	32.3	52.3	0.0	37.7	52.4	0.1	31.8	52.3	0.0	36.8	52.4	0.1
R7	51.5	33.6	51.6	0.1	39	51.7	0.2	33.1	51.6	0.1	38.1	51.7	0.2
R8	46.1	34.2	46.4	0.3	39.6	47.0	0.9	33.7	46.3	0.2	38.7	46.8	0.7
R9	45.1	36.5	45.7	0.6	42	46.8	1.7	36.1	45.6	0.5	41	46.5	1.4
R10	44.1	41	45.8	1.7	46.4	48.4	4.3	40.5	45.7	1.6	45.5	47.9	3.8
R11	43.1	49.4	50.3	7.2	54.8	55.1	12.0	48.8	49.8	6.7	53.8	54.2	11.1
R12	42.6	49.3	50.1	7.5	54.7	55.0	12.4	48.7	49.7	7.1	53.7	54.0	11.4
R13	41.7	39.8	43.9	2.2	45.2	46.8	5.1	39.3	43.7	2.0	44.3	46.2	4.5
R14	41.0	35.7	42.1	1.1	41.2	44.1	3.1	35.3	42.0	1.0	40.2	43.6	2.6
R15	40.1	32.1	40.7	0.6	37.6	42.0	1.9	31.7	40.7	0.6	36.7	41.7	1.6
R16	39.0	28.7	39.4	0.4	34.2	40.2	1.2	28.3	39.4	0.4	33.2	40.0	1.0
R17	38.2	26.4	38.5	0.3	31.9	39.1	0.9	26	38.5	0.3	30.9	38.9	0.7
R18	36.6	23.1	36.8	0.2	28.6	37.2	0.6	22.7	36.8	0.2	27.6	37.1	0.5

ALTERNATIVE C

Impacts of Alternative C

Under alternative C, ORV use (by visitors and by NPS for administrative purposes) would continue at the Seashore and the general patterns (geographic and seasonal) and intensity of ORV use would be similar to the description of the impacts of alternative A. However, alternative C would reduce the percentage of the beach open to ORVs from the Friday preceding Memorial Day through Labor Day when compared to alternative A (74 percent instead of 81 percent). This increase in pedestrian-only areas would reduce the geographic extent of the area potentially affected by ORV noise, resulting in long-term beneficial effects on soundscapes in those areas.

Under alternative C, non-sport ATVs and UTVs would be permitted between September 15 and December 15. During other times of the year, ATVs and UTVs would not be permitted. ORV-related impacts on soundscapes would be lower during the months where ATVs would be prohibited because ATVs are generally noisier than automobiles. For example, based on the L_{max} analysis, the impact on natural soundscapes of an auto operating on the beach would be 7.7 dBA less at 20 feet than the impact of an ATV (table 63). Similar to alternative B, all high-performance sport-model and two-stroke ATVs and UTVs (as defined by the manufacturer) would be prohibited under alternative C after a five-year grace period. No data were located identifying sound levels specific to high-performance sport-model ATVs. Therefore, it is not possible to make a conclusive comparison between typical ATVs and high-performance sport-model ATVs.

TABLE 63: ALTERNATIVE C L_{max} RESULTS—IMPACT OF ELIMINATING ATVs

Receptor ID	Natural Ambient (dBA)	Difference in Impact on Natural Ambient, Auto vs. ATV	
		Beach	Back route
R1	73.5	-0.2	0.0
R2	60.8	-4.1	-0.2
R3	56.8	-7.6	-0.7
R4	55.0	-7.7	-1.1
R5	53.3	-6.9	-1.8
R6	52.3	-6.4	-2.5
R7	51.5	-6.2	-5.2
R8	46.1	-6.0	-7.0
R9	45.1	-5.8	-7.5
R10	44.1	-5.5	-7.8
R11	43.1	-5.4	-8.0
R12	42.6	-5.3	-8.0
R13	41.7	-5.2	-7.8
R14	41.0	-5.1	-7.7
R15	40.1	-5.0	-7.6
R16	39.0	-4.9	-7.4
R17	38.2	-4.8	-7.2
R18	36.6	-4.8	-7.0

Another way of understanding the impact of the elimination of ATVs outside the September 15 through December 15 time period is with $L_{eq}(h)$ modeling. Table 64 summarizes the results of the L_{eq} modeling conducted to test the effect of eliminating ATVs. The modeling results are based on the peak fall level of ORV (100 percent auto) use and the assumption that 13 percent of the ORV fleet consists of ATVs under existing conditions (based on 2007-2012 ferry data, see the “Methodology” section). At a distance of 20 feet, the elimination of ATVs reduces the ORV impact to natural ambient by up to 1.0 dBA on the beach and 2.1 dBA on the back route. The reduction would be higher closer to the vehicle path and is smaller at more distant locations from the vehicle path. For reference, a 10 dBA increase is sometimes perceived by humans as being twice as loud; while a 3 dBA increase is a barely perceptible change. A 10 dBA increase is equivalent to a 90 percent reduction in listening area, compared to a 50 percent reduction with a 3 dBA increase.

TABLE 64: ALTERNATIVE C L_{eq} MODELING RESULTS—IMPACT OF ELIMINATING ATVs

Receptor ID	Natural Ambient (dBA)	Peak Use On Beach, No ATVs			Peak Use On Back route, No ATVs			Change in impact on natural ambient from Eliminating ATVs, on beach	Change in impact on natural ambient from Eliminating ATVs, on back route
		Modeled ORV $L_{eq}(h)$ dBA	Total $L_{eq}(h)$ dBA	Change from Natural Ambient (dBA)	Modeled ORV $L_{eq}(h)$ dBA	Total $L_{eq}(h)$ dBA	Change from Natural Ambient (dBA)		
R1	73.5	39.1	73.5	0.0	25.8	73.5	0.0	0.0	0.0
R2	60.8	44.5	60.9	0.1	26.9	60.8	0.0	-0.1	0.0
R3	56.8	52.9	58.3	1.5	31.5	56.8	0.0	-0.8	0.0
R4	55.0	52.9	57.1	2.1	31.3	55.0	0.0	-1.0	0.0
R5	53.3	45.5	54.0	0.7	33.1	53.3	0.0	-0.5	-0.1
R6	52.3	41.5	52.6	0.3	34.5	52.4	0.1	-0.3	-0.1
R7	51.5	39.8	51.8	0.3	36.2	51.6	0.1	-0.3	-0.1
R8	46.1	37.7	46.7	0.6	36.7	46.6	0.5	-0.6	-0.5
R9	45.1	34.7	45.5	0.4	39.3	46.1	1.0	-0.5	-0.9
R10	44.1	32.6	44.4	0.3	44.2	47.2	3.1	-0.4	-1.5
R11	43.1	31.5	43.4	0.3	52.9	53.3	10.2	-0.4	-2.1
R12	42.6	30.1	42.8	0.2	52.8	53.2	10.6	-0.3	-2.1
R13	41.7	28.9	41.9	0.2	42.8	45.3	3.6	-0.3	-1.8
R14	41.0	28.1	41.2	0.2	38.4	42.9	1.9	-0.3	-1.4
R15	40.1	26.9	40.3	0.2	34.4	41.1	1.0	-0.3	-1.1
R16	39.0	25.4	39.2	0.2	31	39.6	0.6	-0.2	-0.7
R17	38.2	24.1	38.4	0.2	28.7	38.7	0.5	-0.2	-0.5
R18	36.6	22	36.7	0.1	25.4	36.9	0.3	-0.2	-0.4

Alternative C would include a permit system (with fees) and an annual limit on the number of ORVs based on historical use levels. The limit is expected to be similar to existing use levels (2,500 permits annually for North Core Banks and 3,000 permits annually for South Core Banks). This provision would prevent ORV use and associated soundscape impacts from increasing over time as could occur under

alternative A and B. In addition, the permit fees could potentially reduce ORV use by 10 to 30 percent, with corresponding minor beneficial impacts on soundscapes as was discussed above for alternative B.

Similar to alternative B, the back route would be retained under alternative C; regular maintenance of the back route would occur and pull-outs along the back route would be provided for opposing vehicles to pass each other. As a result of these changes to the back route, it is possible that ORV travel on the back route could increase slightly relative to alternative A and would be similar to those impacts described under alternative B.

Cumulative Impacts under Alternative C

The past, present, and future actions discussed under the cumulative impact scenario for alternative A would be the same under alternative C and would result in long-term and adverse impacts to soundscapes. These impacts, combined with the long-term beneficial impacts under alternative C, would likely result in long-term adverse and beneficial cumulative impacts. While adverse effects on soundscapes from other actions occurring at the Seashore would still exist, actions under alternative C (such as increased pedestrian-only areas, limits on ORV permits and limiting ATV use to the period between September 15 and December 15) would offset some of the adverse effects.

ALTERNATIVE D

Impacts of Alternative D

ORVs would be used at the Seashore by visitors and by NPS for administrative purposes under alternative D. Alternative D would involve most of the same management changes discussed above for alternative C. As a result, the impact of alternative D would be similar, but less than alternative C. The differences with alternative D include greater limits on the percent of the beach open to ORVs during different times of the year, which would reduce the geographic extent of impacts on soundscapes. The number of annual ORV permits would also be reduced under alternative D by 8 percent, relative to alternative C (designed to prevent the density of ORVs from increasing). The lower average ORV density would result in reduced intensity of impacts on soundscapes on an annual average basis, although there is no guarantee that peak fishing season ORV access would be reduced.

Finally, alternative D would eliminate all ATVs year-round. The numerical impact of eliminating ATVs in terms of L_{\max} and L_{eq} is shown in tables 63 and 64 (under the discussion for alternative C, above). The beneficial effects of eliminating ATVs would be greatest for visitors/wildlife in close proximity to the vehicle operating path (e.g., within 20-50 feet). The results show 5 to 6 dBA L_{\max} reductions over much of the modeled area with the elimination of ATVs on the beach and larger reductions (7 dBA) with the elimination of ATVs on the back route.

Cumulative Impacts under Alternative D

The past, present, and future actions discussed under the cumulative impact scenario for alternative A would be the same under alternative D and would cause long-term and adverse impacts to soundscapes. These impacts, combined with the long-term beneficial impacts under alternative D, would likely result in long-term adverse and beneficial cumulative impacts. While adverse effects soundscapes from other actions occurring at the Seashore would still exist, actions under alternative D (such as increased pedestrian-only areas, limits on vehicle permits and prohibition of ATV use) would offset some of the adverse effects.

ALTERNATIVE E

Impacts of Alternative E

Public ORV access would be closed under alternative E. NPS ORV use for official purposes would continue, but the overall impact on soundscapes from official ORV use would be negligible due to the low number of trips anticipated (less than 10 per day in summer/fall). The difference in natural soundscapes would be the most noticeable during the peak fishing season when currently there are the most ORVs. The effect of alternative E would be prominent near the back route where lower existing sound levels make ORV noise audible across greater distances than on the beach. At other times of the year and in other locations (such as visitors close to the surf), the elimination of ORV use would not result in a meaningful change in soundscapes because typical ORV use is infrequent and masked by the surf.

Cumulative Impacts under Alternative E

The past, present, and future actions discussed under the cumulative impact scenario for alternative A would be the same under alternative E and would result in long-term and adverse impacts to soundscapes. These impacts, combined with the long-term beneficial impacts under alternative E, would likely result in long-term adverse and beneficial cumulative impacts. While adverse effects on soundscapes from other actions occurring at the Seashore would still exist, actions under alternative E (e.g., prohibition of ORV use) would offset some of the adverse effects.

COMPARISON OF ALTERNATIVES

Alternative B would result in fewer impacts than alternative A through various management measures, including prohibition of high-performance sport-model ATVs and limits on night driving. Alternative B would result in greater impacts to soundscapes than alternative E because ORV use would be permitted.

Alternative C would result in fewer impacts than alternative A through various management measures, including reduced area of beach available for ORV use (74 percent of Seashore beach would be available for ORV use from the Friday preceding Memorial Day through Labor Day (compared to 81 percent under alternative A), a limit on vehicle permits, and limiting ATV use to the period between September 15 and December 15. Alternative C would result in greater impacts to soundscapes than alternative E because ORV use would be permitted.

Alternative D would result in fewer impacts than alternative A through various management measures, including reduced area of beach available for ORV use (63 percent of Seashore beach would be available for ORV use from the Friday preceding Memorial Day through Labor Day (compared to 81 percent under alternatives A), a limits on vehicle permits, and prohibition of ATV use. Alternative D would result in greater impacts to soundscapes than alternative E because visitor auto/truck use would be permitted.

Alternative E would result in fewer impacts to soundscapes than alternative A because all ORV use would be eliminated (low levels of NPS administrative ORV use would continue under alternative E).

CONCLUSION

All the action alternatives would have beneficial impacts on soundscapes because of management measures that would limit the extent and intensity of ORV activity (e.g., increased pedestrian-only areas, limitations on night driving or certain types of ORVs). Alternative D would eliminate the noisiest type of ORVs entirely (ATVs) and alternative E would eliminate all ORVs. Impacts of alternative B would be

slightly less than alternative A, while impacts of alternative E would be less than alternative B. Similar to alternative A, none of the action alternatives would result in significant adverse impacts. The overall character of the Seashore soundscapes would remain consistent with a remote barrier island environment.

Significance Discussion

The purpose of the Seashore is to preserve the outstanding natural, cultural, and recreational resources and values of a dynamic, intact, natural barrier island system where ecological processes dominate. The Seashore is one of the few remaining locations on the Atlantic coast where visitors can experience and recreate in an undeveloped, remote barrier island environment that can be reached only by boat or ferry. ORV use at the Seashore predates establishment of the Seashore in 1976. ORV use at the Seashore is limited to some degree by ferry size and availability, with an estimated 5,500 ORVs transported to the Seashore each year. While ORV use is generally low through most of the year, it does intermittently impact the natural soundscapes of the Seashore. However, the majority of ORV activity occurs on the beach side of the islands where surf and wind sounds are prominent. Other human sounds influencing soundscapes at the Seashore include various watercraft and aircraft overflights. Overall soundscape quality remains high and consistent with the character of the Seashore as evidenced by the L_{90} sound level of 35.9 dBA during the day and 42.9 dBA at night during monitoring in 2008.

Tables 56 through 64 define the intensity of impacts of the alternatives in terms of L_{eq} and L_{max} metrics. The unique characteristics of the seashore were taken into account by incorporating natural ambient data based on monitoring in the impact assessment and accounting for the masking provided by the surf. Even under peak use (which occurs for relatively few days per year), exceedances of 3 dBA over the natural ambient in terms of $L_{eq}(h)$ would be limited to within 20 feet of the vehicle operating path on the beach. Impact of operating on the back route would be higher than the impacts of operating on the beach because of the lower natural ambient on the sound side of the islands (located farther away from surf sounds). However, the frequency of ORV operations on the back route is generally lower than on the beach. Considering these facts and the low level of ORV use under alternatives A, B, C, and D, none of these alternatives would result in significant adverse impacts to natural soundscapes. Alternatives B, C, and D would have beneficial effects on soundscapes relative to alternative A from the implementation of various management measures such as limits on certain types of vehicles and the permit system, among others. Alternative E would eliminate ORV use and thus would have beneficial impacts on soundscapes.

There are no applicable laws pertaining specifically to soundscapes at the Seashore. Director's Order 47 and the NPS *Management Policies 2006* set a certain general policy direction with respect to soundscapes management, but do not set any absolute standard. The ambient noise levels at the Seashore would be well below levels that would constitute a public health concern.¹²

Under alternatives A, B, C, and D, designating legal routes for ORV use does not establish a precedent for future actions with significant effects, as ORV use has occurred at the Seashore since the 1930s and continued since the establishment of the Seashore as a park unit in 1976, and the current and proposed ORV management measures result in a low overall level of impacts to soundscapes. ORV use is also currently legally permitted in several other national seashores and recreation areas, and in this regard is not precedent-setting within the national park system. As described above, ORV use also does not cause significant impacts to soundscapes, in part because of the management measures taken by the Seashore,

¹² For example, the Occupational Safety and Health Administration limit for occupational exposure is 85 dBA averaged over 8 hours.

as well as the adaptive management strategy in alternatives B, C, and D, which would further strengthen mitigation measures/limits on ORV use. Alternative E, which prohibits ORV use, would also not establish a precedent for future actions with significant effects on soundscapes, as many other national park units do not allow ORV use.

There are a number of cumulative impacts to soundscapes, described in the impacts analysis above, which may be short- and long-term, limited, and adverse, as well as long-term beneficial. However, while adverse effects to soundscapes from other actions occurring in the region would still exist, actions under alternatives A, B, C, D, and E would provide additional protections that would be beneficial to soundscapes and would partially mitigate any adverse cumulative impacts already occurring.

In conclusion, compared to the existing condition, additional impacts to soundscapes under alternatives A, B, C, D, and E would be small. The Seashore has in place ORV management and mitigation measures that would continue and even be strengthened in the action alternatives. When compared to the existing condition, in light of the significance criteria at 40 CFR 1508.27, there would be no significant adverse impacts to soundscapes from alternatives A, B, C, D, or E.

VISITOR USE AND EXPERIENCE

GUIDING REGULATIONS AND POLICIES

Congress authorized the establishment of Cape Lookout National Seashore as a unit of the NPS “to preserve for public use and enjoyment an area in the State of North Carolina possessing outstanding natural and recreational values” (Seashore’s enabling legislation; Act of March 10, 1966 [16 USC 459g]). The enabling legislation, as amended, further states that “[t]he Secretary shall administer the Cape Lookout National Seashore for the general purposes of public outdoor recreation, including conservation of natural features contributing to public enjoyment” (16 USC 459g-4). Management goals related to ORV use are included in the Seashore’s GMP (1982), which states, “Use of private vehicles on Core banks and Portsmouth Island will be allowed to continue. Drivers will be directed, through appropriate regulations, to avoid dunes, vegetation, loggerhead turtles and shorebird nesting areas, and conflicts with other visitor activities.” The 2001 amendment to the GMP addressed improvements to overnight accommodations and transportation services to persons visiting North Core Banks (excluding the Portsmouth Village area) and South Core Banks, and is also applicable to visitor use and experience under this planning effort.

NPS *Management Policies 2006* (NPS 2006d) state that the enjoyment of park resources and values by people of the United States is part of the fundamental purpose of all parks and that the NPS is committed to providing appropriate, high-quality opportunities for visitors to enjoy the parks.

Section 1.5 of NPS *Management Policies 2006* (NPS 2006d) states that in its role as steward of park resources, the NPS must ensure that park uses that are allowed would not cause impairment of, or unacceptable impacts on, park resources and values. When proposed park uses and the protection of park resources and values come into conflict, the protection of resources and values must be predominant. Appropriate visitor enjoyment is often associated with the resource conditions and inspirational qualities of parks. As a general matter, preferred forms of enjoyment are those that are uniquely suited to the superlative natural and cultural resources found in the parks and that (1) foster an understanding of and appreciation for park resources and values, or (2) promote enjoyment through a direct association with, interaction with, or relation to park resources. These preferred forms of use contribute to the personal growth and well-being of visitors by taking advantage of the inherent educational value of parks. Equally important, many appropriate uses also contribute to the health and personal fitness of park visitors. These are the types of uses that the Service will actively promote, in accordance with the Organic Act.

As stated in *NPS Management Policies 2006* (NPS 2006d), off-road motor vehicle use in national park units is governed by Executive Order 11644 (Use of Off-Road Vehicles on Public Lands, as amended by Executive Order 11989), and 36 CFR 4.10. ORV routes and areas may be allowed only in locations where there would be no adverse impacts on the area's natural, cultural, scenic, and esthetic values, and in consideration of other existing or proposed recreational uses. The Executive Orders require that ORV routes and areas be located to minimize conflicts between ORV use and other existing or proposed recreational uses of the same or neighboring public lands and to ensure the compatibility of such uses with existing conditions in populated areas, taking into account noise and other factors.

While recreation is a key component of the *NPS Management Policies 2006*, the policies also instruct park units to maintain all native plants and animals as parts of the natural ecosystem. The NPS would achieve this by preserving and restoring the natural abundances, diversities, dynamics, distributions, habitats, and behaviors of native plant and animal populations and the communities and ecosystems in which they occur (NPS 2006d).

In addition, the Seashore has identified objectives for communicating with the general public and visitor population that enjoy the recreational opportunities and natural and cultural resources provided by the Seashore. Communication and information sharing is an integral component of ensuring visitor satisfaction. Thus, the proposed plan should also accomplish the following:

- Continue an ongoing and meaningful dialogue with the multiple public groups interested in and/or affected by ORV management.
- Establish procedures for prompt and efficient public notification of management actions (for example, beach access status) including any temporary ORV use restrictions for reasons such as resource and public safety closures or storm events.
- Build stewardship through public awareness and understanding of NPS resource management and visitor use policies and responsibilities as they pertain to the Seashore and ORV management.

METHODOLOGY AND ASSUMPTIONS

Quantitative information was used to assess the overall impact of ORV management on the supply of available recreational resources. This assessment considers the availability of ORV recreational opportunities to assess the level of impacts for each action. The planning team incorporated the comments received during public scoping and the history of ORV use at the Seashore to help make a determination of the level of impact on visitor use and experience. Data used in this analysis, including visitor statistics, historical use patterns, visitor use observations obtained from park rangers, and data provided by other land management agencies, are presented in chapter 3.

The likelihood of ORV or full recreational closures and the associated restriction of ORV or pedestrian access were also considered in determining visitor use impacts. These closures are dependent on the breeding habits of specific species, particularly the piping plover, American oystercatcher, and four species of colonial waterbirds, including when the bird species court, establish territory, build nests, and lay eggs, as well as when the young first leave the nest to forage for food. Consideration was also given to three species of sea turtles, including when turtles establish nests until turtle hatchlings return to the sea. However, in times of ORV or full recreational closures, visitors have the opportunity to use the back route to access areas of the Seashore.

Also, in evaluating visitor experience, the Seashore's enabling legislation was considered so that the analysis evaluated the ability of visitors to engage in a desired activity. For example, allowing year-round ORV access at the Seashore could provide for enhanced visitor experience and would allow visitors to

engage in a desired activity, but it would not meet the objectives of the ORV management plan/EIS to minimize impacts on natural physical resources, wildlife, and wildlife habitat and vegetation, and was thus not carried forward as a viable alternative element. Please refer to chapter 2 for more information on alternatives considered but dismissed from further analysis.

STUDY AREA

The geographic study area for the visitor use and experience analysis includes the entire area within the Seashore boundary.

ALTERNATIVE A

Impacts of Alternative A: No Action

ORV and Full Recreational Closures—In addition to the resource protection measures outlined in the *Cape Lookout National Seashore Interim Protected Species Management Plan/Environmental Assessment* (NPS 2006a), the Seashore would implement additional resource management activities to support long-term species protection and recovery goals. Measures that have the potential to impact visitor use and experience include authorizing and designating ORV routes from March 16 through December 31, restricting ATV and UTV use to the period between March 16 and December 31; and closing the Seashore to all vehicles from January 1 through March 15 to provide habitat for wintering species and to allow the beach profile to recover from heavy fall fishing use. Further resource management activities that would be implemented under alternative A can be found in “Chapter 2: Alternatives.”

Under alternative A, it is expected that up to approximately 81¹³ percent of the Seashore’s ocean beach (45 out of 56 total miles) would remain designated as ORV routes from March 16 through December 31; 11 of 56 miles of the Seashore would be closed to ORV use (all of Shackleford Banks, the Cape Lookout spit and the beach near the Cape Lookout lighthouse), and all ORV routes would close from January 1 through March 15 of each year. No other non-ORV areas would be established. Complying with the resource protection measures under alternative A would mean the designated routes may be temporarily closed for species, resource management and safety when needed (based on data from 2008 through 2013, species, resource management and safety closures average approximately 10 miles in the summer, and 5.4 miles in the fall). ORV users occasionally change their planned route from one Seashore location to another. In most cases, the back route would be used as an alternate route. But in some instances, access to a preferred location, such as a specific location on the beach, may not be allowed for the duration of a visit, or for an entire season if species activity such as nesting, breeding, and fledging are occurring. Visitors would also be made aware of the purpose of the species management measures which include meeting the Seashore’s obligations under the ESA and park guidance such as the *NPS Management Policies 2006*, and protecting park resources for future generations. Efforts would be made to ensure visitors are aware of these closures before they reach the Seashore, including information provided on the Seashore’s website and via selected social media websites. Because North and South Core Banks would be available for ORV use and access, implementation of resource protection measures would represent an inconvenience, resulting in short delays or temporary changes of plans. While ORV users may not be able to access a specific area, other comparable areas that offer similar opportunities, such as alternative

¹³ For alternatives, these percentages are simply a starting point and do not account for any other ORV or full recreational closures due to resource protection and safety that may be implemented, as needed, which may adjust these percentages.

fishing locations, would be available. However, users would experience inconvenience from having to find a different location that could result in a decrease in visitor satisfaction.

Under alternative A, the back route would be re-established to the same or equivalent locations if certain locations are impacted by a storm event. Because the back route is important for management of ORV access and species protection, maintenance and repairs to the back route would have long-term benefits to visitors of the Seashore as it would maintain access routes around ORV closures, which would continue to allow ORV access to remote areas of the Seashore for both resource management activities and recreational use.

However, ORV users would be slightly impacted by management actions that would not provide ferry service on sections of Core Banks where no ferry landing access is available, because any new islands that might be created due to storm events or other causes would not have ferry landings, and few visitors are expected to make the extra effort to bring their own ATVs and UTVs to the island.

ATV and UTV Use—Under alternative A, ATVs and UTVs would be permitted from March 16 through December 31 at the Seashore, which would be a continuation of current management. As a result, ATV and UTV users would experience beneficial impacts under alternative A, because operating ATVs and UTVs at the Seashore would be allowed. However, continued ATV/UTV use may negatively impact visitors who seek a quiet environment at the Seashore, because these vehicles introduce man-made noise at the Seashore.

Camping—While camping is permitted on all of the beaches at the Seashore, some beach areas may be closed to camping by the Superintendent's Compendium, or for temporarily for safety or resource protection measures. Potential camping restrictions under alternative A would result in slightly adverse, short-term impacts on visitors seeking to camp at the Seashore, as access to some desired camping areas may be prohibited. However, since camping is permitted on all of the beaches at the Seashore (pending the above mentioned closures), ample room would be available to find an alternative camping location. Similarly, campfires under alternative A would only be permitted on the ocean and soundside beaches between the mean high tide line and the water. Campfires would be prohibited within turtle closures or within 300 feet of American oystercatcher nesting buffers. These campfire restrictions would result in slightly adverse, long-term impacts on visitors who desire campfires at the Seashore, since it is possible that visitors may be prohibited from having campfires at their preferred location, due to resource closures.

Permitting and Limits on the Number of Vehicle Permits—Alternative A does not require ORV permitting, or an ORV operator education certificate. Thus, unlimited numbers of ORVs could access the Seashore, with no requirements related to obtaining an ORV use permit, including any additional financial cost to the visitor. Over the short-term, it is not anticipated that this would affect visitor use and experience, as it would maintain current conditions which public comments indicate result in a positive visitor experience. However, over the long-term, unlimited use without ORV permitting requirements or an operator education certification (both potential mechanisms to manage visitation levels) could lead to an increase in visitor use levels that result in degradation of park resources, overcrowding, and increased conflict between park users, because numbers would be allowed to rise unchecked. The lack of an educational certificate may not allow for the full appreciation for and understanding of the Seashore's mission and resources as well as a lack of understanding of the rules and regulations. As a result, unfavorable effects (such as degradation of park resources, overcrowding, increases in conflict among park users, and a lack of understanding of the rules and regulations) are estimated to be long-term, and slightly noticeable.

Long-Term Vehicle Parking/Storage—Under alternative A, long-term vehicle parking/storage would continue to be provided at four parking lots at the Seashore, located at Long Point (North Core Banks),

Great Island main lot (South Core Banks), Great Island Carly Dock lot (South Core Banks), and the Lighthouse Complex (South Core Banks). A parking permit would continue to be required. There would be a fee for the permit, but there would be no limits on the number of long-term parking permits issued. While the lack of a limit on the number of long-term parking permits issued could result in beneficial impacts to visitors, there is potential for this to also result in slightly adverse impacts to visitors, if the long-term parking lots are full and visitors who have purchased a long-term parking permit are not able to park there. Visitors may also artificially expand the boundary of these lots, increasing the number of vehicles in these lots and detracting from the experience of some visitors who would prefer to see less vehicles during their visit. Allowing long-term parking at the Seashore would result in favorable impacts on visitor use and experience, even with the slight fee, because ORV users would not be required to transport their ORVs to and from the Seashore with each visit, which results in additional cost and inconvenience to the visitor.

ORVs and Other Recreational Uses—Under alternative A, ORVs would be restricted from accessing certain areas of the Seashore (see “ORV and Full Recreational Closures”), but up to 81 percent of the Seashore would be open for ORV use from March 16 through December 31. The back route would be re-established to the same or equivalent locations when it is impacted by a storm event for resource protection and safety, resulting in beneficial impacts to ORV users because the back route is the primary mechanism for traversing the Seashore via ORV, even when there are resource closures. There would be occasional maintenance on the back route, as needed. For resource protection and safety, the number and location of ramps may be adjusted when they are impacted by a storm event. Ramps would be located or re-established on flat sand, between dunes where there would be fewer impacts. As a result of the general area that would be available for ORV use, and the maintenance and re-establishment of ramps at the Seashore, impacts to ORV users would be long-term and beneficial.

ORV use at the Seashore would provide access to fishing sites along Seashore beaches, and to fishing tournaments. Because fishing is a popular visitor activity at the Seashore, the largely unrestricted access would continue to support a valuable visitor experience for this user group. Likewise, access to cabin facilities, backcountry camping sites, beaches, and sunbathing areas would continue largely unchanged for both ORV and non-ORV users. On occasion, site-specific resource management activities, such as ORV or full recreational closures on the beach, could result in changes to access routes and relocation of preferred activities, but in most cases, an alternate route would be identified so that ORV users and non-ORV users would be able to reach their initial destination or an alternative destination in the vicinity.

Pedestrian Activities—Pedestrian uses, such as beach walking and shell collecting would continue throughout the entire Seashore outside of any full recreational or safety closures. Existing pedestrian use is generally focused near vehicle and passenger ferry landings and camps, Power Squadron Spit and Shackleford Banks, and access to these areas is not expected to change as sensitive resources are not likely to breed or nest at the ferry landing areas or the camps (Ketel 2013). Access to pedestrian use areas located away from the ferry landings would remain available by use of the back route to circumvent shoreline closures and restricted areas.

Because ORV use would be permitted on up to approximately 81 percent of the Seashore from March 16 through December 31, adverse impacts on visitors pursuing an ORV-free seashore experience at the Seashore would occur, although they would be slight. This is because the areas that pedestrians would most likely access would typically be the areas near ferry landings (since the typical pedestrian visitor does not venture far from ferry landings due to the lack of potable water available at the Seashore, and the difficulty of walking long distances on the sand), and only the Cape Lookout lighthouse ferry landing area has a pedestrian-only beach. There is also a potential for user-conflicts between those that visit the Seashore without access to an ORV (who are generally restricted to using the beach adjacent to the ferry landing), and those with access to ORVs. Visitors wishing to have an ORV-free experience at the

Seashore may be adversely impacted because ORVs may inhibit their ability to experience a remote, natural, undeveloped setting at the Seashore. Additionally, there may be safety concerns related to ORVs driving on a section of beach adjacent to a ferry landing area that has a high density of non-ORV visitors. However, visitors would continue to be able to have an ORV-free experience at the Seashore on Shackleford Banks, where ORVs would continue to be prohibited.

For the pedestrians that do choose to walk outside of the ferry landing areas, they would likely encounter ORVs which may negatively impact their experience. However, the Seashore would allow for pedestrian-only access on 100 percent of its beaches from January 1 through March 15, which would result in favorable impacts on visitors seeking an ORV-free experience.

Night Driving—ORVs use their headlights to navigate Seashore routes at night. The use of headlights and artificial lights at cabin areas used in association with camping (using lanterns, RV lights and campfires), contributes to “light pollution” in an otherwise undeveloped area, where this intrusion is not anticipated (NPS 2012v). Recent research shows that light that is emitted just above the horizontal plane (slightly upwards) is the most likely to cause light pollution (Luginbuhl, Walker, and Wainscoat 2009). This reduces night sky viewing opportunities for visitors. Starry night skies and natural darkness are important resource values that the National Park Service attempts to protect. National parks hold some of the last remaining harbors of darkness and provide an excellent opportunity for the public to experience this endangered resource (NPS 2013k). Under alternative A, night driving and headlight use would not change, and adverse impacts on night skies due to the lack of night driving restrictions would continue, which could potentially degrade night sky viewing opportunities. Conversely, because night driving would be allowed at the Seashore under alternative A, impacts to visitors who enjoy fishing at night would be long-term and beneficial, because this use would continue.

ORV and Pedestrian Conflicts—At locations where pedestrians and ORV users would both be present, the noise and the sight of vehicles could decrease the visitor experience for those seeking solitude and a natural setting. ORVs, through noise and speed, can exclude other users from an area that could otherwise have been enjoyed by those visitors. Adverse effects on visitor experience for those seeking an ORV-free experience would continue to occur outside pedestrian-only areas, and potentially increase, as visitation to the Seashore continues to rise without any limitations on ORV use. Without limits on ORVs accessing the Seashore, greater numbers of ORVs are likely to be used in the park, and adverse impacts on visitor experience could occur if overcrowded conditions are reached.

Miscellaneous Vehicle and Operator Requirements—The following vehicle and operator requirements would be applicable under alternative A: licensing and registration requirements, compliance with North Carolina state laws, drivers must have a valid driver’s license, vehicles with less than three wheels would be prohibited, all ATV users must wear a helmet and eye protection, and ORV drivers and passengers would be prohibited from sitting on the tailgate or roof or hanging outside of moving vehicles.

These operator and vehicle requirements would result in essentially no new impacts on ORV users, because these requirements are currently in place. The beneficial impacts of these requirements to health and safety of all visitors resulting from these equipment requirements would also continue.

Vehicle Delivery—Visitors would be permitted to deliver ATVs and UTVs noncommercially to the Seashore for personal use at designated and marked soundside access points. Other ORVs would only be delivered via NPS authorized vehicle ferries. This would continue current management and continue the long-term, beneficial impacts to ORV users, because ATV and UTV users would have options on how they may transport their ATVs and UTVs to the Seashore and would not notice any change from existing operations.

Shade Shelters—Over time, a number of shade shelters located throughout the Seashore have been destroyed by storms. Under alternative A, shade shelters would remain located at four locations throughout the Seashore (see table 3)

Continuing to provide shade shelters at the Seashore would result in continued long-term, beneficial impacts on all Seashore visitors, as visitors would be able to escape storms and intense sunlight under these shelters, as needed, thus improving their visit to the Seashore.

Cumulative Impacts under Alternative A

Other past, present, and future activities within and surrounding the Seashore have the potential to affect visitors and the recreational opportunities supported within the Seashore.

Until the ORV management plan/EIS is complete, the NPS developed the *Interim Off-road Vehicle Management Plan and Evaluation of Existing ORV Use at Cape Lookout National Seashore* and a *Cape Lookout National Seashore Interim Protected Species Management Plan/Environmental Assessment* and FONSI (NPS 2006a, 2007d) for Cape Lookout National Seashore to ensure for the proper management of protected species and to comply with the ESA. The plan also provides for appropriate use of the Seashore's recreational resources, including prescribing where ORV and full recreational closures occur on the Seashore. The species addressed in the *Cape Lookout National Seashore Interim Protected Species Management Plan/Environmental Assessment* are those federal and state-listed species that are specifically affected by recreation at the Seashore. Since the FONSI was signed in 2007, visitation to the Seashore has declined rather substantially, and steadily (from 860,602 visitors in 2007, to 601,954 in 2009, to 480,294 in 2012 (NPS 2013c); however, the reasons for this decline are not known, but could include the economic downturn. Impacts of the *Cape Lookout National Seashore Interim Protected Species Management Plan/Environmental Assessment* on visitor use and experience are expected to be long-term and adverse to those wishing to have unrestricted ORV access at the Seashore (because the *Cape Lookout National Seashore Interim Protected Species Management Plan/Environmental Assessment* places restrictions on where ORVs are allowed to operate), as well as long-term and beneficial to those visitors seeking solitude from vehicular activities. However, impacts would be short-term and adverse to any visitor whose preferred area is under a temporary full recreational closure at the time of their visit.

The Harkers Island and Cape Lookout National Seashore Keepers' Quarters Exhibit Plan, the Portsmouth Village Exhibit Plan, and the Wayside Exhibit Plan involve exhibit planning and design for new exhibits. The Harkers Island exhibits orient visitors to the breadth of resources and recreational opportunities within the park. The Keepers' Quarters exhibits orient visitors to the cape area and interpret the history of the Lighthouse Complex and associated historic resources. In recent years, the Seashore has increased other visitor amenities, including a new visitor center and bookstore, and shelter and restrooms at the passenger ferry landing by the lighthouse on South Core Banks, and opening the lighthouse to visitors. These improvements also include a replacement boardwalk at the lighthouse Keepers' Quarters. These and future improvements could bring more visitors to the lighthouse area on South Core Banks, resulting in long-term beneficial impacts on visitor use and experience due to increased visitor activities and amenities.

Special Use Permits are available at the Seashore. These permits authorize activities that provide benefit to an individual, group or organization, rather than the public at large, and that require written authorization and some management control in order to protect park resources and the public interest. Examples include long-term parking, special events, commercial filming/still photography, weddings, group camping, First Amendment activities, and constructing temporary Duck Blinds. Special Use Permits are granted for specific periods of time and specific locations. Certain cost recovery, fees, and insurance requirements may apply. The availability of Special Use Permits at the Seashore contributes to

beneficial impacts to visitor use and experience, because these permits allow for certain special uses (listed above), which otherwise would not be available.

The Passenger Ferry Feasibility Study, Passenger Ferry Departure Site (Selection), and Harkers Island Passenger Ferry Departure Site (Facility) Environmental Assessments involve implementing improvements to ferry service at Beaufort and Harkers Island, such as creating a new ticketing office, a queuing shelter, additional restrooms, expanded parking, and new docks. These improvements would result in long-term beneficial impacts to visitor use and experience, because there would be improved and expanded amenities for visitors boarding ferries to the Seashore from these locations.

The *Cape Hatteras National Seashore Long-term ORV Management Plan/EIS* has influenced ORV management at Cape Lookout, primarily due to lessons learned from the Cape Hatteras ORV management process, their proximity to each other, and because beach driving is a unique visitor experience for the region. Although the experience at each seashore is different for ORV users, change in management at one seashore may result in a visitation shift to the other seashore in order for visitors to get their desired experience. Impacts to visitors to Cape Lookout under these scenarios are unknown at this time and would depend on visitor views and how visitation patterns shift.

The Seashore recently completed historic structure protection activities at the Cape Lookout lighthouse area. This project included adding about 75,000 cubic yards of sand to the shoreline for protection of historic structures at the Cape Lookout lighthouse. The Seashore also recently completed a Cape Lookout Village Historic Structures Reuse Implementation Plan/EA in 2007. This project proposes reuse of historic structures as rental cabins, interpretive and visitor facilities. These plans have long-term beneficial impacts on visitor use and experience, due to the improvements made to the historic structures and districts that provide enhancements to the visitor experience.

The Seashore's *Foundation Document*, which identifies the purpose, need, and objectives of the Seashore, provides Seashore-wide guidance for long range planning including the eight priority projects identified in table 51. The planning actions identified in this document would likely have long-term beneficial impacts on visitor use and experience, as a result of implementing long-range planning for Seashore management and operations throughout the entire Seashore that meet the needs of the various visitors and visitor activities found at the Seashore. Likewise, the contracts for commercial service providers (ferry and concessioner operators) are currently in the process of being developed under a commercial services plan, and would likely have long-term beneficial impacts on visitor use and experience due to maintaining a regular ferry schedule for visitors, and improving concessioner operations and services through additional NPS oversight of this sole source of public transportation to the Seashore, outside of a personal boat.

The Seashore plans to update the *Horse Management Plan* (NPS 2007h) for the wild horse population on Shackleford Banks. The plan would define how this culturally significant resource is to be cooperatively managed by both the NPS and the Foundation of Shackleford Horses. This Congressionally mandated cooperative partnership began in 1999 and operates under a Memorandum of Understanding that states that the herd size will be maintained at 110–130 animals (NPS 2000a). The plan would likely have long-term beneficial impacts on visitor use and experience, as it would use a comprehensive approach to maintain and manage the wild horse population at Shackleford Banks, which is a popular attraction for visitors and ensure that the visitor experience in this area of the Seashore is maintained and/or enhanced.

A long-range interpretive plan (NPS 2011k) articulates the purpose, significance, and themes of the Seashore, and the necessity to inform and guide the Seashore's interpretive and education programs into the next decade. The plan also provides an overall framework for the Seashore's efforts to improve and expand upon visitor services including ranger-led programs, exhibits, and facilities, which would have

long-term beneficial impacts on visitor use and experience because of the enhancement of the visitor experience achieved through these improved programs.

Currently, the BOEM North Carolina Renewable Energy Task Force is discussing plans for off-shore commercial wind leasing. The task force, comprised of relevant Federal agencies, State government officials, and local and Tribal elected government officials, assists BOEM in the planning and decision-making process in identifying a Wind Energy Area off the coast of North Carolina. Although the planning process includes a thorough analysis of reasonable alternatives and cumulative impacts, it is possible that the development of off-shore wind stations could adversely impact visitor experience at the Seashore if the wind turbines are visible from the Seashore, thus negatively impacting the natural viewscape for Seashore visitors.

Military overflights above the Seashore may result in long-term slightly adverse impacts on visitor use and experience, especially for those visitors seeking quiet and solitude at the park. This source of noise would contribute to long-term adverse impacts on visitor use and experience when considered together with the ORV noise from alternative A. However, the intensity of noise from military overflights would likely be less than noteworthy because of the masking effect of the surf sounds, and the concentration of motorized noises in developed/transportation oriented-areas (such as the ferry landings) where it is consistent with the use of park.

The overall combined impacts of these past, current, and future actions on visitor use and experience would be long-term, limited, and adverse (from restricting ORV access at the Seashore to visitors wanting unrestricted access, from the noise from ORVs and military overflights to visitors seeking quiet and solitude at the Seashore, and from the potential visual impact of the BOEM wind turbines), as well as long-term beneficial (from increased visitor amenities, improvements made to the historic structures and districts, maintaining a regular ferry schedule, improving concessioner operations and services, maintaining and managing the wild horse population at Shackleford Banks, the improvement of visitor services including ranger-led programs and exhibits, and the availability of the Special Use Permits). These impacts, combined with the noticeable long-term adverse and beneficial impacts under alternative A, would likely result in long-term adverse and beneficial cumulative impacts, of which management of ORV use under alternative A would contribute a large part.

ALTERNATIVE B

Impacts of Alternative B

ORV and Full Recreational Closures—Under alternative B, up to 81 percent (45 out of 56 miles) of the Seashore's ocean beach would remain open to ORV use from March 16 through December 31. Further, approximately 19 percent (11 of 56 total miles of the Seashore's ocean beach) would be closed to ORV use (all of Shackleford Banks, the Cape Lookout Spit and the beach near the Cape Lookout lighthouse). No other non-ORV areas would be established. The same impacts associated with resource protection closures under alternative A would apply to alternative B, with the addition of the adaptive management strategy. The adaptive management strategy would possibly increase protection measures, based on the condition of the American oystercatcher, which is being used as an indicator species for potential impacts to other species at the Seashore. Thus, depending on the resource management activities as prescribed under the adaptive management strategy, ORV users and pedestrians alike could experience long- and short-term, noticeable, adverse and beneficial impacts to visitor use: no impacts would result if resource protection activities are not changed as a result of the adaptive management strategy. Adverse impacts would result if increased protection measures are implemented as directed in the adaptive management strategy.

ORV users would be slightly impacted by management actions under all action alternatives that discontinue ORV use on sections of Core Banks where no ferry landing access is available, because any new islands that might be created due to storm events or other causes would not have ferry landings, and would not allow ORV use.

ATV and UTV Use—Under alternative B, all high-performance sport-model and two-stroke ATVs and UTVs would be prohibited after a five-year grace period, whereas non-sport ATVs and UTVs would be permitted from March 16 through December 31. Owners and operators of high-performance sport-model and two-stroke ATVs and UTVs would be adversely impacted because these vehicles would no longer be permitted at the Seashore and this visitor experience would no longer be available. However, this restriction would also result in long-term beneficial impacts on visitors seeking quiet and solitude at the Seashore, because these vehicles would no longer be allowed at the Seashore.

Camping—Impacts related to camping under alternative B would be the same as those under alternative A. Other impacts to camping would remain localized and short-term due to temporary resource and safety closures, and localized long-term adverse due to camping restrictions, and campfire restrictions. Further, emergency (storm refuge) parking could be provided, on a case-by-case basis, in designated areas along the back route under alternative B. This would allow for overnight vehicle parking during times of adverse weather or unusually high tide events, which would result in beneficial impacts to visitor experience.

Permitting and Limits on the Number of Vehicle Permits—Under alternative B, a vehicle permit would be required. The Seashore would offer a short-term permit (estimated to cost the operator \$80 and last up to 10 days), and a long-term permit (estimated to cost the operator \$150, and last a calendar year). Because there would be no limit on the number of permits issued, and the NPS would ensure that the permit is easily obtainable, impacts on ORV users are expected to be noticeable, particularly due to the time, effort, and cost needed to obtain the vehicle permit. An operator education certificate would also be required in order to operate an ORV at the Seashore, which would result in slight impacts on visitor use and experience due to the time and effort required to obtain the permit. Revocation of the vehicle permit and/or the education certificate could result from a visitor violating applicable park regulations or terms and conditions of the permit, which would result in adverse impacts on those visitors, and also beneficial impacts on all users as overall experience at the Seashore would improve if all visitors are obeying the rules.

Long-Term Vehicle Parking and Storage—Under alternative B, a parking permit would be required for long-term parking, and there would be a fee for the monthly permit. Under alternative B, the quantity of the permits would be limited based on the season and the geographic location of the parking lot (North Core Banks - Long Point would allow 20 vehicles; South Core Banks Great Island lots (including the Great Island main lot and the Great Island Carly Dock lot) would allow 90 vehicles; and the South Core Banks Light Station lot would allow 20 vehicles). Based on data collected on parking lot use in 2009 and 2010, the limit on the number of parking permits would result in between 5 and 10 days when the parking lots would be full as a result of the restrictions under alternative B. This would result in less than 50 fewer parking space days spread over the spring and summer, where a parking space day is one vehicle in one parking space for one day. There would be less impact on parking in the fall season because more permits would be available. Allowing long-term parking at the Seashore would result in favorable impacts on visitor use and experience, even with the fee and limited number of permits available, because ORV users would not be required to transport their ORVs to and from the Seashore with each visit. Limiting the number of permits would also prevent the boundary of the lots from expanding because of lack of space, and would be a beneficial long-term impact to those visitors preferring not to see as many vehicles during their visit to the Seashore. Long-term adverse impacts are also possible for those visitors who are unable

to get a permit and would experience the additional cost and inconvenience of taking their vehicles on and off the Seashore by ferry each time they visit.

ORVs and Other Recreational Uses—Under alternative B, ORVs would be restricted from accessing certain areas of the Seashore (see “ORV and Full Recreational Closures”), but up to 81 percent of the Seashore would be open to ORV use from March 16 through December 31¹⁴. The back route would be re-established to the same or equivalent locations when they are impacted by a storm event for resource protection and safety, resulting in beneficial impacts to ORV users because the back route is critical for traversing the Seashore via ORV. Occasional maintenance would occur on the back route as needed. Up to four additional ramps may be created on North Core Banks, and five on South Core Banks, and pull-outs would be established along the back route. For resource protection and safety, the location of ramps may be adjusted when they are impacted by a storm event. As a result of the general area that would be available for ORV use, and the maintenance, re-establishment, and establishment of additional ramps at the Seashore, impacts to ORV users would be long-term and beneficial.

ORV use would provide access to fishing sites along Seashore beaches (except for those areas closed for resource, safety, or administrative uses, which is approximately 10 miles in the summer, and 5.4 miles in the fall, based on data from 2008 through 2013), and to fishing tournaments held during the spring and fall. Because fishing is a popular visitor activity at the Seashore, the largely unrestricted access would continue to support a valuable visitor experience for this user group. The resource closures would not be overly restrictive because the back route would provide access around turtle nests and bird closures. Therefore, impacts under alternative B to fishermen would not result in new noticeable adverse impacts on visitors participating in fishing because historical beach access for fishermen would be maintained as they are under alternative A. Likewise, access to cabin facilities, backcountry camping sites, swim beaches, and sunbathing areas would continue largely unchanged for both ORV and non-ORV users. On occasion, site-specific resource management activities, such as ORV or full recreational closures, could result in changes to access routes and relocation of preferred activities, but in most cases, an alternate route would be identified so that ORV users and non-ORV users would be able to reach their initial destination or an alternative destination in the vicinity.

Pedestrian Activities—As under alternative A, pedestrian uses, such as swimming, sunbathing, beach walking, and shell collecting would be allowed outside of any full recreation closure under alternative B. There would still be the same pedestrian-only areas at the Seashore under alternative B as there would be under alternative A. Visitors would continue to be able to have an ORV-free experience at the Seashore on Shackleford Banks, where ORVs would continue to be prohibited. Impacts to all user groups would not be noticeable as the location and extent of pedestrian-only areas would be the same as the existing condition.

Night Driving—The use of headlights for driving at night at the Seashore may adversely impact night sky viewing opportunities for visitors. However, nighttime driving restrictions would be implemented under alternative B, from 9 p.m. to 6 a.m. from May 1 through August 31. The night driving restriction would prohibit ORV use during these times, though all other permitted recreational activities would be allowed. This restriction would result in noticeable long-term impacts on ORV users, particularly in the early fall, because many ORV users and fishermen enjoy the opportunity to operate an ORV at night to

¹⁴ For alternatives, these percentages are simply a starting point and do not account for any other safety or resource closures due to resource protection and safety that may be implemented, as needed, which may adjust these percentages.

change fishing locations, return to camp after dusk, or to leave camp to go fishing before dawn. This would result in adverse impacts to ORV users and fisherman, because these activities would no longer be allowed. However, there would be long-term beneficial impacts on visitors seeking to view night skies without the intrusion of headlights, which diminish the ability to see night skies.

ORV and Pedestrian Conflicts—Because pedestrians and ORVs could be present in the same areas under alternative B, the noise and the sight of vehicles and vehicle tracks could degrade the visitor experience for those visitors seeking solitude and a natural setting, which would result in short-term, adverse impacts to those visitors which would be similar to those described under alternative A.

Miscellaneous Vehicle and Operator Requirements—Due to the restrictions on vehicle type (such as three-wheeled vehicles and trailers), and other restrictions (number of axles, wheels, vehicle length), certain vehicles would not be allowed to be operated at the Seashore. This would result in slightly noticeable, adverse impacts on visitor use and experience, because visitors would no longer be able to operate vehicles that do not meet these requirements and may choose to not visit the Seashore. Further, certain vehicle equipment requirements could also result in slightly adverse impacts on ORV users, since various items would be required for each ORV which visitors might view as a burdensome requirement that requires additional financial investment.

Vehicle Delivery—Impacts related to vehicle delivery under alternative B would be the same as those under alternative A (continued long-term, beneficial impacts to ORV users, because ATV and UTV users would be permitted to transport their ATVs and UTVs to the Seashore to certain designated soundside access points and would not notice any change from existing operations).

Shade Shelters—Providing six additional shade shelters at the Seashore would result in long-term, beneficial impacts on all Seashore visitors, as visitors would be able to escape storms and intense sunlight under these shelters, as needed, thus improving their visit to the Seashore beyond the current number of shade shelters offered.

Cumulative Impacts under Alternative B

The past, present, and future actions under alternative B would be the same under alternative A which would be long-term, limited, and adverse (from restricting ORV access at the Seashore to visitors wanting unrestricted access, from the noise from ORVs and military overflights to visitors seeking quiet and solitude at the Seashore, and from the potential visual impact of the BOEM wind turbines), as well as long-term beneficial (from increased visitor amenities, improvements made to the historic structures and districts, maintaining a regular ferry schedule, improving concessioner operations and services, maintaining and managing the wild horse population at Shackleford Banks, the improvement of visitor services including ranger-led programs and exhibits, and the availability of the Special Use Permits). These impacts, combined with the long-term adverse and beneficial impacts under alternative B, would likely result in observable long-term adverse and beneficial cumulative impacts of which management of ORV use at the Seashore would be a large part.

ALTERNATIVE C

Impacts of Alternative C

ORV and Full Recreational Closures—Under alternative C, up to 79 percent¹⁵ (44 of 56 miles) of Seashore beach would be available for ORV use from March 16 through the Thursday preceding Memorial Day and from the day after Labor Day through December 15. Up to approximately 74 percent (41 of 56 miles) of Seashore beach would be available for ORV use from the Friday preceding Memorial Day through Labor Day. This would result in unfavorable, localized and short-term impacts on visitor use and experience, due to the restrictions placed on areas that visitors would be able to access. Temporary resource and safety closures under alternative C would be the same as under alternative A.

As under alternative B, alternative C would implement the adaptive management strategy. Under the adaptive management strategy, actions may increase protection measures, based on the condition of the American oystercatcher, which is being used as an indicator species for potential impacts to other species at the Seashore. Thus, depending on the resource management activities as prescribed under the adaptive management strategy, ORV users and pedestrians alike could experience long- and short-term, noticeable, adverse and beneficial impacts to visitor use: no impacts would result if no resource protection activities are changed as a result of the adaptive management strategy; adverse impacts would result if resource protection measures are increased, including reduction in the number of permits issued, reduction in available parking, or increased species buffers where ORV and other use is not permitted; and beneficial impacts to visitor experience would result for those wishing to view birds and other wildlife, if increased protection measures are implemented as directed under the adaptive management strategy.

Under alternative C, ORV and full recreational closures at the Seashore would result in restricting areas where ORV use and recreational pursuits occur; however, pedestrians and visitors participating in activities such as swimming, sunbathing, beach walking, and shell collecting would be able to participate in activities outside of any full recreational closure. The effects of full recreational closures on visitor experience would result in long-term, noticeable adverse impacts, if visitors are prohibited from entering an area they wish to access. When full recreational closures are implemented at the Seashore, impacts on users would likely be short-term and noticeably adverse, even if the closures were temporary, since any full recreational closure that restricts ORV access and other visitor uses would most likely occur during the spring/summer months. The fall fishing season is expected to be less impacted by full recreational closures, because the Seashore does not implement full recreational closures as frequently as they do in the spring/summer months. In most cases, the back route would be used as an alternate route so that ORV users would be able to reach their initial destination if an ORV closure temporarily restricts their access.

ORV users would be slightly impacted by management actions under all alternatives that discontinue ORV use on sections of Core Banks where no ferry landing access is available, because any new islands that might be created due to storm events or other causes would not have ferry landings, and would not allow ORV use.

ATV and UTV Use—Under alternative C, non-sport ATVs and UTVs would be permitted between September 15 and December 15. All high-performance sport-model and two-stroke ATVs and UTVs

¹⁵ For alternatives, these percentages are simply a starting point and do not account for any other safety or resource closures due to resource protection and safety that may be implemented, as needed, which may adjust these percentages.

would be prohibited after a five-year grace period. Owners and operators of high-performance sport-model and two-stroke ATVs and UTVs would be adversely impacted after the five-year grace period because these vehicles would no longer be permitted at the Seashore and this visitor experience would no longer be available. Owners and operators of non-sport ATVs and UTVs would also be impacted, as these vehicles would only be allowed to operate at the Seashore during the fall and early winter months.

Camping—Impacts to visitors wishing to camp at the Seashore would be the same as those under alternative B (localized and short-term due to temporary resource and safety closures, and localized long-term adverse due to camping restrictions, and campfire restrictions).

Permitting and Limits on the Number of Vehicle Permits—Under alternative C, short- and long-term vehicle permits and applicable fees would be required, and limits on the number of permits would be established. The initial number of permits issued would be 2,500 for North Core Banks, and 3,000 for South Core Banks, which is based on 2005-2010 user data for the average number of vehicles delivered to each island, excluding decreases due to hurricanes. Because the limit on the number of permits issued would be determined in year 4 of the ORV plan and based on the average number of permits issued per island in years 1–3 of the ORV plan, short-term impacts on ORV users are expected to be slight but noticeable, as the number of permits would be based on the average number of ORVs entering the Seashore for those years. Long-term impacts to ORV users would be expected to be noticeable and adverse if the demand to bring ORVs to the Seashore surpasses the number of permits issued, which would restrict some visitors from bringing their ORVs to the Seashore. The same operator education certificate described under alternative B would also be required in order to operate an ORV at the Seashore. These requirements would result in slight impacts on visitor use and experience, particularly due to the time, effort, and cost of obtaining the permit and the education certificate. Revocation of the vehicle permit and/or the education certificate could result from a visitor violating applicable park regulations or terms and conditions of the permit, which would result in adverse impacts on those visitors, and beneficial impacts on all users because overall experience at the Seashore would improve if all visitors are obeying the rules.

Long-Term Vehicle Parking and Storage—A parking permit would be required for long-term parking as described under alternative B; however, the number of long-term parking lots would be reduced from four to three; the parking lots at the Great Island area would be consolidated at the north end of Great Island, near Great Island Carly Dock, while still accommodating the number of vehicles described under alternative B. There would be a fee for the monthly permit, and the same quantity of permits available under alternative B would be available under alternative C. Based on data collected on parking lot use in 2009 and 2010, the limit on the number of parking permits might result in 5 to 10 days when the parking lots would be full as a result of the restrictions under alternative C. This would result in less than 50 fewer parking space days spread over the spring and summer, where a parking space day is one vehicle in one parking space for one day. There would be less impact on parking in the fall season because more permits would be available. Even though ORV users would not be required to transport their vehicles to and from the Seashore with each visit, allowing long-term parking at the Seashore would result in unfavorable impacts on visitor use and experience for ORV users, due to the fee for the long-term parking lots, the reduced number of parking lots, and the limited number of permits available which would all result in some visitors not being able to park and incurring the cost and inconvenience of transporting their vehicle back and forth from the Seashore for each visit. However, by consolidating the four existing parking lots into three parking lots, impacts on the visual environment would be beneficial, as less land area would be devoted to parking lots and the natural setting of the Seashore would be restored at the site of the former parking lot.

ORVs and Other Recreational Uses—Under alternative C, ORVs would be restricted from accessing certain areas of the Seashore (see “ORV and Full Recreational Closures”). ORV use areas would decrease

by approximately 4 miles (0.7 miles year-round and 3.1 miles in the summer) under alternative C, resulting in long-term slightly adverse impacts to ORV users. However, up to 79 percent of the Seashore would be open to ORV use from March 16 through the Thursday preceding Memorial Day and from the day after Labor Day through December 15. Seventy-four percent of Seashore beach would be available for ORV use from the Friday preceding Memorial Day through Labor Day.

The back route would be re-established to the same or equivalent location when it is impacted by a storm event for resource protection and safety, resulting in beneficial impacts to ORV users because the back route is critical for traversing the Seashore via ORV. Occasional maintenance would occur on the back route as needed. Up to four additional ramps may be created on North Core Banks, and five on South Core Banks, and pull-outs would be established along the back route. For resource protection and safety, the location of ramps may be adjusted when they are impacted by a storm event. As a result of the general area that would be available for ORV use, and the maintenance, re-establishment, and establishment of additional ramps at the Seashore, impacts to ORV users would be long-term and beneficial.

ORV use at the Seashore would provide access to fishing sites along Seashore beaches (except for those areas closed for resource, safety, or administrative uses, which is approximately 10 miles in the summer, and 5.4 miles in the fall, based on data from 2008 through 2013), and to fishing tournaments held during the spring and fall. Because fishing is a popular visitor activity at the Seashore, the largely unrestricted access would continue to support a valuable visitor experience for this user group. However, when the resource, safety, or administrative closures are considered with the 4-mile reduction of ORV use areas, impacts under alternative C to fishermen would result in slightly noticeable adverse impacts on visitors participating in fishing activities because historical beach access for fishermen would be reduced when compared to current conditions, even though the back route would provide access around turtle nests and bird closures. Likewise, access to cabin facilities, backcountry camping sites, swim beaches, and sunbathing areas would continue largely unchanged for both ORV and non-ORV users. On occasion, site-specific resource management activities, such as ORV or full recreational closures, could result in changes to access routes and relocation of preferred activities, but in most cases, an alternate route would be identified so that ORV users and non-ORV users would be able to reach their initial destination or an alternative destination in the vicinity.

Pedestrian Activities—Pedestrian-only areas would increase by approximately 4 miles (0.7 miles year-round and 3.1 miles in the summer) under alternative C. Under alternative C, pedestrian uses, such as swimming, sunbathing, beach walking, and shell collecting would be allowed outside of any full recreational or safety closure. Because there would be an increase of pedestrian-only areas at the Seashore under alternative C, those seeking an ORV-free visitor experience would benefit from alternative C. Two of the proposed pedestrian-only areas are at ferry landing locations, which would be easily accessible to pedestrians arriving by ferry. The third proposed area is at Codd's Creek. It is likely that visitors would either use an ORV, private boat or a kayak to access the pedestrian-only area at Codd's Creek, because of its distance from the lighthouse or Great Island ferry landings. Therefore while the additional pedestrian-only area at Codd's Creek represents a beneficial impact to non-ORV users, it is unknown how many visitors would benefit from this area. Furthermore, visitors would continue to be able to have an ORV-free experience at the Seashore on Shackleford Banks, where ORVs would continue to be prohibited.

Night Driving—Nighttime driving restrictions would be expanded under alternative C, from 9 p.m. to 6 a.m. from May 1 through September 14. The night driving restriction would prohibit ORV use during these times, though all other permitted recreational activities would be allowed. This restriction would result in noticeable long-term impacts on ORV users, particularly in the fall, because many ORV users and fishermen enjoy the opportunity to operate an ORV at night to change fishing locations, return to camp after dusk, or to leave camp to go fishing before dawn. This would result in noticeable adverse impacts to ORV users and fisherman, because these activities would no longer be allowed. However,

there would be long-term beneficial impacts on visitors seeking to view night skies without the intrusion of headlights, which diminish the ability to see night skies.

ORV and Pedestrian Conflicts—In some cases, pedestrians and ORV users could encounter each other on the oceanside beaches, raising the possibility of conflict between ORV and non-ORV uses and a diminished visitor experience for visitors seeking solitude and freedom from vehicular distractions. Because pedestrians and ORVs could still be present in the same areas under alternative C, the noise and the sight of vehicles could decrease the visitor experience for those visitors seeking solitude and a natural setting. The increase in pedestrian-only areas by approximately 4 miles would have slightly adverse impacts on ORV users, as there would be less area to operate ORVs, and beneficial impacts to non-ORV users wishing to experience the Seashore in the absence of ORV use.

Miscellaneous Vehicle and Operator Requirements— The impacts from the vehicle and operator requirements under alternative C would be similar to those under alternative B. Due to the restrictions on vehicle type (such as three-wheeled vehicles and trailers), restrictions on trailers (after a five-year grace period), and other restrictions (number of axles, wheels, vehicle length), certain vehicles and all trailers would not be allowed to be operated at the Seashore. This would result in slightly noticeable, adverse impacts on visitor use and experience, because visitors would no longer be able to operate vehicles that do not meet these requirements and may choose to not visit the Seashore. Further, certain vehicle equipment requirements could also result in slightly adverse impacts on ORV users, since various items would be required for each ORV, which visitors might view as a burdensome requirement that requires additional financial investment.

Vehicle Delivery—Because vehicles would only be transported to the Seashore via NPS authorized ferries under alternative C, adverse impacts to ORV users would be long-term and slight, because ORV users would no longer be able to transport their vehicles to the Seashore via private or noncommercial means. This could result in some visitors not coming to the Seashore because they cannot afford or do not want to pay a commercial ferry operator for transport of their ORV.

Shade Shelters—The impacts related to shade shelters under alternative C would be the same as those under alternative B (long-term, beneficial impacts on all Seashore visitors, as visitors would be able to escape storms and intense sunlight under these shelters, as needed, thus improving their visit to the Seashore beyond the current number of shade shelters offered).

Cumulative Impacts under Alternative C

The past, present, and future actions under alternative C would be the same under alternative A, which would be long-term, limited, and adverse (from restricting ORV access at the Seashore to visitors wanting unrestricted access, from the noise from ORVs and military overflights to visitors seeking quiet and solitude at the Seashore, and from the potential visual impact of the BOEM wind turbines), as well as long-term beneficial (from increased visitor amenities, improvements made to the historic structures and districts, maintaining a regular ferry schedule, improving concessioner operations and services, maintaining and managing the wild horse population at Shackleford Banks, the improvement of visitor services including ranger-led programs and exhibits, and the availability of the Special Use Permits). These impacts, combined with the long-term adverse and beneficial impacts under alternative C, would likely result in observable long-term adverse and beneficial cumulative impacts, of which management of ORV use at the Seashore would contribute a large part.

ALTERNATIVE D

Impacts of Alternative D

ORV and Full Recreational Closures—Under alternative D, up to 73 percent¹⁶ (41 of 56 miles) of Seashore beach would be available for ORV use from March 16 through the Thursday preceding Memorial Day and from the day after Labor Day through December 15. Sixty-three percent (35 of 56 miles) of Seashore beach would be available for ORV use between the Friday preceding Memorial Day and Labor Day. Temporary resource and safety closures under alternative D would be the same as under alternative B, with the exception of increased resource buffers for sensitive bird species (buffers would be increased during courtship/mating including increasing colonial water bird buffers to 600 feet; least tern buffers to 300 feet; and American oystercatcher buffers to 450 feet) as well as increased pedestrian-only areas in the vicinity of unfledged piping plovers (pedestrian-only areas would extend at least 650 feet on each side of the nest site during the first week following hatching, but in no case should be reduced to less than 650 feet on each side of observed broods. In some cases, highly mobile broods may require protected areas up to 3,250 feet, even when intensively monitored). This would result in ORV closures that are at least 50 feet and up to 2,650 feet greater than currently occurring. These resource protection measures would result in, localized and short-term adverse impacts on visitor use and experience, due to the restrictions placed on areas that visitors would be able to access.

As under alternative B, alternative D would implement the adaptive management strategy. Under the adaptive management strategy, management actions may increase protection measures, based on the condition of the American oystercatcher, which is being used as an indicator species for potential impacts to other species at the Seashore. Thus, depending on the resource management activities as prescribed under the adaptive management strategy, ORV users and pedestrians alike could experience long- and short-term, noticeable, adverse impacts to visitor use: no impacts would result if no resource protection activities are changed as a result of the adaptive management strategy; adverse impacts would result if resource protection measures are increased including reduction in the number of permits issued, or increased species buffers where ORV and other use is not permitted.

Under alternative D, ORV and full recreational closures at the Seashore would result in restricting areas where ORV use and recreational pursuits could occur; however, pedestrians and visitors participating in activities such as swimming, sunbathing, beach walking, and shell collecting would be able to participate in activities outside of any resource closure. The effects of ORV or full recreational closures for resource protection on visitor experience would result in long-term, noticeable adverse impacts, if visitors are prohibited from entering an area they wish to access. Impacts on users from ORV and full recreational closures would likely be long-term and adverse, even if the closure were temporary, since any full recreational closure that restricts ORV access and other visitor uses would most likely occur during the spring/summer months. The fall fishing season is expected to be less impacted by full recreational closures, because the Seashore does not implement full recreational closures as frequently as they do in the spring/summer months. In most cases, the back route would be used as an alternate route so that ORV users would be able to reach their initial destination. However, in the event that the 3,250-foot ORV buffer is required to protect highly mobile piping plover broods, the entire northern portion of Portsmouth

¹⁶ For alternatives, these percentages are simply a starting point and do not account for any other safety or resource closures due to resource protection and safety that may be implemented, as needed, which may adjust these percentages.

Island (on North Core Banks) would be closed, and the back route would not be available for ORV use, resulting in noticeable adverse impacts to ORV users.

ORV users would be slightly impacted by management actions under all alternatives that would discontinue ORV use on sections of Core Banks where no ferry landing access is available, because any new islands that might be created due to storm events or other causes would not have ferry landings, and would not allow ORV use.

ATV and UTV Use—Non-sport UTVs would be permitted between September 15 and December 15. All ATVs and high-performance sport-model and two-stroke UTVs would be prohibited after a five-year grace period. These restrictions would result in noticeable, adverse impacts on visitor use and experience, as visitors who previously used those vehicles at the Seashore would no longer be able to do so under alternative D as the experience for UTV users would be limited to approximately three months, compared to the nine months currently permitted. The types of UTVs allowed would be greatly limited compared to current use, because all ATVs and sport-model UTVs would be banned any time of the year.

Owners and operators of all ATVs and high-performance sport-model and two-stroke UTVs would be adversely impacted after the five-year grace period because these vehicles would no longer be permitted at the Seashore, and this visitor experience would no longer be available. However, this restriction would also result in long-term beneficial impacts on visitors seeking quiet and solitude at the Seashore.

Camping—Impacts to visitors wishing to camp at the Seashore would be the same as those under alternative B (localized and short-term due to temporary resource and safety closures, and localized long-term adverse due to camping restrictions, and campfire restrictions).

Permitting and Limits on the Number of Vehicle Permits—Under alternative D, short- and long-term vehicle permits and applicable fees would be required as under alternative B, while additional limits on the number of permits would be established. The limit on the number of permits issued would be determined in year 4 of the ORV plan from the average number of permits issued per island in years 1–3 of the ORV plan, minus 8 percent. Short-term impacts on ORV users would be noticeable and adverse, because the number of vehicle permits available would represent an 8 percent decrease from the current average. Long-term impacts to ORV users would be noticeable and adverse if the demand to bring ORVs to the Seashore surpasses the number of permits issued, which would restrict some visitors from bringing their ORVs to the Seashore. The same operator education certificate described for alternative B would also be required in order to operate an ORV at the Seashore. These requirements would result in slight impacts on visitor use and experience due to the time, effort, and cost required to obtain the permit and education certificate. Revocation of the vehicle permit and/or the education certificate could result from a visitor violating applicable park regulations or terms and conditions of the permit, which would result in adverse impacts on those visitors, and also beneficial impacts on all visitors as overall experience at the Seashore would improve if all visitors are obeying the rules.

Long-Term Vehicle Parking and Storage—Under alternative D, long-term parking and storage would be discontinued, which would result in long-term substantial adverse impacts on ORV users at the Seashore because ORV users would be required to transport their vehicle to and from the Seashore with every visit, rather than leave their vehicle at the Seashore for part of or the entire season, likely resulting in inconvenience and a higher cost to the user. Furthermore, the lack of long-term parking under alternative D could discourage some ORV users from visiting the Seashore entirely, due to this inconvenience and high cost to ORV users, resulting in long-term, substantially adverse impacts to those users. Portions of the long-term parking lots would be designated as emergency overnight parking areas, which would allow for overnight vehicle parking during times of adverse weather or unusually high tide events, thus improving visitor use and experience because visitors would be able to seek shelter at the

central location of the parking lots in times of severe weather. For those who desire an ORV-free Seashore experience, the prohibition of long-term parking would result in long-term beneficial impacts, because the visual impacts from ORVs in the long-term parking lots would be eliminated.

ORVs and Other Recreational Uses—Under alternative D, ORVs would be restricted from accessing certain areas of the Seashore (see “ORV and Full Recreational Closures”), but generally 73 percent of Seashore beach would be open to ORV use from March 16 through the Thursday preceding Memorial Day and from the day after Labor Day through December 15. Sixty-three percent of Seashore beach would be available for ORV use from the Friday preceding Memorial Day through Labor Day. This reduction in ORV use areas would result in long-term, noticeable adverse impacts to ORV users.

The back route would be re-established to the same or equivalent locations when they are impacted by a storm event for resource protection and safety, resulting in beneficial impacts to ORV users because the back route is critical for traversing the Seashore via ORV. Occasional maintenance would occur on the back route as needed. For resource protection and safety, the location of ramps may be adjusted when they are impacted by a storm event. Ramps would be located or re-established on flat sand, between dunes where there would be fewer impacts. The back route on South Core Banks from mile marker 44a to mile marker 44b would be open from March 16 through December 15 (through construction of bridges over the low-lying area; this bypass route would allow access around the Point when resource closures are in effect). As a result of the general maintenance, re-establishment, and establishment of additional ramps at the Seashore, impacts to ORV users would be long-term and beneficial.

Fishing would continue at all of the open Seashore beaches, except for those areas closed for resource, safety, or administrative reasons (approximately 10 miles in the summer, and 5.4 miles in the fall, based on data from 2008 through 2013). The resource closures would not be overly restrictive because the back route would provide access around turtle nests and bird closures. When the resource, safety, or administrative closures are considered with the roughly 10 mile reduction of ORV use areas, impacts under alternative D to fishermen would result in noticeable adverse impacts on visitors participating in fishing activities because historical beach access for fishermen would be reduced when compared to current conditions. Likewise, access to cabin facilities, backcountry camping sites, beaches, and sunbathing areas may also be restricted to ORVs based on the available ORV use areas. On occasion, site-specific resource management activities, such as ORV or full recreational closures, could result in changes to access routes and relocation of preferred activities, but in most cases, an alternate route would be identified so that ORV users and non-ORV users would be able to reach their initial destination or an alternative destination in the vicinity.

Pedestrian Activities—Pedestrian-only areas would increase by 4.2 miles year-round and 5.7 miles in the summer under alternative D, which would result in long-term beneficial impacts to non-ORV users due to the increase in areas that would be available to experience an ORV-free Seashore, and long-term slightly adverse impacts for ORV users, because the areas they would be able to operate an ORV would be decreased. Visitors to the Seashore would be able to access the pedestrian-only areas at Johnsons Creek, Long Point, Great Island, Codd's Creek, and the lighthouse (due to the proximity of these areas to ferry landings or maintenance of docks to facilitate access), while the other pedestrian-only areas at Middle Core Banks and Portsmouth beach (the ocean beach north from the road to Portsmouth) would be much more difficult to access without ORVs or other modes of transportation. Thus, the benefits of the pedestrian-only areas that are in close proximity to ferry landings would be greater than the pedestrian-only areas that are further away from ferry landings. As under alternative A, pedestrian uses, such as swimming, sunbathing, beach walking, and shell collecting would be allowed outside of any full recreational or safety closure under alternative D. Furthermore, visitors would continue to be able to have an ORV-free experience at the Seashore on Shackleford Banks, where ORVs would continue to be prohibited.

Night Driving—Because nighttime driving would be prohibited at the Seashore from 9 p.m. to 6 a.m., from May 1 through September 14, under alternative D, there would be long-term beneficial impacts on visitors seeking to view night skies without the intrusion of headlights, which may diminish the ability to see night skies. Conversely, this restriction would also result in noticeable long-term impacts on ORV users, particularly in the fall, because many ORV users and fishermen enjoy the opportunity to operate an ORV at night to change fishing locations, return to camp after dusk, or to leave camp to go fishing before dawn. This would result in adverse impacts to ORV users and fisherman, because these activities would no longer be allowed.

ORV and Pedestrian Conflicts—Under alternative D, pedestrians and ORV users could encounter each other on the oceanside beaches, raising the possibility of conflict between ORV and non-ORV users and a diminished visitor experience for visitors seeking solitude and freedom from vehicular distractions. However, because there would be an increase in pedestrian-only areas at the Seashore by approximately 10 miles under alternative D, those seeking an ORV-free visitor experience would benefit from the additional area allowing a pedestrian-only experience.

Miscellaneous Vehicle and Operator Requirements—Under alternative D, no trailers would be allowed after a five-year grace period, while UTV trailers (5 feet or less) would continue to be allowed. Further, the same vehicle equipment requirements under alternative B would be implemented, which could also result in slightly adverse impacts on ORV users, since various items would be required for each ORV, which visitors might view as a burdensome requirement that requires additional financial investment.

Vehicle Delivery—The impacts related to vehicle delivery under alternative D would be the same as those under alternative C. The adverse impacts to UTV users would be long-term and noticeable, because UTV users would no longer be able to transport their vehicles to the Seashore via private or noncommercial means. However, based on NPS staff observation, this restriction would likely impact very few visitors, because the number of visitors that transport their UTVs to the Seashore is very limited.

Shade Shelters—The impacts related to shade shelters under alternative D would be the same as those under alternative B (long-term, beneficial impacts on all Seashore visitors, as visitors would be able to escape storms and intense sunlight under these shelters, as needed, thus improving their visit to the Seashore beyond the current number of shade shelters offered).

Cumulative Impacts under Alternative D

The past, present, and future actions under alternative D would be the same under alternative A which would be long-term, limited, and adverse (from restricting ORV access at the Seashore to visitors wanting unrestricted access, from the noise from ORVs and military overflights to visitors seeking quiet and solitude at the Seashore, and from the potential visual impact of the BOEM wind turbines), as well as long-term beneficial (from increased visitor amenities, improvements made to the historic structures and districts, maintaining a regular ferry schedule, improving concessioner operations and services, maintaining and managing the wild horse population at Shackleford Banks, the improvement of visitor services including ranger-led programs and exhibits, and the availability of the Special Use Permits). These impacts, combined with the long-term adverse and beneficial impacts under alternative D, would likely result in observable long-term adverse and beneficial cumulative impacts, of which management of ORVs at the Seashore would contribute a large part.

ALTERNATIVE E

Impacts of Alternative E

ORV and Full Recreational Closures—As a result of prohibiting all ORVs at the Seashore, the NPS would not designate specific areas and trails on public lands where the use of ORVs may be permitted. This would result in substantial long-term adverse impacts on ORV users, as well as long-term beneficial impacts on visitors seeking an ORV-free Seashore experience. However, due to the nature and the geography of the Seashore, it is unlikely that many visitors would be able to access the entire Seashore without the aid of a vehicle. While this may be provided by a commercial provider, this access is not guaranteed under this ORV management plan/EIS. Thus, the long-term benefits to non-ORV users may be limited to the areas of the Seashore that are within a reasonable walking distance of a ferry landing. Similarly, these areas could become overcrowded (because visitors might not walk far from the ferry landings), thus presenting adverse impacts on visitors seeking solitude at the Seashore.

As under alternative B, alternative E would implement the adaptive management strategy. The adaptive management strategy would possibly increase protection measures, based on the condition of the American oystercatcher, which is being used as an indicator species for potential impacts to other species at the Seashore. Thus, depending on the resource management activities as prescribed under the adaptive management strategy, pedestrians could experience long- and short-term, noticeable, adverse impacts to visitor use: no new impacts would result if no resource protection activities are changed; adverse impacts would result if resource protection measures are increased including species buffers.

ATV and UTV Use—All ATVs and UTVs would be prohibited year-round at the Seashore, resulting in long-term substantial adverse impacts to ATV and UTV users, because this use would no longer be allowed. Although ATV and UTV areas may be available in other areas outside the Seashore, the environment of the Seashore is unique and adjacent areas would not offer the same type of remote beach experience. However, there would be long-term beneficial impacts on visitors seeking solitude and an ORV-free Seashore experience, because non-ORV users and visitors seeking solitude and a natural setting would not have any audible or visual disturbances from ATVs and UTVs.

Camping—Official camping regulations under alternative E would be the same as those under alternative A. However, the lack of ORV use at the Seashore would severely limit access to camping areas along Seashore beaches. Because it would be much more difficult to access remote areas of the Seashore for camping, impacts to visitors wishing to camp would be long-term and substantially adverse.

Permitting and Limits on the Number of Vehicle Permits—Under alternative E, there would be no ORV allowed at the Seashore and therefore a permitting system would not be required and there would be no impact from such a system.

Long-Term Vehicle Parking and Storage—Under alternative E, there would be no long-term vehicle parking or storage, because vehicles would not be allowed at the Seashore, therefore impacts related to long-term vehicle parking and storage are not applicable.

ORVs and Other Recreational Uses—Under alternative E, ORVs would be restricted from accessing the Seashore. One-hundred percent of Seashore beach would be available for pedestrian-access only, year-round. The back route would be re-established to the same or equivalent locations when it is impacted by a storm event for resource protection and safety, but would only be used by NPS staff for administration and management purposes. Occasional maintenance would occur on the back route as needed. Because the Seashore would prohibit ORV use year-round, impacts to ORV users would be long-term and substantially adverse, while impacts to non-ORV users would be long-term and beneficial,

because non-ORV users and visitors seeking solitude and a natural setting would not have any vehicular intrusions or distractions.

The lack of ORV use at the Seashore would severely limit access to fishing sites along Seashore beaches, and to fishing tournaments held during the spring and fall. Fishing would likely be limited to the ferry landing areas due to the lack of available options for accessing remote areas of the Seashore with fishing equipment in tow. This would result in long-term substantial adverse impacts on fishermen, because it would be difficult to access many historical and preferred fishing areas at the Seashore.

Pedestrian Activities—As under alternative A, pedestrian uses, such as swimming, sunbathing, beach walking, and shell collecting would be allowed outside of any full recreational or safety closure under alternative E. The opportunity to experience the Seashore in solitude from vehicular distractions would be entirely attainable under alternative E. Therefore, impacts would be long-term beneficial for pedestrians and visitors seeking an ORV-free Seashore experience. However, the long-term benefits to non-ORV users may be limited to the areas of the Seashore that are within a reasonable walking distance of a ferry landing. Similarly, these areas could become overcrowded (because visitors might not walk far from the ferry landings), thus presenting adverse impacts on all visitors, and especially visitors seeking solitude at the Seashore.

Night Driving—Because ORVs would not be permitted under alternative E, there would be long-term beneficial impacts on visitors seeking to view night skies without the intrusion of headlights, which diminish the ability to see night skies. Similarly, impacts to visitors who desire to drive at night at the Seashore would be long-term and substantially adverse.

ORV and Pedestrian Conflicts—Because ORVs would be prohibited from the Seashore year-round, there would not be any impacts related to ORV and pedestrian conflicts.

Miscellaneous Vehicle and Operator Requirements—Because ORVs would be prohibited from the Seashore year-round, there would not be any miscellaneous vehicle or operator requirements or impacts from these requirements.

Vehicle Delivery—Because ORVs would be prohibited from the Seashore year-round, there would not be any vehicle delivery requirements or impacts from these requirements.

Shade Shelters—The impacts related to shade shelters under alternative E would be the same as those under alternative B (long-term, beneficial impacts on all Seashore visitors, as visitors would be able to escape storms and intense sunlight under these shelters, as needed, thus improving their visit to the Seashore beyond the current number of shade shelters offered).

Cumulative Impacts under Alternative E

The past, present, and future actions discussed under alternative A would be similar under alternative E, which would be long-term, limited, and adverse (from restricting ORV access at the Seashore to visitors wanting unrestricted access, and from the noise from military overflights to visitors seeking quiet and solitude at the Seashore), as well as long-term beneficial (from increased visitor amenities, improvements made to the historic structures and districts, maintaining a regular ferry schedule, improving concessioner operations and services, maintaining and managing the wild horse population at Shackleford Banks, and the improvement of visitor services including ranger-led programs and exhibits, and the availability of Special Use Permits). These impacts, combined with the long-term adverse and beneficial impacts under alternative E, would likely result in observable long-term adverse and beneficial cumulative impacts, of

which management of ORV use (including discontinuing ORV use under alternative E) would contribute a large part to long-term adverse impacts.

COMPARISON OF ALTERNATIVES

Compared to alternative A, impacts on ORV users under alternative B would be slightly more adverse, due to the expanded rules and regulations that would be implemented under alternative B, such as night driving, vehicle requirements, and vehicle permits. Compared to alternative A, impacts on non-ORV users would not be noticeable. Compared to alternative E, impacts on ORV users under alternative B would be beneficial, as ORV use would be prohibited under alternative E. Compared to alternative E, impacts on non-ORV users would be noticeably adverse, due to the presence of ORVs under alternative B.

Compared to alternative A, impacts on ORV users under alternative C would be slightly more adverse, due to the expanded rules and regulations that would be implemented under alternative C, such as night driving, vehicle requirements, vehicle permits, and vehicle restrictions. Compared to alternative A, impacts on non-ORV users would be beneficial. Compared to alternative E, impacts on ORV users under alternative C would be considerably beneficial, due to the prohibition of ORVs under alternative E. Compared to alternative E, impacts on non-ORV users would be noticeably adverse, due to the continued presence of ORVs under alternative C.

Compared to alternative A, impacts on ORV users under alternative D would be more adverse, due to the expanded rules and regulations that would be implemented under alternative D, such as night driving, vehicle requirements, an 8 percent reduction in the number of vehicle permits, and vehicle restrictions. Compared to alternative A, impacts on non-ORV users would be slightly beneficial, due to the increase in pedestrian-only areas. Compared to alternative E, impacts on ORV users under alternative D would be considerably beneficial, due to the prohibition of ORVs under alternative E. Compared to alternative E, impacts on non-ORV users would be noticeably adverse, due to the presence of ORVs under alternative D.

Compared to alternative A, impacts on ORV users under alternative E would be substantially adverse, as ORVs would be prohibited throughout the entire Seashore. Impacts on non-ORV users would be long-term and beneficial, as ORVs would be prohibited throughout the entire Seashore. However, the benefits of alternative E to non-ORV users would be primarily limited to the areas of the Seashore that are within reasonable walking distance of a ferry landing, and further limited if those areas become over-crowded with pedestrians.

CONCLUSION

Alternatives A, B, C, and D would not adversely impact the unique geography and undeveloped qualities that many visitors come to the Seashore to enjoy. Surfing, hunting, shelling, and beachcombing would continue to be allowed under all alternatives. In addition, under all alternatives visitors would still be able to learn about the natural history of coastal North Carolina and the cultural and historic significance of the region.

Under alternative A, visitors would be able to witness the vast ocean viewshed by day and night. Because nighttime driving would not be restricted, visitors who enjoy fishing would be able to leave their camps before dawn to reach their fishing locations, as well as leave their fishing locations after dusk to return to their camps. However, there would be impacts on the ability to enjoy some of the darkest night sky vantages along the East Coast. Visitors to the Seashore would still be able to experience a unique recreational setting and enjoy noncommercialized and self-reliant outdoor activities in a remote and

natural setting, even though the presence of ORVs may create some adverse impacts by detracting from the feeling of solitude and the natural setting. Alternative A may also have adverse impacts on visitor use and experience due to restrictions on ORV access in certain areas.

Under alternatives B, C, and D, visitors would still be able to witness the vast ocean viewshed by day. The ability to enjoy some of the darkest night sky vantages along the East Coast by night would be achievable because nighttime driving would be restricted from at least May 1 through August 31, with 15 additional days (until September 14) under alternatives C and D. Conversely, due to the nighttime driving restrictions, visitors who enjoy fishing would not be allowed to leave their camps before dawn to reach their fishing locations, and would not be allowed to leave their fishing locations after dusk to return to their camps. Visitors to the Seashore would still be able to experience a unique recreational setting where visitors enjoy noncommercialized and self-reliant outdoor activities in a remote and natural setting, even though the presence of ORVs may create some adverse impacts by detracting from the feeling of solitude and the natural setting in some areas. Alternatives B, C, and D may also have adverse impacts on visitor use and experience due to restrictions on ORV access in certain areas.

Under alternative E, visitors would be able to witness the vast ocean viewshed by day and enjoy some of the darkest night sky vantages along the East Coast by night, because ORV use would not be allowed at the Seashore under alternative E. Visitors would still be able to learn about the natural history of coastal North Carolina and the cultural and historic significance of the region. Visitors to the Seashore would still be able to experience a unique recreational setting where visitors enjoy noncommercialized and self-reliant outdoor activities in a remote and natural setting, without ORVs detracting from this experience. However, many areas of the Seashore may no longer be as easily accessible due to the distance from the ferry landings and difficulty accessing these areas by foot. The elimination of ORV use at the Seashore under alternative E is likely to have severe adverse impacts on ORV visitor use and experience, because this alternative eliminates ORV use, which is a traditional use at the Seashore that many visitors expect. Eliminating ORV use at the Seashore would also severely decrease visitors' opportunities to access remote areas of the Seashore, due to the geography of the Seashore and the general lack of amenities that would facilitate visitors walking far distances.

Significance Discussion

The purpose of Cape Lookout National Seashore is to preserve the outstanding natural, cultural, and recreational resources and values of a dynamic, intact, natural barrier island system where ecological processes dominate. The Seashore is one of the few remaining locations on the Atlantic coast where visitors can experience and recreate in an undeveloped, remote barrier island environment that can be reached only by boat or ferry. ORV use at the Seashore predates establishment of the Seashore in 1976. Beginning in the 1930s, vehicles were transported to the banks by shallow draft ferries and were used to provide access to productive commercial and recreational fishing spots, as well as for other recreational pursuits such as sightseeing and camping. ORV use has been ongoing since the establishment of the Seashore in 1976. ORV use at the Seashore is limited to some degree by ferry size and availability, with an estimated 5,500 ORVs transported to the Seashore each year. The percentage amount of Seashore beaches available to ORVs varies depending on the season and alternative, ranging from up to 81 percent available in alternatives A and B, up to 79 percent available in alternative C, up to 73 percent available in alternative D, and 0 percent available in alternative E, with the Seashore being completely closed to ORVs late December through mid-March in alternatives A, B, C, and D. However, routes available to ORVs have historically been reduced for resource protection measures, with average reductions to beach access as described above between 10 and 25 percent in the summer season (May through August) and 6 and 14 percent in the fall season (September through November). While the percentage of beach closed is based on the number and type of species at the Seashore at any given time and concurrent buffer zones, the protections generating these closures would continue in the action alternatives, with potentially greater

reductions in alternative D due to increased buffer zones. Thus, while ORV access is allowed throughout many areas of the Seashore, the restrictions in place for resource protection may cause some inconveniences to ORV users.

Visitors at the Seashore currently enjoy several different types of recreational opportunities, including fishing, camping, visiting the lighthouse, shell collecting, and swimming, which would continue under all of the proposed alternatives. The impacts to visitor use and experience under alternatives A, B, C, and D are not likely to be significant, or highly controversial, because ORV use would still be allowed in a majority of the Seashore (which would facilitate an array of visitor opportunities at the Seashore), and there are relatively minor changes from the existing condition. However, due to full recreational and ORV closures under alternatives A, B, C, and D, the ability to access all areas of the Seashore would be reduced, and could inconvenience some visitors using vehicles if full recreational or ORV closures prevent them from accessing a desirable area of the Seashore. Adverse impacts to visitor use and experience across all the alternatives would generally be noticeable, as described in the impacts analysis above. There would be no significant impacts to visitor use and experience under alternative A, as the impacts to visitor use and experience are limited, the current species protection measures do not cause significant impacts to visitor use and experience at the Seashore, and the action simply formalizes existing ORV routes that currently occur under the existing condition. Under alternatives B, C, and D, constructing up to six additional shade shelters along the back route would benefit visitor use and experience, above and beyond the no-action alternative and existing conditions. Conversely, additional pedestrian-only areas on the Seashore would adversely impact ORV users, since ORVs would be prohibited from these areas. However, an increase in pedestrian-only areas under alternatives C and D would benefit visitors seeking an ORV-free Seashore experience. As a result, there would be no significant adverse impacts to visitor use and experience under alternatives B, C, and D, as the impacts to visitors would be small, as described above.

The impacts on visitor use and experience under alternative E, which prohibits ORV use, would likely be significant and highly controversial, because a majority of the visitors at the Seashore use ORVs to access different areas of the Seashore. Alternative E would severely limit visitor opportunities, because the geography of the Seashore and the general lack of amenities that would facilitate visitors walking far distances, visitors would likely be confined to the areas surrounding the ferry landings, thus altering the visitor experience at the Seashore significantly. Conversely, visitors seeking an ORV-free experience at the Seashore would experience beneficial impacts under alternative E, because the use of ORVs would be prohibited.

Under alternatives A, B, C, and D, designating legal routes for ORV use does not establish a precedent for future actions with significant effects to visitor experience, as ORV use has occurred at the Seashore since the 1930s and continued since the establishment of the Seashore as a park unit in 1976. ORV use is also currently legally permitted in several other national seashores and recreation areas, and in this regard is not precedent-setting within the national park system. Alternative E, which prohibits ORV use, would also not establish a precedent for future actions with significant effects to visitor experience, as many other national park units do not allow ORV use.

In conclusion, in light of the significance criteria at 40 CFR 1508.27, impacts to visitor experience under alternatives A, B, C, and D would be small when compared to the existing condition, but under alternative E could be significant.

SOCIOECONOMIC RESOURCES

GUIDING REGULATIONS AND POLICIES

Although economic or social effects do not by themselves require the preparation of an environmental impact statement (EIS), when an EIS is prepared and economic or social and natural or physical environmental effects are interrelated, then the EIS must discuss all these effects on the human environment (40 CFR 1508.14). CEQ also requires NPS to consider the effects of actions on the quality, growth, expansion, and use of outlying and gateway communities (40 CFR 1502.16).

NEPA requires the analysis of social and economic impacts resulting from proposed major federal actions in an EIS. From these requirements, NPS has identified conditions that it wants to achieve in association with its management of national parks. These conditions are described in the NPS *Management Policies 2006* (NPS 2006d).

METHODOLOGY AND ASSUMPTIONS

The economic situation and business revenue within the region of influence (ROI) is influenced by Seashore management decisions, in addition to other factors. The socioeconomic impact is closely tied to the impact on visitor use and experience. The long term impacts of any alternative depend in part on how visitors and businesses alter their behavior in response to an alternative. Visitors may decide to visit other beaches for recreation or vary their activities or the timing of their trips. Businesses may change the goods and services they offer in response to changes in regulations and visitor preferences. These long term adjustments are difficult to predict.

The methods and assumptions used for this analysis are guided by past experience and historical data. A variety of information was used to assess the impacts of the proposed alternatives including data on visitation, parking permits, and ferry traffic; the results from an input-output model; interviews with potentially affected businesses, and interviews with NPS staff. The data on visitation, parking permits and ferry traffic are of variable quality and the numbers for any particular year reflect unpredictable variation in weather, gas prices, and other factors. The analysis presents a qualitative discussion of the expected impacts of the alternatives informed by the data and the quantitative modeling results for the ROI. The actual impacts would vary year to year based on the many factors that affect visitation such as the weather, rules governing the use of ORVs at other nearby beaches, gas prices, bird nesting patterns, and fish abundance.

This analysis does not consider the economic impacts on regions outside the ROI.

If an alternative results in individuals visiting other sites outside the Seashore, then these regions would experience an increase in business while businesses in the ROI would experience a decrease. Similarly, if one of the alternatives resulted in increased visitation to the Seashore that attracted visitors away from other beaches, these other regions would suffer an economic loss. The socioeconomic impacts of the alternatives were estimated at two different scales. Impacts to the ROI, Carteret County, were estimated for several scenarios using IMPLAN (MIG, Inc. 2012), an input-output model that provides a way to measure the impact of changes in spending by visitors from outside the ROI on output and employment within the ROI. The predicted change in output and employment is compared to the size of the Carteret County economy to assess the order of magnitude of the impacts relative to the ROI as a whole. However, the potential impacts of the alternatives on the businesses that directly serve ORV visitors to the Seashore are also discussed. The impacts on this group of businesses would be much larger than the impacts on the economy of Carteret County as a whole.

Summary of Interviews with Businesses

To gather input for the analysis, interviews were conducted with three vehicle ferry operators who serve visitors using ORVs and the Crystal Coast Tourism Authority (RTI 2013). The ferry operators were asked about the number of employees and whether they fell under the threshold to be considered a small business (\$7 million in annual revenue for the Small Business Association threshold). The businesses employed between two and six employees, including the owners, and were all small businesses.

The respondents were asked for their predictions of business in the future under the different alternatives. Below is a summary of what the respondents reported.

- Under alternative A, the respondents thought that with no changes to current management their revenue would increase or stay the same in the future.
- For alternative B, most of the respondents believed it would decrease business and that the prohibition on nighttime driving in the summer would have the biggest single impact among the features of the alternative. However, some respondents thought that there might be an increase in visitors who do not use ORVs and that the parking permit limit would improve safety and crowding. The respondents differed in what they believed the size of the decline might be, with responses varying between 25 percent and 75 percent.
- Under alternative C, the respondents differed in what they believed the size of the decline might be, with responses varying between 50 percent and 75 percent. Some respondents believed that nighttime driving restrictions might have the biggest impact. Other respondents thought there was a chance that because of the ban on nighttime driving, visitors who fished might make more day trips and revenue would increase. Some respondents thought that there might be an increase in visitors who do not use ORVs similar to alternative B.
- When asked about alternative D, the respondents all believed the alternative would reduce visitation and revenue, with their estimates varying between 75 percent and 100 percent. Some respondents thought alternative D might potentially force some businesses to close. The decline in miles of beach open to ORVs, the ban of long-term parking, and limitations on ATVs and UTVs were listed by respondents as the most important factors.
- The respondents believed that alternative E would result in large declines in revenue, with estimates varying from 75 percent to 100 percent reduction in business with the potential to force some businesses to close.

Summary of Visitation Data and IMPLAN Analysis

To estimate the impacts on the ROI, the IMPLAN model requires estimates of the changes in spending by out-of-town visitors in different industry categories as inputs. Deriving the changes in spending in turn requires assumptions about the current level of visitation associated with ORV use including vehicle and passenger ferry trips, the average length of a trip, and spending per day per visitor. Although some visitation data are collected each year by the NPS, there are gaps in the data that make it difficult to firmly establish baseline visitation. Likewise, data on current visitation do not indicate how visitors will react to the management changes in action alternatives.

Given the available data, the goal of the economic analysis is to provide a range of potential outcomes and a sense of the relative magnitude of the outcomes for the entire ROI and for the smaller set of businesses that serve visitors to the Seashore who use ORVs. To do this, two estimates of baseline visitation under the no-action alternative were created using different assumptions about the number of days the average trip lasted. The analysis then looked at the impact of a decline of 10 percent, 30 percent

and 100 percent in visitation and ferry trips using IMPLAN. The assumptions used to create the high and low baseline visitation estimates are discussed below. Where possible, the assumptions are based on historical data collected by the NPS. As reported below, the predicted impacts for all the scenarios were very small relative to the whole economy of Carteret County, which contains many attractions and businesses in addition to the Seashore. Small variations in the assumptions do not produce qualitatively different results at the county level.

Table 65 presents the estimates for the baseline number of vehicle and passenger ferry trips and the number of visitor days (the number of visitors multiplied by the number of days per trip) for two assumptions about the number of days per trip. In the table, values are identified as “approximate” or “assumed.” “Approximate” variables are based on professional judgment using data either reported by ferry owners or collected by the NPS staff, while “assumed” variables are based on the judgment of NPS staff in the absence of reliable data. In most cases, the assumptions err on the side of overstating the number of vehicles and passengers. For example, the lower bound estimate for the length of an average trip is a three-day trip, although there are day-trip visitors to the islands and weekend visitors who may only spend two days on the islands (the upper bound estimate for the average trip length is seven days). As another example, because data on the number of separate trips made by visitors who leave their vehicles in the long term parking lots on the islands are not available, it was assumed that visitors with cars in the parking lots on the islands made an average of 18 trips over the season (18 weeks was the average number of weeks per parking permit based on data from 2010 through 2012). As discussed above, the IMPLAN model assumes visitors bring new money to the ROI that would not have been spent in the ROI on something else if they did not make the trip. It was assumed that all the visitors are from out of the ROI or that if they are local, they would not spend the money they spent on their trips to the Seashore at other businesses in the ROI if they do not visit the Seashore.

Adding together the total number of passenger ferry round trips for ATV and UTV passengers and other ORV passengers yields an estimate of over 22,000 ferry round trips. In 2010, the vehicle ferries reported approximately 16,000 passenger round trips, suggesting that for the estimate to be accurate over 6,000 passenger round trips for visitors associated with vehicles would occur on passenger-only ferries. Assumptions are conservative, and may overstate vehicle trips and visits by ORV users. Although other assumptions could be made, the results from the IMPLAN analysis presented below suggest that the impacts on the economy of the ROI would be very small regardless of the assumptions.

The Seashore has not conducted a study of visitor spending. NPS has created spending profiles based on surveys in other national parks, and for this study the spending profile for visitors camping in the park was used (Stynes 2011). The camping profile was selected because NPS staff believe that the majority of ORV visitors to the islands do not stay in hotels on the mainland and bring most of their supplies with them, although some visitors to the islands who use ORVs may stay in cabins (which are operated by the Seashore). Table 66 presents the spending assumptions by category. The documentation for the Money Generation Model (used to generate the results in Stynes 2011)¹⁷ suggests that the average party size was three for camping in the park, however to err on the side of overstating the potential economic losses from a decline in visitation, an average party size of two was assumed to calculate per person spending.

¹⁷ Information about party size and other assumptions are available at <http://www.mgm2impact.com/files/AppendixC.pdf>.

TABLE 65: ASSUMPTIONS TO CALCULATE VISITATION UNDER ALTERNATIVE A: NO ACTION

Description	Annual Estimate	Source
Vehicle ferry round trips	5,500	Approximate, based on data from ferry owners on vehicle trips from 2005 through 2010, matches assumption in alternative A for baseline vehicle numbers
ATV and UTV ferry round trips	1,025	Approximate, based on data reporting breakdown of vehicle types
ORV ferry round trips	4,475	Approximate, based on data reporting breakdown of vehicle types
ATV and UTV passengers	1538	Approximate, 1.5 people per ATV and UTV based on NPS (2012)
ORV passengers	11635	Approximate 2.6 people per ORV based on number of passengers and vehicles carried by vehicle ferries from selected years with complete data between 2005 and 2011
ATV and UTV passenger ferry round trips	2238	Assumed, 1 trip per person plus 700 visitors taking ATV and UTV tours on island (approximate based on data from tour operator)
ORV passenger ferry round trips	20586	Approximate, 1.79 passenger ferry trips per vehicle trip based on average number of parking permits sold 2010-2012 (207) and average number of weeks per permit (18), assuming 1 trip per week for 207 parking permit holders and 1 trip for per vehicle for vehicles without parking permits
Lower bound visitor days	68470	Assumed, three-day trip per person
Upper bound visitor days	159764	Assumed, seven-day trip per person

^a Approximate estimates are based on professional judgment using data collected from ferry owners and NPS staff, data may not be complete for all years and values should be interpreted as approximations.

^b Assumed estimates are assumptions where no reliable data exist.

TABLE 66: SPENDING BY CATEGORY (PER PARTY PER DAY/NIGHT)

Spending Category	Average Per Party Per Day/Night Spending (in 2010 dollars)	IMPLAN Sector Name
Motel, hotel, B&B	\$0.83	Hotels and motels, including casino hotels
Camping fees	\$18.09	Other accommodations
Restaurants & bars	\$13.86	Food services and drinking places
Amusements	\$9.99	Other amusement and recreation industries
Groceries	\$16.32	Retail Stores - Food and beverage
Gas & oil	\$24.59	Retail stores - gasoline stations
Local transportation	\$4.42	Scenic and sightseeing transportation and support activities for transportation
Retail Purchases	\$13.27	Retail Stores- Miscellaneous
Total	\$101.39	

Source: Stynes (2011), Table 1.

Based on discussions with staff at the Seashore, it was assumed that there would be no change in visitation by visitors who do not use ORVs. It is possible that restricting ORVs might result in an increase in visitation by those who do not use ORVs, but any increase was not expected to be large enough to impact the results.

IMPLAN Model Results

Economic impact analyses trace the flows of spending associated with the affected industries to identify changes in sales, income, jobs, and tax revenues resulting from a policy action. An economic impact analysis typically examines the effect of a change in policy on the economy of a particular region. Economic impact analysis differs from benefit-cost analysis, which focuses on the change in economic efficiency resulting from a change in policy and includes both market and nonmarket values.

To measure the economic impacts of the proposed alternatives, IMPLANv3 (MIG, Inc. 2012) was used. IMPLAN is an input-output model that simulates how changes in sales and employment in one industry can affect other industries and the regional economy as a whole. IMPLAN is one of the most widely used regional economic impact modeling software packages, and it has been used frequently in economic impact studies for the NPS (see examples of applications of IMPLAN to National Parks at <http://web4.canr.msu.edu/mgm2/>).

The process for generating the impacts in the IMPLAN model is illustrated in figure 29. This process can be separated into three types of impacts:

Direct Impacts—the immediate consequences in industries that experience a change in sales.

Indirect Impacts—responses in other industries to changes in the industries experiencing direct impacts.

Induced Impacts—responses by households to the change in income received as the economy changes. Since wage payments adjust as the economy experiences impacts, households purchase more or less goods and services, which leads to greater expansion or contraction of the economy.

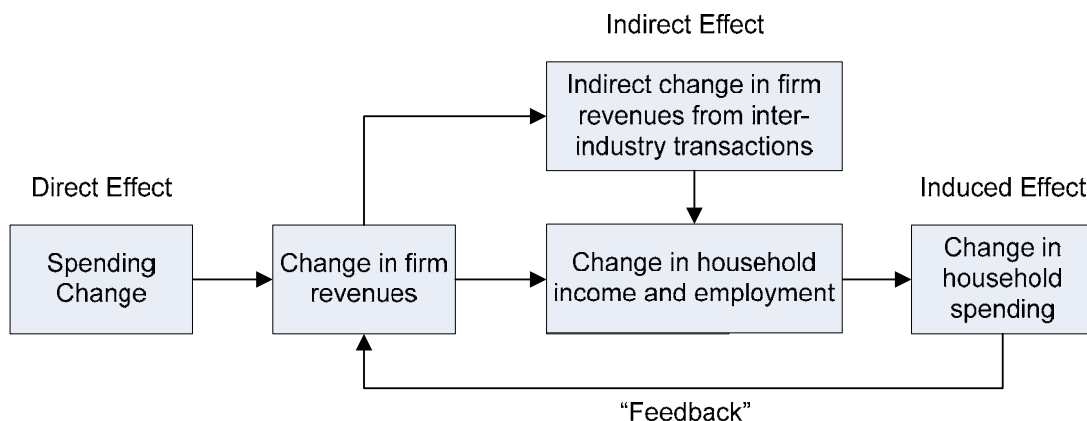


FIGURE 29: FEEDBACK PROCESS THAT GENERATES A PROGRAM'S TOTAL ECONOMIC IMPACT

To apply IMPLAN, the analyst must estimate the direct impacts of an economic activity or policy and provide them as input. IMPLAN contains a data file with information on the region of interest that provides information, such as ratios of jobs to sales for each sector, the proportion of spending by

individuals and firms located within the region, the amount that is spent within the region, and the amount that each sector purchases from all the other sectors within the region per unit of output. Applying the multipliers generated from the data file allows the IMPLAN program to estimate the total regional impacts resulting from a given direct impact.

The economic database that IMPLAN uses comes from official government statistics (e.g., the National Income and Product Accounts published annually by the Bureau of Economic Analysis, the Bureau of Economic Analysis accounts for the United States, along with numerous other data sources). These data are constructed to be internally consistent (i.e., county data sum to state totals and state data sum to national totals). In some cases, regional values are created where no data previously existed, and for other categories new values are calculated to replace existing data. Thus, IMPLAN contains comprehensive and consistent regional accounts but at the cost of making alterations to existing data and creating new data (Crihfield and Campbell 1991). Because of this, IMPLAN may not match data on economic output from other reports. The NPS did not calibrate the IMPLAN data for tourism sectors of the economy to other, external data because all data in IMPLAN is generated using the same assumptions, providing consistency across sectors.

Using the estimate of visitation in baseline under the no-action alternative (alternative A), impacts were calculated for three scenarios for reductions in visitation by visitors who use ORVs (a subset of total visitors to the Seashore): 10 percent reduction in visitation, 30 percent reduction in visitation, and 100 percent reduction in visitation using the assumptions from tables 65 and 66. Table 67 presents the change in value added¹⁸ (comparable to Gross Regional Product) and employment for the upper and lower bound assumptions about trip length. The change in output and employment predicted by the model are just approximations of the impacts based on multipliers and not an examination of the actual businesses affected, but they provide a sense of the potential magnitude. The scenarios for a 10 percent and 30 percent reduction in visitation related to vehicle use on the islands in the Seashore is predicted to result in impacts on value added and employment representing less than one tenth of a percent of the Carteret County economy. The upper bound estimate for a 100 percent reduction in visitation results in a loss of approximately \$10 million in value added and 200 jobs based on the IMPLAN multipliers. These numbers represent approximately 0.6 percent of the total Gross Regional Product and labor force for Carteret County. It is difficult to say whether a change of 200 employees could be distinguished from the monthly variations in the county employment. From January 2009 through June 2013, the U.S. Bureau of Labor Statistics reported the average month-to-month change (in absolute value) in the number of people employed in Carteret County was 600 with a standard deviation of 300. If all 200 jobs were lost in one month and if all the people who lost their jobs continued looking for another job and were unable to find one, a change of this size could increase the monthly unemployment rate by an average of approximately 0.60 percent. However, many factors would influence the observed changes in the county unemployment rate including the timing of the job losses (e.g., it is unlikely all job losses would occur in one month), how quickly the people found new jobs, whether they stayed in Carteret County, whether the lost jobs were seasonal or permanent, and other changes in economic conditions unrelated to the plan.

¹⁸ In IMPLAN, value added is defined as “The difference between an industry’s or an establishment’s total output and the cost of its intermediate inputs. It equals gross output (sales or receipts and other operating income, plus inventory change) minus intermediate inputs (consumption of goods and services purchased from other industries or imported)” (see www.implan.com).

TABLE 67: RANGE OF PROJECTED ANNUAL IMPACTS BY SCENARIO AND AS A PERCENT OF CARTERET COUNTY TOTALS

Scenario	Scenario	Change in Value Added	Percent of Carteret County Total ^a	Change in Employment	Percent of Carteret County Total
10% Reduction in Visitation	Lower Bound ^b	-\$488,000	-0.03%	-10	-0.03%
	Upper Bound ^b	-\$992,000	-0.06%	-20	-0.06%
30% Reduction in Visitation	Lower Bound	-\$1,464,000	-0.09%	-30	-0.09%
	Upper Bound	-\$2,975,000	-0.18%	-60	-0.18%
100% Reduction in Visitation	Lower Bound	-\$4,880,000	-0.29%	-100	-0.31%
	Upper Bound	-\$9,917,000	-0.60%	-200	-0.61%

^a Total value added (Gross Regional Product) for Carteret County in the IMPLAN model was \$ 1,654,657,189 and total employment was 32,693 (2008 data).

^b The lower bound scenario assumes a three-day trip, the upper bound assumes a seven-day trip.

Note: Results estimated using IMPLANv3 (MIG Inc. 2012) with 2008 data on the Carteret County economy. Results are in 2012 dollars.

Although the impacts on the county as a whole may be small, the effects would be concentrated on a small number of businesses that serve Seashore visitors, particularly the vehicle ferry operators. It is believed that the ORV visitors typically stay on the island and their spending on hotels and restaurants may be limited. Their spending on other supplies, including gas, fishing and camping supplies, may be larger. However, as a percentage of total revenue, changes in the number of ORV visitors will have the greatest impact on the vehicle ferry operators because there are many other visitors who come to Carteret County beyond those that visit the Seashore. For businesses that directly serve ORV visitors, the impacts may be large, and it is possible that some businesses may close under these scenarios.

ALTERNATIVE A

Impacts of Alternative A: No Action

Alternative A, the no-action alternative, represents a continuation of current ORV management. There would be no limit on the number of ORVs using the beach from March 16 through December 31. Up to 81 percent of the beach would be designated as available to ORV use during the season. ORV drivers would not be required to purchase vehicle permits or receive educational training. Parking lots would be open with a weekly fee for a parking permit and no limit on the number of permits issued, which could result in the lots becoming overfilled.

Under alternative A, visitation and spending are expected to continue according to historical patterns. Visitation to the Seashore increased steadily until 2008. Visitation has been lower between 2008 and 2011, falling from a high of approximately 860,000 in 2007 to between 500,000 and 600,000 in the following years. However, ferry passengers represent a portion of the total visitation. For passenger and vehicle ferries, between 2007 and 2011 there was an average of approximately 99,000 ferry passengers per year, including all destinations on North Core, South Core and Shackleford Banks (NPS 2012). If all other conditions remain the same and visitation continues as it has been, alternative A would have beneficial impacts in terms of continued visitor spending for the businesses that serve ORV visitors and the economy of the ROI. Alternative A allows for unregulated increases in visitation, which would have beneficial impacts on the local economy in the form of future increased visitor spending unless ORV visitors became so numerous that visitors who wanted a less crowded experience stopped visiting. While

visitation would not be limited by number of permits, some limitation would still exist as a result of capacity of the vehicle ferries, which would create a limit to this potential increase. Alternative A would have adverse impacts on visitors who do not currently visit because they would prefer an ORV-free experience on the island, however staff at the Seashore believe that even prohibiting ORV use on the island would not result in a large increase in other visitors.

Alternative A would continue the current visitation and business revenue trend, bringing long-term benefits to businesses that serve current visitors. The visitors who come to the Seashore bring economic benefits to the area in the form of spending on ferry rides, food, gas, souvenirs, overnight lodging, and other items. However, the Seashore is located in a county that attracts a large number of visitors to other beaches and attractions in the area. According to data from the Seashore provided by the vehicle ferries, the vehicle ferries carried a total of approximately 16,000 passengers. In comparison, Fort Macon State Park had over 1 million visitors in 2011 and the Pine Knoll Shores Aquarium had over 600,000 visitors between May 2006 and May 2007 (North Carolina Aquariums n.d.). The number of ORV visitors to the islands in the Seashore is small compared to overall visitation to the area.

Cumulative Impacts under Alternative A

Other past, present, and future planned actions within and surrounding the Seashore have the potential to impact the economy of the ROI and the businesses that serve visitors that bring their ORVs to the islands or take ATV and UTV tours of the islands. Anything that results in a change in visitation or the way the Seashore manages contracts with outside vendors would have impacts on the economy and businesses in the ROI.

The *Commercial Services Plan / Environmental Assessment / Assessment of Effect* (NPS 2007m) guides the Seashore in improving the management and operation of commercial visitor services, while providing both self-directed and facilitated visitor opportunities. Concessionaire services that are offered and would continue to be offered at the Seashore include passenger and vehicle ferry services, guided recreational and educational activities, land transportation and shuttle services on the islands, and kayak rentals. The commercial services have been managed through two contracts and eight commercial use authorizations (CUAs), all operating on short (one- to three-year) contracts (NPS 2007m). Currently, three vehicle/passenger ferries enable the public to transport their vehicles to North and South Core Banks. Passenger-only ferries operate from several other locations. The contracts for commercial service providers (ferry and concessioner operators) are currently in the process of being developed under a commercial services plan. The plan is likely to have long-term beneficial impacts on visitor use and experience, because visitation and revenue for businesses could be increased if the new contracts improve concessioner operations and services for visitors. The impacts on the businesses that currently operate in the Seashore could be long-term adverse or beneficial, depending on how the contracts are structured and whether all the current businesses would be able to continue operating.

The Seashore increased visitor amenities in 2006-2007, including a new visitor center and bookstore, and shelter and restrooms at the passenger ferry landing by the lighthouse on South Core Banks. The Cape Lookout lighthouse has reopened to the public, which has increased visitation to the islands. Plans for increased visitor amenities also include other improvements to the historic structures and visitor services on the islands. If these improvements result in more visitors to the island, then they would have a beneficial impact on the local economy.

Special Use Permits are available at the Seashore and offer benefits to visitors. Under these permits, visitors can engage in activities such as special events, commercial filming/still photography, weddings, scattering of ashes, group camping, First Amendment activities, and constructing a temporary Duck

Blind. These permits add to the opportunities for visitors to use the Seashore and, if carefully managed, would increase the economic activity associated with use of the Seashore.

Until the ORV management plan/EIS is complete, the NPS developed an Interim Off Road Management Report and a *Cape Lookout National Seashore Interim Protected Species Management Plan/Environmental Assessment* and FONSI (NPS 2006a, 2007d) for Cape Lookout National Seashore to ensure the proper management of protected species and to comply with the ESA. The plan also provides for appropriate use of recreational resources at the Seashore, including prescribing the locations of resource closures on the Seashore. Impacts of the *Cape Lookout National Seashore Interim Protected Species Management Plan/Environmental Assessment* on the businesses and economy of the ROI are expected to be long-term and adverse to the extent that the measures reduce visitation by visitors who use ORVs and therefore reduce revenue to the communities surrounding the Seashore.

Cape Hatteras National Seashore developed a long-term ORV management plan/EIS to replace ORV management under *Cape Hatteras National Seashore Interim Protected Species Management Strategy / Environmental Assessment*. Both plans place restrictions on ORV use at Cape Hatteras and may result in increases in ORV use at the Seashore if visitors who drive ORVs are looking for a less crowded area or when popular stretches of beach are closed in Cape Hatteras. The changes in ORV management in Cape Hatteras are expected to have short and long-term beneficial impacts on the businesses and economy of the ROI if visitation increases at the Seashore.

The Carteret County Comprehensive Plan provides policies and programs to promote continued quality of life and a sustainable development pattern over a 20-year period. Goals and objectives are set out for economic development, education, the environment, health care, quality of life, recreation, cultural and natural resources, regional relations, and transportation. To the extent that the plan strengthens the economy of the ROI, it should have long-term, beneficial impacts.

Currently, the BOEM North Carolina Renewable Energy Task Force is discussing plans for offshore commercial wind leasing. The task force, comprised of relevant Federal agencies, State government officials, and local and Tribal elected government officials, assists BOEM in the planning and decision-making process in identifying a Wind Energy Area off the coast of North Carolina (BOEM n.d.).

The development of wind farms has the potential for long-term impacts that may be beneficial or adverse for the local economy of the ROI and businesses that serve visitors to the Seashore. Economic development associated with the wind farms could have short and long-term beneficial impacts if the projects bring jobs to the ROI. On the other hand, if the offshore commercial wind farms are an eyesore, which would depend on where the wind farms are located and how large they are, and the growth of the wind farm industry results in reductions in visitation to the Seashore or the ROI in general, then the project would have short and long-term adverse impacts because declining visitation would result in less revenue for businesses that serve these visitors.

Taken as a whole, past, present and future actions may have both adverse and beneficial impacts. Improvements such as enhancements to visitor services that bring additional visitors to the Seashore or additional jobs to the ROI would have short and long term beneficial impacts on the economy of the ROI from increased revenue to businesses in the ROI. However, changes to the contracts for ferry operators could have adverse or beneficial impacts, depending on how the new contracts are structured. These impacts, combined with the long-term beneficial impacts under alternative A, particularly for the businesses that serve ORV visitors, would likely result in observable long-term adverse and beneficial cumulative impacts.

ALTERNATIVE B

Impacts of Alternative B

Like alternative A, alternative B allows for the same percentage of beach to be designated as available for ORV use as alternative A and there would be no limits on the number of ORVs. Like alternative A, while visitation would not be limited by number of permits, some limitation would still exist as a result of capacity of the vehicle ferries. However, there are a number of provisions in alternative B that could lead to a reduction in visitation and visitor spending relative to alternative A. Alternative B requires ORV drivers to purchase permits at an expected fee of \$80 for a 10-day permit and \$150 for a one-year permit. Drivers would be required to obtain an educational certificate and carry certain required equipment such as a jack and a shovel. Night driving by ORVs would be prohibited from May 1 through August 31. Based on statistics from the Seashore, approximately 25 percent to 35 percent of ORV visitors came during the summer between 2007 and 2010. The Seashore does not collect data on night driving frequency, however staff observations suggest that there is minimal night driving.

Only non-sport ATVs and UTVs would be allowed. High-performance sport models would be banned after a five-year grace period. Based on data from vehicle ferry operators for 2007-2012, ATVs and UTVs averaged 13 percent of vehicles on South Core and 20 percent on North Core. Although there are no data available on the number of high-performance sport-model ATVs and UTVs, the ban on these vehicles would only affect a small portion of total ORV use.

The number of parking permits available in the lots on the islands would be reduced in spring and summer and increased in the fall relative to alternative A. An average of 207 individuals per year bought parking permits between 2010 and 2012. These permit holders paid for an average of 18 weeks of long-term parking per permit based on data from 2010 through 2012. Based on data collected on parking lot use in 2009 and 2010, the limit on the number of parking permits would result in between 5 and 10 days when the parking lots would be full under the alternative B restrictions. This would result in less than 50 fewer parking space days spread over the spring and summer, where a parking space day is one car in a space for one day. The same data suggests that in 2008 the impact would have been larger, with parking lots being over-capacity mostly during the spring between 42 and 81 days, depending on the lot, with a total of approximately 1,000 parking space days lost. There would be less impact on parking in the fall season because more permits would be available.

Table 67 provides an estimate of the magnitude of the impact a reduction in visitation by ORV visitors might have on the ROI for different levels of visitation. If alternative B results in a decrease in overall visitation, it would likely be closer to 10 percent and probably not as large as 30 percent, depending in large part on how the restriction on night driving during the summer affects visitation and the number of sport-model ATVs and UTVs in use. Looking at the results in table 67, even a 30 percent reduction in ORV visitation would result in an impact of less than one-tenth of one percent on output and employment in the ROI, although vehicle ferry operators believed the reduction in their business might be larger than 30 percent (between 25 percent and 75 percent).

The impact on the economy of the ROI under alternative B would be adverse, but, as discussed above, the impacts are likely to be very small relative to the whole of Carteret County. However, the impacts would be larger for the businesses that directly serve ORV visitors. Alternative B may result in some reduction in visitation by ORV users relative to alternative A. The permit price is not expected to have a big impact on visitation based on the low cost of the permits relative to the cost of trips to the Seashore and the popularity of the site. However, interviews with ferry operators suggest they think that the prohibition on night driving during the summer might have a noticeable impact on ORV visitation, although that might be partially offset if some visitors make day trips. While the regional economy is unlikely to suffer a

measurable impact, the businesses that directly serve ORV visitors may experience noticeable, long-term adverse impacts. A decline in ferry trips would impact ferry operator revenue. Depending on the size of the change in visitation, the level of ferry traffic might not support the current number of ferry operators.

Cumulative Impacts under Alternative B

Past, present and reasonably foreseeable actions that have the potential to impact piping plover under alternative B would be the same as those described under alternative A. Taken as a whole, the cumulative past, present and future actions may have both adverse and beneficial impacts on socioeconomics. Improvements resulting from past, present and future actions by the Seashore and Carteret County that may bring additional visitors to the Seashore or additional jobs to the ROI would have short and long term beneficial impacts on the economy of the ROI from increased revenue to businesses in the ROI. Future actions affecting the ferry operator's contracts could have beneficial or adverse impacts on ferry operators depending on whether the number of operators was reduced. When combined with the potential for decreases in ORV visitation under alternative B, the cumulative adverse impacts on the ferries and other businesses the directly serve ORV visitors would be long-term and adverse for businesses that serve ORV visitors. For the economy of the ROI, the cumulative impacts combined with the direct impacts of alternative B, would likely result in observable long-term adverse and beneficial cumulative impacts.

ALTERNATIVE C

Impacts of Alternative C

Alternative C contains provisions similar to alternative B for vehicle permits, education, and required vehicle equipment and would expand existing and create additional vehicle-free areas. In the spring from March 16 through the Thursday before Memorial Day and in the fall from Labor Day weekend through December 15, up to 79 percent of the beach would be designated as available for ORV use. Between Memorial Day and Labor Day, up to 74 percent would be designated as available for ORV use depending on the size of the resource closures. Similar to alternative B, alternative C requires ORV drivers to purchase permits at an estimated fee of \$80 for a 10-day permit and \$150 for a one-year permit. Drivers would be required to obtain an educational certificate and carry certain required equipment such as a jack and a shovel. Night driving would be prohibited from May 1 through September 14, somewhat longer than under alternative B. The Seashore does not collect data on night driving frequency, however staff observations suggest that there is minimal night driving.

Non-sport ATVs and UTVs would be allowed on a seasonal basis (between September 15 and December 15); high-performance sport-model ATVs and UTVs would not be allowed at any time after a five-year phase-out period. Based on data from vehicle ferry operators for 2007-2012, ATVs and UTVs averaged 13 percent of vehicles on South Core Banks and 20 percent on North Core Banks. Although there is no data available on the number of high-performance sport-model ATVs and UTVs, the ban on these vehicles would only affect a portion of total ORV use. Under alternative C, all ORVs, including ATVs and UTVs would have to be transported by commercial ferry (visitors would not be permitted to transport ATVs and UTVs to the seashore by private vessel). NPS staff have observed very few visitors transporting ATVs and UTVs by private vessel, so the impact is expected to be negligible.

The number of parking permits available in the lots on the islands would be reduced in spring and summer and increased in the fall relative to alternative A. Based on data collected on parking lot use in 2009 and 2010, the limit on the number of parking permits might result in 5 to 10 days when the parking lots would be full under the alternative C restrictions. This would result in less than 50 fewer parking space days spread over the spring and summer, where a parking space day is one car in a space for one day. The same data suggest that in 2008 the impact would have been larger, with parking lots being over-

capacity mostly during the spring between 42 and 81 days, depending on the lot, with a total of approximately 1,000 parking space days lost. There would be less impact on parking in the fall season because more permits would be available.

In contrast to alternative B, alternative C would impose a limit on the number of vehicle permits that would be issued. The limit would start at an initial level based on the historical average number of vehicles that were transported to North and South Core Banks per year. With the reduced miles of beach designated as available for ORVs, there may be an increase in crowding. It is unlikely that any increased crowding due to the restrictions would result in a reduction in visitation. The limit on the number of vehicle permits issued under alternative C may limit the future growth of ORV visitation relative to alternatives A and B, which have no vehicle permits and vehicle permits without limits respectively.

Relative to alternative A, the collective requirements under alternative C may result in a decrease in ORV visitors and visitor spending for businesses and the ROI and the decrease may be more than alternative B. Table 67 provides an estimate of the magnitude of the impact a reduction in visitation by ORV visitors might have on the ROI for different levels of visitation. If alternative C results in a decrease in visitation, it would also likely be closer to 10 percent but potentially up to 30 percent or more, depending in large part on how the restriction on night driving during the summer affects visitation. Looking at the results in table 67, even a 30 percent reduction in ORV visitation would result in an impact of less than one-tenth of one percent on output and employment in the ROI, which would likely be small, although the businesses contacted during the survey expected larger reductions for their businesses (more than 50 percent to 75 percent)

As with alternative B, the impacts are likely to be very small relative to the whole of Carteret County. However, there would be adverse impacts for the businesses that directly serve ORV visitors. The businesses that directly serve ORV visitors may experience noticeable, long-term, adverse impacts. A decline in ferry trips would impact ferry operator revenue. Depending on the size of the change in visitation, the level of ferry traffic might not support the current number of ferry operators.

Cumulative Impacts under Alternative C

Past, present and reasonably foreseeable actions that have the potential to impact piping plover under alternative and C would be the same as those described under alternative A. Taken as a whole, the cumulative past, present and future actions may have both adverse and beneficial impacts on business revenue and the regional economy. Improvements resulting from past, present and future actions by the Seashore and Carteret County that may bring additional visitors to the Seashore or additional jobs to the ROI would have short and long term beneficial impacts on the economy of the ROI from increased revenue to businesses in the ROI. Future actions affecting the ferry operator's contracts could have beneficial or adverse impacts on ferry operators depending on whether the number of operators was reduced. When combined with the potential for decreases in ORV visitation under alternative C, the cumulative adverse impacts on the ferries and other businesses the directly serve ORV visitors would be long-term and adverse. For the economy of the ROI, the cumulative impacts combined with the impacts of alternative C would likely result in observable long-term adverse and beneficial cumulative impacts.

ALTERNATIVE D

Impacts of Alternative D

Alternative D contains provisions similar to alternatives B and C for vehicle permits, education certificates, and required vehicle equipment and creates some additional vehicle-free areas. However, the Seashore would reduce the number of vehicle permits available with the goal of reducing the number of

ORVs on the islands by 8 percent compared to historical levels. In the spring from March 16 through the Thursday before Memorial Day and between the day after Labor Day weekend and December 15, up to 73 percent of the beach would be designated as available for ORV use. Between Memorial Day and Labor Day, up to 63 percent would be designated as available for ORV use depending on the size of the resource closures. The combination of increased pedestrian-only beach areas with fewer vehicle permits would likely result in crowding (which considers the level of visitor use combined with the number of beach miles open to a specific use) levels similar to historical conditions. Under alternative D, no ATVs would be permitted at the Seashore. Non-sport UTVs would be allowed between September 15 and December 15. Additionally, after five years UTVs with two-stroke engines would be prohibited. Based on data from vehicle ferry operators for 2007-2012, ATVs and UTVs averaged 13 percent of vehicles on South Core and 20 percent on North Core. Taken together, these requirements and restrictions would most likely result in a decrease in ORV visitors and spending by ORV visitors at businesses in the ROI.

Under Alternative D long-term parking would not be provided on the islands, and the lots would only be used for emergencies. An average of 207 individuals per year bought parking permits between 2010 and 2012. These permit holders paid for an average of 18 weeks of long-term parking per permit based on data from 2010 through 2012. The net impact of closing the parking lots on ferry operators is hard to predict. The lack of long term parking may reduce visitation if visitors decide to make fewer trips. Alternatively, it may increase the number of ferry trips by visitors who want to make multiple trips to the islands and can no longer store their vehicles in the long-term parking.

If alternative D resulted in a reduction in visitation, that would result in a reduction in spending in the area. Based on the number of visitors who come during the summer and who may use ATVs and sport-model UTVs, the reduction in visitation that might result may be around 30 percent or perhaps more of current ORV visitors, depending on the impact of the night driving prohibition in the summer, the closure of the long-term parking lots, and the size of resource closures. As with the other alternatives, businesses contacted during the survey expected larger reductions in business (a loss of 50 percent to 100 percent of revenue). Based on the results in table 67, the regional economic impacts are expected to be long-term and adverse, but most likely the impacts would be very small for Carteret County, the ROI.

The businesses that directly serve ORV visitors may experience noticeable and much larger long-term, adverse impacts, unless the elimination of long-term parking lots results in increased ferry trips. Depending on the size of the change in visitation, the level of ferry traffic might not support the current number of ferry operators.

Cumulative Impacts under Alternative D

Past, present and reasonably foreseeable actions that have the potential to impact piping plover under alternative D would be the same as those described under alternative A. Taken as a whole, the cumulative past, present and future actions may have both adverse and beneficial impacts. Improvements resulting from past, present and future actions by the Seashore and Carteret County that may bring additional visitors to the Seashore or additional jobs to the ROI would have short and long term beneficial impacts on the economy of the ROI from increased revenue to businesses in the ROI. Future actions affecting the ferry operator's contracts could have beneficial or adverse impacts on ferry operators depending on whether the number of operators was reduced. When combined with the potential for decreases in ORV visitation under alternative D, the cumulative adverse impacts on the ferries and other businesses the directly serve ORV visitors would be long-term and adverse. For the economy of the ROI, the cumulative impacts combined with the direct impacts of alternative D would likely result in observable long-term adverse and beneficial cumulative impacts.

ALTERNATIVE E

Impacts of Alternative E

Alternative E would prohibit ORV use at the Seashore, resulting in a total loss of current ORV visitor spending for the ferry operators and other businesses ORV visitors frequent. The vehicle ferries could still operate as passenger ferries, but according to the ferry operators it is unlikely that there would be enough passenger business to support the current number of ferry operators. Ferry operators indicated in the survey that they might lose most or all of their revenue. Conversely, the prohibition on ATVs at the Seashore could result in increased business for commercial ATV providers, which would not be prohibited¹⁹.

Alternative E would result in long-term, adverse impacts for businesses that serve visitors using ORVs because the alternative would result in the total loss of revenue from ORV visitors. The impact on the regional economy would be adverse. As discussed in IMPLAN model results section, the upper bound scenario for a 100 percent reduction in ORV visitation could result in a loss of approximately 200 jobs, at least in the short term, based on the IMPLAN multipliers. While 200 jobs is less than 1 percent of total employment, if all the jobs were lost in the same time period it could have a noticeable impact on the unemployment rate in the short term.

Cumulative Impacts under Alternative E

Past, present and reasonably foreseeable actions that have the potential to impact piping plover under alternative E would be the same as those described under alternative A. Taken as a whole, the cumulative past, present and future actions may have both adverse and beneficial impacts. Improvements resulting from past, present and future actions by the Seashore and Carteret County that may bring additional visitors to the Seashore or additional jobs to the ROI would have short and long term beneficial impacts on the economy of the ROI from increased revenue to businesses in the ROI. When combined with the elimination of ORV visitation under alternative E, the cumulative adverse impacts on the ferries and other businesses the directly serve ORV visitors would be long-term and adverse. For the economy of the ROI, the cumulative impacts combined with the direct impacts of alternative E would likely result in observable long-term adverse and beneficial cumulative impacts.

COMPARISON OF ALTERNATIVES

Alternative A would result in long-term, beneficial impacts relative to alternative E for businesses that serve current ORV visitors. Alternative A would result in continued revenue from ORV visitors, which would provide support for businesses that serve these visitors and the economy of the ROI.

Alternatives B, C, and D may result in long-term adverse impacts resulting from a loss of visitor spending relative to alternative A for businesses that serve visitors using ORVs if the restrictions on ORVs such as the prohibition of night driving in the summer, loss of long-term parking, restrictions on ATVs and UTVs and the permit fee and education requirements result in fewer visitors and lower visitor spending. Adverse impacts relative to alternative A would be greater under alternatives C and D, than B, because additional

¹⁹ Executive Order 11644, Use of ORVs on public lands, section 3(C), defines ORVs, and excludes “any vehicle whose use is expressly authorized by the respective agency head under a permit, lease, license, or contract.” This definition is incorporated by reference into 36 CFR 4.10 governing ORVs in park units. Therefore, commercial vehicle uses, including CUAs, do not require routes designated by special regulation.

use restrictions are added such as more pedestrian-only areas, no long-term parking available (under alternative D), additional limitations on ATV and UTV use, and a limit on the number of vehicle permits available. The smaller percentage of beach open to ORVs under alternative C compared to alternative A might result in increased crowding, which could result in a reduction in visitation and greater impacts to those businesses that rely on Seashore visitation. Under alternative D, additional adverse impacts would be realized from prohibitions on all ATVs and sport-model UTVs, seasonal restrictions on non-sport UTVs, and lower limits on vehicle permits, all of which would result in fewer visitors and less visitor spending. The loss of long-term parking under alternative D could have positive or negative impacts on the number of ferry trips visitors make relative to alternative A.

Alternatives A, B, C, and D offer long-term, beneficial impacts for businesses serving ORV visitors and the economy of the ROI when compared to alternative E because these alternatives allow ORVs on the islands, which would result in more visitors and spending by visitors in the ROI. The benefits to the ROI from alternatives A, B, C, and D relative to alternative E are not expected to be noticeable because the revenue from ORV visitors is small compared to the size of the economy of the ROI. However, the specific businesses that serve ORV visitors would experience noticeable beneficial impacts under all the other alternatives relative to alternative E because they would continue to profit from ORV visitor traffic.

CONCLUSION

Socioeconomic impacts from the alternatives depend on how the alternatives affect visitor experience and the cost of a visit. The impacts of the alternatives on visitor experience, whether beneficial or adverse, influence whether and how often visitors make trips to the Seashore and how much the visitors spend at local businesses. For some visitors, the use of ORVs enhances their trips by providing access to areas that would be difficult to walk, especially with fishing gear or other supplies. However, the presence of ORVs detracts from the experience for other visitors, who are looking for a natural environment free from motorized vehicles on the beach or who may be concerned about the safety of having vehicles on the beach.

Alternatives B, C, and D may result in long-term adverse impacts resulting from a loss of visitor spending relative to alternative A for businesses that serve visitors using ORVs if the restrictions on ORVs such as night driving restrictions, long-term parking restrictions, ATVs and UTVs restrictions, and the permit fee and education requirements result in fewer visitors and lower visitor spending. Adverse impacts relative to alternative A would be greater under alternatives C and D, than B, because additional restrictions on the areas ORVs can use to create more pedestrian-only areas, the loss of long-term parking on the islands (under alternative D), more stringent restrictions on ATV and UTV use, and a limit on the number of vehicle permits available. The smaller percent of beach open to ORVs under alternative C compared to alternative A might result in increased crowding, which could result in a reduction in visitation and greater impacts to those businesses that rely on Seashore visitation. Under alternative D, additional adverse impacts would be realized from prohibitions on all ATVs and sport-model UTVs, seasonal restrictions on non-sport UTVs, and lower limits on vehicle permits, all which would result in fewer visitors and less visitor spending. The loss of long-term parking under alternative D could have beneficial or adverse impacts on the number of ferry trips visitors make relative to alternative A depending on whether visitors took more day trips in response to the loss of long-term parking. The reductions in visitors may result in the closure of one or more of the vehicle ferries if demand is not sufficient to support the existing ferries under alternatives B, C, and D.

Alternative E prohibits ORV use by visitors and would have an adverse impact on the businesses that serve ORV visitors because it would eliminate visitation by ORVs and the need for vehicle ferries, which would result in lower revenue for these businesses. The vehicle ferries would have to rely on passenger traffic and some or all of the vehicle ferries may have to close depending on the level of passenger traffic.

Conversely, the prohibition on ATVs at the Seashore could result in increased business for commercial ATV providers, which would not be prohibited.

There are a number of cumulative impacts to the economy of the region, described in the impacts analysis above, which may be both long-term adverse and beneficial impacts. Efforts by the Seashore and other entities in the ROI to improve visitor experience and bring additional visitors to the area would have a beneficial impact on the economy, and none of the alternatives are expected to have long-term, adverse impacts on the economy of the ROI as a whole. Future decisions about contracting between the Seashore and vendors such as vehicle ferries could have adverse or beneficial impacts on the vehicle ferry operators, depending on the content of the contracts. Actions under alternative A would continue the current beneficial impacts for vehicle ferry operators. Actions under alternatives B, C, D, and E could have adverse impacts on the vehicle ferry operators that might detract from other beneficial trends in the ROI that could bring additional visitors to the Seashore.

Significance Discussion

The purpose of Cape Lookout National Seashore is to preserve the outstanding natural, cultural, and recreational resources and values of a dynamic, intact, natural barrier island system where ecological processes dominate. The Seashore is one of the few remaining locations on the Atlantic coast where visitors can experience and recreate in an undeveloped, remote barrier island environment that can be reached only by boat or ferry. ORV use at the Seashore predates establishment of the Seashore in 1976. Beginning in the 1930s, vehicles were transported to the banks by shallow draft ferries and were used to provide access to productive commercial and recreational fishing spots, as well as for other recreational pursuits such as sightseeing and camping. ORV use has been ongoing since the establishment of the Seashore in 1976. ORV use at the Seashore is limited to some degree by ferry size and availability, with an estimated 5,500 ORVs transported to the Seashore each year. The percentage amount of Seashore beaches available to ORVs varies depending on the season and alternative, ranging from 81 percent available in alternatives A and B, 79 percent available in alternative C, 73 percent available in alternative D, and 0 percent available in alternative E, with the Seashore being completely closed to ORVs from late December through mid-March in alternatives A, B, C, and D. However, routes available to ORVs have historically been reduced during sensitive nesting and breeding seasons, with average reductions to beach access as described above between 10 and 25 percent in the summer season (May through August) and 6 and 14 percent in the fall season (September through November). Use at the Seashore by both ORV drivers and visitors not bringing vehicles is limited to some degree by ferry size and availability, with an estimated 5,500 ORVs transported to the Seashore each year. Thus, while ORV access is allowed throughout many areas of the Seashore, the number of ORVs visiting the Seashore annually is low. Currently, three vehicle ferries serve the Seashore, along with a business that offers ATV tours. While the number of ORVs using the Seashore is low, changes in visitation by ORV drivers would potentially have an adverse impact on the businesses that directly serve these visitors. As discussed above, reductions in ORVs are not expected to noticeably increase the number of visitors not using ORVs, based in part on the isolated nature of the islands.

Looking at the ROI, Carteret County, as a whole, none of the alternatives are expected to have a significant, adverse, long-term impact on the economy of the ROI. Based on the results from the IMPLAN modeling reported in table 67, the contribution of ORV visitation to the economy of the ROI is small (less than 1 percent of output and employment), so even a 100 percent reduction in visitation should not be significant for the ROI as a whole in the long term. In the short term, a 100 percent reduction in visitation would likely involve short-term adverse impacts as the local economy and job market absorbs the displaced workers or the workers leave the area.

However, the impacts on individual businesses in the ROI, in particular the vehicle ferries, may be adverse under the alternatives that restrict ORV use, including alternatives B, C, and D, and would likely be significant to individual operators under alternative E, which would not allow private ORV use. However, due to the existing capacity of the vehicle ferries, these use restrictions in alternatives C and D are not likely to cause a large drop in visitation compared to current levels. Under alternatives A, B, C, and D, designating legal routes for ORV use does not establish a precedent for future actions with significant effects to socioeconomics, as ORV use has occurred at the Seashore since the 1930s and continued since the establishment of the Seashore as a park unit in 1976. ORV use is also currently legally permitted in several other national seashores and recreation areas, and in this regard is not precedent-setting within the national park system. Alternative E, which would prohibit ORV use, would also not establish a precedent for future actions with significant effects to visitor experience, as many other national park units do not allow ORV use.

The impacts on socioeconomics under alternative E, which would prohibit ORV use, would likely be significant and highly controversial, because a majority of the visitors at the Seashore use ORVs to access different areas of the Seashore and may not choose to visit if this use is not permitted. This reduction in visitation could adversely impact businesses that currently benefit from ORV users. Conversely, visitors seeking an ORV-free experience at the Seashore would experience beneficial impacts under alternative E, because the use of ORVs would be prohibited, and the increased visitation of this segment of visitors may result in positive socioeconomic impacts.

In conclusion, in light of the significance criteria at 40 CFR 1508.27, there would not be significant impacts to the economy of the ROI as a whole. Alternatives B, C, and D could have adverse impacts on the vehicle ferry operators, whereas alternative E would have significant adverse impacts on the vehicle ferry operators as well as any mainland business that currently benefit from ORV users at the Seashore. These impacts to socioeconomics under alternatives A, B, C, and D would be small when compared to the existing condition, but under alternative E could be significant.

SEASHORE MANAGEMENT AND OPERATIONS

METHODOLOGY AND ASSUMPTIONS

For the purpose of this analysis, Seashore management and operations refer to the quality and effectiveness of NPS staff to maintain and administer Seashore resources and provide for an appropriate visitor experience. This includes an analysis of the projected need for staff time and materials in relationship to ORV management under each of the alternatives, as well as the various funding mechanisms available to implement these alternatives. The analysis also considers trade-offs for staff time or the budgetary needs required to accomplish the proposed alternatives and discusses each alternative in terms of its impacts on the various divisions that comprise Seashore management: Visitor and Resource Protection, Resource Management, Administration, Facility Management, and Interpretation and Education. NPS staff from each of the divisions were members of the interdisciplinary team and were consulted regarding expected staffing and funding needs under each alternative. The impact analysis is based on the current description of Seashore operations presented in chapter 3.

STUDY AREA

The study area for the Seashore management and operations is the Seashore boundary.

ALTERNATIVE A

Impacts of Alternative A: No Action

Under the no-action alternative, the operations and maintenance of the Seashore related to ORV use would continue. Table 68 provides funding needs for each division under alternative A.

TABLE 68: STAFFING AND FUNDING—ALTERNATIVE A: NO ACTION

Division	Total Annual Costs
Visitor and Resource Protection	\$259,600
Resource Management	\$201,700
Administration	\$12,500
Facility Management	\$12,700
Interpretation and Education	\$0
Total Annual Costs	\$486,500

Visitor and Resource Protection—Under alternative A, Seashore law enforcement staff would continue to be responsible for enforcing visitor compliance with ORV regulations and resource closures in addition to other resource protection activities. Law enforcement staff would continue to perform routine patrols of beach areas, respond to violations, conduct investigations, monitor public safety, respond to medical emergencies, search and rescues, and assist in public education through visitor contacts. No restrictions on night driving would occur under alternative A, which would reduce the need for nighttime and early morning patrols. Other actions that the visitor and resource protection division would remain responsible for under alternative A include, maintaining a telephone number for visitors to report law enforcement violations, and conducting presentations for local organizations regarding what to look for when reporting violations.

In order to accomplish the above activities, an approximate personnel costs would be \$259,600 a year. However, there are some inadequacies under alternative A regarding the visitor and resource protection division. The current management structure for the visitor and resource protection division uses temporary field staff that is limited to a six-month appointments, while the visitor use season is nine months long (March through December). Relying heavily on temporary staff is not efficient because (1) the positions do not cover the entire visitor season, and (2) temporary staff generate higher training and equipment costs, and result in higher turnover.

Resource Management—Under alternative A, resource management staff would continue to be responsible for monitoring and establishment of buffers for protected birds, turtles, and seabeach amaranth. Resource management staff would also continue to be responsible for determining monitoring requirements, hiring, training and supervising field staff, conducting all field surveys and for preparation of annual monitoring reports.

Resource management staff would continue to be responsible for surveying and monitoring of piping plovers, colonial waterbirds, Wilson's plovers, American oystercatchers, seabeach amaranth, and sea turtles (see tables 4 and 5 in chapter 2).

Total approximate personnel costs for the resource management division would equal \$201,700 a year.

However, there are some inadequacies under alternative A regarding the resource management division. The Seashore currently does not have an information technology specialist to perform network administration or communications; the Seashore has only very limited geographic information system (GIS) capacity; and there are insufficient supervisors for field staff.

Under alternative A, resource management functions related to ORV management would continue to be accomplished within the existing Seashore budget.

Administration—Under alternative A, Seashore administrative staff would continue to be directly involved in ORV management activities and all divisions would require administrative support. This support would provide technical assistance to field and administrative staff associated with ORV management including training, procurement, and human resources. Total approximate personnel costs for the administration division would equal \$12,500 a year. Under alternative A, Seashore management and administrative functions related to ORV management would continue to be accomplished within the existing Seashore budget.

Facility Management—Under alternative A, the facility management division at the Seashore would continue to be responsible for providing support for all island operations, including maintenance of visitor facilities, utility systems, ferry docks, passenger docks, island ranger stations and bunkhouses for staff and volunteers, routine maintenance, emergency repairs of the back route and beach ramps, and would also be responsible for maintaining the vehicles, boats and ranger stations and other support structures used by law enforcement, resources management, and other staff associated with ORV management. Total approximate personnel costs for the facility management related to ORV management would equal \$12,700 a year.

Under alternative A, facility management functions related to ORV management would continue to be accomplished within the existing Seashore budget.

Interpretation and Education—Under alternative A, there would not be staff devoted to ORV management or education from the interpretation and education division. Existing interpretation and education staff provide the information to visitors about ORV management. The division publishes a limited number of publications to ensure ORV users are informed about seashore resources and rules.

Cumulative Impacts under Alternative A

Certain ongoing activities within the Seashore contribute to cumulative impacts including, for example, maintenance of over 70 historic structures, two National Register Historic Districts, many National Register structures, over 45 cabins and other structure in the cabin areas, multiple independent utility systems, species management activities, reopening of the lighthouse and increased visitor amenities, visitor use studies, the issuing of special use permits, and the preparation of park planning documents. These activities are generally accounted for in the current staff and budget of the Seashore and represent negligible adverse impacts on Seashore management and operations.

Other past, present, and planned future activities within the Seashore that have the potential to affect Seashore management and operations would include the *Cape Lookout National Seashore Interim Protected Species Management Plan/Environmental Assessment*, the Harkers Island and Cape Lookout National Seashore Keepers' Quarters Exhibit Plan, the Wayside Exhibit Plan, the *Interim Off-road Vehicle Management Plan and Evaluation of Existing ORV Use at Cape Lookout National Seashore*, the *Commercial Services Plan / Environmental Assessment / Assessment of Effect*, the *Cape Lookout National Seashore Long-Range Interpretive Plan*, the *Foundation Document*, the establishment of Ferry Gateways and the concession based ferry operations. The creation of these plans and their implementation would

require varying levels of staff time. For example, the implementation of the *Cape Lookout National Seashore Interim Protected Species Management Plan/Environmental Assessment*, which was developed as an interim plan until the long-term ORV management plan is finalized, involves considerable effort from all of the divisions that comprise Seashore management and operations, which has resulted in long-term noticeable adverse impacts on Seashore management and operations from activities such as carrying out and compiling research, determining alternative elements of the Plan/EA, hiring and managing consultants, facilitating public involvement, and reviewing and finalizing the Plan/EA. The implementation of the Harkers Island and Cape Lookout Keepers' Quarters Exhibit Plan has had long-term adverse impacts on Seashore management and operations as a result of planning and installing exhibits on Harkers Island and near the Keepers' Quarters and the staff time required for those activities. The Interim ORV Management Plan, which is in part based on the actions outlined in the Interim Protected Species Management Plan/EA and the Superintendent's Compendium, has also had long-term adverse impacts on Seashore management and operations due to increased ranger patrols and increased ranger presence at the vehicle landings at Long Point and Great Island. The Commercial Services Plan/EA and the concession based ferry operations is expected to have long-term beneficial impacts on Seashore management and operations as a result of establishing ferry concession contracts, which would give the Seashore more oversight over these services. A long-range interpretive plan (NPS 2011k) articulates the purpose, significance, and themes of the Seashore. The plan informs and guides the Seashore's interpretive and education programs into the next decade. The implementation of the *Foundation Document* could have noticeable long-term adverse impacts on Seashore management and operations depending on the amount of time and resources devoted to implementing the priority planning projects identified under the plan, and whether the planning effort detracts from other efforts at the Seashore.

The overall combined impacts of these past, current, and future actions on Seashore management and operations would be long-term, and adverse (from time and funding spent to complete the *Cape Lookout National Seashore Interim Protected Species Management Plan/Environmental Assessment*, the time and funding needed for planning and installing of exhibits on Harkers Island and near the Keepers' Quarters, increased ranger patrols at Long Point and Great Island, as well as long-term beneficial (from renewing concession contracts, thus freeing up Seashore management time, staffing and funding for other management activities). These impacts, combined with the long-term negligible impacts under alternative A, would likely result in observable long-term adverse and beneficial cumulative impacts.

ALTERNATIVE B

Impacts of Alternative B

Under alternative B, the operations and maintenance would require additional staff and operational funding. Table 69 provides funding needs under alternative B.

TABLE 69: STAFFING AND FUNDING—ALTERNATIVE B

Division	Total Annual Costs
Visitor and Resource Protection	\$439,600
Resource Management	\$276,900
Administration	\$43,000
Facility Management	\$98,000 (Plus one-time, first-year cost: \$190,000)
Interpretation and Education	\$83,500
Total Annual Costs	\$941,000 (Plus one-time, first-year cost: \$190,000)

Visitor and Resource Protection—Under alternative B, Seashore visitor and resource protection staff would be responsible for enforcing visitor compliance with ORV regulations and resource closures and managing fee collection. Law enforcement staff would perform routine patrols for beach areas, respond to violations, conduct investigations, and assist in public education through visitor contacts. Fee collection staff would be involved in managing the ORV permit program.

Additional actions that the visitor and resource protection division would be responsible for under alternative B are described in more detail in chapter 2.

In order to accomplish resource protection and ORV vehicle permit and fee management activities under alternative B (see tables 1 and 5), additional staff would be required, which would be filled by law enforcement rangers and ORV fee collection employees. These employees would operate at the Seashore for nine months of the year, and they would likely be permanent employees. Total approximate personnel costs for the visitor and resource protection division related to ORV use would equal \$439,600 a year.

Under alternative B, the Seashore's visitor and resource protection division would need additional staffing and approximately \$180,000 in additional funding when compared to current funding estimates in alternative A. Additional revenue from the ORV program would be used to recover costs and would in part cover additional requirements for this division. Any costs not covered by permit fees would need to be addressed by obtaining additional funding. The use of additional sources of funding sought as a result of this ORV management plan/EIS would offset costs for this division related to ORV management activities, resulting in negligible adverse effects. If additional funding is not procured, impacts to Seashore management and operations could experience noticeable long-term adverse impacts.

Resource Management—Under alternative B, resource management staff would be responsible for monitoring and establishment of buffers for protected birds, turtles, and seabeach amaranth. Resource management staff would also be responsible for determining monitoring requirements, hiring, training and supervising field staff, and conducting all field surveys. These staff would also provide input into the weekly resources management report updates, access updates and map products that are provided to the public through a GIS specialist.

Pre-nesting surveys, courtship and mating season surveys, nesting surveys, observations of hatchlings, and nonbreeding surveys for piping plover, colonial waterbirds, and American oystercatchers would be the same as under alternative A. Surveys for sea turtles and seabeach amaranth would also be the same as under alternative A (see tables 1 and 5).

Additional actions that the resource management division would be responsible for under alternative B include monitoring and implementing the adaptive management strategy, providing information on the “state of the species” throughout the Seashore (to show visitors the results of species management measures), attending meetings of local organizations and presenting information regarding ORV use and species protection (as practical), documenting species information in GIS, providing GIS based mapping for communications to the public, assisting with maintenance of web-based mapping of closures to the public, and improved training and supervision of field staff.

Total approximate personnel costs for the resource management division would equal \$276,900 a year.

Under alternative B, the Seashore’s resource management division would need additional staffing and approximately \$75,200 in additional funding when compared to alternative A. Additional revenue from the ORV program would be used to recover costs and would in part cover additional requirements for this division. Any costs not covered by permit fees would need to be addressed by obtaining additional funding. The use of additional sources of funding sought as a result of this ORV management plan/EIS would offset costs for this division related to ORV management activities, resulting in negligible adverse effects. If additional funding is not procured, impacts to Seashore management and operations could experience noticeable long-term adverse impacts.

Administration—Under alternative B, Seashore administrative staff would be directly involved in ORV management activities and all divisions would require administrative support. This support reflects overhead costs such as payroll, human resources functions, involvement of the superintendent, and other similar costs, as well as procurement and fee collection services. Support would also include management of the long-term parking permit program. Under alternative B, the Seashore’s administration division would need additional staffing and approximately \$30,500 in additional funding when compared to alternative A. Additional revenue from the ORV program (from permit fees) would be used to recover costs and would in part cover additional requirements for this division. Any costs not covered by permit fees would need to be addressed by obtaining additional funding. The use of additional sources of funding sought as a result of this ORV management plan/EIS would offset costs for this division related to ORV management activities, resulting in negligible adverse effects. If additional funding is not procured, impacts to Seashore management and operations could experience noticeable long-term adverse impacts.

Facility Management—Under alternative B, the facility management division at the Seashore would be responsible for maintenance activities related to ORV management. Facility management personnel would provide routine maintenance and emergency repairs of the back route, beach ramps and parking lots and would also be responsible for maintaining the vehicles used by law enforcement, resources management, and other staff associated with ORV management. Up to four additional ramps may be created on North Core Banks and five on South Core Banks. Under alternative B, the facility management divisions would develop and maintain pull-outs along the back route that allow northbound and southbound vehicles to more easily pass one another on the road. Designated overnight emergency parking (storm refuge) areas would be established on each island, to allow for overnight vehicle parking during times of adverse weather or high-tide events. Designated campsites may also be established on each island, accessible from the back route. Facility management employees would also be responsible for constructing up to six additional shade shelters on the back route, distributed throughout the Seashore.

Total approximate personnel costs for the facility management division would equal approximately \$98,000 a year. A one-time, first-year cost of \$190,000 would be needed for heavy equipment needed to maintain the back route.

Under alternative B, the Seashore’s facility management division would need additional staffing and approximately \$85,300 in additional funding when compared to current funding estimates under

alternative A. There would also be a first-year cost of \$190,000 to acquire equipment. Additional revenue from the ORV program (from permit fees) would be used to recover costs and would in part cover additional requirements for this division. Any costs not covered by permit fees would need to be addressed by obtaining additional funding. The use of additional sources of funding sought as a result of this ORV management plan/EIS would offset costs for this division related to ORV management activities, resulting in negligible adverse impacts. If additional funding is not procured, impacts to Seashore management and operations could experience noticeable long-term adverse impacts.

Interpretation and Education—Under alternative B, staff in the interpretation and education division would provide materials to Seashore visitors related to ORV use, as well as species management. Interpretation and education division staff would also be responsible for issuing the operator education certificates, which would be required for all ORV operators under alternative B. Staff time would be required to develop these materials, as well as funds to print and distribute the materials and education certificates. The interpretation and education division would also be responsible for developing and delivering the education certification program. Total approximate personnel costs for the interpretation and education division would equal \$83,500 a year.

Under alternative B, the Seashore's interpretation and education division would need additional staffing and approximately \$83,500 in additional funding when compared to funding estimates under alternative A. Additional revenue from the ORV program (from permit fees) would be used to recover costs and would in part cover additional requirements for this division. Any costs not covered by permit fees would need to be addressed by obtaining additional funding. The use of additional sources of funding sought as a result of this ORV management plan/EIS would offset costs for this division related to ORV management activities, resulting in negligible adverse impacts. If additional funding is not procured, impacts to Seashore management and operations could experience noticeable long-term adverse impacts.

Cumulative Impacts under Alternative B

The past, present, and future actions under alternative B would be the same under alternative A. The overall combined impacts of these past, present, and future actions on Seashore management and operations would be long-term, limited, and adverse (from time and funding spent to complete the *Cape Lookout National Seashore Interim Protected Species Management Plan/Environmental Assessment*, the time and funding needed for planning and installing of exhibits on Harkers Island and near the Keepers' Quarters, increased ranger patrols at Long Point and Great Island, and time and funding spent expanding and improving upon existing visitor services). There would also be long-term beneficial impacts from renewing concession contracts, thus freeing up Seashore management time, staffing and funding for other management activities. The impacts of these actions, in combination with the slightly long-term adverse impacts on Seashore management and operations under alternative B, would likely result in observable long-term adverse cumulative impacts on Seashore management and operations.

ALTERNATIVE C

Impacts of Alternative C

Under alternative C, the operations and maintenance of the Seashore would continue to include the same divisions outlined under alternative B. Table 70 provides the total staffing and funding needs under alternative C.

TABLE 70: STAFFING AND FUNDING—ALTERNATIVE C

Division	Total Annual Costs
Visitor and Resource Protection	\$439,600
Resource Management	\$276,900
Administration	\$43,000
Facility Management	\$98,000 (Plus one-time, first-year cost: \$190,000)
Interpretation and Education	\$83,500
Total Annual Costs	\$941,000 (Plus one-time, first-year cost: \$190,000)

Visitor and Resource Protection—Under alternative C, Seashore visitor and resource protection staff would be responsible for enforcing visitor compliance with ORV regulations and resource closures as described in chapter 2. Although the nighttime driving restriction under alternative C would be two weeks longer than under alternative B, the increase in hours spent enforcing the nighttime driving restrictions would be nominal for law enforcement staff. Therefore, under alternative C, the visitor and resource protection division would have the same responsibilities, and staffing and funding requirements as under alternative B (described above).

Under alternative C, visitor and resource protection functions related to ORV management would require additional staffing and approximately \$180,000 in additional funding beyond what is currently budgeted. Additional revenue from the ORV program (from permit fees) would be used to recover costs and would in part cover additional requirements for this division. Any costs not covered by permit fees would need to be addressed by obtaining additional funding. The use of additional sources of funding sought as a result of this ORV management plan/EIS would offset costs for this division related to ORV management activities, resulting in negligible adverse impacts. If additional funding is not procured, impacts to Seashore management and operations could experience noticeable long-term adverse impacts.

Resource Management—Under alternative C, the resource management division would have the same responsibilities, and staffing and funding requirements as under alternative B (described above).

Under alternative C, resource management functions related to ORV management would require additional staffing and approximately \$75,200 in additional funding beyond what is currently budgeted. Additional revenue from the ORV program (from permit fees) would be used to recover costs and would in part cover additional requirements for this division. Any costs not covered by permit fees would need to be addressed by obtaining additional funding. The use of additional sources of funding sought as a result of this ORV management plan/EIS would offset costs for this division related to ORV management activities, resulting in negligible adverse impacts. If additional funding is not procured, impacts to Seashore management and operations could experience noticeable long-term adverse impacts.

Administration—Under alternative C, the administration division would have the same responsibilities, and staffing and funding requirements as under alternative B (described above).

Under alternative C, Seashore administrative functions related to ORV management would require additional staffing and approximately \$30,500 in additional funding beyond what is currently budgeted. Additional revenue from the ORV program (from permit fees) would be used to recover costs and would in part cover additional requirements for this division. Any costs not covered by permit fees would need to be addressed by obtaining additional funding. The use of additional sources of funding sought as a

result of this ORV management plan/EIS would offset costs for this division related to ORV management activities, resulting in negligible adverse impacts. If additional funding is not procured, impacts to Seashore management and operations could experience noticeable long-term adverse impacts.

Facility Management—Under alternative C, the facility management division would have the same responsibilities, and staffing and funding requirements as under alternative B (described above).

Under alternative C, facility management functions related to ORV management would require additional staffing and approximately \$85,300 in additional funding beyond the current budget (plus a one-time, first-year cost of \$190,000 for heavy equipment needed to maintain the back route, and to support the expansion of bunkhouse facilities at the Harkers Island headquarters area, which would be needed to accommodate the increase in staff and their equipment for the facility management division under this alternative). Additional revenue from the ORV program (from permit fees) would be used to recover costs and would in part cover additional requirements for this division. Any costs not covered by permit fees would need to be addressed by obtaining additional funding. The use of additional sources of funding sought as a result of this ORV management plan/EIS would offset costs for this division related to ORV management activities, resulting in negligible adverse impacts. If additional funding is not procured, impacts to Seashore management and operations could experience noticeable long-term adverse impacts.

Interpretation and Education—Under alternative C, the interpretation and education division would have the same responsibilities, and staffing and funding requirements as under alternative B (described above).

Under alternative C, the Seashore would require additional staffing and approximately \$83,500 in additional funding beyond what is currently budgeted to conduct interpretive activities related to ORV use and species protection. Additional revenue from the ORV program (from permit fees) would be used to recover costs and would in part cover additional requirements for this division. Any costs not covered by permit fees would need to be addressed by obtaining additional funding. The use of additional sources of funding sought as a result of this ORV management plan/EIS would offset costs for this division related to ORV management activities, resulting in negligible adverse impacts. If additional funding is not procured, impacts to Seashore management and operations could experience noticeable long-term adverse impacts.

Cumulative Impacts under Alternative C

The past, present, and future actions under alternative C would be the same under alternative A. The overall combined impacts of these past, present, and future actions on Seashore management and operations would be long-term, limited, and adverse (from time and funding spent to complete the *Cape Lookout National Seashore Interim Protected Species Management Plan/Environmental Assessment*, the time and funding needed for planning and installing of exhibits on Harkers Island and near the Keepers' Quarters, increased ranger patrols at Long Point and Great Island, and time and funding spent expanding and improving upon existing visitor services). There would also be long-term beneficial impacts from renewing concession contracts, thus freeing up Seashore management time, staffing and funding for other management activities. The impacts of these actions, in combination with the long-term adverse impacts on Seashore management and operations under alternative C, would likely result in observable long-term adverse cumulative impacts on Seashore management and operations.

ALTERNATIVE D

Impacts of Alternative D

Under alternative D, the operations and maintenance of the Seashore would continue to include the same divisions as outlined under alternative B. Table 71 provides the total staffing and funding needs under alternative D.

TABLE 71: STAFFING AND FUNDING—ALTERNATIVE D

Division	Total Annual Costs
Visitor and Resource Protection	\$439,600
Resource Management	\$276,900
Administration	\$43,000
Facility Management	\$98,000
Interpretation and Education	\$83,500
Total Annual Costs	\$941,000

Visitor and Resource Protection—Although the visitor and resource protection staff would have slightly increased responsibilities under alternative D when compared to alternative B (two additional weeks of enforcing nighttime driving restrictions, and enforcing increased ATV and UTV restrictions), the visitor and resource protection division would have the same staffing and funding requirements as under alternative B (described above).

Under alternative D, visitor and resource protection functions related to ORV management would require additional staffing and approximately \$180,000 in additional funding beyond what is currently budgeted. Additional revenue from the ORV program (from permit fees) would be used to recover costs and would in part cover additional requirements for this division. Any costs not covered by permit fees would need to be addressed by obtaining additional funding. The use of additional sources of funding sought as a result of this ORV management plan/EIS would offset costs for this division related to ORV management activities, resulting in negligible adverse impacts. If additional funding is not procured, impacts to Seashore management and operations could experience noticeable long-term adverse impacts.

Resource Management—Under alternative D, although resource management staff would be responsible for establishing resource buffers that are larger than the resource buffers proposed under any other alternatives, the time and staffing needed to establish these increased resource buffers would be nominal in comparison to the other alternatives. Therefore, under alternative D, the resource management division would have the same responsibilities, staffing and funding requirements as under alternative B (described above).

Under alternative D, resource management functions related to ORV management require additional staffing and approximately \$75,200 in additional funding beyond what is currently budgeted. Additional revenue from the ORV program (from permit fees) would be used to recover costs and would in part cover additional requirements for this division. Any costs not covered by permit fees would need to be addressed by obtaining additional funding. The use of additional sources of funding sought as a result of this ORV management plan/EIS would offset costs for this division related to ORV management activities, resulting in negligible adverse impacts. If additional funding is not procured, impacts to Seashore management and operations could experience noticeable long-term adverse impacts.

Administration—Under alternative D, Seashore administrative staff would be directly involved in ORV management activities and all divisions would require administrative support. This support reflects overhead costs such as payroll, human resources functions, involvement of the superintendent, and other similar costs. Under alternative D, the administration division would have similar responsibilities, and the same staffing and funding requirements as under alternative B (described above).

Under alternative D, Seashore administrative functions related to ORV management would require additional staffing and approximately \$30,500 in additional funding beyond what is currently budgeted. Additional revenue from the ORV program (from permit fees) would be used to recover costs and would in part cover additional requirements for this division. Any costs not covered by permit fees would need to be addressed by obtaining additional funding. The use of additional sources of funding sought as a result of this ORV management plan/EIS would offset costs for this division related to ORV management activities, resulting in negligible adverse impacts. If additional funding is not procured, impacts to Seashore management and operations could experience noticeable long-term adverse impacts.

Facility Management—Under alternative D, the facility management division at the Seashore would be responsible for all maintenance activities related to ORV management. Facility management personnel would provide emergency repairs to beach ramps, and would also be responsible for maintaining the vehicles used by law enforcement, resources management, and other staff associated with ORV management. Under alternative D, the facility management division would not provide camping pull-outs along the back route, nor would they provide routine maintenance to the back route; the back route and other routes would only be reestablished when they are impacted by storm events.

Under alternative D, facility management functions related to ORV management would require additional staffing and approximately \$85,300 in additional funding beyond what is currently budgeted. Additional revenue from the ORV program (from permit fees) would be used to recover costs and would in part cover additional requirements for this division. Any costs not covered by permit fees would need to be addressed by obtaining additional funding. The use of additional sources of funding sought as a result of this ORV management plan/EIS would offset costs for this division related to ORV management activities, resulting in negligible adverse impacts. If additional funding is not procured, impacts to Seashore management and operations could experience noticeable long-term adverse impacts.

Interpretation and Education—Under alternative D, the interpretation and education division would have the same responsibilities, and staffing and funding requirements as under alternative B (described above).

Under alternative D, the Seashore would require additional staffing and approximately \$83,500 in additional funding beyond what is currently budgeted in order to conduct interpretive activities related to ORV use and species protection. Additional revenue from the ORV program (from permit fees) would be used to recover costs and would in part cover additional requirements for this division. Any costs not covered by permit fees would need to be addressed by obtaining additional funding. The use of additional sources of funding sought as a result of this ORV management plan/EIS would offset costs for this division related to ORV management activities, resulting in negligible adverse impacts. If additional funding is not procured, impacts to Seashore management and operations could experience noticeable long-term adverse impacts.

Cumulative Impacts under Alternative D

The past, present, and future actions under alternative D would be the same under alternative A. The overall combined impacts of these past, present, and future actions on Seashore management and operations would be long-term, limited, and adverse, (from time and funding spent to complete the *Cape*

Lookout National Seashore Interim Protected Species Management Plan/Environmental Assessment, the time and funding needed for planning and installing of exhibits on Harkers Island and near the Keepers' Quarters, increased ranger patrols at Long Point and Great Island, and time and funding spent expanding and improving upon existing visitor services). There would also be long-term beneficial impacts from renewing concession contracts, thus freeing up Seashore management time, staffing and funding for other management activities. The impacts of these actions, in combination with the slightly long-term adverse impacts on Seashore management and operations under alternative D, would likely result in observable long-term adverse cumulative impacts on Seashore management and operations.

ALTERNATIVE E

Impacts of Alternative E

Under alternative E, the operations and maintenance of the Seashore would continue to include the same divisions as outlined under alternative B. Table 72 provides the total staffing and funding needs under alternative E.

TABLE 72: STAFFING AND FUNDING—ALTERNATIVE E

Division	Total Annual Costs
Visitor and Resource Protection	\$194,100
Resource Management	\$191,700
Administration	\$0
Facility Management	\$12,700
Interpretation and Education	\$0
Total Annual Costs	\$398,500

Visitor and Resource Protection—Under alternative E, Seashore law enforcement staff would be responsible for enforcing visitor compliance with safety and resource closures, and ensuring that no ORVs and ATVs/UTVs access the Seashore. Law enforcement staff would perform routine patrols areas along the Seashore, respond to violations and emergency situations (ensuring visitor safety), conduct investigations, and assist in public education through visitor contacts.

In order to accomplish the above activities, as well as enforce all applicable regulations at the Seashore, less law enforcement staff would be required. Total approximate labor cost for these positions would equal \$194,100 a year.

Under alternative E, protection functions related to ORV management would be accomplished with a decrease in staffing and a decrease in approximately \$65,500 in personnel costs, resulting in long-term beneficial impacts to Seashore management and operations.

Resource Management—Under alternative E, resource management staff would be responsible for all surveying, monitoring and establishment of buffers for protected birds, turtles, and seabeach amaranth, including monitoring and implementing the adaptive management strategy, to the degree applicable. Resource management staff would also be responsible for determining monitoring requirements, hiring, training and supervising field staff, and conducting all field surveys. These staff would also provide input into the weekly resources management report updates and access updates that are provided to the public. Resource management staff would continue to have responsibilities for resource management closures

related to essential vehicle use, and would be responsible for establishing pedestrian closures for resource protection.

In order to accomplish the above activities, the resources management division would not require additional staff. Total approximate labor cost for these positions would equal approximately \$201,700 a year. Under alternative E, resources management functions related to species management would be accomplished with no additional staff or funding.

Administration—Under alternative E, all management divisions would require administrative support. This support reflects overhead costs such as payroll, human resources functions, involvement of the superintendent, and other similar costs. However, due to the prohibition of ORV use at the Seashore, administration staff would no longer be responsible for administrative support related to ORV use. Actions under alternative E would not require any FTE staffing to support field operations, or any personnel costs.

Under alternative E, Seashore administrative functions related to ORV management would be accomplished with a decrease in staffing and a decrease of approximately \$12,500 in personnel costs, resulting in long-term beneficial impacts to Seashore management and operations.

Facility Management—Under alternative E, the facility management division at the Seashore would be responsible for all maintenance activities. Facility management personnel would provide maintenance for the vehicles used by law enforcement, resources management, and other staff. Under alternative E, facility management functions related to management would be accomplished with no additional staff or funding.

Interpretation and Education—Under alternative E, staff in the interpretation and education division would provide materials to Seashore visitors related to species management. Staff time would be required to develop these materials, as well as funds to print and distribute the materials. The interpretation and education division would also be responsible for additional interpretive programs at the Seashore. However, due to the prohibition of ORV use at the Seashore, interpretation and education staff would no longer be responsible for providing materials to Seashore visitors related to ORV use. Actions under alternative E would not require any new staffing under the interpretation and education division.

Cumulative Impacts under Alternative E

The past, present, and future actions under alternative E would be the same under alternative A. The overall combined impacts of these past, present, and future actions on Seashore management and operations would be long-term, limited, and adverse (from time and funding spent to complete the *Cape Lookout National Seashore Interim Protected Species Management Plan/Environmental Assessment*, the time and funding needed for planning and installing of exhibits on Harkers Island and near the Keepers' Quarters, increased ranger patrols at Long Point and Great Island, and time and funding spent expanding and improving upon existing visitor services). There would also be long-term beneficial impacts from renewing concession contracts, thus freeing up Seashore management time, staffing and funding for other management activities. The impacts of these actions, in combination with the long-term beneficial impacts on Seashore management and operations under alternative E, would likely result in observable long-term beneficial cumulative impacts on Seashore management and operations.

COMPARISON OF ALTERNATIVES

Compared to alternative A, implementation of alternatives B and C (which have the same impacts to Seashore management and operations) would result in long-term noticeable adverse impacts on Seashore

management and operations due to the increase in staffing and personnel costs in order to enforce visitor compliance with ORV regulations and resource closures, enforce nighttime driving restrictions, work with vehicle ferry operators, provide visitors with ORV closure information, manage a vehicle permit system, develop, update and manage the education certificate, manage the ORV parking lots, record the number of vehicles operating or stored at the Seashore each day, attend meetings of local organizations and present information regarding ORV use and species protection, construct additional ramps along the back route, and designate emergency overnight parking areas. Total approximate annual cost to implement alternative B, as well as alternative C, would be \$941,000 (plus one-time, first-year cost of \$190,000), compared to an approximate annual cost of \$486,500 to implement alternative A, resulting in an increase of \$454,500 annually that would need to be covered with additional permit fees or new funding sources (including the one-time cost of \$190,000, the first-year cost would be \$1,131,000).

Compared to alternative A, implementation of alternative D would result in long-term noticeable adverse impacts on Seashore management and operations. This is due to the considerable increase in staffing and funding needs in order to enforce visitor compliance with ORV regulations and resource closures over a nine-month visitor season, enforce nighttime driving restrictions, work with vehicle ferry operators, provide visitors with ORV closure information, manage a vehicle permit system, develop, update and manage the education certificate, manage the ORV parking lots, record number of vehicles operating or stored at the Seashore each day, attend meetings of local organizations and presenting information regarding ORV use and species protection, construct additional ramps along the back route, and designate emergency overnight parking areas. Total approximate annual cost to implement alternative D would be \$941,000, compared to an approximate annual cost of \$486,500 to implement alternative A, resulting in an increase of \$454,500 annually that would need to be covered with additional permit fees or new funding sources.

Compared to alternative A, the implementation of alternative E would have long-term beneficial effects on Seashore management and operations. For alternative E, implementation would allow a decrease staffing, and a decrease in annual spending across all Seashore operations. Total approximate annual cost to implement alternative E would be \$398,500.

CONCLUSION

Implementation of alternative A would require approximately \$486,500 in personnel costs. Under alternative A, all management functions related to ORV management would continue to be accomplished within the existing Seashore budget. However, there are some inadequacies under alternative A as stated above, regarding the visitor and resource protection division and the resource management division. The funding and staffing for the visitor and resource protection division under alternative A only covers a six-month period, while the visitor use season is nine months long (March through December). The resource protection division under alternative A also relies heavily on seasonal staff, which results in greater turnover and is not as efficient as permanent staff. Furthermore, the resource management division currently does not have an information technology specialist to perform network administration or communications, nor does this division have adequate GIS capacity or sufficient supervisors for field staff. Although the implementation of alternative A would not require staffing or funding that is unavailable to the Seashore, implementation of alternative A would likely result in long-term, noticeable adverse impacts due to the inadequacies stated above. However, the Seashore would still be able to comply with all applicable laws and regulations and management would continue in a way that furthers the purpose and significance of the Seashore.

Under alternatives B, C, and D there would be an overall increase in duties related to ORV management for staff in the Seashore management and operations divisions. The increased level of effort for these alternatives would be the same under alternatives B, C, and D, which would be approximately \$454,500

annually in additional funding in order to meet the staffing, support, and other costs. However, alternatives B and C would also have a one-time, first-year additional cost of \$190,000 for heavy equipment needed to maintain the back route, and to support the expansion of bunkhouse facilities at the Harkers Island headquarters area. Additional revenue from the ORV program (from permit fees) would be used to recover costs and would in part cover additional requirements for the Seashore under alternatives B, C, and D. Any costs not covered by permit fees would need to be addressed by obtaining additional funding. Although the implementation of alternatives B, C, and D would require staffing or funding that is currently unavailable to the Seashore, implementation of alternatives B, C, and D would likely result in long-term, slightly adverse impacts due to the increases in management and operations responsibilities. However, the Seashore would still be able to comply with all applicable laws and regulations and management would continue in a way that furthers the purpose and significance of the Seashore.

Implementation of alternative E would require less staff for Seashore management and operations. Total personnel costs would equal approximately \$398,500. Under alternative E, all Seashore management functions would continue to be accomplished within a decreased Seashore budget. Alternative E would be accomplished with a decrease in staff, and a decrease of \$88,000 in total annual personnel costs. Because the implementation of alternative E would not require staffing or funding that is unavailable to the Seashore, implementation of alternative E would result in long-term beneficial impacts to Seashore management and operations.

Significance Discussion

The purpose of the Seashore is to preserve the outstanding natural, cultural, and recreational resources and values of a dynamic, intact, natural barrier island system where ecological processes dominate. The Seashore is one of the few remaining locations on the Atlantic coast where visitors can experience and recreate in an undeveloped, remote barrier island environment that can be reached only by boat or ferry.

Under alternatives B, C, and D there would be an overall increase in responsibilities related to ORV management for staff in the Seashore management and operations divisions. The increased level of effort for these alternatives would be the same under alternatives B, C, and D, which would be approximately \$454,500 annually in additional funding in order to meet the staffing, support, and other costs. However, alternatives B and C would also have a one-time, first-year additional cost of \$190,000 for heavy equipment needed to maintain the back route, and to support the expansion of bunkhouse facilities at the Harkers Island headquarters area. Even though the Seashore would need to obtain additional funds and staffing compared to current management, the implementation of alternatives B, C, and D is not likely to result in significant adverse impacts on Seashore management and operations. The Seashore would still be able to comply with all applicable laws and regulations and management would continue in a way that furthers the purpose and significance of the Seashore. In the event that the Seashore is unable to procure additional funding for alternatives B, C, and D, impacts to Seashore management and operations could be notably adverse, requiring the Seashore to reprogram other management priorities to effectively manage ORV use.

Under alternative A, NPS staff would be able to manage ORV use with existing staff and funding, resulting in negligible adverse impacts to Seashore management and operations. However, there are some inadequacies under alternative A as stated above, regarding the resource protection division and the resource management division. The funding and staffing for the visitor and resource protection division under alternative A only covers a six-month period, while the visitor use season is nine months long (March through December). The visitor and resource protection division under alternative A also relies heavily on seasonal staff, which results in greater turnover and is not as efficient as permanent staff. Furthermore, the resource management division currently does not have an information technology

specialist to perform network administration or communications, nor does this division have adequate GIS capacity or sufficient supervisors for field staff.

Implementation of alternative E would allow for a reduction in staff. Total personnel costs would equal approximately \$398,500. Under alternative E, all Seashore management functions would continue to be accomplished within a decreased Seashore budget. Alternative E would be accomplished with a decrease of \$88,000 in total annual personnel costs. The implementation of alternative E would not require staffing or funding that is unavailable to the Seashore. Therefore, implementation of alternative E would not result in significant impacts on Seashore management and operations as the Seashore would still be able to comply with all applicable laws and regulations and management would continue in a way that furthers the purpose and significance of the Seashore.

As stated above, there is uncertainty regarding procuring some of the additional funding required in order to implement alternatives B, C, and D. Additional revenue from the ORV program (from permit fees) would be used to recover costs and would in part cover additional requirements for the Seashore under alternatives B, C, and D. Any costs not covered by permit fees would need to be addressed by obtaining additional funding. In the event that the Seashore is unable to procure additional funding for alternatives B, C, and D, impacts to Seashore management and operations could be notably adverse, because the ability of NPS staff to perform ORV management responsibilities would be considerably reduced. However, the implementation of alternatives B, C, and D would involve some additional funding through the ORV permit program, and as a result, the lack of additional funding beyond the ORV permit program would not result in significant adverse impacts.

RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF THE ENVIRONMENT AND MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

NEPA regulations (40 CFR 1502.16) require an EIS to consider the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity. Special attention should be given to impacts that narrow the range of beneficial uses of the environment or pose a long-term risk to human health or safety.

Alternatives A, B, C, and D would all allow for ORV use, with varying levels of management activities. All of these alternatives would have impacts on the resources at the Seashore including threatened and endangered species, species of special concern, other wildlife and soundscapes. While these impacts may result in population fluctuations or temporary alterations to the soundscape at the Seashore, long-term productivity of these resources would not be impacted as a result of the various management measures including species protection measures that are common to all action alternatives. Additional mitigation measures under alternatives B, C, and D such as limits on the types of ATVs and UTVs, vehicle permits, and night driving restrictions would further establish that there are no impacts to long-term productivity of the Seashores resources.

Alternative E would not allow for recreational ORV use at the Seashore. While minimal impacts would result from administrative ORV use, potential impacts to Seashore resources would be reduced, and long-term productivity of Seashore resources would continue.

IRREVERSIBLE OR IRRETRIEVABLE COMMITMENTS OF RESOURCES

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

An irreversible commitment of resources applies primarily to the effects of using nonrenewable resources, such as minerals or cultural resources, or to those factors such as soil productivity that are renewable only over long periods. It could also apply to the loss of an experience as an indirect effect of a “permanent” change in the nature or character of the land.

An irretrievable commitment of resources is defined as the loss of production, harvest, or use of natural resources. The amount of recreational activities foregone is irretrievable, but the action is not irreversible. If the use changes, it is possible to resume production. An example of such a commitment would be the loss of ORV access in a particular area of the Seashore as a result of a decision to close that area. If the decision were reversed, visitor experiences related to ORV access, though lost in the interim, would be available again.

ALTERNATIVE A: NO ACTION

Under alternative A, there would be no irreversible impacts to any resources found within the Seashore. However, alternative A has the potential to have irretrievable impacts on federally listed endangered, threatened, or candidate species; state-listed and special-status species; other wildlife and wildlife habitat; soundscapes/acoustic environment; visitor use and experience (of non-ORV visitors); and Seashore management and operations. Irretrievable impacts to ORV users would be minimal as the amount of Seashore available currently for use would not change, and additional requirements such as an education permit or vehicle type restrictions, would not occur. This is due to the continued use of ORVs at the Seashore in designated areas with the least restrictions compared to any other alternative. Impacts on these resources would be concentrated along designated ORV routes and areas, and outside of any designated resource closures, rather than scattered along user-created routes.

ALTERNATIVE B

Under alternative B, there would be no irreversible impacts to any resources found within the Seashore. Alternative B has a potential for irretrievable impacts (federally listed endangered, threatened, or candidate species; state-listed and special-status species; other wildlife and wildlife habitat; soundscapes/acoustic environment, visitor use and experience for non-ORV users, and Seashore management and operations) similar to alternative A, due to continued ORV use at the Seashore in designated areas. However, ORV driving restrictions under alternative B (including a slight decrease in areas where ORV use would be allowed, restrictions on ATV and UTV use, miscellaneous vehicle requirements, vehicle permits, and educational requirements), would decrease the potential for irretrievable impacts to occur on resources, while increasing to some degree the irretrievable impacts on the visitor experience of ORV users.

ALTERNATIVE C

Under alternative C, there would be no irreversible impacts to any resources found within the Seashore.

Alternative C has a potential for irretrievable impacts (federally listed endangered, threatened, or candidate species; state-listed and special-status species; other wildlife and wildlife habitat; soundscapes/acoustic environment; visitor use and experience for non-ORV users; socioeconomics; and Seashore management and operations) due to continued ORV use at the Seashore in designated areas. In addition, the implementation of permit limits could impact visitation at the Seashore which would result in a change in visitation patterns and therefore also impact, to some degree, socioeconomics. However, ORV driving restrictions under alternative C (a decrease in areas where ORV use would be allowed, increased restrictions on ATV and UTV use, miscellaneous vehicle requirements, limited number of vehicle permits available, and educational requirements), would decrease the potential for irretrievable impacts to occur to natural resources, but would increase the potential for irretrievable impacts to the visitor experience of ORV users.

ALTERNATIVE D

Under alternative D, there would be no irreversible impacts to any resources found within the Seashore. Alternative D has a potential for irretrievable impacts (federally listed endangered, threatened, or candidate species; state-listed and special-status species; other wildlife and wildlife habitat; soundscapes/acoustic environment, visitor use and experience for non-ORV users; socioeconomics; and Seashore management and operations) due to continued ORV use at the Seashore in designated areas, with these impact slightly reduced due to additional non-ORVs provided under this alternative, as well as limit on ORV user permits that keeps use at current levels. However, ORV driving restrictions under alternative D (a decrease in areas where ORV use would be allowed, increased restrictions on ATV and UTV use, miscellaneous vehicle requirements, a limited and reduced number of vehicle permits available, and educational requirements), would decrease the potential for irretrievable impacts to occur to natural resources and the visitor experience of non-ORV users, but would increase the potential for these types of impacts to the visitor experience of ORV users and socioeconomics.

ALTERNATIVE E

Under alternative E, there would be no irreversible impacts to any resources found within the Seashore. Alternative E has the least potential for irretrievable impacts to natural resources (federally listed endangered, threatened, or candidate species; state-listed and special-status species; other wildlife and wildlife habitat; and soundscapes/acoustic environment) and to the visitor use and experience of non-ORV users and Seashore management and operations) since no ORV use would be authorized at the Seashore. Alternative E has the potential for irretrievable impacts related to the prohibition of ORV use within the Seashore and the forgone visitor use and experiences related to ORV use as well as the potential socioeconomic impacts to local businesses from the prohibition of that use.

UNAVOIDABLE ADVERSE IMPACTS

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

ALTERNATIVE A: NO ACTION

Under alternative A, there would be long-term, unavoidable adverse impacts on Seashore wildlife (federally listed endangered, threatened, or candidate species; state-listed and special-status species; other wildlife and wildlife habitat), soundscapes/acoustic environment, and visitor use and experience, and Seashore management and operations due to the continued ORV use at designated areas at the Seashore. Unavoidable impacts to Seashore wildlife would include potential disturbance from human uses including

both ORV use and pedestrian use, however, these disturbances would be minimized to the extent possible by the full recreational and ORV closures that are established throughout the Seashore. Unavoidable impacts on soundscapes would result from ORV noise being audible to visitors and impacting the opportunity for visitors to experience natural quiet in areas of the Seashore where ORV use is allowed. In addition, there would be continued unavoidable adverse impacts on visitor use and experience for ORV users and non-ORV users alike. ORV use would only be permitted on designated routes, thus restricting ORV users to a confined space; conversely, non-ORV users could be adversely impacted by the sights and sounds of ORVs if they wish to experience the Seashore without such audible and visual intrusions. Management divisions at the Seashore would continue to incur staffing and total personnel costs in order to successfully manage ORV use at the Seashore under alternative A.

ALTERNATIVE B

Under alternative B, there would be long-term, unavoidable adverse impacts on Seashore wildlife (federally listed endangered, threatened, or candidate species; state-listed and special-status species; other wildlife and wildlife habitat), soundscapes/acoustic environment, and visitor use and experience, and Seashore management and operations due to the continued ORV use at designated areas at the Seashore. Unavoidable impacts to Seashore wildlife would include potential disturbance from human uses including both ORV use and pedestrian use, however, these disturbances would be minimized to the extent possible by the full recreational and ORV closures that are established throughout the Seashore.

Unavoidable impacts on soundscapes would result from ORV noise being audible to visitors and impacting the opportunity for visitors to experience natural quiet in areas of the Seashore where ORV use is allowed. In addition, there would be continued unavoidable adverse impacts on visitor use and experience for ORV users and non-ORV users alike. ORV use would only be permitted on designated routes, thus restricting ORV users to a confined space; conversely, non-ORV users could be adversely impacted by the sights and sounds of ORVs if they wish to experience the Seashore without such audible and visual intrusions. Management divisions at the Seashore would be required to increase staffing and total personnel costs in order to successfully manage ORV use at the Seashore under alternative B. ORV use would be monitored and mitigation measures, including vehicle permits, an educational certificate, and full recreational closures would be used to reduce impacts on resources.

ALTERNATIVE C

Under alternative C, there would be long-term, unavoidable adverse impacts on Seashore wildlife (federally listed endangered, threatened, or candidate species; state-listed and special-status species; other wildlife and wildlife habitat), soundscapes/acoustic environment, and visitor use and experience, and Seashore management and operations due to the continued ORV use at designated areas at the Seashore. Unavoidable impacts to Seashore wildlife would include potential disturbance from human uses including both ORV use and pedestrian use, however, these disturbances would be minimized to the extent possible by the full recreational and ORV closures that are established throughout the Seashore. Unavoidable impacts on soundscapes would result from ORV noise being audible to visitors and impacting the opportunity for visitors to experience natural quiet in areas of the Seashore where ORV use is allowed. In addition, there would be continued unavoidable adverse impacts on visitor use and experience for ORV users and non-ORV users alike. ORV use would only be permitted on designated routes, thus restricting ORV users to a confined space; conversely, non-ORV users could be adversely impacted by the sights and sounds of ORVs if they wish to experience the Seashore without such audible and visual intrusions. Management divisions at the Seashore would be required to increase staffing and total personnel costs in order to successfully manage ORV use at the Seashore under alternative C. ORV use would be monitored and mitigation measures, including vehicle permits, an educational certificate, and full recreational closures would be used to reduce impacts on resources.

ALTERNATIVE D

Under alternative D, there would be long-term, unavoidable adverse impacts on Seashore wildlife (federally listed endangered, threatened, or candidate species; state-listed and special-status species; other wildlife and wildlife habitat), soundscapes/acoustic environment, and visitor use and experience, and Seashore management and operations due to the continued ORV use at designated areas at the Seashore. Unavoidable impacts to Seashore wildlife would include potential disturbance from human uses including both ORV use and pedestrian use, however, these disturbances would be minimized to the extent possible by the full recreational and ORV closures that are established throughout the Seashore. Unavoidable impacts on soundscapes would result from ORV noise being audible to visitors and impacting the opportunity for visitors to experience natural quiet in areas of the Seashore where ORV use is allowed. In addition, there would be continued unavoidable adverse impacts on visitor use and experience for ORV users and non-ORV users alike. ORV use would only be permitted on designated routes, thus restricting ORV users to a confined space; conversely, non-ORV users could be adversely impacted by the sights and sounds of ORVs if they wish to experience the Seashore without such audible and visual intrusions. Management divisions at the Seashore would be required to increase staffing and total personnel costs in order to successfully manage ORV use at the Seashore under alternative D. ORV use would be monitored and mitigation measures, including vehicle permits, an educational certificate, and full recreational closures would be used to reduce impacts on resources.

ALTERNATIVE E

Unavoidable adverse impacts under alternative E would be reduced compared to alternatives A, B, C, and D. The prohibition of ORV use at the Seashore would result in the increased protection of resources (federally listed endangered, threatened, or candidate species; state-listed and special-status species; other wildlife and wildlife habitat, and soundscapes/acoustic environment) in highly impacted ORV areas, which would mitigate adverse impacts on these resources. There would be some unavoidable adverse impacts on visitors no longer being able to access areas of the Seashore on their ORVs, and to the local economy from loss of visitor spending, jobs, and income (particularly for the ferry operators).

Chapter 5:

Consultation and Coordination

CHAPTER 5: CONSULTATION AND COORDINATION

One intent of the National Environmental Policy Act (NEPA) is to encourage the participation of federal and state involved agencies and affected citizens in the assessment procedure, as appropriate. This chapter describes the consultation conducted during development of this Off-road Vehicle Management Plan and Environmental Impact Statement (ORV management plan/EIS), including consultation with other agencies. This chapter includes a description of the public involvement process and a list of the recipients of the draft document.

HISTORY OF PUBLIC INVOLVEMENT

The public involvement activities for this ORV management plan/EIS fulfill the requirements of the NEPA and National Park Service (NPS) Director's Order 12 (NPS 2011h).

THE SCOPING PROCESS

The NPS divides the scoping process into two parts: internal scoping and external / public scoping. Internal scoping involved discussions among NPS personnel regarding the purpose of and need for management actions, issues, literature reviews, management alternatives, mitigation measures, the analysis boundary, available references and guidance, and other related topics.

Public scoping is the early involvement of the interested and affected public in the environmental analysis process. The public scoping process helps ensure that people have been given an opportunity to comment and contribute early in the decision-making process. For this ORV management plan/EIS, project information was distributed to individuals, agencies, and organizations early in the scoping process, and people were given opportunities to express concerns or views and identify important issues or even other alternatives or alternative elements.

Taken together, internal and public scoping are essential elements of the NEPA planning process. The following sections describe the various ways scoping was conducted for this project.

INTERNAL SCOPING

Internal scoping for this project began on May 8, 2007, with NPS staff members from the Seashore, NPS Environmental Quality Division, NPS Southeastern Region, and contractor personnel in attendance. During the three-day meeting, the NPS identified the purpose of and need for action, management objectives, issues, and impact topics. The planning team also discussed possible alternative elements, cumulative impacts, and strategies for public involvement throughout the process. Various roles and responsibilities for developing the ORV management plan were clarified. The results of the meetings were captured in a report that is on file as part of the decision file.

PUBLIC SCOPING

Public scoping was conducted to engage the public, the major interest groups, and local public entities on the planning effort, and provide an opportunity to comment on the purpose and need for the planning effort, as well as preliminary alternatives.

PUBLIC NOTIFICATION

The public scoping process began on August 7, 2007, with the publication of a Notice of Intent in the *Federal Register* (FR, Volume 72, Number 151). The Notice of Intent summarized the history of ORV management at the Seashore, discussed preliminary issues and impact topics, listed the project website, and announced the upcoming public scoping meetings. The Seashore posted a public scoping newsletter on the NPS Planning, Environment, and Public Comment (PEPC) website at <http://parkplanning.nps.gov/cal0>, and sent the newsletter to individuals, businesses, agencies, and organizations on the Seashore's email distribution list.

PUBLIC SCOPING MEETINGS

On September 11, 12, and 13, 2007, the NPS held public scoping meetings for the ORV management plan/EIS. The scoping meetings were intended to initiate public involvement early in the planning stages and to obtain community feedback on the initial purpose, need, and objective statements for ORV management at Cape Lookout National Seashore. Meetings were held in the following locations:

- On September 11, 2007, a public meeting was held in Beaufort, North Carolina at the Duke Marine Lab from 6 p.m. to 9 p.m. Thirty-eight people attended.
- On September 12, 2007, a public meeting was held in Raleigh, North Carolina at the McKimmon Center from 7 p.m. to 9:30 p.m. Twenty-six people attended.
- On September 13, 2007, a public meeting was held in Charlotte, North Carolina at The Hut from 6 p.m. to 9 p.m. Thirty-one people attended.

The meetings were open house style and offered a variety of methods for the public to provide comments. NPS personnel and contractor staff were present at each display to answer questions from attendees and record attendees' comments. Comment sheets were provided to meeting attendees as an additional method for accepting public comment. Those attending the meetings were also given a newsletter that provided additional opportunities for comment, including directing comments to the PEPC website. To keep the public involved and informed throughout the planning process, individuals were given the option to receive notification of the availability of draft ORV management documents by either e-mail or regular mail and the option to either download a digital copy or receive a hardcopy through the mail. The public scoping period was open until October 26, 2007.

PUBLIC SCOPING COMMENTS

During the public comment period (August 24, 2007 to October 26, 2007), 98 items of correspondence were received, containing a total of 667 signatures and 2,290 individual comments. Of the 2,290 comments received, 832 were related to the alternative concepts; 704 comments were related to the affected environment at the Seashore; 601 comments were related to the impact analysis; and 42 comments were concerned with the purpose and need of the ORV management plan/EIS. The remaining comments were of a general nature concerning consultation and coordination, park operations, socioeconomics, threatened and endangered species, various values of visitor experience, and visitor conflicts and safety.

THE COMMENT ANALYSIS PROCESS

Comment analysis is a process used to compile and correlate similar public comments into a usable format for decision makers and the NPS planning team. Comment analysis assists the team in organizing,

clarifying, and addressing technical information pursuant to NEPA regulations. It also aids in identifying the topics and issues to be evaluated and considered throughout the planning process.

The process includes

- Reading and coding public comments from correspondence received
- Interpreting and analyzing the comments to identify issues and themes
- Preparing a comment summary.

A coding structure was developed to help sort comments into logical groups by topic and issue. The NPS derived the coding structure from an analysis of the range of topics discussed during internal scoping, past planning documents, and the comments themselves. The coding structure was designed to capture all comment content rather than restricting or excluding any ideas.

The NPS PEPC database was used to manage the comments. The database stores the full text of all correspondence and allows each comment to be coded by topic and issue. The database tallies the total number of pieces of correspondence and comments received, sorts and reports comments by particular topics or issues, and provides demographic information on the sources of each comment.

Analysis of the public comments involved assigning codes to statements made in public letters, email messages, and written comment forms. All comments were read and analyzed, including those of a technical nature; opinions, feelings, and suggestions for alternative elements to be considered in the ORV management plan/EIS; and comments of a personal or philosophical nature.

A comment analysis report was prepared that summarized concern statements as well as the full text of all comments corresponding to the appropriate concern statement (NPS 2008i). All scoping comments were considered to be important as useful guidance and public input to the public scoping process. With regard to development of the ORV management plan/EIS, comments in favor of or against the proposed action or alternatives, those that only agree or disagree with NPS policy. Comments that offer opinions or provide information not directly related to the issues, alternatives, or impact analysis were considered non-substantive comments. Although the analysis process attempts to capture the full range of public concerns, the content analysis report should be used with caution. Comments from people who chose to respond do not necessarily represent the sentiments of the entire public.

PUBLIC ALTERNATIVE DEVELOPMENT WORKSHOPS

After the internal and public scoping meetings, suggestions and ideas for alternatives for ORV management were gathered and compiled into an extensive list of preliminary alternative elements. These alternative elements were organized by topic areas and formatted into an alternatives options workbook for presentation to the public to obtain further comments and suggestions. Although not required by the NEPA process, the development of these workbooks and the public workshops that followed was intended to generate more detailed public input during the alternatives development process. Members of the public were asked to evaluate the preliminary alternatives and encouraged to identify possible new alternative options for ORV management at the Seashore. The workbook was organized into the following sections: ORV Management, Education and Outreach, Law Enforcement, ORV Permits, Other ORV Management Issues, and Species Protection. The Alternatives Option Workbook was distributed to the public as follows:

- A press release, with the workbook as an attachment, was sent electronically to all recipients on the Cape Lookout National Seashore ORV e-mail list.

- Microsoft Word and PDF versions of the workbooks were made available online on the NPS PEPC website.
- Hard copies of the workbook were distributed at public alternatives development meetings discussed below, and provided to members of the public by the Seashore when requested.

The NPS held meetings to inform the public about the Alternatives Options Workbook for the ORV management plan/EIS as follows:

- On April 7, 2008, a public meeting was held in Beaufort, North Carolina at the Duke Marine Lab from 7 p.m. to 8:30 p.m.
- On April 8, 2008, a public meeting was held in Raleigh, North Carolina at the McKimmon Center from 7:30 p.m. to 9 p.m.
- On April 9, 2008, a public meeting was held in Charlotte, North Carolina at Bass Pro Shops Outdoor World from 7 p.m. to 8:30 p.m.

The public was asked to provide completed workbooks by June 5, 2008. A total of 90 workbooks, containing 6,175 comments, were received during the public comment period in both electronic and hard copy formats. All workbooks were reviewed and considered during the alternatives development process. Extensive comments were received on the preliminary alternatives, many of which provided suggestions on how preliminary management options could be improved. Most comments offered options for protected species management, law enforcement, ORV permitting, closures, and ORV ramp and route configuration.

ALTERNATIVES NEWSLETTER PUBLIC SCOPING

On June 15, 2012, the NPS issued an ORV management plan/EIS alternatives newsletter for the Seashore. The alternatives newsletter invited the public to review additional proposed alternatives, and submit comments on the alternatives through July 20, 2012. The NPS received 350 items of correspondence in response to the ORV management plan/EIS alternatives newsletter. The Seashore evaluated comments and information received in finalizing the alternatives for this draft ORV management plan/EIS.

OTHER CONSULTATION

Consultation and coordination with local and federal agencies and various interest groups is ongoing during the NEPA process to identify issues or concerns related to protected species management within the Cape Lookout National Seashore. The U.S. Fish and Wildlife Service (USFWS) prepared a Biological Opinion on August 14, 2006, in response to the Interim Protected Species Management Strategy and amended the biological opinion on April 24, 2007. As required by this Biological Opinion, the Seashore submits annual reports to the USFWS that contains information regarding “performance standards” which are required in the *Cape Lookout National Seashore Interim Protected Species Management Plan / Environmental Assessment* Finding of No Significant Impact (FONSI).

The North Carolina State Environmental Review Clearinghouse was also notified of the proposed alternatives in 2012. The North Carolina Wildlife Resources Commission (NCWRC) reviewed the draft alternatives newsletter, and stated that NCWRC biologists are available to work with the NPS as alternatives and management strategies are developed for the EIS. The North Carolina Department of Environment and Natural Resources concurred that the proposed activity is consistent with the enforceable policies of the State's coastal management program, and also encouraged the NPS to work

with the NCWRC to resolve any concerns regarding the protection of sea turtles, colonial waterbirds, and shorebirds.

Prior to implementation of the selected alternative, additional consultations will be conducted with the State Historic Preservation Officer (SHPO) under section 106 of the National Historic Preservation Act, the USFWS under the Endangered Species Act (ESA), and the North Carolina Coastal Commission under the Coastal Zone Management Act (CZMA).

Notice of the availability of this document will be posted on the PEPC website and provided to a variety of federal, state, and local agencies and interest groups, including those listed below.

LIST OF RECIPIENTS OF THE OFF-ROAD VEHICLE MANAGEMENT PLAN / ENVIRONMENTAL IMPACT STATEMENT

This ORV management plan/EIS was made available to the agencies and governmental representatives listed below. In addition, a variety of media outlets were notified about the availability of the document for public review. Copies for review are available at park headquarters.

CONGRESSIONAL DELEGATES

- Honorable Richard Burr, Senator
- Honorable Kay Hagan, Senator
- Honorable Walter B. Jones, Jr. North Carolina 3rd District Representative

FEDERAL AGENCIES

- Environmental Protection Agency, Region 4
- National Marine Fisheries Service
- National Oceanic and Atmospheric Administration
- National Park Service, Cape Hatteras National Seashore
- U.S. Army Corps of Engineers
- U.S. Fish and Wildlife, Ecological Services, Raleigh Field Office

STATE AND LOCAL GOVERNMENTS

- State of North Carolina Clearinghouse
- North Carolina Office of the Governor
- North Carolina Office of the Lt. Governor
- North Carolina State Historic Preservation Officer

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- 2012a Personal communication via email with J. Gutierrez, Louis Berger Group, Inc. regarding occurrence of beach vitex at Cape Lookout National Seashore during 2010 and 2011. September 28, 2012.
- 2012b Personal communication via email with L. Fox, Louis Berger Group, Inc. providing 2012 sea turtle nesting database. May 23, 2012.
- 2013a Personal communication via email with C. Cunningham, Louis Berger Group, Inc. providing piping plover hatching and fledging success data. May 7, 2013.
- 2013b Personal communication via email with C. Cunningham, Louis Berger Group, Inc. providing information on colonial waterbird monitoring at Cape Lookout National Seashore. May 15, 2013.

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GLOSSARY

Adaptive management—A system of management practices based on clearly identified outcomes, monitoring to determine if management actions are meeting outcomes, and, if not, facilitating management changes that will best ensure that outcomes are met or to re-evaluate the outcomes. Adaptive management recognizes that knowledge about natural resource systems is sometimes uncertain and is the preferred method of management in these cases (source: Departmental Manual 516 DM 4.16).

All-terrain vehicle (ATV)—A motorized off-highway vehicle designed to travel on four low-pressure tires, having a seat designed to be straddled by the operator and handlebars for steering control.

Demarcation line—The North Carolina Division of Marine Fisheries uses as the boundary between the Atlantic Ocean and the inside sounds a federally designated line. This line delineates “International Regulations for Preventing Collisions at Sea” (COLREGS Lines of Demarcation) which were established by the Coast Guard to designate where “International Rules of the Road” separate from “U.S. Inland Rules.” Individual lines were established where practical, by physical objects like fixed aids to navigation or prominent points of land, because they are readily discernible by eye rather than by instruments.

Full recreational closures—In these areas, all recreational users are prohibited, including pedestrians, their pets, and ORVs.

Ocean beach—The area adjacent to the ocean and ocean inlets that is subject to public trust rights. This area is in constant flux due to the action of wind, waves, tides, and storms and includes the wet sand area of the beach that is subject to regular flooding by tides and the dry sand area of the beach that is subject to occasional flooding by tides, including wind tides other than those resulting from a hurricane or tropical storm.

ORV closures—In these areas, ORV use is prohibited, but other recreational users such as pedestrians and leashed pets are allowed.

Off-road vehicle (ORV)—Any motorized vehicle designed for or capable of cross-country travel on or immediately over land, water, sand, snow, ice, marsh, swampland, or other natural terrain (source: Executive Order 11644: Use of Off-road Vehicles on Public Lands, as amended by Executive Order 11989).

Soundside beach—The soundside beach is defined as the beach/shore on the soundside of the islands beginning at the U.S. Coast Guard demarcation line, with the exception of the area between the end of Power Squadron Spit to the demarcation line near the Cape Lookout Lighthouse which will be managed as sound side shoreline and beach

Street-legal—Meeting all legal requirements for use on ordinary roads.

Utility-type vehicle (UTV)—A motorized vehicle designed and manufactured for general maintenance, security, recreational, and landscaping purposes, but does not include vehicles designed and used primarily for the transportation of persons or property on a street or highway.

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Appendix A:
Cape Lookout Interim Protected
Species Management Plan /
Environmental Assessment
Modified Preferred Alternative

APPENDIX A: CAPE LOOKOUT INTERIM PROTECTED SPECIES MANAGEMENT PLAN / ENVIRONMENTAL ASSESSMENT MODIFIED PREFERRED ALTERNATIVE

ALTERNATIVE ELEMENTS SUMMARY—SPECIES SURVEY AND MANAGEMENT

Activity	Alternative D: Increased Species Protection Areas, Education, and Outreach (Preferred Alternative)
Bird—Pre-nesting*	<p>Species Survey</p> <p>PIPL—Survey active nesting areas for piping plover arrival and pre-nesting behavior beginning March 15, at least once a week on North Core Banks (NCB) and South Core Banks (SCB). Beginning April 1, surveying in these areas would increase to three times a week (or every other day). Survey would include potential new habitat and historic nesting areas as determined appropriate by a qualified staff biologist. Monitoring reports will include descriptions of management measures in place and document piping plover behavior sufficient to evaluate the effects of management actions at the site.</p> <p>AMOY—Survey all NCB and SCB beaches for AMOY activity 2 days per week beginning mid-April. Surveys cease when all chicks have fledged or are lost.</p> <p>CWB—Survey active nesting areas for CWB at least 3 days per week when PIPL monitoring occurs. Survey potential new habitat and historic nesting areas as time permits. Surveys cease when all chicks have fledged or are lost.</p> <p>Every 3 years during the statewide census, map colonies using GPS.</p> <p>WIPL—No survey.</p> <p>Species Management</p> <p>PIPL—April 01, establish full recreational closure in active, historic, and potential new habitat as determined by a qualified staff biologist.</p> <p>Enlarge protected areas where PIPL observed prospecting for territories outside of full recreational closure area (same as alternative A).</p> <p>If birds do not use site, open by July 15.</p> <p>CWB—April 01, establish full recreational closure in active CWB nesting areas. Establish ORV closures in historic least tern and black skimmer nesting areas and any potential new habitat where, from site inspection, a qualified staff biologist determines that nesting may be likely to occur.</p> <p>Closures would be expanded as necessary when nests or nest scrapes are found in new areas.</p>
Bird—Courtship/ Mating*	<p>Species Survey</p> <p>PIPL—Survey, 7 days per week NCB and SCB and other areas at least 1 day per week, locations where territorial, courtship, and/or mating behavior observed. Monitoring will include descriptions of the management measures in place and human activity observed in the areas where courting behavior occurred.</p> <p>AMOY—Survey number (pair/single), behavior, courtship, and evidence of scrapes.</p> <p>CWB— Record territorial/mating behavior if observed during PIPL surveys.</p> <p>WIPL—No monitoring.</p> <p>Species Management</p> <p>PIPL—Expand full recreational closures to provide for a 150-foot buffer in areas of territorial, courtship, and/or mating (scrapes) behavior occurring outside existing closures.</p> <p>AMOY—No closures.</p> <p>WIPL—Post WIPL nests or scrapes found outside existing closures on NCB and SCB.</p>

Activity	Alternative D: Increased Species Protection Areas, Education, and Outreach (Preferred Alternative)
Bird—Nesting*	Species Survey
	<p>PIPL—Survey nests 7 days per week on NCB and SCB. Survey nests at least one day per week if they occur elsewhere.</p> <p>Record (1) date & time; (2) nest number; (3) nest location with a GPS unit (1 time). Nest markers should not be placed in the sand; (4) number of eggs (if bird is not flushed, record that the bird was incubating and number of eggs was not observed); (5) habitat; (6) status of nest (laying, incubating, lost, abandoned, hatching, hatched); (7) presence and behavior of the adults [incubating eggs, shading eggs, resting, foraging, disturbed (record source), territorial flight, territorial encounter, distraction display or other defensive behavior toward predator or pedestrian, courtship, other behavior (describe)]; (8) presence of potential predators, humans, pets, or ORVs within 300 feet and locations relative to the nest; (9) evidence (i.e., trails) and number of potential predators, humans, pets, or ORVs within posted areas, including distance to the nest; and (10) suspected cause of nest loss, if apparent. Other specific data will include number of observations of plovers performing territorial defense or courtship displays outside symbolic fencing; and, making nest scrapes outside the symbolic fencing. Data will include a description of the management measures in place where these behaviors are observed.</p> <p>After incubation starts, observe incubating bird with optical equipment from appropriate distance that does not disturb the birds.</p> <p>AMOY—Survey nests every 2 days on NCB and SCB, other areas 1 day per week. Record (1) nest locations with GPS and mile marker locations; (2) number of eggs present and hatch date; (3) presence or evidence of predators, including trails within 30 feet of the nest; and (4) human, or ORV tracks within 90 feet of a nest. CWB—Survey nests at least once every 2 days on NCB and SCB and 1 day per week elsewhere when PIPL monitoring occurs. Record center of colony using GPS. Record same information as PIPL except regular counts of CWB are not performed and productivity information is not recorded.</p> <p>WIPL—Census WIPL during annual PIPL window census (1st week of June).</p>
	Species Management
	<p>PIPL—Expand full recreational closures to provide for a 150-foot buffer around nests. Place predator exclosures over nest after 4th egg is laid if conditions allow. Areas remain closed until chicks fledge or are lost. Any nest that appears to be at risk, reported to park biologist from field when possible.</p> <p>AMOY—Mark nest in an unobtrusive manner and establish a 10 square foot full recreational closure around the nest if nest in area subject to ORV or pedestrian traffic. Generally, nests found in the dunes are not posted because there is concern that predators might learn to associate posts with nests. Areas remain closed until chicks fledge or are lost, typically August 15.</p> <p>CWB—Expand full recreational closure to provide for a 150-foot buffer from all nests.</p> <p>WIPL—Post WIPL nests or scrapes found outside existing closures on NCB and SCB.</p>

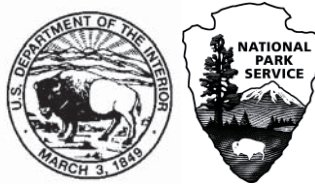
Activity	Alternative D: Increased Species Protection Areas, Education, and Outreach (Preferred Alternative)
Bird—Unfledged Chicks*	<p>Species Survey</p> <p>PIPL—Survey brood 7 days per week on NCB and SCB; at least once per week elsewhere. Record (1) date & time; (2) nest/brood number; (3) location of brood; (4) number of chicks; (5) brood age (this is known from other data on hatch date); (6) brood behavior [foraging, resting/brooding, disturbed (record source), other]; (7) presence and behavior of adults [foraging, brooding, resting, disturbed (record source), territorial flight, territorial encounter, distraction display or other defensive behavior toward predator or pedestrian, courtship, other behavior (describe)]; (8) presence or evidence of potential predators, humans, or ORVs within 300 feet and location relative to the brood including tracks within closures; (9) cause of chick loss, if carcass found and source of mortality apparent. Includes data on the interaction between people and plovers, including instances where vehicles, pedestrians, or pets are observed within the symbolic fencing and the type of response exhibited by the plovers.</p> <p>AMOY—Survey brood at least once every 2 days on NCB and SCB. Surveys cease when all chicks have fledged or are lost.</p> <p>CWB—Survey brood at least once every 2 days when PIPL monitoring occurs. Surveys cease when all chicks have fledged or are lost.</p> <p>WIPL—No survey.</p>
	<p>Species Management</p> <p>PIPL—After nest hatches, when a chick is found using the ocean beach, expand buffer to include a 600-foot ORV closure around each brood. ORV routed to backroad or, if no road, park would consider an escort. An escort program may be used on a case-by-case basis to maintain access to Portsmouth Village or areas with no backroad access if staffing allows. Establish a 2-mile ORV closure at north end of SCB from first nest hatch until last chick has fledged or is lost. Increase enforcement of public compliance with closures. Closures removed when last chick is fledged or is lost.</p> <p>AMOY—Establish ramp-to-ramp ORV closures if chicks present on the beach (route ORV traffic to backroad via designated ramps) unless no backroad is present, then ORV would be allowed at 15 mph, with signs warning operators of flightless chicks in the area. Adjust ORV closures based on chick movement, providing a minimum 300-foot buffer around brood. Closures would move with chicks. Closed areas reopened to ORV after last chick has fledged or is lost.</p> <p>CWB—Establish ORV closure that provides at least a 150-foot buffer around broods when chicks present at Cape Lookout Point Beach. In other areas, route traffic around ORV closures if chicks are in danger of being run over.</p> <p>WIPL—Post areas with WIPL chick found outside existing closures on NCB and SCB.</p>

Activity	Alternative D: Increased Species Protection Areas, Education, and Outreach (Preferred Alternative)
Bird— Non-breeding (migrating / wintering)	Species Survey
	<p>PIPL—Survey entire seashore non-breeding population once per month August 1 to March 31. Coordinate with Cape Hatteras Natl. Seashore to conduct simultaneous surveys or receive survey data from Portsmouth Island during winter, since, based on past banding data, wintering birds move across Ocracoke Inlet. Send data on winter birds to NCWRC. Record: (1) date; (2) weather variables [air temperature, wind speed and direction, visibility, % cloud cover (est. by eye), precipitation; (3) tidal stage (hours after high tide); (5) number of birds; (5) habitat; (6) behavior of majority of birds in flock [foraging, resting, disturbed (record source), other]; and (7) check for band combination of any banded birds, using reporting protocols developed by staff for band color and location. A log will also be kept that records the date, time, and purpose of each official trip through areas where unfledged chicks are present. Monitors, law enforcement personnel, and other Cape Lookout National Seashore staff will record all observations of violations of dog leashing requirements in plover breeding areas, both inside and outside posted habitat.</p> <p>AMOY—No survey of non-breeding individuals.</p> <p>REKN—Survey in spring and fall on NCB and SCB following International shorebird survey protocols on frequency and timing.</p>
	Species Management
	Closures not specifically implemented for wintering/ migrating shorebird protection. Permanent ORV closures at Shackleford Banks, Portsmouth Flats, the interior of Cape Lookout Point, beach between mile markers 41A and 41B, and Power Squadron Spit are maintained.

Activity	Alternative D: Increased Species Protection Areas, Education, and Outreach (Preferred Alternative)
Sea Turtles	<p>Species Survey</p> <p>May 01–September 15 survey for crawls/nests before 12:00 PM daily on SCB and NCB; Shackleford Banks 2-3 days per week; Middle Core Banks monitored irregularly (difficult access). Monitoring procedures and data collection follow the monitoring and reporting guidelines in the Handbook for Sea Turtle Volunteers in North Carolina (NCWRC 2002) and the USFWS Index Nesting Beach Survey Protocol. Periodic monitoring (e.g. every two or three days) for unknown nesting and emerging hatchlings will continue, especially in areas that are not surveyed regularly or that receive high visitor use, through November 15. Monitoring will also occur for post-hatchling washbacks during periods where there are large quantities of seaweed washed ashore or following severe storm events.</p> <p>Before May 1, park staff conduct PIPL monitoring and, if possible, note any turtle crawls/nests. Record (1) date & time; (2) species, if known; (3) whether it is a false or nesting crawl; (4) sequential nest number; (5) whether nest was relocated, original and relocation site names, and coordinates of original and relocation sites in Lat/Long; (6) distance from nest to tideline, in meters; (7) date when nest excavation conducted; (8) date(s) of nest overwash; (9) sources of egg or whole nest loss, if apparent; and (9) geographic coordinates of false crawls when first found. Monitor the effects of management actions on nesting, hatching, and stranded sea turtles on beaches within park boundaries.</p> <p>Conduct a nest excavation inventory to determine nest success after hatching.</p> <p>Species Management</p> <p><u>Nest Protection:</u> Each located nest is immediately marked with stakes.</p> <p>50 days after nest laid, funnel shaped ORV closure established from nest to 15 feet below high tide line. ORV closure is 30 feet wide at nest; 60 feet wide below high tide line, with minimum 10-foot buffer duneward of nest. If 10-foot minimum buffer is not possible, ramp-to-ramp ORV closure is established (vehicles routed around nest via backroad). ORV closure removed after nest hatches.</p> <p><u>Nest Relocation:</u> Relocate nests laid at or below high tide line or in areas where they are likely to be washed away or are in danger of erosion. According to USFWS recommendations.</p> <p>3 nest relocation areas (up to 1 mile in length) are designated on SCB and NCB where ORV traffic is prohibited beginning 50 days after first nest relocated to area. Nests are relocated to the nearest designated area. No ORVs are allowed on Shackleford Banks, so nests are relocated to the nearest suitable habitat.</p> <p>Nests are relocated within 12 hrs after eggs laid or 14 days after the nest was laid.</p> <p><u>Nest Excavations:</u> Nest excavated 5th day after a major hatch (indicated by distinctive hatchling tracks), 10 days after depression forms, or 75 days after nest was laid if no sign of hatching.</p> <p>If nest outside of a designated relocation area, the ORV closure would be removed after excavation.</p> <p><u>Predator Management:</u> Screens or cages used to protect nests and prevent egg loss to raccoons.</p> <p><u>Light Management:</u> Camping and campfires prohibited in nest relocation areas to prevent disturbance of hatchlings from artificial lights.</p> <p>Park encourages concessionaires and people staying in park cabins to minimize use of outdoor lights. Park will also ensure park users, concessionaires, and contractors are aware of the sea turtle protection measures implemented within the park boundaries.</p> <p>Nests in locations deemed vulnerable to light pollution, 2 foot high plywood barriers erected behind and to the sides of the nest 10 days before estimated hatch date.</p> <p>Fireworks are prohibited within the seashore. Seashore will coordinate with FWS to develop and implement measures to further minimize beach lighting threats.</p>

Activity	Alternative D: Increased Species Protection Areas, Education, and Outreach (Preferred Alternative)
Seabeach amaranth	Species Survey
	<p>June 1 begin monitoring habitat outside existing bird closures 1-2 days per week for seedlings/juvenile plants.</p> <p>Conduct annual survey in late-July or early-August to record plant numbers and distribution and identify areas for ORV closure. Survey habitat but concentrate on where plants have been found before. Surveys conducted in all areas of suitable habitat and results mapped using GIS. Data collected will include number of plants; general distribution of plants; general proportions of seedlings, medium and large plants at the time of the survey; and overall health (signs of stress, damage, disease or herbivory, etc).</p>
	Species Management
	<p>Establish ORV closure around all emergent plants. Size of closure based on best professional judgment but with at least a minimum 30-foot buffer around plant.</p> <p>Survey bird/turtle closures prior to reopening to ORV traffic, also no tent camping in ORV closure areas.</p> <p>Open closed area at end of growing season.</p>

Note: AMOY–American oystercatcher; CWB–colonial waterbird; NCB–North Core Banks; PIPL–piping plover; REKN–red knot; SCB–South Core Banks; WIPL–Wilson’s Plover.



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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