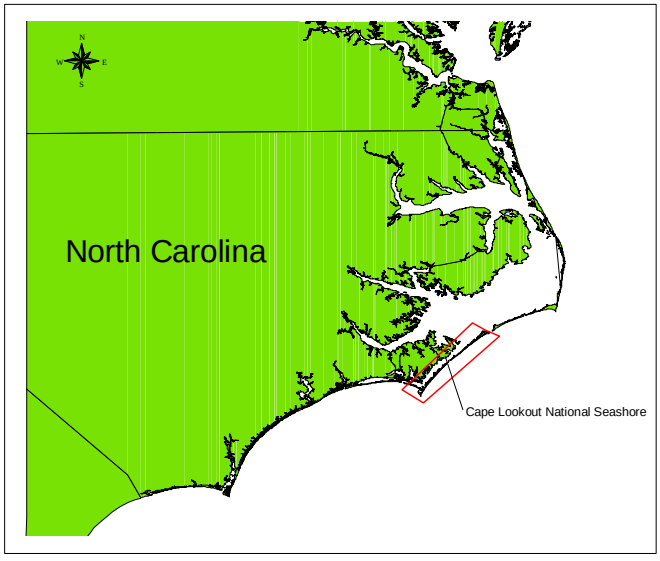
BIOLOGICAL ASSESSMENT
OF THE INTERIM PROTECTED SPECIES MANAGEMENT PLAN
CAPE LOOKOUT NATIONAL SEASHORE
NATIONAL PARK SERVICE

December 21, 1005

INTRODUCTION

Cape Lookout National Seashore (CALO) is located in the central coastal area of North Carolina between Beaufort and Ocracoke Inlets (Figure 1). The park is currently divided into five barrier islands. The northernmost island, North Core Banks (NCB) is approximately 19 miles long, extending from Ocracoke Inlet to Old Drum Inlet. From Old Drum Inlet to New Drum Inlet is a 3-mile long island of land formerly connected to NCB known as Middle Core Banks. A ¾ mile section of South Core Banks south of New Drum Inlet was isolated with the creation of a new inlet following Hurricane Ophelia. South Core Banks (SCB) extends southward from New Drum Inlet 25 miles to the Cape Lookout bight area. Core Banks have a northeast to southwest orientation and exhibit a low profile landscape. The fifth island, Shackleford Banks (SHACK) is 9 miles long and has an east-west orientation with a higher dune system and larger areas of vegetation. All islands in the park are subject to constant and dramatic change by the actions of wind and waves.

Figure 1.



The beaches of the park are undeveloped and accessible only by boat. Two concession-operated ferries transport visitors and off-road vehicles to NCB and SCB. Passenger ferries and private boats carry visitors to other locations in the park. Off-road vehicles are permitted on 45 miles of ocean beach and a 30 mile sand road system.

Congress authorized the establishment of Cape Lookout National Seashore as a unit of the National Park Service (NPS) in 1966 "to preserve for public use and enjoyment an area in the State of North Carolina possessing outstanding natural and recreation values". The General Management Plan for CALO reflects a systematic approach to park management for balancing recreational use and long term preservation of natural resources, processes and values. One of the mission goals of the park's Strategic Plan under the Government Performance and Results Act (GPRA) is that natural "resources and associated values are protected, restored, and maintained in good condition and managed within their broader ecosystem and cultural context."

Increased use by the public for recreational purposes necessitates the development of a long term management plan to meet the requirements for protection of federally listed species under Sections 7(a) (1) and (2) of the Endangered Species Act (ESA). According to the 2001 National Park Service Management Guidelines: "The NPS will survey for, protect, and strive to recover all species native to national park system units that are listed under the Endangered Species Act. The Service will fully meet its obligations under the NPS Organic Act and the Endangered Species Act to both pro-actively conserve listed species and prevent detrimental effects on these species."

The ESA directs federal agencies to carry out programs for the conservation of endangered and threatened species and to ensure that any action authorized, funded, or carried out by an agency is not likely to jeopardize the continued existence of endangered or threatened species or result in the destruction or adverse modification of critical habitat.

The purpose of the Interim Protected Species Management Plan (Appendix A) is to evaluate and implement strategies to protect sensitive species and provide for recreational use as directed in the park's enabling legislation, NPS management policies, and other laws and mandates until the long-term ORV Management Plan is developed. The effectiveness of the management actions will be assessed in an ongoing manner to the extent possible in order to assist managers in choosing from among the most effective and feasible management options recommended in the strategy.

The National Park Service has prepared this Biological Assessment pursuant to Section 7 of the ESA in order to evaluate the potential effects of the proposed plan on the federally threatened or endangered species that occur within the project area. This document provides the most current data available on the status of the piping plover (*Charadrius melodus),* seabeach amaranth (*Amaranthus pumilis),* and four species of sea turtles (loggerhead *Caretta caretta,* leatherback

Dermochelys coriacea, green turtles *Chelonia mydas,* and Kemps' Ridley *Lepidochelys kempi),* and assesses potential impacts to these protected species under each alternative.

PROJECT DESCRIPTION

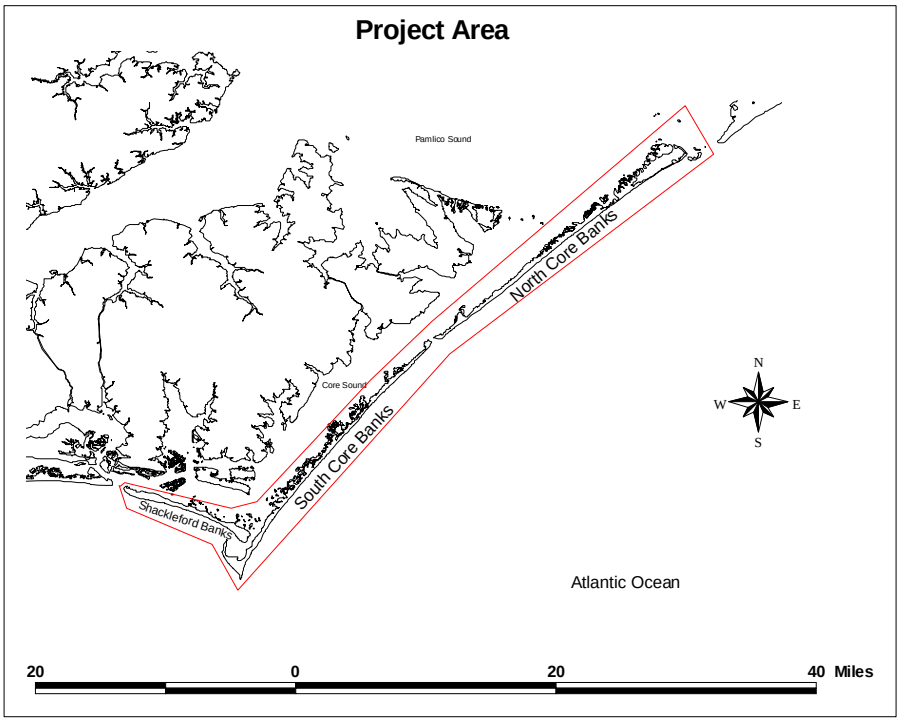
The action which serves as the basis for this biological assessment is described as the Interim Protected Species Management Plan (Plan). This Plan will guide management practices for recreational use and protection of species at CALO for the next three to four years until the long-term Off -Road Vehicle (ORV) Management Plan and regulations are completed (currently scheduled for completion in 2008). The Interim Plan was developed considering public input, practical knowledge, federal laws, science, and NPS policy. The scope of the Plan is limited to consideration of ORV and pedestrian access and the relationship of these activities to protected species. Analysis of the Plan was conducted via National Environmental Policy Act (NEPA) and NPS Directors Order 12 process. Given the limited timeframe and scope of this Plan, the NPS will initiate another consultation process with U.S. Fish and Wildlife Service as part of the longer term planning effort.

ORV use on CALO beaches predates establishment of the Seashore in 1966 and is considered an appropriate visitor use. The Seashore's enabling legislation allows for hunting and fishing. During the development of the General Management Plan in 1982, the use of ORV's to conduct surf fishing activities was considered a traditional use. The General Management Plan allowed for vehicle use on North and South Core Banks, while Shackleford Banks was listed as proposed wilderness with no public vehicle use. ORV's are currently used to provide vehicular access onto CALO beaches for recreational purposes, including surf fishing; surfboarding; sunbathing; swimming; bird watching; scenic driving; etc. ORV use at the CALO is seasonal. Vehicle ferries cease operation from Mid-December through late March. ORV use is concentrated during September, October, and November. The number of ORV's transported to the Seashore from 2000 to 2004 ranged from 5000 to 5400 vehicles. The actual number of individual vehicles that use the Seashore is less because some vehicles will be transported on and off the Seashore more than once.

The long term ORV management planning effort is based on the recognition by NPS that ORV's must be regulated in a manner that is not only consistent with applicable law, but also appropriately addresses resource protection (including protected, threatened and endangered species), potential conflicts among the various Seashore users, and visitor safety. Executive Order 11644 of 1972, amended by Executive Order 11989 in1977, requires federal agencies permitting ORV use on agency lands to publish regulations designating specific trails and areas for this use, among other things. Title 36, section 4.10 of the Code of Federal Regulations codified the executive orders by providing that routes and areas designated for ORV use shall be promulgated as special regulations. Section 4.10 also provides that the designation of routes and areas shall comply with E.O. 11644 and with section 1.5 of Title 36 of the Code of Federal Regulations.

The project area that will be affected by the proposed plan includes all of Core Banks from Ocracoke Inlet to Barden Inlet and all of Shackleford Banks (Figure 2). The habitats within the project area include ocean beach, dunes, sand flats, mud flats and soundside beach.

Figure 2.



SPECIES DESCRIPTION

The following federally listed species have been identified as occurring within the action area:

Common Name	Scientific Name	Status	Occurrences
Piping Plover	*Charadrius melodus*	Threatened	Known
Seabeach amaranth	*Amaranthus pumilis*	Threatened	Known
Loggerhead sea turtle	*Caretta caretta*	Threatened	Known
Leatherback sea turtle	*Dermochelys coriacea*	Endangered	Known
Green sea turtle	*Chelonia mydas*	Threatened	Known
Kemp's Ridley sea turtle	*Lepidochelys kempi*	Endangered	Known

Currently, monitoring for all listed species is conducted annually by park staff, SCA Conservation Interns and researchers. Monitoring of nesting piping plovers at CALO began with a baseline study in 1989. Currently, CALO resource management staff close nesting areas, protect nests with predator exclosures, monitor nesting success and compile summary reports (Cordes 2004). Since 2000, monthly counts of non-nesting piping plovers have been made by park staff (Cordes 2003). In 2005 CALO coordinated monitoring for plovers with Cape Hatteras National Seashore in conducting simultaneous surveys during the winter at Portsmouth Island across Ocracoke Inlet. CALO is used by migrating plovers and by wintering plovers from the threatened Atlantic Coast and Great Plains populations and the endangered Great Lakes population.

Surveys to locate and count seabeach amaranth plants are conducted annually in late July and early August to track plant numbers and distribution and to identify areas for closure. At CALO most of the plants are found on the south facing beaches of Shackleford Banks and the area between Cape Point and Power Squadron Spit.

Cape Lookout National Seashore began monitoring sea turtles in 1976. Baseline data was collected for a portion of South Core Banks during an extensive six-year study from 1978 - 1983. Nesting turtles were tagged and nests marked during nightly patrols. Since 1984 Cape Lookout has conducted daytime monitoring to document strandings, protect nest sites, relocate nests in danger of being flooded and protect hatchlings.

Piping Plover

The piping plover is a small (17-18 cm long, 43 – 63 g) sand-colored shorebird endemic to North America (Haig 1992). Breeding piping plovers occur in three distinct sub-populations: the Atlantic Coast (from the Maritime Provinces of Canada to the Outer Banks of North Carolina), the Great Lakes (along Lake Superior and Lake Michigan), and the Great Plains (from southern prairie Canada to Iowa). Wintering populations occur on the Atlantic Coast from North Carolina to Florida, and the Gulf Coast from Florida to Mexico and the Caribbean.

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 to mid-August. In contrast, peak arrival in the Great Plains is the third week of April. Departure from the breeding grounds extends from mid-July to early September. Residency on the wintering grounds occurs from mid-July through early May, with the duration depending on the location.

The Atlantic Coast population of the piping plover (*Charadrius melodus*) was federally listed in 1986 as threatened (Federal Register 1985). At that time approximately 790 pairs remained and the species was in decline (USFWS 1996). Habitat loss caused by human development and recreation, and low reproductive rates caused by human disturbance and predation were considered to be the primary causes of the decline (Haig 1992). Disturbance and predation were intensively managed after listing, and the population rebounded to 1676 pairs by 2003 (USFWS 2004), but was still short of the recovery goal of 2000 pairs (USFWS 1996). The population

south of New Jersey was estimated at 203 pairs in 2003, well short of the regional goal for the southern Atlantic Coast (DE, MD, VA, NC, SC) of 400 pairs, and North Carolina itself experienced a >50% decline in breeding pairs from 1989 to 2003 (USFWS 2004).

No published accounts exist of breeding piping plovers in North Carolina from 1902 to 1960, when a pair was found on Ocracoke Island (Golder 1985). The first records of nesting piping plovers at CALO are from the 1983 and 1986 nesting seasons; 14 nesting pairs in 1983 and 25 pairs in 1986 were found on North Core Banks (Fussell 1986). CALO is a significant nesting area with about 2/3 of the nesting pairs in the state of North Carolina. The nesting population at CALO ranged between 32 – 39 pairs until 1999 when the population began to decline. CALO reached a peak of 39 pairs in 1994 and declined for 10 years to a low of only 13 pairs in 2004 (Cordes 2004). In 2005 numbers rebounded to a total of 27 nesting pairs (Table 1). Ten different nesting sites have been identified in the park

Table 1. Piping Plover Breeding Pairs at Cape Lookout National Seashore 1989-2005

	1989	1992	1993	1994	1995	1997	1998	1999	2000	2001	2002	2003	2004	2005
Ocracoke Inlet	0	2	0	2	2	1	0	1	0	0	0	0	0	0
Portsmouth Flats	14	8	9	7	8	17	15	9	11	9	8	6	4	6
Kathryn-Jane Flats	7	11	9	12	11	10	8	2	1	1	2	1	1	2
Old Drum Inlet	3	2	1	1	2	1	1	0	0	0	0	1	0	0
New Drum Inlet (NCB)	4	5	9	10	6	3	2	3	1	2	2	2	2	3
New Drum Inlet (SCB)	3	3	4	5	4	2	3	3	2	3	2	2	2	2
Plover Inlet (Mile 23.6)	0	0	0	0	0	1	1	1	1	1	1	1	4	8
Cape Point	0	0	0	0	0	0	0	1	0	0	0	0	0	4
Power Squadron Spit	3	2	3	2	2	1	2	1	0	0	0	1	0	1
Shackleford Banks	0	0	0	0	0	0	0	0	0	0	0	0	0	1
CALO Total	34	33	35	39	35	36	32	21	16	16	15	14	13	27

The current recovery plan for piping plovers sets 1.5 fledged chicks per nesting pair as a goal. CALO has fallen well short of this, averaging only 0.40 chicks per nesting pair (Table 2). Cape Lookout is at the southern extreme of the nesting range for piping plover nesting. It is still unknown why productivity is poor compared to northern beaches but may relate to foraging habitat available to chicks (Cordes 2004).

Table 2. Piping Plover Nesting Success at CALO 1989-2005

YEAR	NESTING PAIRS	NUMBER OF NESTS	CHICKS FLEDGED	FLEDGE RATE
1989	34	56	25	0.74
1992	33	39 (NCB only)	7 (NCB only)	0.25 (NCB)
1993	35	56	26	0.74
1994	39	66	9	0.23
1995	35	43	15	0.43
1997	36	41	7	0.19
1998	32	39	11	0.34
1999	21	22	2	0.09
2000	16	18	8	0.50
2001	16	19	5	0.33
2002	15	20	4	0.27
2003	14	15	6	0.43
2004	13	13	12	0.92
2005	27	31	23	0.85

Piping plover nesting sites at CALO include inlets, former inlet sites, sand flats and overwash fans. Nesting success is threatened by predators, flooding in storms and disturbance by people and dogs. Key wintering sites include inlets and the ocean beach within four miles of Ocracoke Inlet. Threats to migrating and wintering piping plovers may include storms and disturbance by off-road vehicles. Most of the sites used by non-nesting piping plovers at CALO have little human disturbance.

Critical habitat has been designated for the areas near the inlets at CALO. The areas included in the critical habitat designation include all the inlets in the park, Portsmouth Flats, Kathryne Jane Flats and Cape Point. The habitat includes ocean beach, mudflats, sandflats and soundside beach used as foraging areas and sparsely vegetated low dunes used by roosting piping plovers.

Current Management at CALO for Piping Plovers

When nesting plovers are present at CALO, ORV traffic is allowed in a corridor along the shoreline on the ocean beach as long as at least a 150 foot buffer from active nests is possible. If a piping plover chick is found using the ocean beach that area is immediately be closed to off-road vehicles using “no vehicle” signs and educational signs explaining the purpose of the closure. The closure remains in affect until the chicks move to a different location or are capable of sustained fight. Twice daily escort programs have been used at Kathryne-Jane flats to allow ORV access to the northern half of North Core Banks and Portsmouth Village.

In 2005 the ocean beach corridor along the nesting area near New Drum inlet on South Core Banks was closed when the first nest in that area hatched. The concentration of nests, narrowness of the island at that point and inability to monitor broods around the clock led to the

management action. This area had nearly 1/3 of the nesting pairs of piping plovers in North Carolina.

Off-road vehicle use in the park is currently light during the summer, except for holiday weekends. The peak in vehicle use occurs from mid-September to mid-November, well after the piping plover nesting season. A backroad system runs most of the length of Core Banks, except for the northern nine miles of North Core Banks. Beach access ramps are located about every mile for the length of the backroad, providing a way for ORVs to move between the ocean beach and backroad. This transportation system allows movement around seasonal beach closures and provides the park with an important management tool for protecting sensitive resources.

CALO has a leash law but it is loosely enforced. CALO has no regulations regarding the flying of kites near endangered species areas. With over 55 miles of beach to patrol, a limited staff size, 24 hour public access, and a lack of a permit requirement for ORV use, biological monitoring and law enforcement are challenging at CALO.

Though there are no specific procedures for protection of nonbreeding plover habitat at CALO, threats to nonbreeding plovers are limited. Migrants may currently benefit from nesting area closures, which in some areas remain in place until early September. Most sites at CALO used by nonbreeding plovers are in areas closed to ORVs and have little visitation. The entire park is closed to vehicles for most of the winter resulting in protection of wintering plover from effects from recreational activities. Storms and cold temperatures may be the greatest threats to nonbreeding plovers at CALO. Predation rates on nonbreeding birds are unknown.

Threats to nesting success include human disturbance, predators and flooding. Human disturbance, including dogs, was found to be a problem in the 1989 study (McConahey 1990). Since that time, through improved compliance of closed areas, human impact has been reduced. Poor nutrition of chicks without access to quality foraging areas is also a suspected limiting factor (Cordes 2005).

Predators in the park that take plover eggs or chicks include: raccoons, feral cats, gulls, crows, grackles and ghost crabs. Predator exclosures have been used on some nests since 1993. Since 1997, 66% of the nests protected with exclosures have hatched. Only 24% of the nests left unprotected hatched. The use of exclosures improved a nests chance of hatching, but did not increase the number of chicks which fledged.

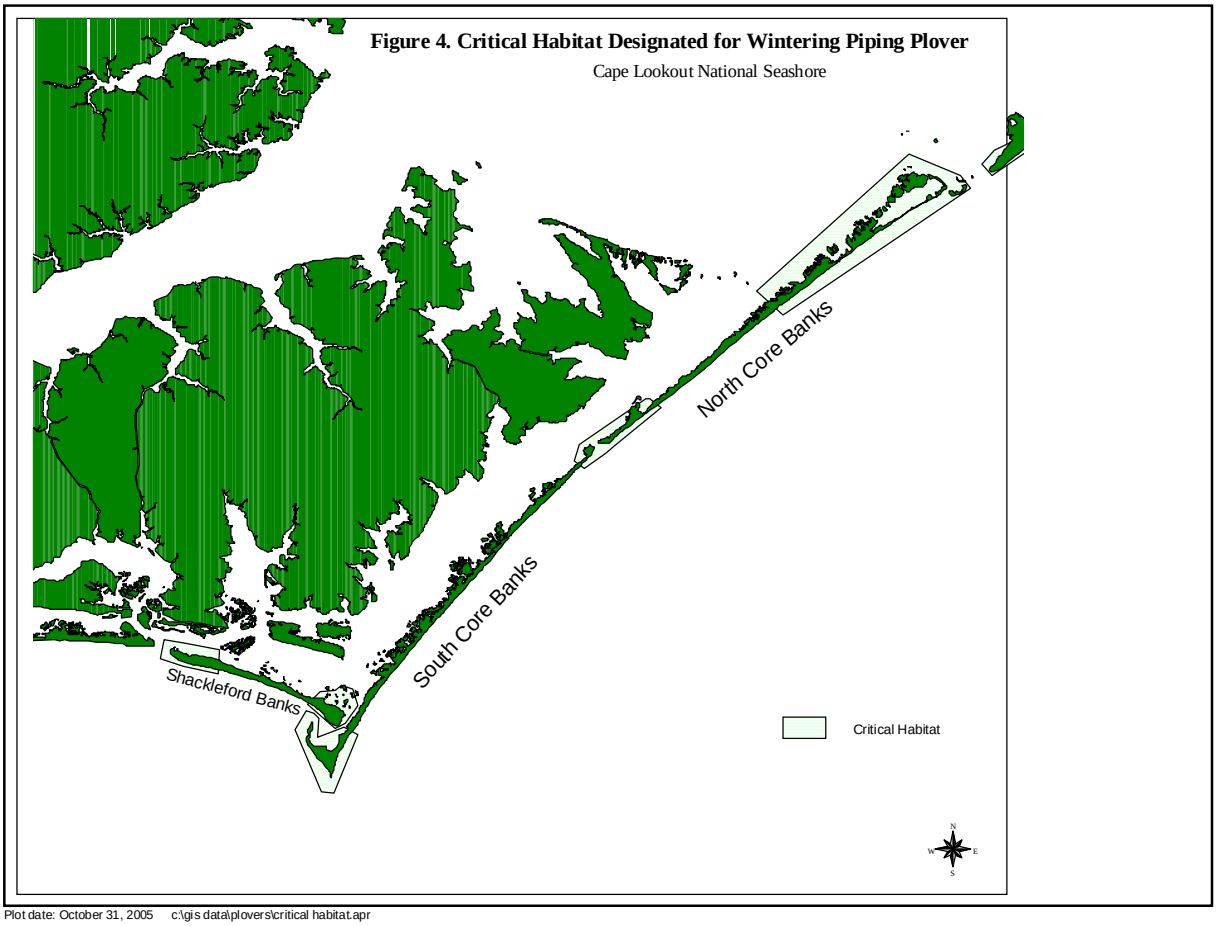
Flooding during the nesting season has been a major threat to nesting success, particularly in 1992 and 1994. Some nests at Portsmouth Flats were elevated to protect them from flooding in 1998 and 1999. Storms have also caused nests failures due to sand accumulation and abandonment**,** however, the impact of storms on chicks is unknown.

Given the vulnerability of the plover population at CALO to poor nesting productivity, the persistence of the population will depend partly on controlling non-random sources of mortality to adults, eggs, and chicks. Predators, adverse weather, and access to quality foraging habitat have been identified in past research as limiting reproductive success at CALO (Cordes 2004).

There may be evidence for an Allele effect at CALO, as plover monitoring reports from 2004 indicate that unpaired birds displaying territorial behavior were observed in the pre-laying period at several sites (Cordes 2004). Thus, providing a disturbance-free environment early in the season may assist plovers attempting to establish territories and attract mates.

Nonbreeding and Wintering Plovers at CALO

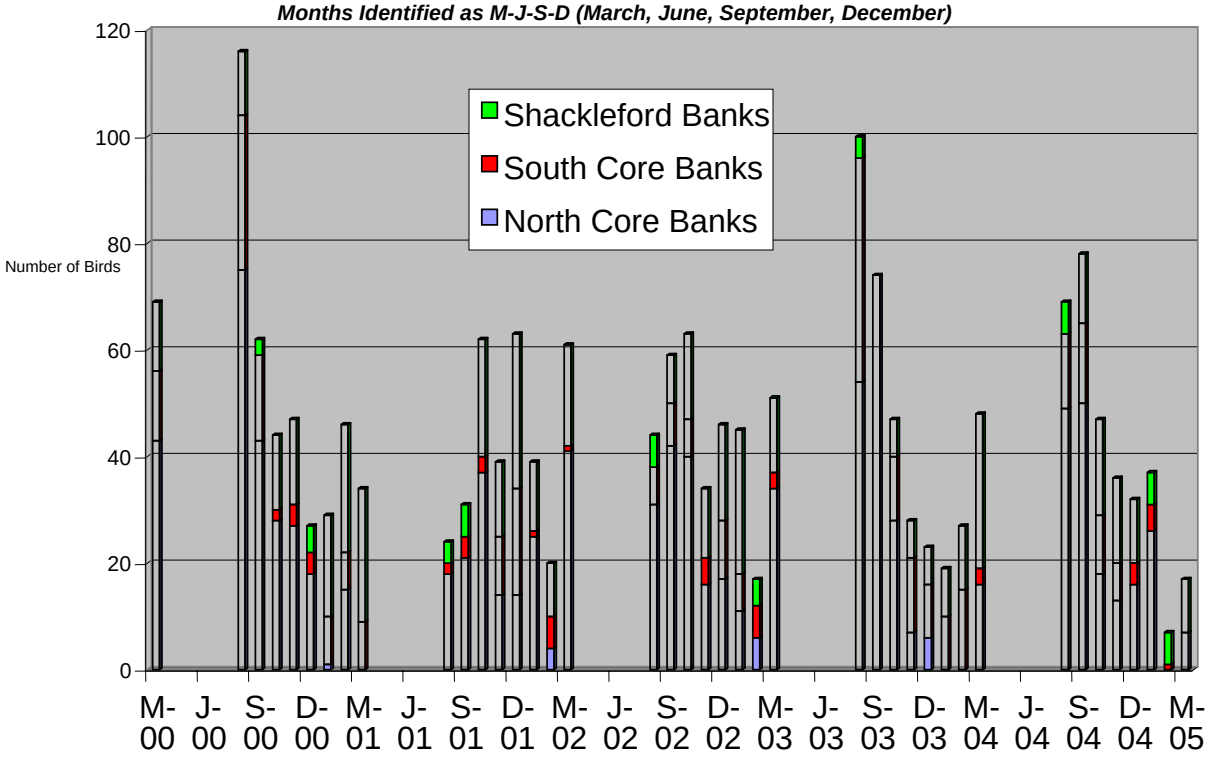
North Carolina is currently the only state on the Atlantic Coast that has piping plovers during all phases of the annual cycle. Band sightings indicate that plovers from all three North American breeding populations use CALO during fall and spring migration and/or the winter. All plover breeding sites at CALO are within areas designated as critical habitat for wintering birds except for a site used on Shackleford Banks in 2005 (Figure 4).



From 2000-2005 monthly counts of piping plovers were conducted from August to March. The greatest number of nonbreeding plovers at CALO occurred during spring and fall migrations (Figure 4). An average of 45 piping plovers were found in the park during the monthly counts.

The area on North Core Banks from Ocracoke Inlet to Mile 4 had the highest number of birds, especially in spring and fall migrations. On average over 20 piping plovers were found in this area and double that during migrations (Cordes 2003).

Figure 5.
Monthly Counts of Non-nesting Piping Plover at Cape Lookout National Seashore
Months Identified as M-J-S-D (March, June, September, December)

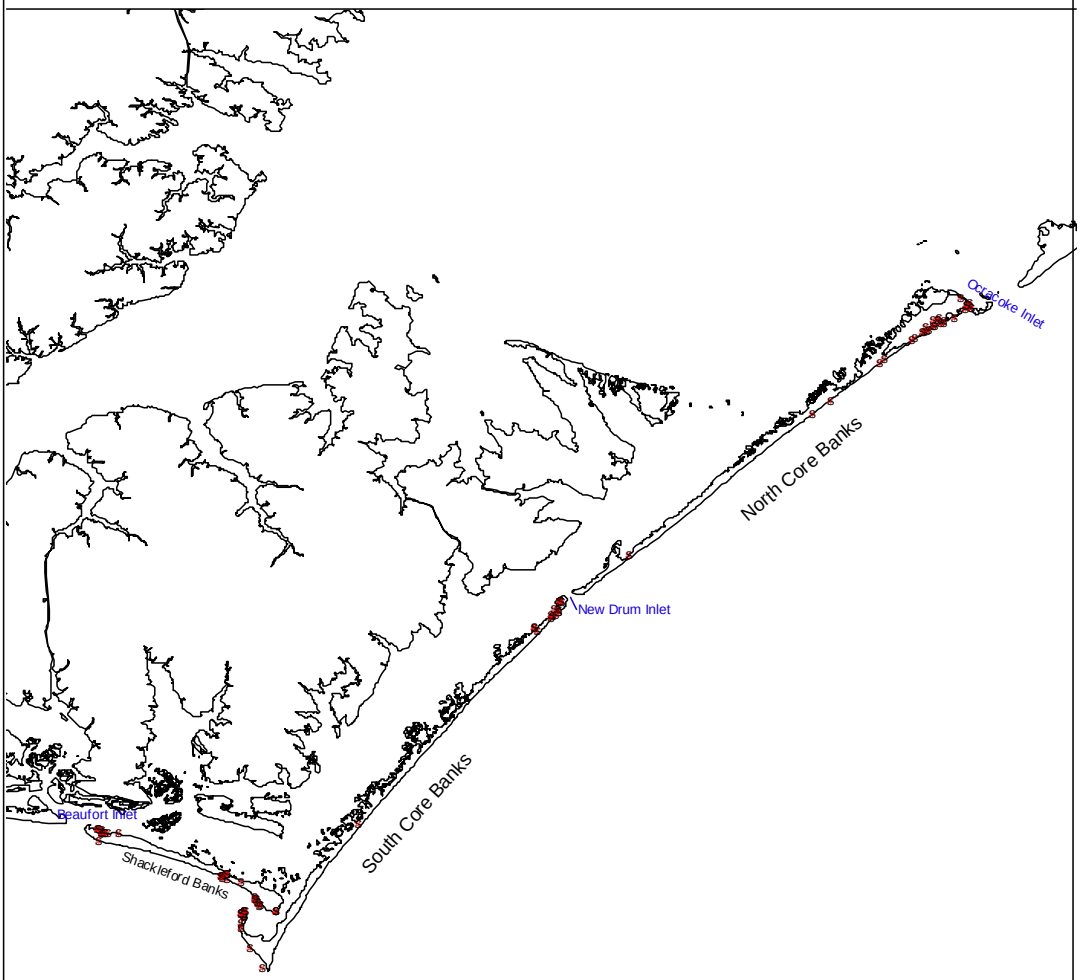


The first banded winter residents have appeared in August, although wintering birds may arrive in July (Figure 5). The non-breeding population occurring at CALO from December -January likely consists entirely of winter residents. The size of the resident wintering population is variable because birds regularly move outside the park boundaries. Based on a sample of banded birds, winter residents can be present until April.

Over half of the birds counted were found on North Core Banks, most within 5 miles of Ocracoke Inlet, and 99% of the observations were made within eight key wintering areas (Figure 6). Rare observations made outside these areas occurred during fall and spring migrations.

Figure 6. Locations of Piping Plover in the Non-nesting Season

2000-2003



S Piping Plover

National Park Service
Cape Lookout National Seashore
Resource Management Division

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W E
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Plot date: February 21, 2003 c:\gis data\plovers\pplover winter counts.apr

The following key wintering locations were identified in surveys from 2000-2003:

Ocracoke Inlet- Piping plovers were in this area every month but February. Depending on tide and weather conditions, birds were found on intertidal beach or mudflats. They occasionally were found as far to the west as Wallace Channel dock, nearly ½ mile from the ocean beach.

Mile 0-Mile 4.0, Ocean Beach- Piping plovers were found in this area throughout the non-nesting season, with an average of 18 birds being present. During spring migration an average of 40 birds were found using this area.

Portsmouth Flats- This area of intermittently flooded sand flats is the primary foraging area used by nesting piping plovers at CALO. An average of seven birds were present in the months of August-December. No piping plovers were ever seen in this area in January, February or March, since insects are likely the primary food source in this area and would not be abundant in the coldest winter months.

New Drum Inlet (South Core Banks)- Mudflats on the soundside of New Drum Inlet were commonly used by piping plovers during the survey. Erosion has washed away much of the flats and the birds have shifted to the ocean beach and shoals in the area. Birds were present in every month but October, with the migration months of August and March having the highest numbers. An average of four birds were found at this location during the surveys. The shoals off Drum Inlet and the north side of the inlet were not covered as part of this survey. It is likely that additional piping plovers are using this area.

Power Squadron Spit (South Core Banks)- Both ocean and soundside beaches were used by foraging piping plovers. The area next to the primary duneline on the ocean beach was often used as a roosting spot. An average of 3 birds were counted in this area with the most birds present in September and December.

East End of Shackleford Banks-The ocean beach on the east end of Shackleford Banks provided a roosting spot at high tide and foraging habitat at low tide. The intertidal beach here is muddier than typical ocean beach because of lower wave energy. Power Squadron Spit shields this area from high wave action. From observations of banded birds it was confirmed that some piping plovers move between this area and Power Squadron Spit across Barden Inlet.
Corral Area of Shackleford Banks-The area of Shackleford Banks between Mile 49 and Mile 50 is used by piping plovers throughout the non-nesting season. Mudflats on the soundside are used for foraging and the ocean beach for roosting at high tide and foraging at low tide. An average of 3 birds were counted in this area with a very consistent number of birds present.

West End of Shackleford Banks-The soundside beach on the West End of Shackleford Banks had an average of 6 piping plovers present. Plovers were present throughout the non-nesting season but more numerous in January through March. The piping plovers in this area spend part of their time foraging on the mudflats of the nearby Rachel Carson National Estuarine Research Reserve. The reserve is only one mile to the north.

Seabeach Amaranth

The seabeach amaranth (*Amaranthus pumilus*) is an annual plant, with no vegetative reproduction, in the Family Amaranthaceae native to the beaches of the Atlantic Coast (Figure 1). Historically the plant occurred in 31 counties of nine states from Massachusetts to South Carolina (USFWS 1996). Currently, seabeach amaranth is known from NY, NJ, DE, MD, VA, NC and SC. The species was federally listed as threatened on April 7, 1993 (USFWS 1993). Seabeach amaranth has a global rank of G2 (The Nature Conservancy).

According to recent survey data collected by FWS in 2005, the number of plants within the state of North Carolina decreased from 7093 to 5959 between 2001 and 2002. However, were found along beaches south of Cape Hatteras National Seashore. However, these numbers represent a fraction of the reports of approximately 40,000 individuals reported in the late 1980's and in 1995 on the North Carolina coast. According to the FWS Survey (unpublished report 2005), there were one to 56 individuals per year within CALO in the period 1995 to 1998, and 2 to 146 individuals were found in the period 2000 to 2002. The number of plants at Cape Lookout National Seashore has been extremely variable due to habitat changes and the impact of hurricanes (Table 3).

Table 3. Annual Counts of Seabeach Amaranth (*Amaranthus pumilus*) at Cape Lookout National Seashore

Year	North Core Banks	South Core Banks	Shackleford Banks	CALO Total
1993	82	1208	975	2265
1994	63	641	948	1652
1995	30	45	1155	1230
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	1354	1560
2004	1	78	58	137
2005	0	284	669	953

The plant grows only on Atlantic Coast beaches, mainly on coastal overwash flats at the accreting ends of the islands and lower foredunes and on ocean beaches above mean high tide (occasionally on sound-side beaches) (NatureServe 2005). It often grows in the same areas selected for nesting by shorebirds such as plovers, terns, and skimmers. It is intolerant of competition with other plants and does not occur on well-vegetated sites. According to Weakley

and Bucher (1991), this species appears to need extensive, dynamic, natural areas of barrier island beaches and inlets. Within this dynamic landscape, *A. pumilus* functions as a fugitive species, occupying suitable habitat as it becomes available (NatureServe 2005). Seeds may survive many years buried in the sand; they germinate when brought near the surface by overwash events or more severe storms.

Some notable studies have recently assessed habitat requirements and experimented with *A. pumilis* recovery methods (Sellars 2001, Sellars and Jolls 2001, Jolls et al. 2004). A model developed by Sellars based on topographical factors, including highly accurate elevation measures obtained from LIDAR data, was used to predict *A. pumilis* occurrence and habitat with evaluations based on the occurrence of 164 plants in Carteret and Brunswick Counties, NC. This work found that elevation was the most limiting topographic variable controlling the occurrence of *A. pumilis.* Subsequent work used natural plant occurrences on Cape Lookout with a stepwise discriminate function analysis with grayscale (passive) LIDAR data to assess the role of vegetation cover. This work found that passive LIDAR (an index of bare sand) and elevation has been able to predict 72% of the plant occurrences and excluding 98% of the landscape as unsuitable habitat (Sellars et al. 2003).

Johnson, Jolls and Holbert (in review) report on a growth chamber experiment that evaluated the competitive effects of perennial plant neighbors (*Cakile edentula*, *Iva imbricata* and *Uniola Paniculata*). *A. pumilis* plants experienced reduced survival and growth with these other plants and reduced growth when grown with other *A. pumilis* plants. Association with other *A. pumilis* plants is less detrimental than with the other species in term of survival, plant diameter, total competitive response and relative growth rate, although the limiting resources and mechanisms remain unknown. According to the authors: "Reduced performance of *Amaranthus* planted with neighbors in this experiment suggests that this species is a relatively poor competitor and may suffer lower reproductive fitness from competitive interactions with associates on the beach." The specific mechanisms of competition were not investigated but are cited as a future research need, particularly the abiotic resource partitioning (Hutchinson, 1961) and the relative effects of biotic and abiotic factors among the associate species in the dune community.

Current Management at CALO for Seabeach Amaranth

Surveys to locate and count all plants are conducted annually in late July and early August to track plant numbers and distribution and to identify areas for closure. Thorough searches are conducted in all areas of suitable habitat and the results are mapped using GIS software.

At CALO most of the plants are found on the south facing beaches of Shackleford Banks and the area between Cape Point and Power Squadron Spit. In the early 1990's there was a large population on the south side of New Drum Inlet. The seed bank in that area was lost in Hurricane Gordon in 1994 and *A. pumilus* has not recovered.

Areas where seabeach amaranth is found are closed to ORVs for the duration of the growing season. Where necessary, symbolic string and post fencing are installed surrounding all

emergent plants. Historically, most of the plants at CALO are located in areas already closed to vehicles (i.e. Shackleford Banks, Power Squadron Spit or in bird nesting areas).

At CALO, hurricanes have played a major role in *A. pumilus* numbers. In years following major storms (1996, 1999, 2000, 2004) few plants were found in the park. Presumably plants are either killed before they can produce seed or the seeds are buried or washed away. However, following a growing season without major storm impacts the population does recover.

The predominant threat to *A. pumilis* is loss of suitable habitat, primarily due to beach stabilization efforts and storm-related erosion (USFWS 1993). This species occupies a narrow and precarious elevation niche, bounded by its relative intolerance of flooding in lower beach settings and competition with other plants in upper beach and dune settings. 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. If sea levels continue to rise then beach erosion and habitat loss will accelerate, especially where beach stabilization efforts limit the ability of barrier islands to respond naturally to such changes (USFWS 1993).

Previous surveys have found very few *A. pumilis* plants on east- and north-east facing coastlines, which experience the greatest erosion rates. South-facing beaches have lower erosion rates and likely provide better habitat for *A. pumilis*. Particularly in the Carolinas, webworms (caterpillars) can defoliate the plants to the point of killing them or at least preventing reproductive functions. The primary threats to the plant in the park include flooding, off-road vehicles and grazing by nutria and webworms.

The U.S. Fish and Wildlife Service (1996) Recovery Plan includes the following additional relevant information regarding threats to this species' reproduction and survival:

> "In general, ORV traffic occurring during seabeach amaranth's dormant season could potentially have some negative impacts, including the pulverization of seeds. At levels of ORV use generally found on Carolina beaches, there is little evidence of highly detrimental effects, unless it results in massive physical erosion or degradation of the site, such as can be seen at the northern end of Carolina Beach. In some cases, off-season ORV traffic may even provide some benefits for seabeach amaranth. Physical disturbance by trucks helps prevent the widespread establishment of perennials, which would render the area unsuitable as a nesting ground for birds and as unsuitable habitat for seabeach amaranth. While seabeach amaranth populations are somewhat tolerant of ORV use from December until May, the brittle, fleshy stems are easily broken, and growing plants (May to December) do not generally survive a single pass by a truck tire.
>
> Thus, even minor beach traffic directly across the plants during the growing season is detrimental, causing mortality and reduced seed production. In the Carolinas, traffic has been successfully routed around these sensitive areas,

and most ORV drivers have been respectful of the public land that has been roped off for nesting birds or seabeach amaranth. The seabeach amaranth and nesting shorebirds often occur together in the Carolinas, even outside roped-off areas.

Pedestrian traffic during the dormant season (December to May) is unlikely to have any significant effects in the Carolinas. Even during the growing season pedestrian traffic there generally has little effect on populations of seabeach amaranth. Many beaches with daily use by thousands of sunbathers, joggers, and other recreation enthusiasts have substantial and apparently healthy populations of seabeach amaranth."

Sea Turtles

Five species of sea turtles are found in the waters around CALO. Loggerhead turtles (*Caretta caretta*), green turtles (*Chelonia mydas*), leatherback turtles (*Dermochelys coriacea*) and Kemp's Ridley turtles (*Lepidochelys kempi*) all nest in the park. Hawksbill turtles (*Eretmochelys imbricata*) have rarely been found as dead strandings at CALO. All of the listed sea turtles known to occur at CALO have similar ranges and habitat requirements, therefore, the information provided in this section will be applicable to all four species.

Loggerhead turtles were listed as federally threatened in the U.S. in 1978 (NMFS and USFWS 1991a), green turtles were listed as threatened north of Florida in 1978 (NMFS and USFWS 1991b) and leatherbacks, hawksbill and Kemp's Ridleys were listed as endangered in 1970 (NMFS and USFWS 1992). The U.S. Atlantic loggerhead population has increased since listing, from approximately 14,150 animals in 1983 (NMFS and USFWS 1991a) to between 32,000 – 56,000 by the year 2000 (Ehrhart et al. 2003). Within the northern subpopulation (north Florida to North Carolina), studies in South Carolina and Georgia have documented a decline in number of nests (Ehrhart et al. 2003). Based on genetic evidence, male loggerheads disperse freely among sites within the U.S. Atlantic population, while females are faithful to their natal sites (Bowen et al. 2005). Because sex ratio is determined by temperature during incubation (Miller et al. 2003), 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 et al. 1984, Hansen et al. 1998, Hawkes et al. in review). CALO averages about 15% of the nesting loggerhead turtles in North Carolina. The Kemp's Ridley is the most seriously endangered of the sea turtles. Its numbers have precipitously declined since 1947, when over 40,000 nesting females were estimated in a single *arribada*. The nesting population produced a low of 702 nests in 1985; however, since the mid-1980's, the number of nests laid in a season has been increasing primarily due to nest protection efforts and implementation of regulations requiring the use of turtle excluder devices in commercial fishing trawls.

The loggerhead turtle has a mean carapace length of 92 cm and a mean mass of 133 kg (NMFS and USFWS 1991a) , compared to 102 cm and 136 kg in the green turtle, 62-70 cm and 35-45 kg

for Kemp's Ridleys (National Research Council 1990) and 155 cm and 204-696 kg in the leatherback (NMFS and USFWS 1992). Leatherbacks and green turtles breed primarily in the tropics and are rarer nesters at higher latitudes, while loggerheads have significant nesting populations outside the tropics. Most Kemp's Ridley nesting occurs in Mexico, with very rare nests on the Atlantic coast (National Research Council 1990). Approximately 99% of the sea turtle nests at CALO are of the loggerhead (Cordes and Rikard 2005). For this reason we focus the remainder of the species account on loggerheads, with notes where the biology of the other two species differ in ways relevant to nesting site management.

Less is known about factors that influence nest site selection than about anthropogenic disturbances that discourage nesting (Miller et al. 2003). Typical nesting areas are "sandy, wide, open beaches backed by low dunes, with a flat, sandy approach from the sea" (Miller et al. 2003). Nesting is nonrandom along the shoreline, but studies of the physical characteristics associated with nests *vs*. random or non-nesting sites on the beach have produced varying results. Some factors that have been found to determine nest selection in certain studies are beach slope (3 of 3 studies), temperature (2 of 3 studies), distance to the ocean (1 of 3 studies), sand type (2 of 2 studies), and moisture (1 of 3 studies), although the results were occasionally contradictory (Miller et al. 2003). Other factors examined but not found to be significant were compaction, erosion, pH, and salinity. 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 due to erosion, and where temperature is optimal for development (Miller *et al*. 2003).

CALO beaches are typical of the preferred nesting habitat for sea turtles, consisting of moderate dune system; wide gently sloped beaches with little or no vegetation; beaches which are not renourished and sand which is the appropriate size and texture for nesting habitat.

Current Management at CALO for Sea Turtles

The loggerhead turtle is by far the most numerous sea turtle nesting at CALO. Cape Lookout is a significant northern nesting beach and supports among the highest number of loggerhead turtle nests in North Carolina. Green turtles, leatherbacks and Kemp's Ridleys have nested sporadically at CALO. An average of 130 sea turtle nests are found in the park but the number of nests varies greatly from year to year following females nesting patterns (Figure 7). The number of nests at CALO has gradually increased since standardized monitoring began in 1990 (Cordes and Rikard 2005).

The park uses three categories of nesting activities for monitoring purposes. Nests are confirmed by digging to locate the egg chamber, crawls are tracks above the high tide line with no digging by the female and digs are activities where the sand has been disturbed and eggs potentially were laid but could not be found eggs to confirm that. This information is included in the 2005 Sea Turtle Program Procedures (Appendix C).

One recovery goal for the loggerhead turtle in North Carolina is to attain the pre-listing nesting rate of 800 nests/season (NMFS and USFWS 1991a). The number of nests in NC fluctuated

broadly around 800 nests/season from 1990-2003 (Godfrey and Cluse 2003). Since standardized monitoring began in North Carolina in 1990, the number of sea turtle nests/season at CALO was lowest in 2004 and highest in 1999 (Fig. 8). Only 77 nests were laid in 2004 at CALO, but that year was poor for the entire southeast Atlantic Coast (M. Godfrey, North Carolina Wildlife Resources Commission, pers. comm.).

Figure 7. Cape Lookout Turtle Activities 1990-2004

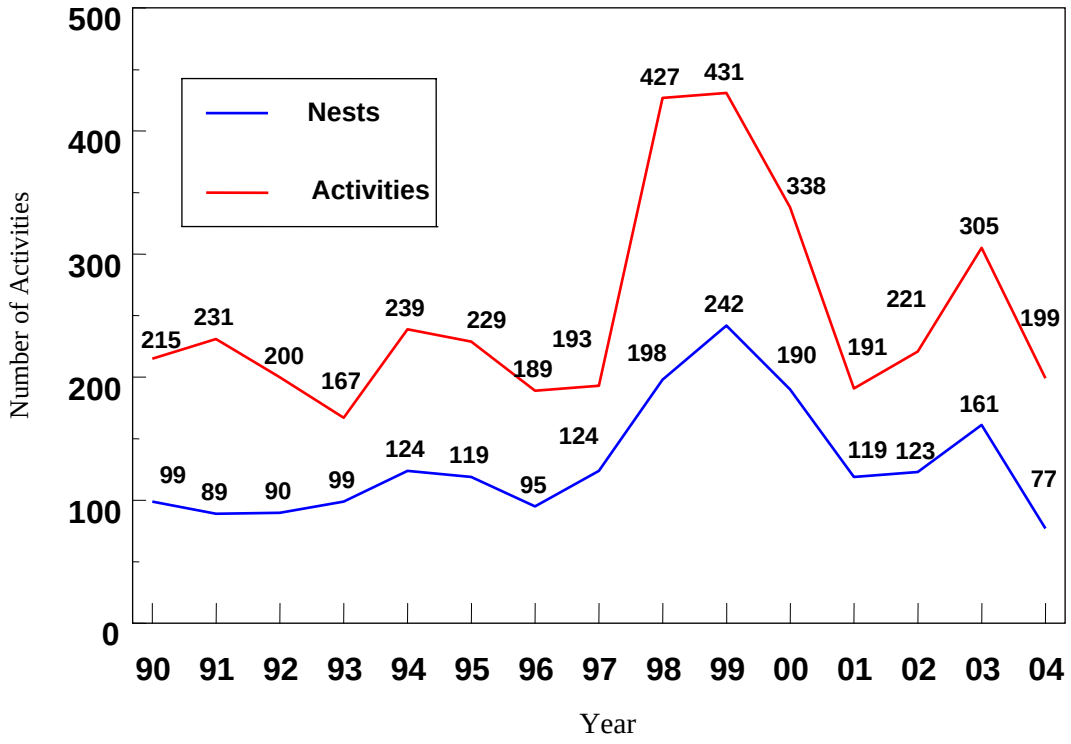
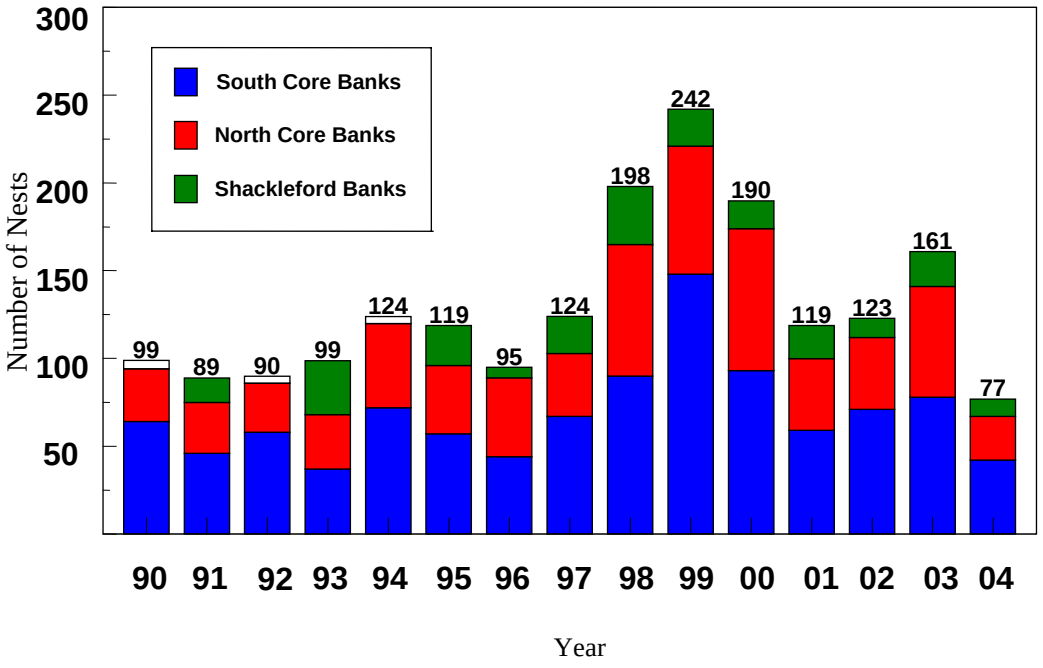


Figure 8. Turtle Nests 1990-2004



The following potential threats to the loggerhead on the nesting grounds, as outlined in the Atlantic Loggerhead Recovery Plan (NMFS and USFWS 1991a) are representative of those potentially faced by green and leatherback turtles also at CALO.

Weather and Tides

Direct effects —Storm events may destroy nests due to flooding or piling of eroded sand on the nest site.
Indirect effects —Beach erosion due to wave action may decrease the availability of suitable nesting habitat (Steinetz et al. 1998), which leads to a decline in nesting rate.

Predation

Direct effects — Predation by mammals, birds, and ghost crabs may eliminate 100% of productivity on beaches where it is not managed (National Research Council 1990). Fire ants may also kill hatchlings about to emerge from the nest cavity.

Human Activities

Direct effects — Crowding of nesting beaches by pedestrians can disturb nesting females and prevent laying. Furthermore, the use of flashlights and campfires may interfere with sea-finding behavior by hatchlings. Beach driving by off-road vehicles may harm sea turtles by (1) running over nests, hatchlings, adult females and live stranded turtles, (2) leave ruts that trap hatchlings attempting to reach the ocean (Hosier et al. 1981), (3) disturbing adults females causing them to abort nesting attempts, and (4) interfering with sea-finding behavior if headlights are used at night. Artificial lighting on human structures may affect turtle behavior in a similar manner (Witherington and Martin 1996). Beach cleaning can directly destroy nests. Poaching is a problem in some countries, and occurs at a low level in the United States.

Indirect Effects — An increased human presence may lead to an increase in the presence of domestic pets that can predate nests, and an increase in litter that may attract wild predators (National Research Council 1990). Pedestrian and ORV traffic and beach-cleaning activities can create ruts that trap emerging hatchling and prevent them from finding the sea (Hosier et al. 1981). Trampling can increase sand compaction that may damage nests or hatchlings (Kudo et al. 2003). When artificial lighting impairs sea-finding behavior of nesting females and emerging hatchlings, the affected animals face increased exposure to the elements and predation.

The rate of habitat loss due to erosion and escarpment may be increased when humans attempt to stabilize the shoreline, either through renourishment (Dolan et al. 1973), or placement of hard structures such as sea walls or pilings (Bouchard et al. 1998). ORV traffic may alter the beach profile, leading to steeper foredunes (Anders and Leatherman 1987), which may be unsuitable for nesting. Improperly placed erosion-control structures such as drift-fencing can act as a barrier to nesting females. Humans may also introduce exotic vegetation in conjunction with beach development, which can overrun nesting habitat or make the substrate unsuitable for digging nest cavities.

The following data are from CALO sea turtle monitoring reports, 1990-1994, for all sea turtle species. The majority of nest losses at CALO were due to weather, particularly hurricanes and other storms. Between 1990 and 2004 an average of 24 nests per year failed to hatch due to flooding. Nesting seasons free of major storms had high hatch success (Table 4).

Table 4. SEA TURTLE HATCH SUMMARY 1990-2005

Year	Nests	Relocated	Excavated	Avg. Clutch	Flooded	Avg. Incu	Eggs	Emerged	EMR %
1990	99	68	89	115	1	57	10,376	7,369	71%
1991	89	56	74	115	6	62	8,393	5,197	62%
1992	90	39	84	114	4	63	9,419	6,791	73%
1993	99	54	89	115	9	59	10,365	7,544	74%
1994	124	98	119	120	3	62	14,459	11,296	79%
1995	119	66	103	115	38	57	12,357	6,157	51%
1996	95	69	85	115	16	65	10,091	5,602	57%
1997	124	92	120	122	3	63	14,824	10,740	73%
1998	198	117	169	114	39	62	19,672	13,315	69%
1999	242	123	191	116	90	62	23,224	11,751	53% *
2000	190	120	176	111	2	67	19,527	13,471	69%
2001	119	60	106	113	5	65	12,358	9,555	79%
2002	123	56	115	119	7	61	13,657	10,758	79%
2003	161	66	138	119	45	65	16,440	10,067	61%**
2004	77	34	75	104	36	64	7,309	3,139	43%
2005	142	49	112	111	54	60	12,423	6,569	53%

*does not include 37 nests washed away with unknown egg totals

**does not include 20 nests washed away with unknown egg totals

Flooding before and during Hurricane Isabel had a great impact on the 2003 nesting season. A total of 60 nests were flooded by the ocean. Forty-five nests were washed away, were buried or failed to hatch due to flooding. Flooding during Hurricane Alex and several other storms had a great impact on the 2004 nesting season. A total of 53 nests were flooded by the ocean. Thirty six nests were washed away or failed to hatch due to flooding.

Other threats to sea turtle nests include ghost crab and raccoon predation. In 2005, raccoons dug into nine nests; no nests were lost to raccoons in 2004. Ghost crabs are a minor threat with just a few eggs taken each year.

Human related threats include ORV tracks preventing hatchlings from reaching the ocean and artificial lighting disorienting hatchlings or nesting females. In 2005, 45 violations of vehicle closures to protect sea turtle hatchlings were recorded.

Cape Lookout National Seashore began monitoring marine turtles in 1976. Baseline data was collected for a portion of South Core Banks during an extensive six-year study from 1978 - 1983. Nesting turtles were tagged and nests marked during nightly patrols. Since 1984 Cape Lookout has conducted daytime monitoring to document strandings, protect nest sites, relocate nests in danger of being flooded and protect hatchlings. The monitoring procedures used at CALO prior to 1990 were significantly different than those used after that year, as1990 marked the beginning of monitoring procedures following the USFWS Index Nesting Beach program (See Appendix D).

Off-road vehicle use in the park is currently light during the summer, except for holiday weekends. The peak in vehicle use occurs from mid-September to mid-November, after many of the turtle nests have hatched. A backroad system runs most of the length of Core Banks, except for the northern nine miles of North Core Banks. Beach access ramps are located about every mile for the length of the backroad, providing a way for ORVs to move between the ocean beach and backroad. This transportation system allows movement around seasonal beach closures and provides the park with an important management tool for protecting sensitive resources.

There is a risk of disturbance or injury to adult females and stranded individuals due to night recreation and ORV driving, including deterrence from nesting. Starting monitoring on June 1 leads to nests laid earlier being missed. Furthermore, nests may be missed by monitors if ORV ruts obscure turtle crawls. Unfound nests are at high risk of being crushed by ORVs or pedestrians, as are any other nests that are laid between nest surveys. The system currently used to mark nests leads to a risk that trespassing by people or domestic animals will affect the nest itself. The presence of ORVs on the beach at night leads to the risk of misdirection and disorientation of emerging hatchlings, which in turn leads to an increase risk of hatchling loss due to crushing by humans or becoming trapped in ruts, and due to predation and the elements. Campfires and artificial lighting on human structures, especially near the concession cabins, may deter nesting or disorient hatchlings.

An objective of the *Recovery Plan for U.S. Population of Loggerhead Turtle* is to implement nest protection measures "to ensure (a) greater than 60 percent hatch rate." This should be done using the "least manipulative method ... to avoid interfering with known or unknown biological processes." Tidal flooding continues to be the principal threat to nesting success at CALO. Nest relocation is the primary management tool used to enhance hatching success in the park and was effective in achieving a hatch rate of 66 percent for relocated nests between 1990 and 2004.

Nests and hatchlings are protected from vehicles and human disturbance through education and beach closures. Egg losses to raccoons can be limited through the use of screens and cages, although “smart predators” are providing new challenges. The management procedures used at CALO have been successful at increasing hatching success with minimal manipulation of natural sea turtle nesting.

EFFECTS OF PROPOSED ACTION

Piping Plover Effects Assessment

This proposed plan (Appendix A) will provide for increased presence of NPS staff to anticipate and be responsive to bird behavior, to provide active management of visitor use and access, and to ensure protection of the species. It will incorporate the use of pre-nesting resource closures in all areas of suitable nesting habitat, along with providing flexibility for the park to erect additional closures based on the presence and territorial behavior or nesting of birds in other areas. The proposed plan will follow the current management actions used in the park since 1993 and will include increased frequency of field observation along with additional closures to protect unfledged chicks. No impacts to critical habitat are anticipated under the proposed plan.

Direct and Indirect Effects
The proposed action has the potential for both positive and negative impacts to piping plover (breeding and non-breeding birds).

Pre-nesting Activity – The proposed plan will provide for pre-nesting closures for all suitable nesting habitat, both active, historic and newly created, by April 1. The current pre-nesting closures include areas at Portsmouth Flats, Kathryn-Jane Flats, New Drum Inlet, Plover Inlet, Cape Point and Power Squadron Spit (Appendix B). Nesting areas will be surveyed by trained monitoring staff every day on North Core Banks and South Core Banks, beginning in mid-April. Surveys of other nesting habitat in the park will be conducted at least once a week. The surveys would be done on foot, maintaining adequate distance to not disturb bird visitor compliance of closures by frequently having uniformed staff at nesting sites. The proposed plan will increase the frequency of monitoring which will likely improve visitor compliance of closures by frequently having uniformed staff at nesting sites.

Under the proposed plan, and current management actions for plovers, suitable nesting habitat as identified by the park biologist will be closed to all recreational activities, including pedestrians, ORVs and pets, by April 1. The areas will be closed using symbolic fencing and the closures will be enforced by law enforcement staff. The actual area to be fenced will vary from year to year due to the dynamic nature of the seashore and the available habitat. ORVs will be allowed on the intertidal portion of the ocean beach adjacent to the closures. ORV use which is restricted to the ocean beach is unlikely to affect nesting birds because at CALO piping plovers spend over 90% of their foraging time on the soundside beach, ephemeral pools and sand flats. The proposed plan, following current management practices, will provide disturbance free nesting areas for piping plovers beginning at their arrival at the sites.

The proposed plan will implement the current management actions used in the park since 1993, but it also provides for increased frequency of monitoring to seven days a week. By increasing monitoring of potential nesting areas to seven days a week beginning April 15, there will be a greater likelihood that any plovers establishing territories in these areas will be noted with appropriate follow-up and protection (see section on Courtship and Mating). Actual monitoring

could cause a negative effect given that plovers are highly sensitive to disturbance during the early period of territory establishment (UFWS 1996). However, with observers using scopes to watch the birds from a distance, this effect will be reduced and considered insignificant.

The proposed plan for pre-nesting plovers, which follows the current management actions, may result in negative effects to the birds as disturbance could occur both day or night since NPS beaches are open to the public 24 hours a day and plovers are known to be active at night (Staine and Burger 1994). However, the increased monitoring in the proposed plan should help to deter daytime violations of closures. In addition, the plan provides for personnel stationed at the ferry docks seven days a week for ten hours a day to provide educational information about listed species and closures which should also increase compliance with the closures day and night. Potential predators may also be attracted to the sites due the presence of humans or their trash, which could increase predation (USGS 2005, Hecht 1999). Allowing ORV use along the ocean may lead to disturbance of feeding or roosting adult piping plovers. However, adult plovers at CALO spend an estimated less than 10% of their time near the ocean beach in the nesting season (NPS unpublished data, 2005).

In the event a storm destroys the symbolic fencing of closed areas, the park will remain closed to visitors until closures can be re-established. This is a management change that ensures that nesting areas would be protected from human disturbance after storm events.

Courtship and Mating Activity – The proposed plan will increase the frequency of monitoring of courtship and mating behavior. Monitoring will occur daily on North Core Banks and South Core Banks and at least once a week in other areas of the park. This will enable the park to promptly establish additional resource closures where courtship or mating behavior is observed outside of the pre-nesting closures. Beneficial effects include ensuring pre-nesting closures are of adequate size to encompass such behavior if it occurs outside of the initial closure by ensuring additional buffer from recreational users is provided. Current management actions and the proposed plan provide for a minimum of a 150 ft buffer following recovery plan guidelines (USFWS, 1996). It also allows the park to be responsive to individuality in bird behavior in determining adequate size of any additional resource closures. If needed, the beach will be closed to vehicles and traffic routed to the backroad, if necessary, to allow vehicle passage while maintaining protection.

In the event a storm destroys the symbolic fencing of closed areas, the park will remain closed to visitors until closures can be re-established. This is a management change that ensures that nesting areas would be protected from human disturbance after storm events.

Nesting Activity – The proposed strategy will continue to provide for protection of piping plover nests through use of a minimum 150 ft buffer distance as recommended under the Piping Plover Recovery Plan. Monitoring for nesting activity, including all active nests, would occur daily on North Core Banks and South Core Banks and at least once a week in other areas of the park. This is an increase from current monitoring which occurs once every two days and will provide a greater likelihood of observing negative impacts on nests, including predators and human

disturbance. Nest checks will be done with optical equipment from a distance that doesn't disturb incubating birds. More frequent monitoring will also allow adjustments to the closures if buffer sizes were not adequate in preventing disturbance of incubating adults. Predator exclosures will continue to be erected around most nests in the proposed plan. The use of predator exclosures has improved hatching success of nests to 68%, compared with 31% for unprotected nests (Cordes, 2005 unpublished draft report).

The proposed plan does not provide for protection of piping plovers foraging outside nesting closures. This may have negative impacts since it does not guarantee that all adult foraging habitat will be protected. The plan also continues to allow night driving on the ocean beach. However, adult plovers at CALO spend a very small percentage of their time (less than 10%) foraging or roosting on the ocean beach in the nesting season (NPS unpublished data). Birds at CALO rarely feed at the ocean beach wrack line, which is sparse compared to northern beaches. Most foraging by piping plovers at CALO is on the soundside beach, ephemeral pools or sand flats. Foraging areas outside nesting closures are likely to be on the soundside beach, in areas with little human disturbance.

In the event a storm destroys the symbolic fencing of closed areas, the park will remain closed to visitors until closures can be re-established. This is a management change that ensures that nesting areas would be protected from human disturbance after storm events.

Unfledged Chicks – The proposed plan will increase the frequency of monitoring of unfledged chicks to seven days a week on North Core Banks and South Core Banks and at least once a week in other areas of the park. Current monitoring of broods occurs at least once every two days. The more frequent monitoring of unfledged chicks will allow rapid adjustments to resources closures if necessary to protect chicks. The proposed plan will continue to close the beach to ORVs if unfledged chicks are present and provide a minimum of 600 ft. buffer around each brood. Beach closures have successfully protected plover chicks foraging on the ocean beach. No vehicle-related mortality has ever been documented in the park (Cordes 2003). The plovers will likely benefit from the fact that the resource closure moves with the chicks, which would be especially important for highly mobile broods, and is the current management practice at CALO.

The proposed plan will also provide for a two-mile vehicle closure maintained at the north end of South Core Banks from the time the first nest in that area hatches until the last chick fledges or is lost. This area had the greatest concentration of nesting piping plovers in North Carolina the past two years and was not closed to vehicles prior to 2005. It is also a location were Core Banks is at its narrowest, with the potential for unfledged chicks to use the ocean beach. There will be an expected benefit of reducing disturbance as well as protecting chicks that may move to the ocean beach to forage. The proposed plan will continue the current management practice of considering, on a case by case basis, an escort system to provide access to Portsmouth Village or other areas without a backroad system if staffing allows.

Actual staff observations of plover chicks may have a detrimental impact by keeping them from foraging or resting as they would under undisturbed conditions. However, this will be avoided by conducting observation activities from a distance so as not to disturb the brood.

In the event a storm destroys the symbolic fencing of closed areas, the park will remain closed to visitors until closures can be re-established. This is a management change that ensures that nesting areas would be protected from human disturbance after storm events.

Migrating and Wintering Activities
The proposed plan provides for continued monthly monitoring of migrating and wintering plovers. The monitoring plan will benefit plovers by continuing to provide park managers with information on the types of habitats used by non-breeding plovers, key times of year and the locations of those habitats. Information on trends in the numbers of plovers using specific areas could also be used by managers to measure the effectiveness of management actions. The current monthly monitoring procedures have identified eight key areas used by plovers during migration and the winter. Past monitoring has allowed the park to analyze potential threats to plovers such as predators, ORVs and pedestrians, during the non-nesting period.

The lack of closures for non-nesting plovers may have a negative impact. Birds feeding or roosting on the ocean beach on much of Core Banks would be subject to disturbance by ORVs. However, vehicles are absent from the park from mid-December to mid-March, which covers most of the winter and the spring migration period. Also, seven of the eight areas identified as key areas for non-nesting plovers are permanently closed to vehicles (Cordes 2003). Pedestrians are allowed in all these areas, but visitation is small due to difficult access and the time of year.

Cumulative Effects:
Any activities that occur within the boundaries of the NPS would require the issuance of a special use permit, a Federal action which would require Section 7 Consultation with the FWS. Additionally, any special use permit issued by CALO will comply with and follow the provisions of this Interim Protected Species Management Strategy. Therefore, cumulative effects, which include the effects of future State, local or private actions that are reasonably certain to occur in the action area, would not be likely due to Federal jurisdiction of all activities within the boundaries of CALO.

Seabeach Amaranth Effects Assessment

Direct and Indirect Effects
Seabeach amaranth could be affected both beneficially and adversely by the proposed action of the Interim Protected Species Management Plan. The proposed plan will result in improved monitoring from the current management actions, in that all potential habitat outside the existing avian closures will be monitored for seedlings and juvenile plants one or two days each week beginning June 1 each year. Currently, the presence of seabeach amaranth plants and/or

seedlings are only identified in late July or early August, possibly resulting in undocumented plants occurring in the area and inadequate protection for these individual plants.

Beneficial effects are anticipated for seabeach amaranth through training monitors on historic plant locations and skills in identifying suitable habitat. This will allow the monitors to focus on these areas in surveys in order to provide early protection of seedlings. Identification of suitable habitat is beneficial in that it allows greater focus for monitoring and adaptive management in the event of human or natural disturbances. Additionally, if a seedling or plant is found in an area open to ORVs, the park would erect symbolic fencing with signage to create a 30 ft closure from the plant. Current management actions only provide for a minimum 20 ft buffer, when a plant or seedling is found outside an existing closure area.

The surveys for seabeach amaranth would, however, be conducted as ancillary surveys during routine bird and turtle monitoring creating a possibility that plants germinating outside of an established bird closure or other area where vehicles are prohibited would not be detected.

Historical locations of seabeach amaranth at CALO have been documented in surveys since 1993 on North Core Banks, South Core Banks and Shackleford Banks. Currently the majority of plants are found on the south facing beaches of Shackleford Banks and the area between Cape Point and Power Squadron Spit. The sites on South Core Banks are also sites used by piping plovers and other nesting birds. Under the proposed plan these areas will be posted for closures when bird nesting activities are observed, therefore, also providing protection for seabeach amaranth seedlings which germinate during the time of bird nesting activities. Private ORVs are prohibited on Shackleford Banks, therefore, seabeach amaranth is already protected on this island from vehicles. However, pedestrians are still allowed on the island. Additionally, the proposed plan provides for monitoring of seabeach amaranth while also monitoring the bird/turtle closure areas, prior to opening these areas to ORV traffic and, therefore, will result in protection for any plants that exist within these areas. Current management actions provide for closures to remain in place until the plant's growing season has ended, but does not provide for monitoring before removing bird/turtle exclosures. Additionally, the proposed plan will prohibit tent camping within the closed areas for seabeach amaranth, which is not implemented in the current management actions. These beneficial effects will result from additional measures included in the proposed plan, providing increased protection and monitoring of the plant.

The predominant herbivore threat to *A. pumilis* at Cape Lookout National Seashore is grazing by webworms (caterpillars), which can defoliate the plants to the point of killing them or at least preventing reproductive functions. Given the limited scope of the plan to only recreational activities, the proposed plan does not provide for any actions to remove the webworms before the caterpillars metamorphose on the plants. Predation (herbivory) by webworms is a major source of mortality and lowered fecundity in the Carolinas on seabeach amaranth (USFWS 1996). Therefore, the continued effects of defoliation on the plant by the webworm could result in a negative effect to the plant. However, the park biologists are unaware of any current land management practices which implement an effective method to eradicate or control the webworms.

Currently, CALO does not implement any education or outreach actions specifically for seabeach amaranth, however, the informational brochures that are provided in the visitor center does include information on the endangered plant. Under the proposed plan there will be a person stationed at the ferry docks seven days per week and ten hours per day to relay educational information about listed species and closures, including seabeach amaranth.

Direct and indirect negative effects may also occur to seabeach amaranth under the proposed plan due to a lack of year round vehicle closures. Seabeach amaranth must recruit annually and seeds can be dispersed long distances via wind and water, therefore, potential habitat where the seeds may germinate would not be protected from ORV traffic outside the growing season. Another impact from ORVs on seeds is burial of the seeds to a depth beyond which they can germinate. In general, ORV traffic occurring during seabeach amaranth's dormant season (December – April) could potentially have some negative impacts, including the pulverization and burial of seeds outside of closures (USFWS 1996). The proposed plan will, however, implement closures at Ophelia Banks and Middle Core Banks to ORV traffic from April 1-August 30, during most of the growing season for seabeach amaranth. After August 30, any plants in these areas will be protected from ORV traffic with vehicle closures if needed.

Violations of closures protecting seabeach amaranth will likely continue to be low. However, no violations of closures protecting seabeach amaranth closures were documented in 2005 (CALO CIRS file).

However, in some cases, off-season ORV traffic may provide benefits for seabeach amaranth through the disturbance to perennial grasses and shrubs (USFWS 1996). Through this disturbance the ORVs prevent the overwash/sand flat areas from revegetating which would make the habitat unsuitable for seabeach amaranth due to the fact that it can't withstand competition from other plants. ORV traffic running over sea oats and other dune plants may prevent succession and therefore benefit seabeach amaranth by maintaining the type of habitat that favors amaranth.

In order to implement the measures identified in the proposed plan for seabeach amaranth, CALO will train seasonal staff, including biological technicians and SCAs, to identify the plant and recognize webworm damages.

Cumulative Effects

Any activities that occur within the boundaries of the NPS would require the issuance of a special use permit, a Federal action which would require Section 7 Consultation with the FWS. Additionally, any special use permit issued by CALO will comply with and follow the provisions of this Interim Species Management Plan. Therefore, cumulative effects, which include the effects of future State, local or private actions that are reasonably certain to occur in the action area, would not be likely due to Federal jurisdiction of all activities within the boundaries of CALO.

Sea Turtles Effects Assessment

The proposed Interim Species Management Plan will continue implementation of current management procedures that have been successful in maintaining a stable nesting population, with adequate protection from recreational users of the park. The average number of sea turtle nests at CALO has increased since the park adopted "index beach" procedures in 1990 (Cordes and Rikard, 2004) with an average hatch rate of 66%, meeting the recovery plan goal (USFWS, 1991).

Direct and Indirect Effects

The proposed plan has the potential for both positive and negative impacts to breeding sea turtles.

Sea turtles would benefit through management of nests under the preferred alternative by continuing the park's sea turtle monitoring procedures (Cordes and Rikard, 2004) which mirror the NCWRC guidelines. Daily monitoring of nesting activity is conducted from June 1 to at least August 15 on North Core Banks and South Core Banks. Shackleford Banks is monitored at least twice a week. Nests are protected from ORVs by posts marked with reflective tape. If monitors determine that a nest would be imperiled by erosion or flooding, the nests are relocated in accordance with the "**Handbook for Sea Turtle Volunteers in North Carolina**" issued by the NCWRC. Nests on North Core and South Core Banks are relocated to designated areas. Nests on Shackleford Banks are relocated to the nearest suitable site if necessary. The 1,166 nests relocated in the park since 1990 have had a hatching success of 65%, which meets the recovery plan goal for loggerhead turtles (USFWS, 1991).

All nests are protected from raccoons, the primary nest predator at CALO, by placing wire screens anchored by rebar over the egg chamber. Nests on South Core Banks south of the lighthouse are further protected with wire cages over the egg chamber. This additional protection is needed in this area, which had the highest rate of raccoon predation in past years, according to park monitoring. These actions were successful in limiting raccoon predation to less than 1% of the total nests in 2005 (Cordes and Rikard, unpublished data).

Hatchlings are currently protected from ORVs by closing the area between the nest and the ocean to vehicles 50 days after the nest was laid with a funnel shaped closure erected from the nest to 15 feet below the high tide line. At relocation areas, this is a full beach closure, routing ORV traffic to the backroad. For non-relocated nests, ORV traffic is permitted between the nest and the dune line with at least a 10 ft buffer between the nest and ORVs. If a 10 ft buffer is not possible, the entire beach is closed and traffic is routed to the backroad around the area. Vehicle closures benefit hatchlings by providing a rut free corridor to the ocean. As a result of the current sea turtle management actions, no ORV related mortality of hatchlings was known to occur in 2005.

Monitoring is currently conducted from June 1-August 15. However, nests which are laid before or after these dates may not be identified and will not be provided adequate protection from ORVs and predators. Missed nests might be run over by ORVs, resulting in the destruction of eggs or compacting sand to the point that hatchlings are unable to emerge. Hatchlings emerging from missed nests would not be protected from ORVs and vehicle ruts, which can be fatal (FWS 1993, USGS 2005). However, staff monitoring nesting birds drive most of the ocean beach in the park regularly from April 1 and are likely to detect sea turtle nests. Monitoring Shackleford Banks only twice a week may also result in nests being missed. However, private ORVs are not allowed on Shackleford, making it impossible for ORV tracks to obscure crawls and eliminating the threat of ORV tracks trapping hatchlings. Missed nests, not protected with screens, may be lost to raccoon predation.

For the years 1990-2005, under current management practices, three turtle nesting activities were found in April, 135 were found in May and two were found in September. Although all these activities occurred outside the time period of daily monitoring, they were found and protected by staff patrolling the beach for other reasons. It is more likely that crawls would be run over by ORVs and obscured outside the time period of daily monitoring. However, the nests that were initially missed and not located until they hatched made up less than 1% of the total nests for the years 1990-2005.

In the current management procedures, nests are only relocated if they are found in low areas with a great likelihood they will be lost to flooding or erosion. Embryos in relocated nests may be damaged or development may be compromised (NCWRC 2002). Nests need to be moved within 12 hours of being laid to avoid embryonic damage (NCWRC 2002). Relocating nests could alter sex ratios or cause other unknown effects. The long-term hatch rate for relocated eggs (65%) is nearly the same as the rate for nests left in situ (67%) (Cordes and Rikard, draft unpublished report). In most cases relocated nests would have failed completely if they had not been moved. The park will modify the current criteria for relocating nests, if necessary, following consultation with N.C. Wildlife Resources Commission.

The proposed plan, which follows current management action, continues to allow night driving on most of Core Banks, outside of closures to protect hatchlings and areas permanently closed to vehicles. Beach driving by off-road vehicles may harm sea turtles by running over nests, adult females and live stranded turtles, can disturb adult females and cause them to abort nesting attempts, and can interfere with sea-finding behavior if headlights are used at night (Hosier et.al., 1981). The negative impacts on nesting females in the surf zone may be particularly severe (USFWS 1993, USGS 2005). Cape Hatteras and Cape Lookout National Seashores are the only federal agencies within the nesting range allowing night driving on beaches. Disturbance by vehicles can lead to false crawls if the female abandoned her nesting attempt. Repeated disturbance could cause a female to abort her nesting attempt and expel her eggs at sea.

Since visibility is reduced at night, there is the potential of turtles being run over by ORVs. 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 (Mathew Godfrey, personal

communication). The ratio of nests to false crawls was 1:1.2 at CALO in the 2005 nesting season. A 1995 study of night time vehicle use impacts concluded that "so long as vehicle numbers on SCB remain low, non-nesting crawl increases will probably not adversely affect the turtle population to a great extent (Schofield, 1995). A visitor use study by East Carolina University to begin in 2006 will examine night time ORV use in the park.

Hatchlings may be subject to disorientation by vehicle lights. However, current management practices provide for closures around hatching nests which also provide buffers from ORV headlights. As a result of the current sea turtle management actions, no artificial light-related mortality of hatchlings was known to occur in 2005. Currently, night time vehicle use is infrequent with 4 to 13 vehicles per night using the ocean beach on South Core Banks during the nesting season (Schofield, 1995).

In the event of a hurricane, beaches will not be reopened for recreation until all existing turtle nests are found and areas reposted with symbolic fencing.

Cumulative Effects:
Any activities that occur within the boundaries of the NPS would require the issuance of a special use permit, a Federal action which would require Section 7 Consultation with the FWS. Additionally, any special use permit issued by CALO will comply with and follow the provisions of this Interim Species Management Plan. Therefore, cumulative effects, which include the effects of future State, local or private actions that are reasonably certain to occur in the action area, would not be likely due to Federal jurisdiction of all activities within the boundaries of CALO.

Staffing Training and Qualifications for all Species

A total of two seasonal biological technicians, two SCA Conservation Interns (six-month positions) and two SCA Resource Assistants (12-week positions) would be trained by the park biologist.

Piping plover training would be completed by April 15 and would include:

1. Knowledge of piping plover biology, behavior and habitats
2. Ability to identify piping plovers in both basic and alternate plumages
3. Ability to identify shorebirds associated with piping plover
4. Ability to identify potential predators, their tracks and evidence of predation
5. Experience in using field binoculars, spotting scope and GPS unit
6. Ability to collect clear, comprehensive data
7. Ability to communicate with public
8. Ability to perform physical work under adverse environmental conditions such as heat, humidity
9. Ability to hike up to two miles in the sand carrying approximately 20 pounds

Sea turtle training would be completed by June 1 and would include:

1. Knowledge of CALO sea turtle monitoring procedures
2. Ability to identify sea turtle species and their nesting crawls
3. Ability to differentiate between false crawls and nests
4. Ability to locate and properly mark sea turtle nest chambers
5. Ability to relocate nests to suitable areas if necessary
6. Ability to collect clear, comprehensive data
7. Ability to use GPS equipment
8. Ability to communicate with public
9. Ability to perform physical work under adverse environmental conditions such as heat, humidity

Amaranth training would be completed by June 1 and would include:

1. Ability to identify sea beach amaranth
2. Ability to identify beach vitex
3. Ability to use GPS equipment
4. Ability to communicate to public
5. Ability to hike up to 5 miles in sand carrying approximately 10 pounds
6. Ability to perform physical work under adverse environmental conditions such as heat and humidity

Predator Management Assessment for Protected Species

Under current management piping plover nests are protected with predator exclosures where appropriate. All sea turtle nests are protected with wire screens or cages. Currently, no predator removal is done in the park. A two-year predator study focusing on raccoons will begin in 2006. Following the completion of this study the park will seek funding for the development of a Predator Management Plan.

Compliance

The proposed plan has no increase in law enforcement positions over FY 2005. It is planned that law enforcement patrols will be directed to areas that are viewed as particularly sensitive or important and in areas which will have beneficial impacts on the species. In addition, education and outreach to park visitors regarding species of concern, compliance with closures, status of closures, and other relevant information is expected to help ensure compliance for the vast majority of visitors to CALO.

CONSERVATION MEASURES

The following conservation measures are actions that when implemented would result in reducing or avoiding adverse effects to and incidental take of listed species. These resource protection strategies would be implemented to provide an effective monitoring and management program under the Interim Species Management Plan. Additionally, information generated from the research studies and monitoring can be used in the development of the long term ORV Management Plan.

Piping Plover

The following actions will be implemented:

- Monitor abundance and distribution of wintering plovers through specific winter surveys.
- Provide monitoring data to the USFWS so that the information may be combined with data from other monitoring efforts to determine the significance of CALO breeding or wintering population segments to the state, region (middle Atlantic coast), or Atlantic coast wide population changes and trends.
- Document violations of bird nesting 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/or productivity.
- Monitor the impact of mammalian and avian predators on piping plover breeding productivity.

On going studies which will continue at CALO:

- "Measure the Impact of Off-road Vehicles on Beach Birds" study conducted by Dr. Ted Simons and Nathan Tarr, Cooperative Research Group, North Carolina State University. This study will include a measurement of the impact of ORVs on piping plovers during fall migration.

- "Evaluate the Consequences of Predator Removal for Endangered Species at Cape Lookout National Seashore" conducted by Alan O'Connell, USGS. A study of raccoon populations in the park and the implications of predator removal.

- "Monitoring and Management of American Oystercatcher on Cape Lookout National Seashore" conducted by Dr. Ted Simons and Shiloh Schulte, Cooperative Research Group, North Carolina State University. The study will monitor plover nesting and chick success/survival and document causes of chick mortality.

- "Conduct a Visitor Use Survey at Cape Lookout National Seashore" by Hans Vogelsong, East Carolina University. This study will examine visitor use patterns, including ORV use.

Funds will be sought to provide for intensive research studies and surveys will be developed and implemented to address the following issues relative to the piping plover:

- Study the role of habitat in fledging success of piping plover chicks.
- Partner with the Navy overflight study to measure the impact of overflights on piping plovers and other shorebirds.
- 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.

Seabeach amaranth

The following actions will be implemented:

- Monitor the effects of nutria grazing on seabeach amaranth at CALO.

Funds will be sought to provide for intensive research studies and surveys will be developed and implemented to address the following issues relative to the piping plover:

- Determine and assess effects of both natural and human disturbances, including ORV use, to the species at CALO.
- Determine the affect of webworm herbivory on seabeach amaranth at CALO.

Sea turtles

The following actions will be implemented:

- Monitor the number of nesting females and their reproductive success so that the current contribution of CALO 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.

Funds will be sought to provide for intensive research studies and surveys to address the following issues relative to sea turtles:

- Determine the effects of night driving on nesting sea turtles at CALO.

Protection of Habitat Created as a Result of Storms and Other Natural Processes

Overwash and breach-created landscape features are a normal part of the barrier-island system, but armoring or renourishing the shoreline and filling or stabilizing inlets to protect human structures is a common practice that prevents such features from forming and alters patterns of vegetative succession (Dolan *et al*. 1973). Piping plovers and other species may exhibit preference for such dynamic features for roosting, nesting, and foraging, and hindering their formation may indirectly effect a local population by decreasing the carrying capacity of the landscape for these animals (Goldin and Regosin 1998, Nicholls and Baldassarre 1990, Elias *et al*. 2000, Cohen 2005). Therefore, the Park will allow natural processes to occur unimpeded whenever feasible. Newly-created inlets and overwash areas will be assessed to determine whether alteration of the habitat would lead to effects on plovers or their prey in the present or future.

SUMMARY EFFECT DETERMINATION

This assessment has examined the potential impacts of the proposed project on the habitat and listed species of plants and animals that are, or have been, present in the project area. Both direct, indirect and cumulative impacts have been considered. Critical habitat has been designated for only non-breeding/wintering plovers at CALO and there will be no adverse impacts from the proposed action to the designated critical habitat.

Based on this analysis, the following effects determinations have been made for each federally listed species found at CALO:

- It has been determined that the proposed project will result in a may affect, not likely to adversely affect the piping plover.
- It has been determined that the proposed project will result in a may affect, likely to adversely affect the three species of sea turtles.
- It has been determined that the proposed project will result in a may affect, likely to adversely affect the seabeach amaranth.

OTHER SPECIES OF CONCERN ON CALO

Colonial Nesting Birds

The Outer Banks region of North Carolina supports a large number of colonial waterbird species that depend upon its extensive sounds and the near-ocean waters for feeding, and relatively undisturbed islands (or portions thereof) for nesting. Many species of waterbirds are in jeopardy in the State, however (Parnell et al. 1977). Reasons for this are many: predation increases by mammals, competition with, and predation by, large gulls, especially herring gulls, *Larus argentatus*, human development, beach stabilization, and recreational disturbances on the outer beaches.

CALO provides nesting habitat for significant regional populations of colonially nesting species, including black skimmers, least terns and common terns (Figure 8). Gull-billed terns have nearly vanished from the park as a nester. The Statewide counts of colonially nesting waterbirds have shown a decline in beach nesting species at CALO however, nesting success varies greatly from year to year The main threats to nesting success appear to be predation by raccoons and feral cats and overwash during storms and high tides.

The colonially nesting species of most concern for CALO include: gull-billed terns (*Sterna nilotica),* common terns (*Sterna hirundo),* least terns (*S. antillarum)* and black skimmers (*Rynchops niger).* Gull-billed terns are listed as "Threatened" in North Carolina, while the other three are "Species of special concern" both to the North Carolina Wildlife Resources

Commission (NC Natural Heritage Program, 2004) and to the National Park Service (S. Harrison, NPS, unpublished report). All of the beach nesting bird species in the park are listed as "Birds of Conservation Concern" by the U.S. Fish and Wildlife Service (see Appendix E).

Numbers of most beach nesting breeding birds within North Carolina have declined over the past 20-30 years for all of these species. During the period 1977 to 2004, Gull-billed terns declined from approximately 268 to only 99 pairs, common terns from 2760 to only 570 pairs, and black skimmers from 976 to 623 pairs; however, least terns increased from 1925 to 2408 pairs in the same period (NC Natural Heritage Program, 2004). At CALO recent nesting by three of the four species has declined sharply from numbers in the early 1990's (Table 5).

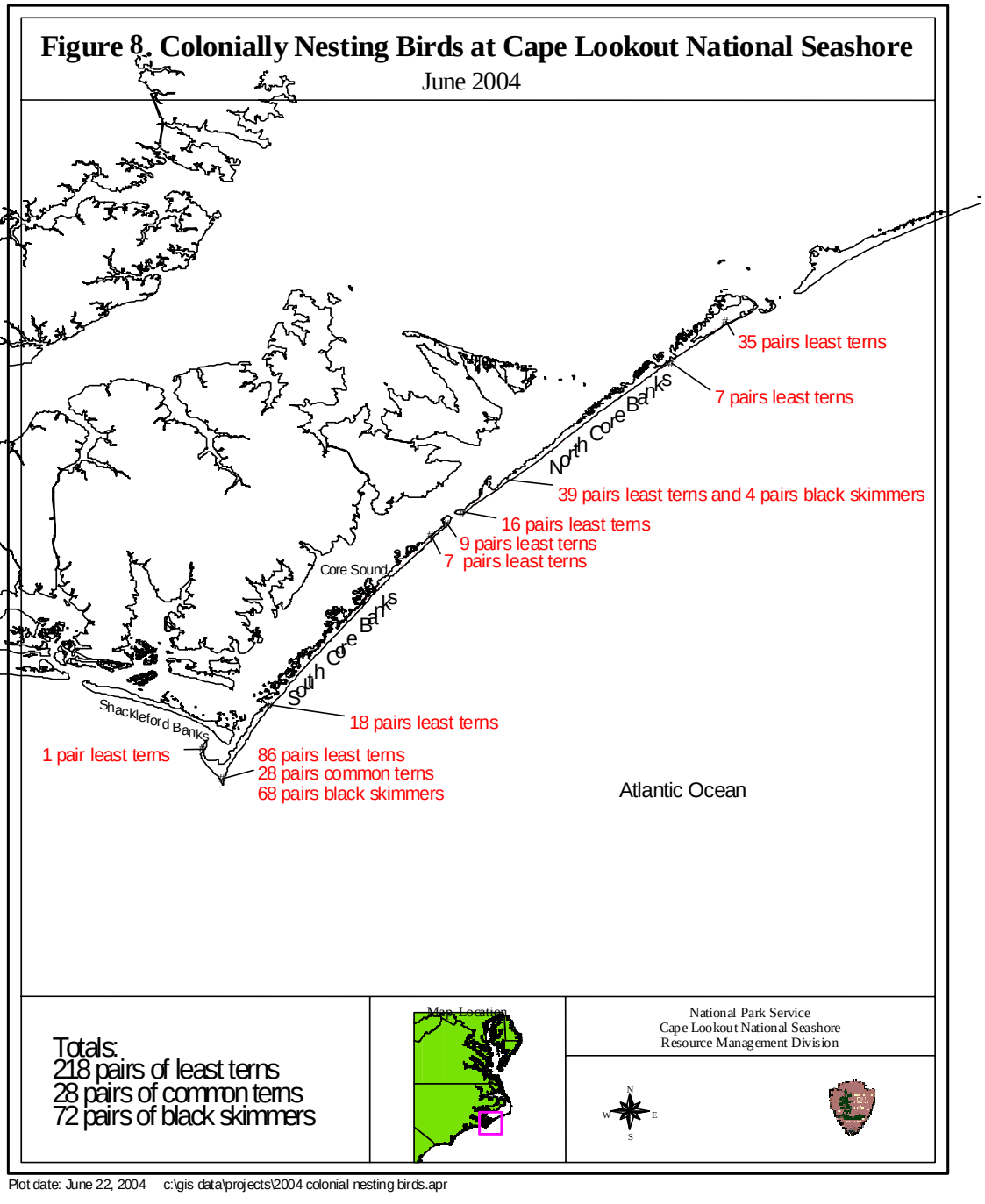


Figure 8. Colonially Nesting Birds at Cape Lookout National Seashore
June 2004
35 pairs least terns
7 pairs least terns
North Core Banks
39 pairs least terns and 4 pairs black skimmers
16 pairs least terns
9 pairs least terns
7 pairs least terns
Core Sound
South Core Banks
18 pairs least terns
Shackleford Banks
1 pair least terns
86 pairs least terns
28 pairs common terns
68 pairs black skimmers
Atlantic Ocean
Totals:
218 pairs of least terns
28 pairs of common terns
72 pairs of black skimmers
Map Location
National Park Service
Cape Lookout National Seashore
Resource Management Division
N
W
E
S
Plot date: June 22, 2004 c:\gis data\projects\2004 colonial nesting birds.apr

Table 5. Counts of Colonially Nesting Waterbirds at Cape Lookout National Seashore

SPECIES	1992	1993	1995	1997	1998	1999	2001	2004
Green Heron	0	1	0	0		0	0	0
Little Blue Heron	40	121	154	234		332	188	436
Cattle Egret	200	462	547	330		1972	?	195
Great Egret	30	138	220	218		158	208	204
Snowy Egret	15	23	165	18		0	44	72
Tricolored Heron	40	132	365	127		138	340	555
Black-crowned Night Heron	22	18	45	51		80	43	105
Glossy Ibis	24	9	8	0		7	11	23
White Ibis	2	0	4	136		549	565	858
Laughing Gull	625	4227	4321	2769		4507	8796	75
Herring Gull	2	1	2	43		60	41	67
Gull-billed Tern	59	57	35	2		0	0	0
Forster's Tern	145	93	92		24	28	?	?
Common Tern	242	582	258	9	41		5	28
Least Tern	363	583	236	179	236	131	96	218
Sooty Tern	0	1	0	2		0	1	0
Black Skimmer	111	307	185	28	10		33	72

Statewide counts of colonially nesting waterbirds are conducted every three years. CALO staff carries out the censuses of beach nesting species. Results of these surveys are stored in a database maintained by the North Carolina Wildlife Resources Commission. This database and the results of statewide waterbird surveys provide the status of species of concern and can help set management priorities.

The main management goals for CALO include monitoring the breeding populations, conducting regular surveys of nesting populations and limiting human disturbance. Historically used tern and skimmer nesting areas, such as Cape Point, will be posted in mid-April. Nesting areas will be closed to entry by pedestrians, off-road vehicles and pets using the park's standard "Bird Sanctuary" signs mounted on wood posts. Bird nesting closures will be expanded as necessary when nests or nest scrapes are found in new areas. Symbolic fencing (rope or string between posts) will be used in areas with large concentrations of people to provide further protection for the colony. The general approach to protect beach-nesting birds has been to create a corridor for ORV and pedestrian traffic along the high tide line. Vehicles may drive or park within the corridor. Pedestrians are also permitted in the corridor. Areas with nesting birds receive resource closures using signs. When young hatch, sections of the entire beach from the water line to the dunes are closed to prevent direct mortality of chicks.

Monitoring will be conducted by park staff at least three times a week to ensure that all nests are protected from disturbance by people and off-road vehicles. Black Skimmer and tern chicks will be protected from off-road vehicles by closing areas to driving and re-routing traffic if chicks are in danger of being run over.

American Oystercatcher

The Outer Banks region of North Carolina supports approximately 90 breeding pairs of American Oystercatchers (Simon et al. 2004), along 160 km of beach, of an estimated 327 pairs surveyed in the state (Cameron and Allen 2004. Monitoring of American Oystercatchers (AMOY) reproductive success in North Carolina began in 1995 and continues at CALO and Cape Hatteras National Seashore on an annual basis. A 2004 survey estimated North Carolina's breeding population at 327 pairs (Cameron and Allen 2004). An average of 58 pairs nested at CALO between 1998 and 2004**.** Hatching success was found to be highly variable among years, and among locations along the coast of North Carolina.

American oystercatchers are common nesters throughout Cape Lookout National Seashore, primarily on the ocean beach. They are listed as a 'Bird of Conservation Concern' on the southeast coastal plain and as a breeding species of highest regional priority in the U.S. Shorebird Conservation Plan – Southeast Coastal Plains (Hunter 2002). A study completed in 2004 showed that although Cape Lookout National Seashore had the lowest overall hatching probability, hatching and fledging success on North Core Banks were the highest ever recorded in North Carolina (Simmons, Schulte and Cordes). Additionally, some signs of successful reproduction have been noted at Middle Core Banks in 2004 (Simon et al. 2004). Monitoring results showed that hatch rates in 2004 were the highest since monitoring began in 1995. Nests on North Core Banks and Middle Core Banks did particularly well with 80% of the nests hatching. Fledging success was also the highest ever recorded in the Park and at least 88 chicks hatched and 45 survived to fledge (51%) (Table 6).

Table 6. Summary of Oystercatcher Reproductive Success Data at CALO

Year	Island	#Nests	#Nests Hatched	#Chicks fledged
1995	South Core Banks	36	10 (28%)	7
1997	South Core Banks	34	4 (12%)	2
1998	North & South Core Banks	98	12 (12%)	6
1999	North & South Core Banks	114	16 (14%)	6
2000	North & South Core Banks	75	25 (33%)	9
2001	North & South Core Banks	109	19 (17%)	1
2002	North & South Core Banks	90	10 (11%)	6
2003	Cape Lookout N. S.	106	17 (16%)	8
2004	Cape Lookout N. S.	68	37 (54%)	45
2005	Cape Lookout N. S.	65	26 (40%)	18
All		795	176 (22%)	108

There are several possible factors contributing to the tremendous increase in nesting success by American oystercatchers in 2004 at CALO. Hurricane Isabel in September 2003 created large overwash areas, particularly at the northern end of the park. These are the areas that had the highest nesting success. Raccoon populations also seemed to have greatly declined on North Core Banks following the hurricane. Only four nests were lost to predators north of New Drum Inlet. In areas where the impact from Hurricane Isabel was minor (Shackleford Banks), nesting productivity was poor. The other positive factor was a nesting season free of storms and flooding that were problems in previous years. The combination of all these factors seems to have produced ideal nesting conditions for American oystercatchers throughout much of the park.

Threats to nesting oystercatchers are numerous and inter-related, but more than 51% of nest losses are from undetermined causes, which does not allow managers to correct the problem (Simons et al. 2004). Due to the birds' choice of nesting habitat they are particularly vulnerable to disturbance by park visitors and off-road vehicles. Major causes of known nest failures (<49% of nesting attempts) are mammalian predation (60%), overwash (25%), avian predation (5%), abandonment (5%, possibly another cause), and humans (3%), vehicles (<2%), and ghost crabs (<2%) (Simon et al. 2004). The 2004 Summary Report for AMOY Monitoring at Cape Lookout National Seashore identified mammalian predators, particularly raccoons, as the primary cause of nest losses, and one oystercatcher chick was run over by a vehicle on South Core Banks at Cape Point and one killed by a Great Horned Owl.

The primary focus of management at CALO has been to find ways to minimize the impacts of park visitors and off-road vehicles and improve nesting success. The management goals include continuing long term monitoring and research.

Surveys of nesting habitat on Core Banks are conducted several times per week from early April to mid-July. Surveys of Shackleford Banks are made twice a week. Nests are located and the area around the nest is closed with "Bird Sanctuary" signs if the nest is in danger of being run over by off-road vehicles. Generally, nests found in the dunes are not posted because there is concern that predators might learn to associate posts with nests. Locations of the nests are recorded using a GPS and the park's mile marker system. Nests are checked every few days to monitor the number of eggs present and hatch date. Chicks are monitored until they fledge or are lost.

Beginning in 2005, following the successful hatching of nests, the beach between the ocean water line and the duneline were closed to off-road vehicles. ORVs were routed to the backroad via designated ramps. In areas without a backroad system ORV traffic was allowed at 15 mph, with signs warning operators about flightless chicks in the area. These areas were reopened to ORV traffic after the chicks fledged or were lost.

The effects of the current management are that vehicles and recreationists may still gain access to the majority of the open beach habitats. Restrictions may apply only when a nest is established. CALO has a regulation that all pets must be on a leash but because of staff

restrictions it is difficult to enforce. There are no regulations regarding kite flying. American oystercatcher nests are not concentrated in small areas like colonial nesters but are scattered along the ocean beach the entire 56 mile length of the park, making them more difficult to locate and protect.

Wilson's Plover

The Wilson's plover (*Charadrius wilsonia*) is a medium-sized (16.5-20 cm, 55-70 g) plover of coastal habitats. It breeds along the Atlantic coast from Virginia south to the Florida Keys and along the Gulf Coast. On the Pacific coast it breeds from Baja California down south into Central America. Wilson's plover nest on sparsely vegetated saline areas, including beaches above high tide line, overwash fans, sand flats, dune areas, edges of lagoons, and dredge spoil islands. Nests are scrapes in the sand with typically 3 egg clutches. Egg laying begins in mid April and continues through June. The birds may renest if the first nest fails and exhibit territorial behavior during the nesting season. They are unique in that they engage in group defense of their nesting areas. The chicks are precocial, feeding and moving themselves hours after hatching. Adults and chicks feed on crustaceans and insects in the coastal environment (Corbat and Bergstrom 2000)

The North Carolina coast had approximately 232 pairs of Wilson's plover in 2004 (Cameron 2004). At CALO, 61 nesting pairs were counted in the 2004 census. The birds were distributed throughout the park, with the greatest concentration at Power Squadron Spit. Many of their nesting sites are also used by piping plovers and American oystercatchers.

Population trends and nesting productivity of Wilson's plovers at CALO are unknown. It is likely they face the same threats as other ground nesting species, including flooding and predation. In 1994, 22 of 29 monitored nests on North Core Banks were lost to predators (Philhower, unpublished report to NPS).

Loss of beach habitat and disturbance to nesting areas are the primary threats to the species (Corbat and Bergstrom 2000). In 2004 in North Carolina most Wilson's Plovers (87%) were found nesting on barrier islands in early successional habitat on beaches. Undeveloped beaches including CAHA and CALO supported 63% of the Wilson's plovers in the state (Cameron 2004). Subject to disturbance at nest sites by beachgoers, pets, and vehicle traffic on beaches, Wilson's plovers leave their nests and/or chicks when disturbed and are cautious to return when intruders are near. This exposes eggs and chicks to predation (Corbat and Bergstrom 2000). Predators at CALO include feral cats, raccoons, and ghost crabs.

Red Knot

The red knot is a large, bulky sandpiper (23-25cm, 135g) and one of the most colorful. Its red head, neck and breast in breeding plumage make it easily distinguishable. Winter plumage is plain grey above and dull white underparts. This shorebird makes one of the longest yearly migrations of any bird traveling 15,000 km from its Artic breeding grounds to Tierra del Fuego in southern South America (Harrington, 2001). The United States Shorebird Conservation Plan (2001) has listed the red knot as a "Species of High Concern", due to populations declining in

recent years (Brown, Hickey, Harrington, and Gill, 2001). More recently (July, 28 2005) wildlife conservation groups have filed an emergency petitioned asking Department of the Interior Secretary Gail Norton to list the red knot as endangered.

The Outer Banks of North Carolina serves as a critical link in the migratory path of several shorebird species. The red knot (*Calidris canutus*) is present all year at CALO but peak numbers are recorded during the spring migration in May and June. Numbers of red knots in the park are lowest from January to March. In a 1992 and 1993 shorebird study of the outer banks, most red knots were seen around Ocracoke Inlet, North Core Banks (65% of total) and Ocracoke Island (28% of total) (Collazo, Parnell, and Walters, 1995).

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LIST OF PREPARERS

Cherry Green
National Park Service
Southeast Regional Office
December 2005

Jeff Cordes
National Park Service
Cape Lookout National Seashore
December 2005

Michael Rikard
National Park Service
Cape Lookout National Seashore
December 2005

APPENDIX A
INTERIM PROTECTED SPECIES MANAGEMENT PLAN

The action addresses the following species:

- federally threatened piping plover (*Charadrius melodus*)
- federally listed sea turtles:

  threatened loggerhead (*Caretta caretta*)

  threatened green turtle (*Chelonia mydas*)

  endangered leatherback turtle (*Dermochelys coriacea*)

  endangered hawksbill turtle *(Eretmochelys imbricata)*

  endangered Kemp's ridley turtle *(Lepidochelys kempii)*
- federally threatened seabeach amaranth (*Amaranthus pumilus*)
- state listed threatened species and species of special concern:

  common tern (*Sterna hirundo*)

  least tern (*Sterna antillarum*)

  gull-billed tern (*Sterna nilotica*)

  black skimmer (*Rynchops niger*)
- rare species of concern to the park

  American oystercatcher (*Haematopus palliatus*)

  Wilson's plover (*Charadrius wilsonia*)

  Red knot (*Calidris canutus rufa*)

The management of endangered and threatened species is mandated by law and should be based on the best available information, including published research, reports and the practical experience of scientists and park resource managers. All of these sources, along with public input, were consulted and formed the basis of the management action. Management guidance or scientific references were gleaned from the following documents:

- Piping Plover (*Charadrius melodus*) Atlantic Coast Population Revised Recovery Plan .U.S. Fish and Wildlife Service. 1996.
- Technical/Agency Review Draft, Revised Recover Plan for Piping Plovers, Charadrius melodus, Breeding on the Great Lakes and Northern Great Plains. U.S. Fish and Wildlife Service. 1994.
- Recovery Plan for the Great Lakes Piping Plover *(Charadrius melodus)*. U.S. Fish and Wildlife Service. 2003.

- Recovery Plan for Seabeach Amaranth *(Amaranthus pumilus*). U.S. Fish and Wildlife Service. 1996.
- *North American Colonial Waterbird Conservation Management Plan*
- North Carolina Wildlife Resources Commission (NCWRC) in *Handbook for Sea Turtle Volunteers in North Carolina* (2002). An annual permit is issued by NCWRC under the authority of the U.S. Fish and Wildlife Service and USFWS Recovery Plans referenced.
- Recovery Plan for U.S. Population of Loggerhead Turtle *(Caretta caretta*). U.S. Fish and Wildlife Service. 1991.
- Recovery Plan for U.S. Population of Atlantic Green Turtle *(Chelonia mydas).* U.S. Fish and Wildlife Service. 1991.
- Recovery Plan for the Leatherback Turtles in the US. Caribbean, Atlantic, and Gulf of Mexico (*Dermochelys coriacea*). U.S. Fish and Wildlife Service. 1992.
- Recovery Plan for the Hawksbill turtles in the U.S. Caribbean, Atlantic Ocean, and Gulf of Mexico *(Eretmochelys imbricata)*. U.S. Fish and Wildlife Service. 1993.
- Recovery Plan for the Kemp's Ridley Sea Turtle (*Lepidochelys kempii*). U.S. Fish and Wildlife Service. 1992.

Overarching Framework for the Management Action

1. In general, because of the dynamic nature of the CALO beaches and inlets, the actual management may change by location and time, and new sites (overwash areas) may require additional management, or management actions may become inapplicable for certain sites due to changes in ground conditions.
2. Posted areas are closed to recreational access (both ORV and pedestrian) unless otherwise noted.
3. Frequencies provided for species observations are minimums. If a need arises for more frequent observations than the minimum stated, and staff is available, the park may conduct observations more frequently on a case-by-case basis.
4. Staff used for field observations, education and outreach will be trained by qualified National Park Service staff and will meet the following minimum qualifications:
    a. Training will conducted by qualified staff biologist. Training will include:
        i. Job description/Expectations
        ii. Personal safety
        iii. Professional behavior
        iv. NPS and Park rules, regulations, policies
        v. Geographic locations orientation
        vi. Housing requirements
        vii. ATV/beach driving
        viii. Protected species monitoring and management

1. Identification
2. Behavior
3. Needs
4. Closures

ix. Completion of required forms etc.
x. Overview of existing park activities and studies occurring within the park
xi. Equipment care and upkeep

b. Returning staff may not need the full training.

5. Public compliance with resource closures and species management as described in this action addressed via combination of education and outreach efforts and by law enforcement.

Species Monitoring and Management

Pre-nesting and Monitoring

Suitable nesting habitat, both active, historic and newly created habitat for the piping plover and colonial waterbirds (based on last year's of breeding/nesting data) would be closed to the public with symbolic fencing (posts and signs) by April 1st each year. The presence of territorial or courting birds outside of existing closures could further extend these initial closures 150 feet. Wilson's plover are managed when they are present in existing piping plover habitat. Monitoring for piping plovers, American oystercatchers, and colonial waterbirds would begin April 15. Monitoring is to include active and historical nesting areas and potential new habitat as determined appropriate by a qualified biologist. Piping plover monitoring would occur 7 days per week on North and South Core Banks and at least one day per week in other areas. Potential new habitat means habitat recently created, usually by storms, e.g. overwash passes, blowouts, etc. A range of observation activities would occur for bird species across pre-nesting, nesting, migration, and over-wintering life-stages and include such things as: observing and noting adult behavior, identifying scrapes, nests, eggs, broods, and chicks, and providing outreach and education materials. Training and personnel used are described above in Overarching Framework.

Nesting and Foraging

When nests are found, park staff would collect data on bird behavior, location of nests, and presence of predators. Park staff would ensure adequate buffers are provided within existing closures or create buffers for the nests that are found outside of existing closures. Buffer sizes vary according to bird species. A 150 foot buffer, from which all recreational uses would be restricted, would be established around any piping plover or colonial waterbird nests, with additional buffer provided if warranted based on observed bird behavior. Staff would erect predator exclosures directly over piping plover nests when they contain 3-4 eggs. Nesting areas would be monitored for predators.

Unfledged Chicks

Piping Plovers. Park staff will monitor piping plover chicks 7 days/week on North and South Core Banks and at least one day per week in other areas. A 600 foot buffer will be maintained around all chicks. If chicks move to the ocean beach then this area will be closed to ORV access with the potential for limited escorts in those areas (North Core Banks) where no backroad is present.

American oytstercatchers and colonial waterbirds. If oystercatcher chicks are present on beach then the park will close the beach to vehicles and route traffic onto the backroad. In areas where there is no backroad system, then ORV traffic would be allowed past the area at 15 mph with signs warning operators of flightless chicks in the area. Areas closed to ORV traffic would be reopened after chicks fledged or were lost. Closures would be adjusted based on chick movement with a minimum 300 ft buffer. Closures will move with chicks.

Observational data collected would include brood status, behavior, movements, and effects of human presence, predator tracks, or other environmental interactions.
Migrating/Wintering Plover. Park staff will survey entire seashore non-breeding population once per month. The park will also 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.

Sea Turtles

Cape Lookout National Seashore follows sea turtle management guidelines defined by the North Carolina Wildlife Resources Commission (NCWRC) in *Handbook for Sea Turtle Volunteers in North Carolina* (2002) and the USFWS Index Nesting Beach Survey Protocol. An annual permit is issued by NCWRC under the authority of the U.S. Fish and Wildlife Service. Beaches would be patrolled daily between June 1 and August 15 on North and South Core Banks and 2 to 3 days per week on Shackleford Banks in search of turtle crawls (tracks left by the turtle when they come ashore to nest). Monitoring for sea turtle nests prior to June 1 would be conducted by piping plover monitoring staff during their normal monitoring routines.

Each located nest is marked with 4 stakes: 2 white PVC stakes w/ orange reflector tape 5 feet apart spanning nest and perpendicular to shoreline and 2 wooden stakes at primary dune line a set distance perpendicular to the shoreline so that the nest can be found should the 2 PVC stakes be lost. 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 are relocated according to USFWS and NCWRC recommendations. Fifty days after a nest is laid, a funnel shaped closure is erected from nest to 15 feet below high tide line. The closure is 30 ft wide at nest and 60 feet wide below high tide line, with a minimum 10 ft buffer duneward of the nest. If a 10 ft minimum buffer is not possible, the beach is closed to vehicle access and vehicles will be routed around nest via back road. The beach is reopened after the nest hatches.

Three 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 that need to be relocated are relocated to the nearest designated area. No ORVs are allowed on Shackleford

Banks, nests that need to be relocated here are relocated to the nearest suitable habitat. Nests are relocated within 12 hrs after eggs laid or 14 days after the nest was laid.

Camping and campfires prohibited in nest relocation closures to prevent disturbance of hatchlings by artificial lights. Park encourages concessionaires and people staying in park cabins to minimize use of outdoor lights. For nests in locations deemed vulnerable to light pollution, 2-ft high plywood barriers will be erected behind and to the sides of the nest 10 days before estimated hatch date.

Seabeach Amaranth

On June 1, begin monitoring habitat outside existing avian closures 1-2 days per week for seedlings/juvenile plants. Conduct annual survey in late July or early August to track plant numbers and distribution and identify areas for closure. Survey covers habitat but concentrates on where plants have been found before (historic sites). Thorough searches conducted in all areas of suitable habitat and results mapped using GIS. Symbolic fencing would be erected around all emergent plants in areas with ORV traffic. These closures would remain in place until the end of the plant's growing season (late fall/early winter or earlier due to overwash). The size of closure based on best professional judgment but with at least a minimum 30 ft buffer around plants. Bird and turtle closures would be surveyed for seabeach amaranth prior to opening them to ORV traffic.

Recreation

ORV traffic is allowed in a corridor along the shoreline, as long as there is at least a 150 ft buffer from active piping plover nests. Once chicks are mobile the buffer increases to 600 ft. When a chick is found using the ocean beach, the area would be immediately closed to ORV's. The closure remains in effect until the chicks move to a different location or are capable of sustained flight. When the beach is closed due to the presence of chicks, pedestrian access is maintained. The full closure around active piping plover nesting sites prohibit ORV and pedestrian access.

ORV traffic would be routed to the backroad via designated ramps when American oystercatcher chicks are present on the beach. In areas without a backroad, ORV traffic would be allowed at 15 mph, with signs warning operators of flightless chicks in the area. Closed areas reopened to ORV traffic after chicks fledged or lost.

When colonial waterbird nests hatch, the Cape Lookout Point beach area would be closed to vehicle access when chicks present on beach.

ORV's would be prohibited from entering sea turtle nest relocation areas 50 days after first nest laid/relocated until after the last nest has hatched. ORV's must use back road to detour around these areas. Outside of nest relocation areas, ORV's prohibited from entering turtle closures erected 50 days after first nest is laid until after the nest hatched. Where possible, ORV traffic routed around the nest on the duneward side, maintaining a minimum buffer of 10 ft or more based on topography and professional judgment. If sufficient minimum buffer is not possible, then the beach is closed to through traffic and ORV's are required to use the backroad to circumvent nest. This type of total beach closure encompasses area between the nearest access ramps on either side of the nest. Pedestrian access is allowed in turtle closures.

A 30 ft buffer ORV buffer is maintained around Seabeach Amaranth.

Pets should be leashed and under control of their owners at all times in all areas of the park (36 CFR Sec. 2.15 Pets). Pets prohibited from all active closure areas.

Outreach and Compliance

The seashore will station one person at each of the two vehicle ferry landings seven days a week from April 1 to November 31 to relay educational information about species and closures. The park would continue to provide information about endangered species at the visitor's center. Articles would be provided in the park newspaper and on the website. In addition, the public would be notified of closures that would temporarily limit ORV traffic via the park's website, press releases, or through visitor contacts at the vehicle ferry landings.

Annual reports regarding the previous bird breeding season would be published on the park website. A variety of educational materials are available at the park's visitor center regarding the impacts of trash-disposal, wildlife-feeding, fireworks, and pets. These materials will be distributed through ferry operators and community organizations. In addition, interpretive signage is being developed for certain species.

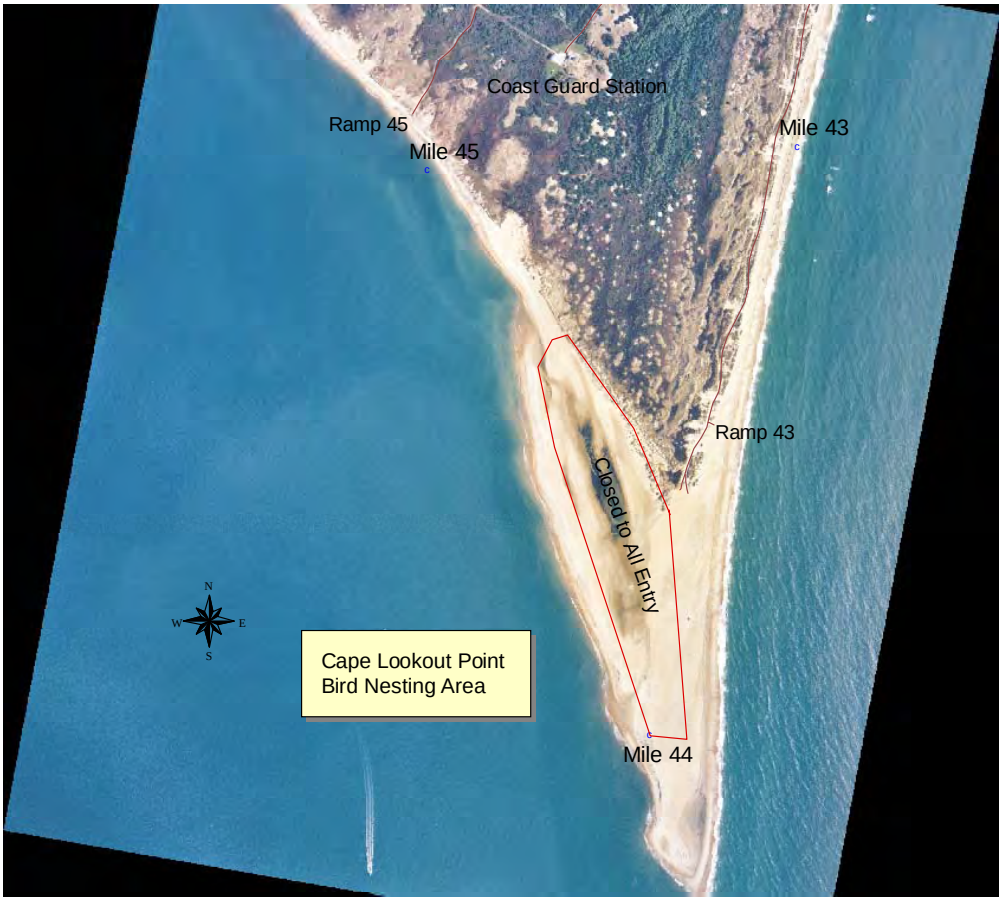
Staffing/Cost

Costs of implementing this alternative would include the same costs described under the no-action alternative (Continuation of Current Management Practices), plus costs of hiring additional interpretive and resource management staff and materials for interpretation, education and outreach. The costs would include renting cabins from the concessionaire so that staff may stay on the islands which greatly increase their efficiency in completing their tasks.

Cost Estimate—Preferred Alternative

Action	Assumptions	Costs
Natural Resource Management	1 seasonal bio-tech, 2 12 week SCA's, 1 RM specialist, and 50 % of Chief, no additional funding required. Additional funding required for 1 seasonal bio-tech, and 2 6-month SCA's .	Based funded positions plus: Staff: $40,500; Materials & Housing: $62,50000 Total additional: $103,000 Total (base + additional) annual costs = $258,500
Interpretation/Visitor Education/Outreach	13% of Chief Ranger, 25% of: 2 full-time interpreters, two seasonal interpreters, one park guide and 1 6-month SCA, focused on species protection Additional funding for 4, 6-month seasonal interpretive positions stationed 7 days per week at Long Point and Great Island vehicle ferry landings.	Based funded positions plus: Staff: $66,00; Materials & Housing: $55,000 Total addition: $121,000 Total (base + additional) annual costs= $197,088, focused on species protection
Law Enforcement	No additional law enforcement staff.	No additional costs.

APPENDIX B
CAPE LOOKOUT'S MAJOR CLOSURES TO PROTECT NESTING BIRDS


Coast Guard Station
Ramp 45
Mile 45
Mile 43
Ramp 43
Closed to All Entry
N
W
E
S
Cape Lookout Point
Bird Nesting Area
Mile 44


N
W
E
S
Whalebone Flats
Mile 6
Kathryne-Jane Flats
Bird Nesting Area
7


Core Sound
Haywood Weeks
Lease
Mile 21
N
W
E
S
Middle Core Banks
Bird Nesting Area
New Drum Inlet


New Drum Inlet
Core Sound
South Core Banks-New Drum Inlet
Bird Nesting Area
N
W
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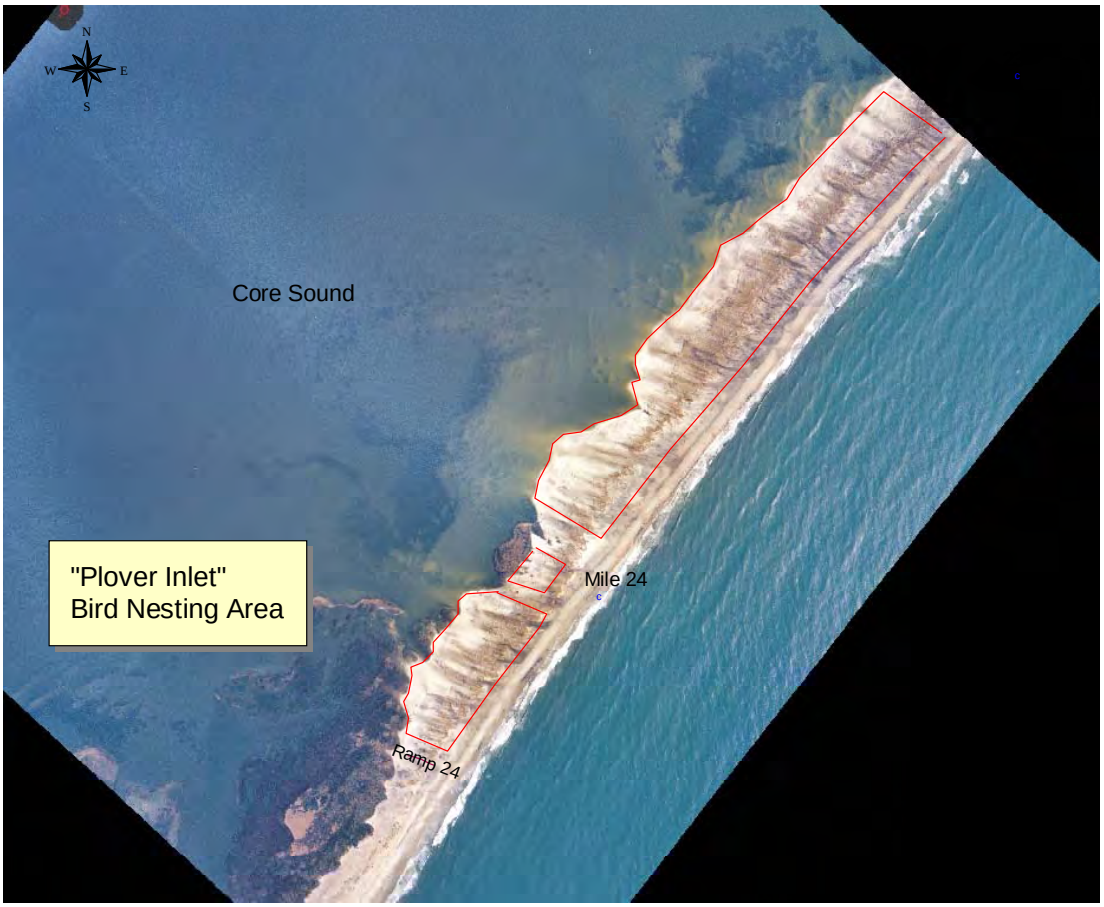
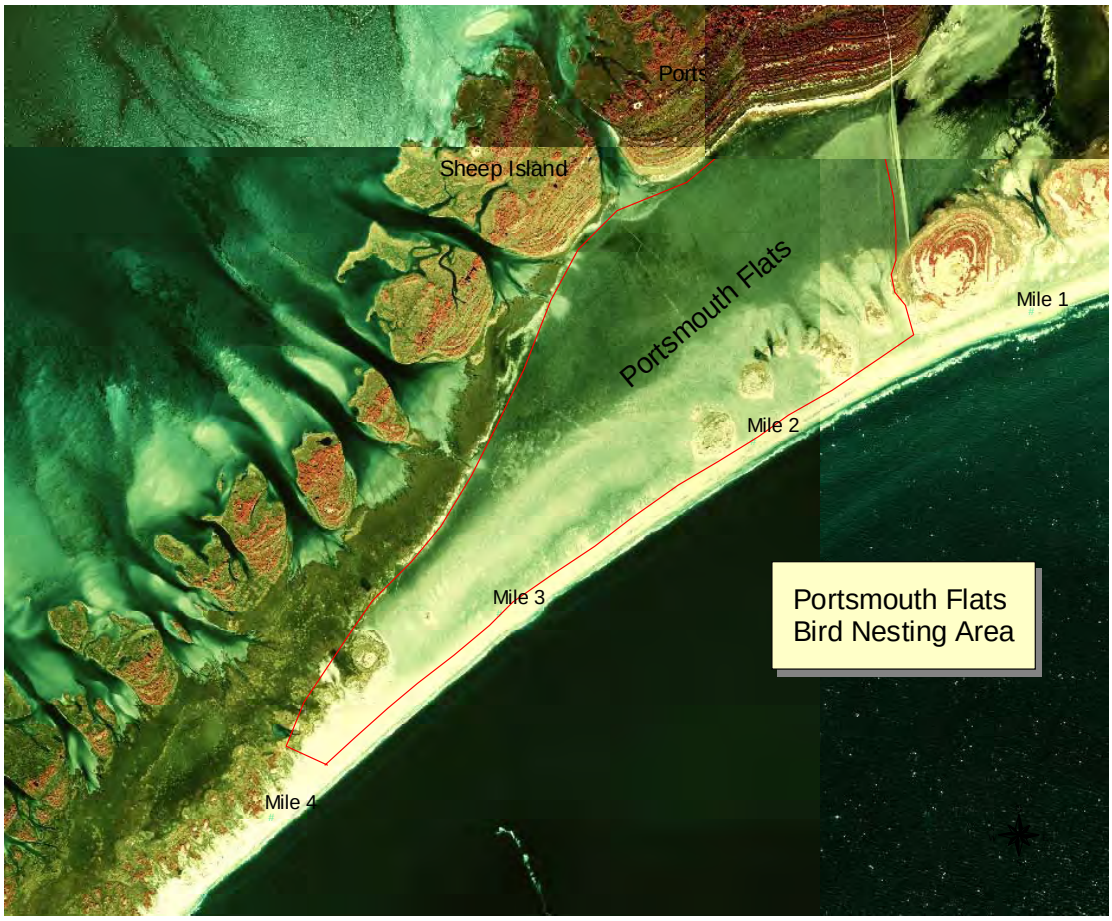

N
W
E
S
Core Sound
"Plover Inlet"
Bird Nesting Area
Mile 24
Ramp 24


Ports
Sheep Island
Portsmouth Flats
Mile 1
Mile 2
Mile 3
Mile 4
Portsmouth Flats
Bird Nesting Area


N.C. COAST
9:46
Power Squadron Spit
Bird Nesting Area
Mile 47
Atlantic Ocean
Cape Lookout Bight
N
W
E
S

APPENDIX C

2005 TURTLE PROGRAM PROCEDURES

The basic procedures for the 2005 sea turtle program are outlined below. The monitoring program encompasses both turtle nesting activity and turtle strandings. The primary goal of the program is to ensure continued survival of sea turtles. This is done by:

- collecting data that can be used by the NPS and other organizations in developing sea turtle conservation programs
- protecting sea turtle nests and hatchlings

These procedures outline the basic organization of monitoring staff, describe field identification of nesting activities, and provide instructions on the monitoring system. In order to standardize data collection methodology and provide year to year consistency of data collection Cape Lookout will adopt the U.S. Fish and Wildlife's "Index Nesting Beach Survey Protocol". This protocol is given in Attachment 7.

ORGANIZATION OF MONITORING PROGRAM STAFF

The organization of the sea turtle monitoring staff is as follows:

Resource Management Specialist (RMS)
- Oversees the total program and assures all permits are current
- Acts a liaison with other agencies
- Represents CALO at public hearings regarding sea turtles
- Reviews and routes turtle related reports to appropriate authorities

Field Coordinator
- Reviews turtle activity reports
- Checks nest sites for proper marking
- Provides field guidance on locating nests, relocations, marking and follow-up
- Assures turtle monitoring staff are carrying out the program as described in the procedures
- Purchases related supplies and equipment
- Schedules staffing requirements
- Ensures follow-up checks are conducted on all nests and digs
- Completes the annual turtle program summary report

TYPES OF NESTING ACTIVITIES AND FIELD IDENTIFICATION TECHNIQUES

Nesting activity is defined as any terrestrial activity by sea turtles possibly related to nesting. There are three types of nesting activities. Determining the type of nest activity is the initial step in field observations. The types of nesting activities and field techniques for identifying them are:

Nest: Nesting occurs when eggs have actually been laid. Usually, there is a body pit associated with a nest. A body pit is a large shallow depression or disturbance made in the beach from the turtle's initial digging activities; loggerhead body pits are about 2.5' in diameter and 6" deep. There are tracks associated with nesting activity. Loggerhead tracks are approximately 3.5' to 4' wide.

Choose the most likely spot(s) in the body pit and carefully dig down 10 to 15 inches by hand to locate the nest. You may determine the most likely spot by determining the direction of the turtle crawl and digging on the trailing edge of the body pit. The actual nest may be anywhere in or at the edge of the body pit. A methodical approach may be the easiest and most effective way of locating nests. Place surveyor flags in a circle around the area in which the nest is most likely to be found. Such a circle should encompass an area larger than the typical body pit. Divide the circle into quarters and excavate one quarter at a time. Do not refill any portion of the circle until either the nest is found or the entire circle has been checked. Nests are often difficult to find; you may have to dig several times to locate the nest. If eggs are found, do not disturb them unless the nest is to be relocated, refill the nesting area with sand. Pack the sand tightly; this is important for proper incubation.

Dig: A dig occurs when the turtle excavates a body pit or disturbs a large amount of sand but does not lay eggs. A nest is occasionally misidentified as a dig because an egg chamber is difficult to find, often because the body pit is indistinct or obscured by the turtle's activities. For this reason, every "dig" will be accurately marked, recorded, and monitored just as if it is a confirmed nest.

Crawl: Crawls are defined as turtle tracks that are not associated with any type of digging activity by the turtle. Crawls will only be counted if they extend above the most recent high tide line.

TURTLE NESTING ACTIVITY MONITORING SYSTEM

A uniform system to locate, mark, and record turtle nesting activity is necessary for coordinating staff efforts in collecting related data. This will enhance the long-term value of the data collected by making it easier to analyze and retrieve data. Equipment and materials needed for the monitoring program are listed in attachment 1.

Mile Markers: Mile markers are the primary means of recording locations of sea turtle nesting activity. It facilitates determining concentrations of nesting activity and relocating nests for follow-up. Beach areas are marked at one-mile intervals. Attachment 2 shows the "mile marker locations." More information on using the markers is contained in the instructions for completing the "Turtle Nest Data Sheets" (Attachment 3A).

Marking Nesting Activity Sites: Techniques for marking each activity are given below.

Nest Marking: Each nest is marked with four stakes. Stake #4 is placed two feet from the seaward side of the egg chamber. Stake #3 is placed three feet from the dune side of the egg chamber. Stake #1 is placed at the primary dune line and perpendicular to the shoreline (See attachments 4 and 4A). Stake #2 is placed three feet from the seaward side of stake #1 and in line with stakes #1, 3 and 4.

If the nest is laid behind the dune line, also place an extra stake at least 25' seaward of stake #4 so that it may be seen from the beach but not be below the high tide line.

The nest number will be written in waterproof ink on stakes number 1 and 3. This will facilitate identifying nests at a later time. This number is assigned from the "Activity No." column of the "Master Log of Sea Turtle Nesting Activity" (Attachment 5 and 5A). When marking a nest or dig measure 12" up from the surface of the sand at stakes #3 and 4 and mark the stakes at this height with a line completely around the stake using a permanent marker. Observe the mark daily for drastic sand deposition or erosion. Around the time of hatch, level sand over the nest to the original 12" mark.

Dig Marking: Digs will be marked the same as nests. Since the location/existence of any associated nest is in doubt, use the center of the body pit for the nest as a reference in setting stakes. This will require that you carefully excavate the stake locations by hand to check for presence of eggs prior to setting stakes.

Crawl Marking: Simply flag the highest point of the crawl. The flag should be removed when the tracks are no longer visible.

Recording Nesting Activity: Records of sea turtle nesting activity are kept on "Turtle Nest Data Sheets" (Attachment 3) and the "Master Log of Sea Turtle Nesting Activities" (Attachment 5 and 5A). Individual data sheets are used for each nest and dig. The log is used to summarize and keep track of turtle activities. Attachment 3A provides instructions on completing data sheets.

GPS Locations: The latitude and longitude of all activities will be recorded using a Garmin GPS unit. To mark a position press “mark” and “enter.” The waypoint number should be the same as the activity number on the Master Log.

Relocating Nests: Nests laid at or below the high tide line or in areas where they are likely to be washed away will be relocated. Three areas on each island will be designated as closed to vehicles and nests will be relocated into the closed area closest to the original nest site. Attachment 8 indicates which areas will be closed to vehicles for relocation purposes. Nests on Shackleford Banks will be relocated to the nearest suitable area.

Nests should be relocated within 12 hours after the eggs were laid or wait until 14 days after the date the nest was laid. The following procedures should be followed for relocating nests.

1. Dig a nest cavity, approximately 18" deep and 12" wide in a suitable location.
2. Place approximately 6" of cool sand (from the nest cavity) in the bottom of a bucket.
3. When relocating a nest, be careful not to rotate the eggs.
4. Gently move the eggs from the nest into the pail.
5. Fill in the original excavation and mark with a surveyor flag. After wind, rain, or tide has erased the tracks, remove the surveyor flag.

6. Transport the eggs preferably by foot to the new nest site. If the eggs must be moved by vehicle, do so slowly and try to minimize jarring.
7. The eggs should be placed in the new nest site in the same layered fashion as the original nest.
8. Cover the eggs with sand.

This process should be completed quickly so that the temperature of the eggs will not change drastically.

PROTECTING NESTS

Nest protection will start as soon as the nest is discovered. "Digs" will be treated as "nests." Each nest will be staked/marked as described in attachments 4 and 4A. The main purpose of the stakes is to warn ORV Drivers away from nests and facilitate relocating nests later.

Place a 3' by 3' (2"x 4" mesh) screen over each nest. The 4" side of the wire opening should be parallel with the waterline. Anchor the four sides down with steel rebar and cover with 1" to 2" of sand. The screen is designed to protect the nest from raccoon predation. Some nests on SCB will be covered with a 3'x3'x2' wire cage to prevent raccoons from digging through the screen. Bury the edges of the cage about 6" and anchor it with rebar.

After 50 days have passed the turtle monitoring staff will erect a funnel-shaped barricade around those nests/digs not in protected areas from the nest to a point at least 15 feet below the high tide line and smooth any ORV tracks in the enclosure. (The barricade should extend down to a point where the sand is usually hard enough to prevent formation of tire ruts). Attachment 6 diagrams the closure. This action provides a natural beach surface for the hatchlings to crawl to the ocean, protecting them from becoming trapped in ORV tracks. This barricade is removed after the nest is excavated. Barricade stakes will also be wrapped in orange or red reflector tape.

FOLLOW-UP ON NESTS AND DIGS

Follow-up of nesting activity involves excavating nests, looking for signs of turtle hatching, and recording related data.

Follow-up of nesting activity begins fifty days after the nest was laid. Smooth the sand over and around the nest to a height equal to the original sand level indicated by the 12" line on stakes #3 and 4. This facilitates observing the small (2" to 4" inch) depression usually formed in the sand above the nests when hatching begins. Smoothing the sand also facilitates observing hatchling tracks. Excavate the nest on the fifth day after a major hatch (indicated by distinctive hatchling tracks), 10 days after the depression forms, or excavate the nest 75 days after the date laid if there has been no sign of hatching. If many live hatchlings are found in the nest, simply refill the nest with sand and continue to check until hatching occurs. Check the condition of the hatchlings prior to placing them back in the nest. If the egg yoke sack has not been fully absorbed by the hatchlings, then place them

back in the nest, cover lightly with sand and allow them to complete this process. If the hatchlings are weak and or dehydrated (plastrons concave) they should be released as soon as possible. If there are hatchlings with fully absorbed egg yokes found in the nest after the main hatch, release them in the evening hours, preferably after dark. Such hatchlings should be allowed to crawl at least a short distance of beach and enter the ocean under their own power. Create/maintain a clear path to the ocean for the hatchlings; visitors should be kept back from the hatchlings to avoid stressing them. *It is a violation of our permit to dig into nests prior to hatch.*

When motionless hatchlings (apparently drowned) are located in a recently flooded nest, the following resuscitation efforts should be attempted.

1. Remove the hatchling from the water.
2. Invert hatchlings (head lower than tail).
3. Stimulate hatchlings by slight compressions of the plastron.
4. Raise the head to provide an open airway.
5. Continue stimulating for approximately 15 minutes.

If the hatchlings regain consciousness, monitor their progress and assist them in reaching the surf.

During late fall excavations, if sluggish turtles are located well after the 75-day normal incubation period, these measures may be taken.

1. Remove the turtles from the nests.
2. Allow them to warm on the sand or in a warm tidal pool until they become more active.
3. Assist the turtles to hard packed sand near the surf. If the turtles do not respond, the N.C. Aquarium may be telephoned for possible long-term care.

Digs are monitored daily beginning 10 days prior to estimated hatch date and ending at hatch or 75 days from date of lay, whichever occurs first. Look for signs of a depression or hatchling tracks within a 15-foot radius of the nest stakes.

Complete the "Hatching Data" section of the Turtle Nest Data Sheet. Remove the turtle nest stakes.

EQUIPMENT AND MATERIALS
FOR
SEA TURTLE NEST MONITORING PROGRAM

ITEM	DESCRIPTION	QUANTITY
Marker stakes	PVC 1 1/4" x 5' post and Wood 2"x2"x5' post	2 per nest 2 per nest
Post hole diggers		
Turtle monitoring kit	in pack, with contents as described below	1 for each island
Orange reflective tape	2" wide	
Tape measure	100'	
Marker	waterproof (permanent ink or paint)	
Pens		
Clip board	standard size	
Binder	for data sheets	

APPENDIX D

BIRDS OF CONSERVATION CONCERN

Colonially Nesting Waterbirds using ocean beach habitat at Cape Lookout National Seashore and Recent Population Trends:

- Least Tern (*Sterna antillarum*): Apparently Stable. The number of nesting pairs fluctuates (583 nesting pairs in 1993 to 218 pairs in 2004) but the long-term population at CALO seems to be stable. Accurate counts of nesting least terns can be difficult because of high rates of nest losses. A species of "high conservation concern" on the N.C. Bird Watchlist.

- Common Tern (*Sterna hirundo*): Declining. The number of nesting pairs in the park fell from 582 in 1993 to only 28 in 2004. A species of "high conservation concern" on the N.C. Bird Watchlist.

- Gull-billed Tern (*Sterna nilotica*): Declining; Now rare at CALO as a nester. The number of nesting pairs in the park fell from over 50 in 1992 and 1993 to none in 2004. This species is listed as "threatened" by the state of North Carolina.

- Black Skimmer (*Rynchops niger*): Declining. The number of nesting pairs fell from over 300 in 1993 to 72 in 2004. Listed as a state species of special concern.