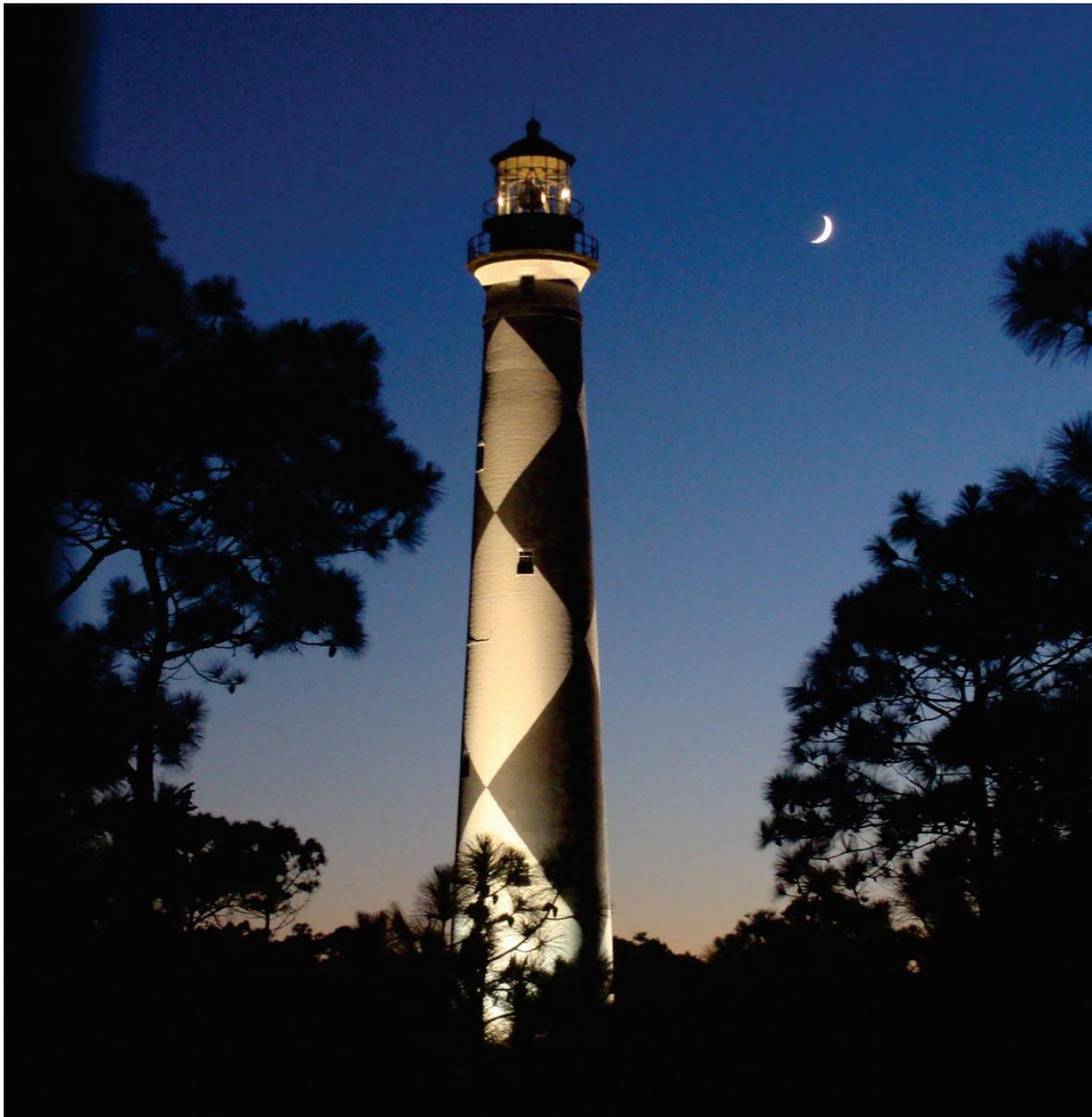




State of the Park Report

Cape Lookout National Seashore North Carolina



2014

On the cover: Cape Lookout Lighthouse at night, during the 150th anniversary celebration of the lighthouse.

Disclaimer. This State of the Park report summarizes the current condition of park resources, visitor experience, and park infrastructure as assessed by a combination of available factual information and the expert opinion and professional judgment of park staff and subject matter experts. The [internet version](#) of this report provides the associated workshop summary report and additional details and sources of information about the findings summarized in the report, including references, accounts on the origin and quality of the data, and the methods and analytic approaches used in data collection and assessments of condition. This report provides evaluations of status and trends based on interpretation by NPS scientists and managers of both quantitative and non-quantitative assessments and observations. Future condition ratings may differ from findings in this report as new data and knowledge become available. The park superintendent approved the publication of this report.

Executive Summary

The mission of the National Park Service is to preserve unimpaired the natural and cultural resources and values of national parks for the enjoyment, education, and inspiration of this and future generations. NPS Management Policies (2006) state that “The Service will also strive to ensure that park resources and values are passed on to future generations in a condition that is as good as, or better than, the conditions that exist today.” As part of the stewardship of national parks for the American people, the NPS has begun to develop State of the Park reports to assess the overall status and trends of each park’s resources. The NPS will use this information to improve park priority setting and to synthesize and communicate complex park condition information to the public in a clear and simple way.

The purpose of this State of the Park report is to:

- Provide to visitors and the American public a snapshot of the status and trend in the condition of a park’s priority resources and values;
- Summarize and communicate complex scientific, scholarly, and park operations factual information and expert opinion using non-technical language and a visual format;
- Highlight park stewardship activities and accomplishments to maintain or improve the State of the Park;
- Identify key issues and challenges facing the park to help inform park management planning.

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

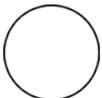
Significance statements express why the park unit’s resources and values are important enough to warrant national park unit designation. The following significance statements have been identified for Cape Lookout National Seashore (statements are in no particular order):

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

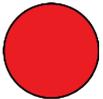
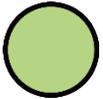
The summary table, below, and the supporting information that follows, provides an overall assessment of the condition of priority resources and values at Cape Lookout National Seashore based on scientific and scholarly studies and expert opinion. The internet version of this report, available at <http://www.nps.gov/stateoftheparks/caloc/>, provides additional detail and sources of information about the resources summarized in this report, including references, accounts on the origin and quality of the data, and the methods and analytical approaches used in the assessments. Reference conditions that represent “healthy” ecosystem parameters, and regulatory standards (such as those related to air or water quality) provide the rationale to describe current resource status. In coming years, rapidly evolving information regarding climate change and associated effects will inform our goals for managing park resources, and may alter how we measure the trend in condition of park resources. Thus, reference conditions, regulatory standards, and/or our judgment about resource status or trend may evolve as the rate of climate change accelerates and we respond to novel

conditions. In this context, the status and trends documented here provide a useful point-in-time baseline to inform our understanding of emerging change, as well as a synthesis to share as we build broader climate change response strategies with partners.

The Status and Trend symbols used in the summary table below and throughout this report are summarized in the following key. The background color represents the current condition status, the direction of the arrow summarizes the trend in condition, and the thickness of the outside line represents the degree of confidence in the assessment. In some cases, the arrow is omitted because data are not sufficient for calculating a trend (e.g., data from a one-time inventory or insufficient sample size).

Condition Status		Trend in Condition		Confidence in Assessment	
	Warrants Significant Concern		Condition is Improving		High
	Warrants Moderate Concern		Condition is Unchanging		Medium
	Resource is in Good Condition		Condition is Deteriorating		Low

State of the Park Summary Table

Priority Resource or Value	Condition Status/Trend	Rationale
Natural Resources web ▶		
Air Quality		For 2005–2009: sulfur and nitrogen wet deposition conditions warrant significant concern; average visibility condition warrant significant concern; and ozone condition warrants moderate concern. Condition levels are based on NPS Air Resource Division benchmarks .
Geologic Features and Processes		The Seashore’s 56 miles of barrier islands provides one of the best examples of a dynamic coastal barrier island system in the world. When allowed to respond naturally, these barrier islands are best able to protect the North Carolina mainland from the devastating losses that might otherwise result from hurricanes and other storm surges. Evidence of sediment loss is evident throughout the park, which is of concern given potential loss of cultural resource sites and structures.
Water Quality		Due to its isolation from the mainland and limited development, CALO water quality remains relatively pristine, and water quality is much better at sampling sites inside CALO than surrounding areas (Parman et al. 2012).
Plant and Wildlife Communities		The park supports a rich variety of plant and animal species, including 596 species of vascular plants, 10 species of amphibians, and more than 600 species of birds that have been documented in the park. Exotic plants are present in the park, but presumed to be in relatively low numbers as compared to other park units in the Southeast.

Priority Resource or Value	Condition Status/Trend	Rationale
Protected Species of Management Concern		The horse herd on Shackleford Banks is currently at a sustainable population size. Populations of four species of nesting sea turtles in the park (loggerhead, green, leatherback, and Kemp’s Ridley) seem to be stable based on park monitoring efforts, but the number of sea turtle strandings has been increasing. The number of breeding pairs of Piping Plovers and the fledging rate has been increasing. Park staff recorded 13 strandings of marine mammals in 2012, with the most common species being Bottlenose dolphin. Numbers of seabeach amaranth, a federally-listed threatened plant species, have decreased significantly during the past 20 years.
Dark Night Sky		Visitors to Cape Lookout NS can experience one of the darkest night skies along the eastern seacoast, but the amount of light pollution relative to other locations nationwide is considered of moderate concern based on NPS standards.
Cultural Resources web ▶		
Archeological Resources		The 152 known archeological sites at the Seashore span prehistoric and historic time periods, but most are historic structures or structural ruins associated with two National Register districts at Portsmouth and Cape Lookout. Most of the park, between these two locations, comprising the Core Banks, has not been adequately surveyed to determine what archeological sites may be present. Shackleford Banks has been pedestrian-surveyed for archeological sites, and it is believed the most significant sites on this island have probably all been identified.
Cultural Anthropology		Cape Lookout National Seashore contains a rich concentration of cultural resources that tell the history of people living at the edge of the sea, dating from approximately 3000 B.C. to the present (i.e., Portsmouth Village, The Lighthouse, and the Life-saving Station). However, to date there has been only one documented ethnographic overview and assessment conducted at the site.
Cultural Landscapes		A Cultural Landscape Report was completed for Cape Lookout Village Historic District in 2005 and Portsmouth Village Historic District in 2007. There have been no Cultural Landscape Inventories completed for Cape Lookout. However, the poor condition of some of the district’s features currently threatens the integrity of design, materials, and workmanship.
Historic Structures		Several of the park’s historic structures have already been lost to or heavily damaged by storm surge and wind during tropical storms, hurricanes, or nor’easters. Aging materials, especially ferrous nails and other fasteners, make all but the lighthouse increasingly susceptible to storm damage with each passing year. If current projections are correct, rising sea levels will almost certainly destroy most, if not all, of the historic structures at Portsmouth and many of the historic structures at Cape Lookout Village before the end of the century. Only a fraction of the park’s historic structures have been adequately documented in the event of that catastrophic loss.
History		Importantly, a recent Historic Resource Study (HRS) has been written for the park, providing contemporary perspectives and analysis that can assist park staff and programs that deal with historic resources. This document should be a staple reference for Interpretation, Facilities Management, and all aspects of historic resource preservation. The HRS can also serve as the basis for updating the park’s National Register nominations. The park needs an Administrative History to help complete the history of park operations at CALO.

Priority Resource or Value	Condition Status/Trend	Rationale
Museum Collections		The museum collection is important as it is wholly relevant to the local community and park resources. The management of the collection is relatively static; however, archival, archeological, and natural resource collections continue to grow. In 2005 the entire collection in storage was moved to Cape Hatteras National Seashore. The overall condition of the collection is currently Good, but there are concerns about being able to maintain the level of stewardship with one Archives Technician managing four distinct museum and archival collections.
Visitor Experience web ▶		
Number of Visitors		The total of 480,294 visitors to Cape Lookout National Seashore in 2012 was 19% lower than the 5-year average of 597,550 visitors for 2007–2011.
Visitor Satisfaction		Based on the standard visitor satisfaction survey conducted each year, the percentage of visitors satisfied in FY12 was 96.0%, which is similar to the average for the previous five years (96.8%) and ten years (95.2%).
Interpretive and Education Programs – Talks, Tours, and Special Events		The number of participants in formal interpretive programs in 2012 was the highest in 5 years, and the number of students participating in education programs presented by park staff has increased over the three-year life of the program. More than 11,000 participants toured the Cape Lookout lighthouse in 2012. However, with recent reductions in budget and staffing, the park may not be able to sustain this level of service.
Interpretive Media – Brochures, Exhibits, Signs, and Website		New exhibits were installed in 2007 at the Harkers Island Visitor Center and at the Keepers Quarters Museum, and in 2009 at four historic buildings in Portsmouth Village. More than 90 interpretive and orientation wayside exhibits have been installed park-wide since 2009. A new park orientation film was developed that is fully accessible and describes the park with a more regional and global context. The website content is improving and the park is using social media and a cell phone tour to provide up-to-date information to visitors. However, some of the waysides are showing advanced weathering and rust and will need replacement soon.
Accessibility		The dynamic nature of a sandy barrier island that moves and is overwashed during storms makes it extremely challenging to provide fully-accessible facilities and exhibits. The visitor center and picnic area on Harkers Island are accessible to visitors with limited mobility, but areas on the barrier islands are not accessible. The park currently does not meet standards for visual and auditory accommodation for many of the exhibits and programs.
Safety		The safety of visitors is a park priority. The park works to quickly identify and mitigate potential hazards, and the number of accidents is very low. The recorded number of law enforcement incidents has been steadily increasing.
Volunteers and Partnerships		Virtually all visitor services functions depend on park volunteers, with 279 volunteers contributing more than 20,000 hours of service to the park in 2012.

Priority Resource or Value	Condition Status/Trend	Rationale
Park Infrastructure web ▶		
Overall Facility Condition Index		The overall Facility Condition Index for 300 assets for FY12 is 0.012, which is Good based on industry and NPS standards.
Energy Consumption		Energy usage (BTUs per gross square footage of buildings) at the park in 2012 was 22.9% lower than the average for the previous 4 years.
Water Consumption		Water consumption at the park in 2012 was 5% lower than the 4-year average for 2008–2011.
Wilderness Character web ▶		
Overall Wilderness Character		The extraordinary landscape and variety of ecological systems create a unique natural character in the proposed Shackleford Banks wilderness. Natural processes predominate, and there are few actions that control or manipulate the earth processes within the wilderness. The outstanding opportunity for solitude and recreation remains a fundamental characteristic of the area, with opportunities for hiking, backpacking, camping, sightseeing, stargazing, nature studying, and wildlife viewing.

Summary of Stewardship Activities and Key Accomplishments to Maintain or Improve Priority Resource Condition:

The list below provides a few examples of stewardship activities and accomplishments by park staff and partners to maintain or improve the condition of priority park resources and values for this and future generations. See Chapter 3 for a more complete list:

Natural Resources

- Continual protection and monitoring of protected animal and plant species including: sea turtle nesting activities since 1990s; piping plover nesting activities since 1989; American oystercatcher nesting activities since 1995; sea beach amaranth since 1992; seasonal migration surveys of red knots and Wilson’s plovers since 2006; sea turtle and marine mammal strandings since 1989; colonial nesting shorebird areas since 2006.
- Continued management of horse herd according to federal legislation in partnership with Foundation for Shackleford Horses, Inc.
- Completion of basic natural resource inventories and initiation of long-term monitoring of a subset of the Park’s natural resources by the Southeast Coast Inventory and Monitoring Network (SECN), and completion of a coastal watershed condition assessment and draft natural resource condition assessment.

Cultural Resources

- Completed renovations to improve safe access of the Cape Lookout Lighthouse and opened it to the public in 2010.
- Survey of archaeological sites impacted by Hurricanes Irene (2011) and Sandy (2012).
- Completed “Ethnohistorical Description of Four Communities Associated with Cape Lookout National Seashore.”
- Stabilized six historic structures within the Cape Lookout Historic District, and completed 13 historic structure reports.

Visitor Experience

- The park expanded the Harkers Island Visitor Center and installed new exhibits, a new 60 seat theater with digital and surround sound, and a new Eastern National Bookstore. A new 27-minute HD surround-sound film “Ribbon of Sand” provides visitors with an overview of the entire seashore and that places the seashore in a regional ecosystem context.

- The park has restored the Cape Lookout Light Station Keepers' Quarters and upgraded facilities, including new accessible bathrooms, a visitor center/bookstore, a large shade shelter, a transportation shelter, and boardwalks connecting these facilities from the dock to the ocean beach, and installed new exhibits.
- Portsmouth Village Exhibits: New exhibits were installed in four buildings in 2009, including the Visitor Center, School, Post Office/General Store, and U.S. Life-Saving Station.
- Education/Teacher Resources: The park established an education program in 2010. Since that time the program has reached over 10 schools in Carteret, Craven and Onslow Counties and over 3,000 students. The park received five grants. Through PAC grants the park has prepared over 15 curriculum based teacher resources. The park provides four Traveling Trunks.
- Urban Youth Grant and Ticket to Ride Grant: The park received two grants to bring underserved youth to the park and to provide transportation to allow 500 students to experience the history of the Lighthouse area and the natural and cultural resources of the seashore.

Park Infrastructure

- The park installed a 4-inch water well at the Lighthouse in 2005 and water treatment facilities to provide potable water to the Cape Lookout Light Station area, Les and Sally's, and in the future to the Cape Lookout Village Historic District.
- Solar panels have been installed to fully power the Cape Lookout Lightstation visitor center which will significantly reduce greenhouse gases by eliminating a gas powered generator.
- Energy improvements have been made at the Harkers Island Administration and Visitor Center building by installing new energy efficient windows and blinds, along with installation of programmable thermostats, and upgraded HVAC system and insulation to the auditorium which has reduced energy consumption by nearly 20% over the last two years.
- The park has substantially expanded its recycling program to now include the visitor centers, park picnic areas, and is expanding its program to include the Great Island and Long Point cabin areas and other key locations throughout the park.
- After hurricanes Irene and Sandy, repairs of the park cabins at Great Island and Long Point were made in addition to restoring both water and waste water systems throughout the cabin areas.

Key Issues and Challenges for Consideration in Management Planning

Cape Lookout National Seashore is an important conservation area on the Atlantic Coast that preserves a dynamic intact natural barrier island system where natural ecological processes dominate. This chain of islands provides habitat to a variety of species of special concern including the piping plover, American oyster catcher, and other shorebirds; nesting sea turtles; and the Shackleford Banks wild horse herd. The Park preserves two National Historic Districts that include several key structures, including the Cape Lookout Lighthouse, representing over two centuries of federal efforts to protect maritime commerce and human lives.

Chapter 4 of this report discusses some of the management issues, challenges, and opportunities that park managers are involved with. A brief summary of some of these key issues are as follows:

Climate Change / Sea Level Rise: The park is very vulnerable to being impacted by the effects of climate change. The highest elevations in the park are dunes that are approximately 15 feet above sea level. The IPCC has project scenarios showing the region experiencing sea levels rising by over three feet by 2100. If these projections become reality, all Park resources would be significantly impacted in one way or another. Managers will be faced with difficult decisions over the preservation of natural and cultural resources.

Special Status Species: The American Bird Conservancy designated Cape Lookout National Seashore as a Globally Important Bird Area in recognition of the value the park provides to bird migration, breeding, and wintering. The park is home to the federally listed piping plover and provides nesting habitat for several state-listed species. Major concerns for conserving this diverse assemblage of birds include recreation management, in particular off-road vehicle management. The Seashore is used as nesting habitat by four federally listed sea turtles: the loggerhead, green, leatherback, and Kemp's ridley. Major concerns for conserving this sea turtle nesting include recreation management, in particular off-road vehicle management. The Shackleford horses are protected by federal legislation. The horse herd is co-managed with the Foundation for Shackleford Horses, and important management issues include maintaining a current horse management plan that focuses on population management in a manner that does not require removal of horses, and continuing educational efforts to prevent human-horse conflicts/interactions.

Recreational opportunities and experiences in a remote setting: The park's recreational opportunities are nationally significant due to the variety and scale afforded by its unique geography and primarily undeveloped character. In addition, multigenerational activities, such as surf fishing, hunting, shelling, and beachcombing celebrate rich cultural traditions. The park is working to develop and implement strategies that ensure public access to the park that is convenient, safe, reliable and accessible. Securing mainland departure sites for the long-term access to the park is critical.

National Historic Districts: Portsmouth Village played a critical role in the conduct of maritime commerce in North Carolina from the colonial period until the American Civil War. It remains an intact village, featuring 21 historic buildings and structures, but the first floor elevations of most of these structures are one-meter or less above sea-level and are at risk to sea level rise. The Cape Lookout Village National Historic District include structures and sites that represent over two centuries of federal efforts to protect maritime commerce and human lives at the Cape , including the 1812 lighthouse (site), 1859 lighthouse and light station, 1886 U.S. Life-Saving Station, and the 1917 U.S. Coast Guard Station. The park is working to complete the documentation of the historic structures, focusing on the most vulnerable structures first, develop management plans for the two districts that factor in climate change and establishes management priorities, and secure funding that will sustain the preservation as outlined in the management plans.

Park Infrastructure and Sustainable Practices: The Park currently has over 300 assets, including historic structure, operation facilities, maintained landscapes, water and sewer systems and array of other structures, and a Park Asset Management Plan (PAMP) was completed to guide management of the park infrastructure. The Park has worked to improve sustainable practices with a heavy focus on reducing energy costs and greenhouse gas emissions. Operations on the islands are typically dependent on energy produced by diesel generators which are not sustainable and require a large amount of staff time to deliver fuel to the islands.

Safety: Safety of park staff, volunteers and visitors is a high priority. The Park is working to train staff and follow the principles of operational leadership, complete and or update required safety plans, and continue to develop a culture where safety is a priority.

Chapter 1. Introduction

The purpose of this State of the Park report for Cape Lookout National Seashore is to assess the overall condition of the park's priority resources and values, to communicate complex park condition information to visitors and the American public in a clear and simple way, and to inform visitors and other stakeholders about stewardship actions being taken by park staff to maintain or improve the condition of priority park resources for future generations. The State of the Park report uses a standardized approach to focus attention on the priority resources and values of the park based on the park's purpose and significance, as described in the park's Foundation Document or General Management Plan. The report:

- Provides to visitors and the American public a snapshot of the status and trend in the condition of a park's priority resources and values.
- Summarizes and communicates complex scientific, scholarly, and park operations factual information and expert opinion using non-technical language and a visual format.
- Highlights park stewardship activities and accomplishments to maintain or improve the state of the park.
- Identifies key issues and challenges facing the park to inform park management planning.

The process of identifying priority park resources by park staff and partners, tracking their condition, organizing and synthesizing data and information, and communicating the results will be closely coordinated with the park planning process, including natural and cultural resource condition assessments and Resource Stewardship Strategy development. The term "priority resources" is used to identify the fundamental and other important resources and values for the park, based on a park's purpose and significance within the National Park System, as documented in the park's foundation document and other planning documents. This report summarizes and communicates the overall condition of priority park resources and values based on the available scientific and scholarly information and expert opinion, irrespective of the ability of the park superintendent or the National Park Service to influence it.

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

Significance statements express why the park unit's resources and values are important enough to warrant national park unit designation. The following significance statements have been identified for Cape Lookout National Seashore (statements are in no particular order):

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

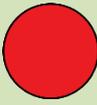
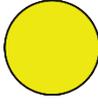
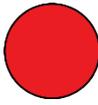
Chapter 2. State of the Park

The State of the Park is summarized below for four categories—Natural Resources, Cultural Resources, Visitor Experience, and Park Infrastructure—based on a synthesis of the park’s monitoring, evaluation, management, and information programs, and expert opinion. Brief resource summaries are provided below for a selection of the priority resources and values of the park. Clicking on the [web ►](#) symbol found in the tables and resource briefs below will take you to the internet site that contains content associated with specific topics in the report.

The scientific and scholarly reports, publications, datasets, methodologies, and other information that were used as the basis for the assessments of resource condition are referenced and linked throughout the report and through the [internet version of this report](#) that is linked to the NPS [IRMA data system](#) (Integrated Resource Management Applications). The internet version of each report, and the associated workshop summary report available from the internet site, provide additional detail and sources of information about the findings summarized in the report, including references, accounts on the origin and quality of the data, and the methods and analytical approaches used in data collection and the assessments of condition. Resource condition assessments reported in this State of the Park report involve expert opinion and the professional judgment of park staff and subject matter experts involved in developing the report. This expert opinion and professional judgment derive from the in-depth knowledge and expertise of park and regional staff gained from their being involved in the day-to-day practice of all aspects of park stewardship and from the professional experience of the participating subject matter experts. This expert opinion and professional judgment utilized available factual information for the analyses and conclusions presented in this report. This State of the Park report was developed in a park-convened workshop.

The status and trends documented in Chapter 2 provide a useful point-in-time baseline measured against reference conditions that represent “healthy” ecosystem parameters, or regulatory standards (such as those related to air or water quality). We also note that climate change adaptation requires us to continue to learn from the past, but attempting to manage for conditions based on our understanding of the historical “natural” range of variation will be increasingly futile in many locations. Thus, these reference conditions, and/or our judgment about resource condition or trend may evolve as the rate of climate change accelerates and we respond to novel conditions. Our management must be even more “forward looking,” to anticipate plausible but unprecedented conditions, also recognizing there will be surprises. In this context, we will incorporate climate considerations in our decision processes and management planning as we consider adaptation options that may deviate from traditional practices.

2.1. Natural Resources

Air Quality		 web ►	
Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Ozone	Annual 4 th -Highest 8-Hour Concentration		The estimated ozone level for 2005–2009 at Cape Lookout NS was 70.8 parts per billion, which is of moderate concern based on NPS Air Resource Division benchmarks . No trend information is available because there are not sufficient on-site or nearby ozone monitor data (NPS ARD 2013). List of ozone-sensitive plant species .
Deposition	Sulfur Wet Deposition		For 2005–2009, estimated wet sulfur deposition was 4.4 kilograms per hectare per year (kg/ha/yr), which warrants significant concern based on NPS Air Resource Division benchmarks . Ecosystems in the park were rated as having low sensitivity to acidification effects relative to national park units nationwide (Sullivan et al. 2011a ; Sullivan et al. 2011b).
	Nitrogen Wet Deposition		For 2005–2009, estimated wet nitrogen deposition was 3.3 kilograms per hectare per year (kg/ha/yr), which warrants significant concern based on NPS Air Resource Division benchmarks . The park may be highly sensitive to nitrogen-enrichment effects relative to national park units nationwide (Sullivan et al. 2011c ; Sullivan et al. 2011d).

Visibility	Haze Index		For 2005–2009, estimated average visibility in Cape Lookout NS was 9.0 deciviews (dv) above natural conditions, which warrants significant concern based on NPS Air Resource Division benchmarks .
-------------------	------------	---	--

Geologic Features and Processes  [web](#) ▶

Cape Lookout National Seashore’s 56 miles of barrier islands provides one of the best examples of a dynamic coastal barrier island system in the world. The barrier islands are constantly reshaped by the dynamic relationship between environmental forces and geography, such as the wind, the tremendous energy of waves and storms, global climate change and the accompanying sea level rise, the supply of sand, and the underlying coastal topography. When allowed to respond naturally, these barrier islands are best able to protect the North Carolina mainland from the devastating losses that might otherwise result from hurricanes and other storm surges.

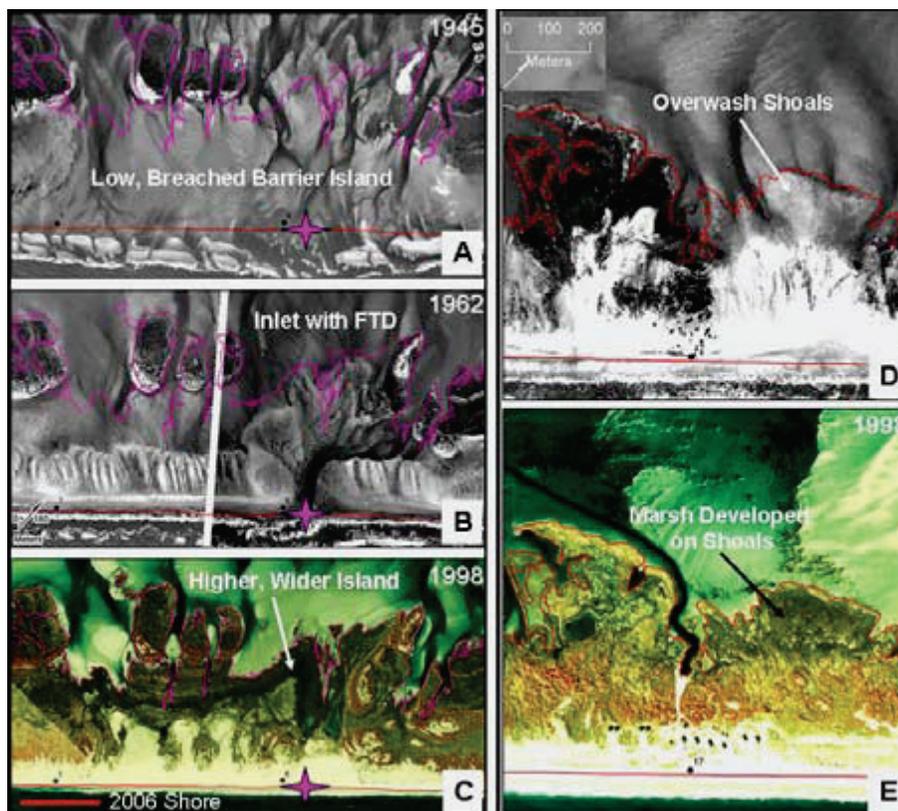
Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Barrier Island Dynamics	Shoreline change		Based on annual beach profile data collected at Shackleford Banks from 2008–2012, annual loss of beach sediments has changed from -1.7 to -9.5 cubic yards per foot, coupled with 4.6 feet of inland migration of shoreline position at the Mean High Water datum. For the 41-year time period of 1960–2001, Riggs and Ames (2007) found that the North Core Banks area had higher average annual rates of both erosion and accretion compared to South Core Banks. Storm-dominated short-term (1960–1962) shoreline erosion rates were -52 ft/yr for North Core Banks compared to -21 ft/yr for South Core Banks, but for the 41-year time period, average erosion rates were -8 ft/yr for North Core Banks and -3 ft/yr for South Core Banks. Average erosion rates ranged from 0 to -30 ft/yr, with an overall net annual average recession rate of -5 ft/yr. These data were in very good agreement with the net long-term change (approx. 1946– 2009) documented by the NC Division of Coastal Management (2011) in an update report and maps. With higher storm activity in recent years, evidence of sediment loss is evident throughout the park, which is of concern given potential loss of cultural resource sites and structures.
Marsh Elevation	Changes in surface elevation		A recent study of fringing marsh vegetation in Carteret County, which included two sites at CALO, suggested that under the current rate of SLR, which is approximately 3 mm yr ⁻¹ , fringing marshes will be able to maintain marsh biomass and surface elevation, with the important caveat that they receive sufficient sediment supply (Currin, in review).

Resource Brief: Barrier Island Dynamics - Core Banks

The barrier islands found along Cape Lookout National Seashore are low-lying, very dynamic landforms that are constantly evolving in response to storms, ocean currents, sea level changes, waves and wind. It is primarily high energy oceanic storms that build the islands and maintain them through time and cause changes to the island landscapes (Riggs et al., 2009). Specifically, the storm processes of overwash and inlet formation which occur due to significant storm surges, constitute the dynamics by which landward barrier island migration occurs during times of rising sea level (Riggs et al., 2009). Storm waters that flow across the islands leave behind sand layers or fans that build the interior island elevation. If the storm waters flow all the way across the island, the sand layers can extend into the sound or bay behind the barrier island, thus building island width and contributing to island migration. Sand that is

swept through an inlet to the sound or bay on a flood tide can be deposited in those quieter waters as a flood tidal delta. Once the inlet closes or migrates away, these flood tidal deltas serve as platforms upon which salt marshes can develop. These backbarrier marshes then also contribute to the island widening and inland migration.

With the lack of development along the barrier islands of Cape Lookout National Seashore, natural coastal processes have been allowed to occur with minimal interference. Inlets along Core Banks have opened and closed naturally, and storm overwash has deposited large areas of sand on the islands. In their study of the effects of storms on barrier island dynamics, Riggs and Ames (2007) analyzed the changes in shoreline position and island elevation that occurred along Core Banks between surveys made in 1960 by the U.S. Army Corps of Engineers and by East Carolina University in 2001. The 2001 survey results represented approximately a 72-percent net increase in barrier island elevation during the 41 year period. Aerial photographic evidence utilized by Riggs and Ames (2007) suggested that Core Banks was dominated by active overwash processes during a very stormy period (1962 and prior), with large areas of non-vegetated sand overwash deposits and tidal or fan deltas and major overwash tidal channels across the islands. The overwash processes were actively building island width during this stormy period. A period of low storm activity (1962–1970) was characterized by minimal overwash events with minor elevation change; however, during the period of more moderate to high storm activity (1971–2005), frequent overwash events led to a major increase in island elevation (Riggs and Ames 2007). The increased elevation has in turn led to a decrease in the frequency and extent of overwash events, and an increase in the growth of vegetation throughout most of the barrier island ecosystems, from salt marshes on low elevation sand flats and tidal delta lobes, to shrub-scrub communities on intermediate overwash deposits, to scattered dune fields and vegetation on higher areas.



Aerial photographs of Core Banks show how storms build island elevation and width. Panel A is a 1945 aerial photograph of a low, unvegetated island segment consisting of multiple breaches. An inlet opened in 1962 and built flood-tidal delta shoals (Panel B). The inlet eventually closed and developed into marsh that became part of a wider and vegetated island segment by 1998 as shown in Panel C. Panel D shows storm-deposited overwash fans extending across the island and into the sound in this 1962 photograph. Panel E shows the marsh that developed on the overwash fans which had built elevation and widened the island. The 1998 estuarine shoreline (Panels C and E) is superimposed on the historic photographs to demonstrate shoreline change. The superimposed ocean shoreline is from 2006. (From Riggs et al. 2009).

Water Quality



[web](#) ▶

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Water Chemistry	Water Quality Index		Ten of 13 sites sampled in 2010 had two or more National Coastal Assessment condition metrics rated as “fair” (Gregory and Smith 2011).
	Water Clarity		2/2 sites sampled in 2010 rated as “good” based on EPA National Coastal Assessment criteria (Water Clarity index scores < 2.3) (Gregory and Smith 2011). However, 13/15 sites had missing data. No significant trends in turbidity based on continuous data collected 2010 – 2013 (Dingle et al. 2012 , Rinehart et al. 2013 , Wright et al. 2012).
	Chlorophyll <i>a</i>		12/13 site sampled in 2010 were rated as “good” based on EPA National Coastal Assessment criteria (chlorophyll <i>a</i> concentrations < 5 µg/L) (Gregory and Smith 2011). No trends observed based on monthly sampling from 2008–2013 (Dingle et al. 2012 , Rinehart et al. 2013 , Wright et al. 2012).
	Total Dissolved Nitrogen		12/13 sites sampled in 2010 rated as “fair” based on EPA National Coastal Assessment criteria (TDN concentrations between 0.1 and 0.5 mg/L) (Gregory and Smith 2011). No trends observed based on monthly sampling from 2008–2013 (Dingle et al. 2012 , Rinehart et al. 2013 , Wright et al. 2012).
	Total Dissolved Phosphorus		9/13 sites sampled in 2010 rated as “fair” based on EPA National Coastal Assessment criteria (TDP concentrations between 0.01 and 0.05 mg/L) (Gregory and Smith 2011). No trends observed based on monthly sampling from 2008–2013 (Dingle et al. 2012 , Rinehart et al. 2013 , Wright et al. 2012).
	Dissolved Oxygen		12/13 sites sampled in 2010 rated as “good” based on EPA National Coastal Assessment criteria (DO Concentrations > 5 mg/L) (Gregory and Smith 2011). No significant trends based on continuous data collected 2010 – 2013 (Dingle et al. 2012 , Rinehart et al. 2013 , Wright et al. 2012).
Sediment Chemistry	Sediment Quality Index		Sediment Quality index rated as “good” for all 13 sites sampled in 2010 (Gregory and Smith 2011).
	Sediment Contaminant Rating		Sediment Contaminant Rating scored as “good” for all 13 sites sampled in 2010 (Gregory and Smith 2011).
	Total Organic Carbon		12/12 sites sampled in 2010 had TOC levels rated as “good” based on EPA National Coastal Assessment criteria (TOC < 2%) (Gregory and Smith 2011).

<p align="center">Benthic Macroinvertebrates</p>	<p>Southeast Coast Benthic Index</p>		<p>Hymel (2009) conducted a review of existing benthic macroinvertebrate (BMI) records found within or adjacent to SECN coastal parks. A list of 68 BMI taxa was compiled for CALO. 11/13 sites sampled in 2010 had Southeast Coast Benthic Index scores that rated as “good” (DeVivo and Gregory 2011)</p>
---	--	---	---

Resource Brief: Estuarine Water Quality

Due to its isolation from the mainland and limited development, CALO water quality remains relatively pristine, although there are potential concerns ([Parman et al. 2012](#)). The resident feral horse population on Shackleford Banks is a potential source of fecal coliforms and organic matter. Compared to CAHA to the north and to the mainland, CALO has fewer water quality issues—there are no TMDLs, algal blooms, beach closures, or shellfish closures. Like CAHA, some wells in CALO contain elevated nitrate levels, most likely due to septic leachate.

Water quality results indicate much better quality inside CALO than surrounding areas ([Parman et al. 2012](#)). The percentage of sites inside the park that ranked Good for DIN, DIP, water clarity, and chlorophyll a was higher by 30.70% compared to sites outside, and the median DO and DIP concentrations from fixed stations between 2000 and 2009 were also ranked Good. Fish tissue results from inside the park indicate a higher percentages of sites that rated Fair and Poor for arsenic and PAHs compared to outside park sites. [Mallin et al. \(2004\)](#) reported high PAH and metal concentrations on Core Banks, possibly from an above-ground storage tank, incinerator, and refueling pad on the island.

Areas near Beaufort and Newport have degraded water quality as evidenced by shellfish closures due to elevated bacteria counts. Shellfish closures have also occurred off the eastern portion of Harkers Island, across the sound from CALO. There have been no documented fish kills in the vicinity of CALO; the closest reported fish kill came from Whortonsville. Beaches at the Coast Guard dock, NPS dock, and Shackleford Banks are routinely monitored for bacteria, but no closures occurred during 2006–2009 ([Parman et al. 2012](#)).

Resource Brief: Coastal Water Quality Assessment

In July 2010, the SECN, in cooperation with the University of Georgia Marine Extension Service, conducted a water quality assessment at 30 sites at Cape Hatteras and Cape Lookout National Seashores as a part of the NPS Vital Signs Monitoring Program ([Gregory and Smith 2011](#)). Monitoring was conducted following methods developed by the U.S. Environmental Protection Agency as a part of the National Coastal Assessment Program and included laboratory analysis for chlorophyll *a*, total dissolved nitrogen and phosphorous concentrations and field measurements of water temperature, pH, dissolved oxygen, and salinity. Estimates of water clarity were made using a secchi disk to estimate turbidity.

Overall water quality in the study area ranged from fair to poor with the majority of sites found to be in fair condition (83%). Only one site was rated as poor, which was due to elevated nutrients.

Nitrogen levels were at concentrations considered fair at 77% of sites although poor conditions were noted at one site. Phosphorus concentrations were generally fair to good. Only a single site located just north of the Cape Hatteras Lighthouse rated poor due to elevated phosphorus levels. Chlorophyll *a* and dissolved oxygen levels were good throughout most of the sampling locations. Only 13% of sites rated in the fair range for chlorophyll *a* and only 3% rated as fair for dissolved oxygen.

Overall sediment conditions were considered good at all sites sampled showing only trace amounts of metals and little or no organic contamination. Higher levels of nutrients, especially total dissolved nitrogen, were more common in the Seashores’ northern waters potentially due to higher population densities in this area. Continued monitoring of nutrient levels in the Seashores’ waters, especially in high uses areas, should be considered.

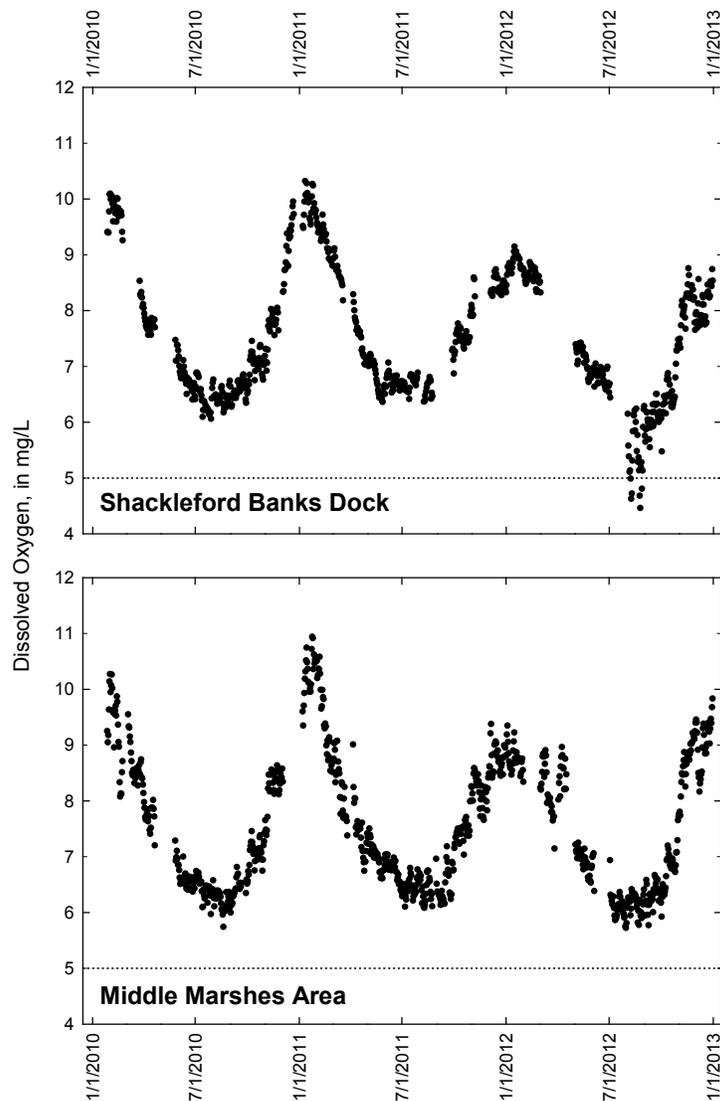
Water quality results indicate much better quality inside CALO than surrounding areas ([Parman et al. 2012](#)). The percentage of sites inside the park that ranked Good for DIN, DIP, water clarity, and chlorophyll a was higher by 30.70% compared to sites outside, and the median DO and DIP concentrations from fixed stations between 2000 and 2009 were also ranked Good.

Resource Brief: Fixed-Station Water Quality Monitoring

In 2007, the National Park Service (NPS) Southeast Coast Network (SECN) Inventory and Monitoring Program began a partnership with the North Carolina National Estuarine Research Reserve (NCNERR) to collect water-quality data in the estuarine waters near Cape Lookout National Seashore (CALO). Two continuous monitoring stations were operational during 2012 at the Shackleford Banks Dock and the Middle Marshes area. Stations collected pH, dissolved oxygen, water temperature, salinity, turbidity and water-level data at 15-minute intervals. Additional water-quality measurements are collected by NCNERR staff and include monthly measurements of water-clarity conditions, nutrients, and chlorophyll a levels. This monitoring effort was designed to collect data so that managers are able to make better-informed decisions by understanding trends and variability of water-quality conditions in park waters.

In 2012, average monthly dissolved oxygen levels were similar at both sites ranging from 8.8 mg/L to 5.4 mg/L with annual lows at each site occurred during the summer months. Mean daily dissolved oxygen levels never dropped below 5.0 mg/L in the Middle Marshes, but dropped below this threshold at Shackleford Banks Dock for six days in August 2012 (see Figure below). However, individual readings below 5.0 mg/L were common at the Middle Marshes station between March and October.

Discrete water-quality samples collected monthly at both sites indicated “Good” conditions with respect to water clarity with one fair reading in February at the Shackleford Banks Dock. Chlorophyll a readings were also good throughout the year (where data were available), with one fair reading in October at the Shackleford Banks Dock. Dissolved inorganic nitrogen and phosphorus levels were good at the Shackleford Banks Dock. Orthophosphate levels were slightly elevated (fair) at the Middle Marshes site during November.



Mean daily values for dissolved oxygen at Shackleford Banks Dock and Middle Marshes continuous water quality monitoring stations at Cape Lookout National Seashore during 2010–2012. Breaks in data record indicate missing and/or flagged data. Concentrations above 5 mg/L are considered “good” and concentrations between 2 and 5 mg/L are considered “fair” based on EPA National Coastal Assessment Criteria.

Plant and Wildlife Communities



[web](#) ▶

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Plant Diversity	Species richness		CALO has 596 known vascular-plant species, subspecies, and varieties (NPSpecies 2012). Virginia live oak had the largest average diameter of any canopy species sampled. Wax myrtle was the most frequently occurring species in the shrub stratum during monitoring surveys, and largeleaf pennywort and saltmeadow cordgrass were the most frequently occurring species in the groundcover stratum (Byrne et al 2012).
Amphibians	Species richness Disease incidence		Ten species of amphibians have been documented at CALO (NPSpecies database), including 8 species of frogs and toads, one salamander, and one newt. Squirrel treefrog (<i>Hyla squirella</i>) was the most widely distributed amphibian during sampling events in 2010 and 2012. Chytrid fungus (a pathogen linked to amphibian population declines around the world) was not found in any species during a 2010 study (Byrne and Moore 2011).
Birds	Species richness Relative Abundance		More than 600 birds representing 66 species were detected at CALO during surveys in 2010 (Byrne et al. 2011a). Red-winged blackbird, laughing gull, willet, boat-tailed grackle, and mourning dove were detected at 77% or more sampling locations, and were the most widely distributed species. Ring-necked pheasant was the only non-native species detected. CALO also participates in the Christmas Bird Count and routine monitoring of non-protected shorebird species including Wilson’s Plover.
Invasive and Nuisance Species	Number of Nest Predation Events per year for American Oystercatcher, Piping Plover, and sea turtles.		Overall, the number of predation events per year is increasing due to the increasing number of predatory species (and individuals) present at CALO. In recent years, evidence of predation by red fox, coyote, mink, raccoon, and feral cats has been detected. In 2012, nest predation events detected totaled 50, including American Oystercatcher (26), Piping Plover (7) and sea turtles (17). Predator exclosures have generally been effective in increasing hatch success for Piping plovers. From 1997–2012, 69% of the Piping plover nests protected with exclosures hatched, compared with a 42% hatch rate of the nests left unprotected.
	Grazing Impacts		Park-wide, nutria are responsible for clearing of vegetation in natural areas. Although present in the park, very little data on population numbers exist.
	Exotic Plants		Exotic plants are present in the park, but presumed to be in relatively low numbers as compared to other park units in the Southeast. <i>Phragmites</i> is of greatest concern to management, but the current extent of infestations is not well documented.

Resource Brief: Amphibians

Amphibian communities in the southeastern U.S. are widely considered to be among the most diverse in the world, and they are a valued resource in SECN parks (Byrne et al. 2011b). According to information gathered in 2004, CALO contains 10 known amphibian species including 8 species of frogs and toads, and 2 species of newts and salamanders (Tuberville et al. 2005). Because of their complex life histories, habitat requirements, anatomy, and physiology, amphibians are considered to be good indicators of changes in ecosystem conditions as they are affected by climate change, land use development and conversion, contaminants, and changes in hydrology.

Amphibian communities were monitored in using automated recording devices at 30 locations in the summers of 2010 and 2012. During these sampling events eight native anuran species were detected and no non-native species were detected (Byrne et al. 2011b; Smrekar et al 2013). Squirrel treefrog (*Hyla squirella*) was the most widely distributed amphibian during both sampling events. These data will serve as a baseline for future monitoring efforts of vocal anurans at the Seashore.

In 2010, the SECN also conducted surveys for chytrid fungus (a pathogen linked to amphibian population declines around the world) and did not find evidence of its presence in any species (Byrne and Moore 2011).

Naïve occupancy estimates (proportion of sites where the species was detected) for amphibians at CALO, in 2010 and 2012 using automated recording devices. Modified from Byrne et al. (2011b), Smrekar et al. (2013).

Scientific Name	Common Name	Proportion of sites where seen	
		2012	2010
<i>Hyla squirella</i>	Squirrel treefrog	0.63	0.33
<i>Anaxyrus fowleri</i>	Fowler's toad	0.27	0.07
<i>Hyla cinerea</i>	Green treefrog	0.17	0.10
<i>Gastrophryne carolinensis</i>	Eastern narrow-mouthed toad	0.10	--
<i>Lithobates sphenoccephalus</i>	Southern leopard frog	0.10	--
<i>Anaxyrus terrestris</i>	Southern toad	0.07	--
<i>Lithobates catesbeianus</i>	Bullfrog	0.07	--
<i>Hyla squirella</i> tadpoles	Squirrel treefrog tadpoles	--	0.03

Resource Brief: Birds

Birds are an important component of park ecosystems, and their high body temperature, rapid metabolism, and high ecological position in most food webs make them a good indicator of the effects of local and regional changes in ecosystems. Long-term trends in the community composition, relative abundance, distribution, and occurrences of breeding-bird populations provide a measure for assessing the ecological integrity and sustainability in southeastern systems. Further, long-term patterns of these attributes in relation to changes in the structural diversity of vegetation resulting from fire and other management practices will improve our understanding of the effects of various management actions. More than 268 species of birds have been reported at CALO.

The SECN conducted a survey of landbirds in 2010 finding a high diversity of birds at CALO. A total of 646 birds representing 66 species were detected, including one non-native exotic species (the ring-necked pheasant). Red-winged blackbird, laughing gull, willet, boat-tailed grackle, and mourning dove were detected at 77% or more sampling locations, and were the most widely distributed species at the Seashore. Several priority species were detected during the sampling effort, including black skimmer, bobolink, brown pelican, brown thrasher, clapper rail, common loon, common tern, dunlin, Eastern kingbird, Eastern meadowlark, Eastern towhee, great egret, greater yellowlegs, gull-billed tern, least tern, lesser yellowlegs, little blue heron, mallard, Northern gannet, Northern parula, orchard oriole, prairie warbler, red-bellied woodpecker, and royal tern.



Sedge wren (*Cistothorus platensis*)
NPS Photo by Darlene J. Moore

Protected Species of Management Concern



[web](#) ▶

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Shackleford Banks Horse Herd	Population size		Federal legislation, passed in 1998, protects the wild horses within Cape Lookout National Seashore and requires an annual report on the status of the herd. The legislated herd range is 120–130 individuals. Although currently below this range, park management considers this to be acceptable at this time for maintaining long-term viability of the herd (NPS CALO 2011).
Sea Turtles	Number of nests and emergence success		Cape Lookout National Seashore began monitoring marine turtles in 1976. The monitoring procedures used prior to 1990 differed significantly from the current monitoring procedures following the USFWS Index Nesting Beach program. The number of nests found in 2012 (228 nests) was above the average for CALO (134 nests). The total emergence success for 2012 was 64%. Although the population fluctuates, the populations of four nesting species (loggerhead, green, leatherback, and Kemp’s Ridley) seem to be stable based on park monitoring efforts (NPS CALO 2012).
	Stranding Rate		Collecting information from stranded turtles is also an important phase of the CALO Sea Turtle Monitoring Program. In 2012 there were 124 strandings at the Seashore. Green turtles accounted for the majority of the strandings (73). There were also 25 Kemp’s ridleys, 25 loggerheads, and 1 leatherback. The past five years has seen a higher number of stranded sea turtles, with an increasing trend of more strandings (NPS CALO 2012).
Shorebirds	Piping Plovers – Number of breeding pairs and chicks fledged per breeding pair		The piping plover is listed as a federal threatened species by the U.S. Fish and Wildlife Service. Piping plover monitoring at CALO began with a baseline study in 1989. The Seashore is a significant nesting area, containing 75% of the nesting pairs in the state of North Carolina. A total of 51 pairs of piping plovers nested at the park in 2012, with 36 nests hatched and 29 chicks fledged. Productivity was 0.57 chicks fledged per nesting pair. (NPS CALO 2012).
	American Oystercatcher – Number of breeding pairs and chicks fledged per breeding pair		Monitoring of American Oystercatcher nesting at Cape Lookout National Seashore began in 1995. In 2012, 58 American Oystercatcher pairs nested throughout the ocean beach habitat of the seashore. A total of 99 nests were documented in 2012 with 42 chicks fledged. Overall for the entire seashore, the fledge success rate was 0.72 per nesting pair (NPS CALO 2012).
	Number of Colonial Waterbird (CWB) nesting sites		The least tern (<i>Sternula antillarum</i>), common tern (<i>Sterna hirundo</i>), gull-billed tern (<i>Gelochelidon nilotica</i>), black skimmer (<i>Rynchops niger</i>), and royal tern (<i>Sterna maxima</i>) nest at CALO in single species and mixed species colonies. In 2012, there were 22 CWB nesting sites in the Seashore (NPS CALO 2012).

	Number of Red Knots observed during migrations		On North Core Banks, spring migration surveys in 2012 showed an average of 46 birds/km, up from 34 birds/km observed in 1992–1993, but numbers have fluctuated between 14 and 46 birds/km since routine monitoring began in 2006. Although the Outer Banks may not be as important as some other sites in the region, CALO provides habitat that may be important for the recovery and long-term survival of red knots (NPS CALO 2012).
Marine Mammals	Number of strandings per year (by species)		The park has stranding data dating back to 1989, with all data being reported to NOAA National Marine Fisheries Service. Causes of strandings are unknown. In 2012, park staff recorded 13 stranding events with the most common species being Bottlenose dolphin.
Seabeach Amaranth	Number of plants		Seabeach Amaranth is a federal and North Carolina listed threatened species. Regular monitoring of this annual plant species began at Cape Lookout in 1993. Numbers have decreased from more than 2,000 plants in 1993 to less than 10 in recent surveys. Zero plants were detected during surveys on Shackleford Banks in 2013, which historically had more than 1,000 plants detected during annual surveys (NPS CALO 2012).

Resource Brief: Shackleford Banks Wild Horses

The herd of free-roaming horses on Shackleford Banks is protected by 1998 amendments to the park’s enabling legislation. According to the legislation the park manages the horse herd with a target range of 120–130 horses. The park uses a combination of birth control and removals to maintain the herd size. Horses selected for birth control and removal are based upon genetics.



The legislation also directs a management partnership; the park has partnered with the local non-profit Foundation for Shackleford Horses, Inc. since 1999. Although relations with other citizen groups and with the Foundation were strained in early years, the partnership is working well now. Decisions on adaptive horse management are made jointly and in many cases carried out jointly. The Foundation has found adoptive homes for more than 70 horses that have been removed from the seashore for population control reasons. The Foundation has been a point of contact with the public in horse education opportunities and has provided funding for some of the genetic testing and educational brochures.

In recent years, the park has observed increased number of visitor interactions with horses. In an attempt to maintain public safety and to keep the horses from becoming accustomed and dependent on humans, the park and its partners have undertaken a public educational program to “Keep the Horses Wild.” Partners in this effort are the Foundation and

the nearby Rachel Carson Reserve, part of the North Carolina Coastal Reserve, which also is having horse-visitor interaction challenges.

Resource Brief: Shorebirds

Cape Lookout National Seashore has been monitoring and protecting nesting shorebirds since 1989. The primary species of concern are piping plovers (a federally threatened species), American Oystercatchers, and colonial nesting shorebirds (terns and black skimmers). Piping plovers have been monitored since 1989. Breeding pair numbers have ranged from 34 pairs in 1989 down to 13 pairs in 2004 and then a rebound to 51 pairs in 2012 after several hurricanes created habitat. Productivity exceeded more than one chick fledged per breeding pair for the first time in 2013. Studies of American Oystercatchers at Cape Lookout began in 1995. Research on these birds have include tagging birds to look at return rates, radio tagging of chicks to study predation issues, and video recording to determine disturbance factors. American Oystercatcher breeding pairs remain fairly stable with a range of 52–62 pairs per year. Productivity for American Oystercatchers remains below 1 chick fledged per breeding pair. The park protects and monitors

nesting areas for colonial shorebirds such as least terns, common tern, gull-billed terns, and black skimmers ([see annual summary reports on park website](#)).

Historical nesting areas for piping plovers and colonial shorebirds are closed by April 1. The park has staff monitoring shorebird activity 7 days a week beginning in April through August. The staff provides additional protection for piping plover nests by erecting a predator enclosure around most nests. If piping plover chicks are found on the beach then the beach is closed to vehicles. American Oystercatcher nests are protected by a buffer that allows visitors and vehicles to pass through the area below the high tide but visitors and vehicles cannot remain in the area. Once the eggs hatch and chicks are on the beach vehicles are routed around the area via the backroad.



Resource Brief: Sea Turtles

Cape Lookout National Seashore (CALO) began monitoring marine turtles in 1976. Baseline data were 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. CALO began routine monitoring of all islands in 1990. Cape Lookout is a significant northern nesting beach and supports among the highest number of loggerhead sea turtle (*Caretta caretta*) nests in North Carolina. The seashore also provides nesting habitat for leatherback (*Dermochelys coriacea*), green (*Chelonia mydas*), and Kemp’s ridley (*Lepidochelys kempii*) sea turtles. Each year data have been collected, analyzed, and presented to management in hopes of better protecting our marine turtle population. From 1990 to 2012, CALO had an average of 134 sea turtle nests and most of these were Loggerheads ([2012 Sea Turtle Monitoring and Management Report](#)).



Nest losses to tidal flooding and predation are the primary threats to nesting success at CALO. Nests laid in the tidal wash zone, primary berm, and back swale are considered in danger of erosion or tidal flooding. Nests laid in locations likely to repeated flooding were relocated to a higher elevation on the primary dune. Relocated nests were moved into the nearest of six designated areas and vehicles were detoured to the back road around these areas when nests neared hatching. Smaller vehicle detours were erected around those nests that were not relocated and were outside other vehicle closures. Vehicle closures provide a rut-free corridor from the nest site to the ocean, preventing hatchlings from being run over or becoming entrapped in tire ruts and dying from predation or desiccation. Camping and campfires were not permitted in the closures to prevent disturbance of hatchlings by artificial lights.



The night sky has been a source of wonder, inspiration, and knowledge for thousands of years. An unfettered night sky with naturally occurring cycles of light and dark is integral to ecosystem function; evident in the fact that nearly half the species on earth are nocturnal. The quality of the nighttime environment is relevant to nearly every unit of the NPS system as the nighttime photic environment and its perception of it by humans (the lightscape) are both a natural and a cultural resource and are critical aspects of scenery, visitor enjoyment, and wilderness character. According to 2010 U.S. Census data, CALO is classified as a non-urban park, and therefore considered to be more sensitive to anthropogenic light. Learn more in the document [Recommended Indicators of Night Sky Quality](#), and the NPS Natural Sounds & Night Skies Division [website](#).

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Anthropogenic Light	Anthropogenic Light Ratio (ALR) — Average Anthropogenic Sky Glow: Average Natural Sky Luminance		Visitors to Cape Lookout NS can experience one of the darkest night skies along the eastern seacoast, but the amount of light pollution relative to other locations nationwide is considered of moderate concern based on NPS standards. The modeled Anthropogenic Light Ratio (ALR), a measure of light pollution, was 0.36. Growth rate for populated areas near the park during the past 5 years has been moderate, resulting in stable trend.

Resource Brief: Historical and Projected Changes in Climate at Cape Lookout National Seashore

Climate change, in conjunction with other stressors, is impacting all aspects of park management from natural and cultural resources to park operations and visitor experience. Effective planning and management must be grounded in our comprehension of past dynamics as well as the realization that future conditions may shift beyond the range of variability observed in historical data. Climate change will manifest itself not only as shifts in mean conditions (e.g., increasing mean annual temperature and sea level) but also as changes in climate variability (e.g., more intense storms and flooding). Put another way, land managers are dealing with both rapid directional change and tremendous uncertainty. Understanding climate change projections and associated levels of uncertainty will facilitate planning actions that are robust regardless of the precise magnitude of change experienced in the coming decades.

Historical climate trends (1893–2012)

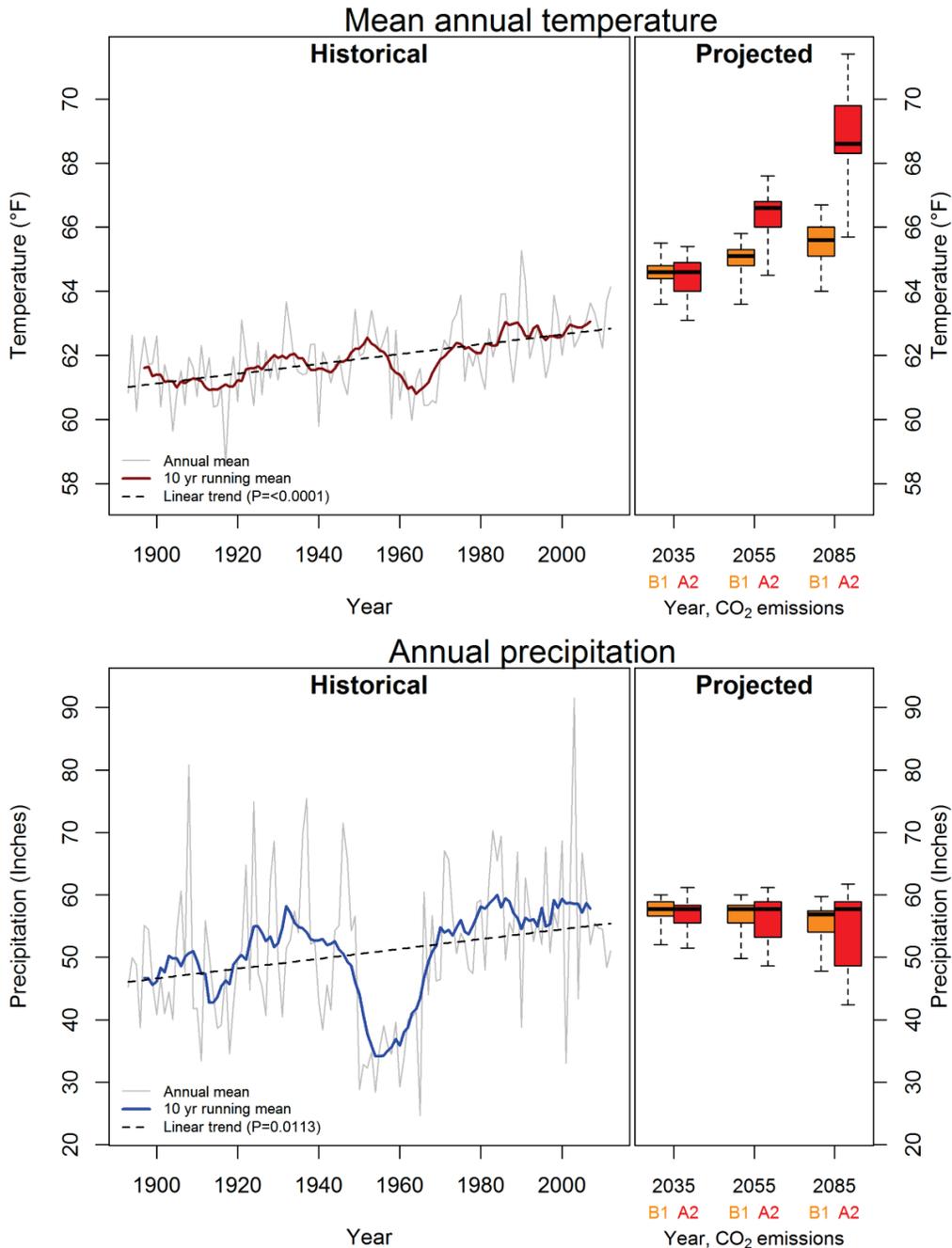
Historical climate trends for Cape Lookout ([Fisichelli 2013](#)) are based on historical climate data from a nearby long-term weather station (Morehead City, NC; [cdiac.ornl.gov](#)). Over the 120 year instrumental record (1893–2012), mean annual temperature showed a significant warming, +0.15 °F per decade (see Figure below). Annual precipitation showed strong interannual variability, though also an increasing trend, +0.8 inches per decade. Data from NOAA (2013) show that sea level has risen around Beaufort, NC over the last 60 years at the rate of 0.11 in/yr ([Caffrey 2013](#)). In addition, a large number of tropical storms and hurricanes have passed through the region. Approximately six hurricane paths have directly moved over CALO since 1842. The strongest storm path to move over CALO belonged to Hurricane Isabel, which was a category 2 hurricane when it struck in 2003.

Future climate projections

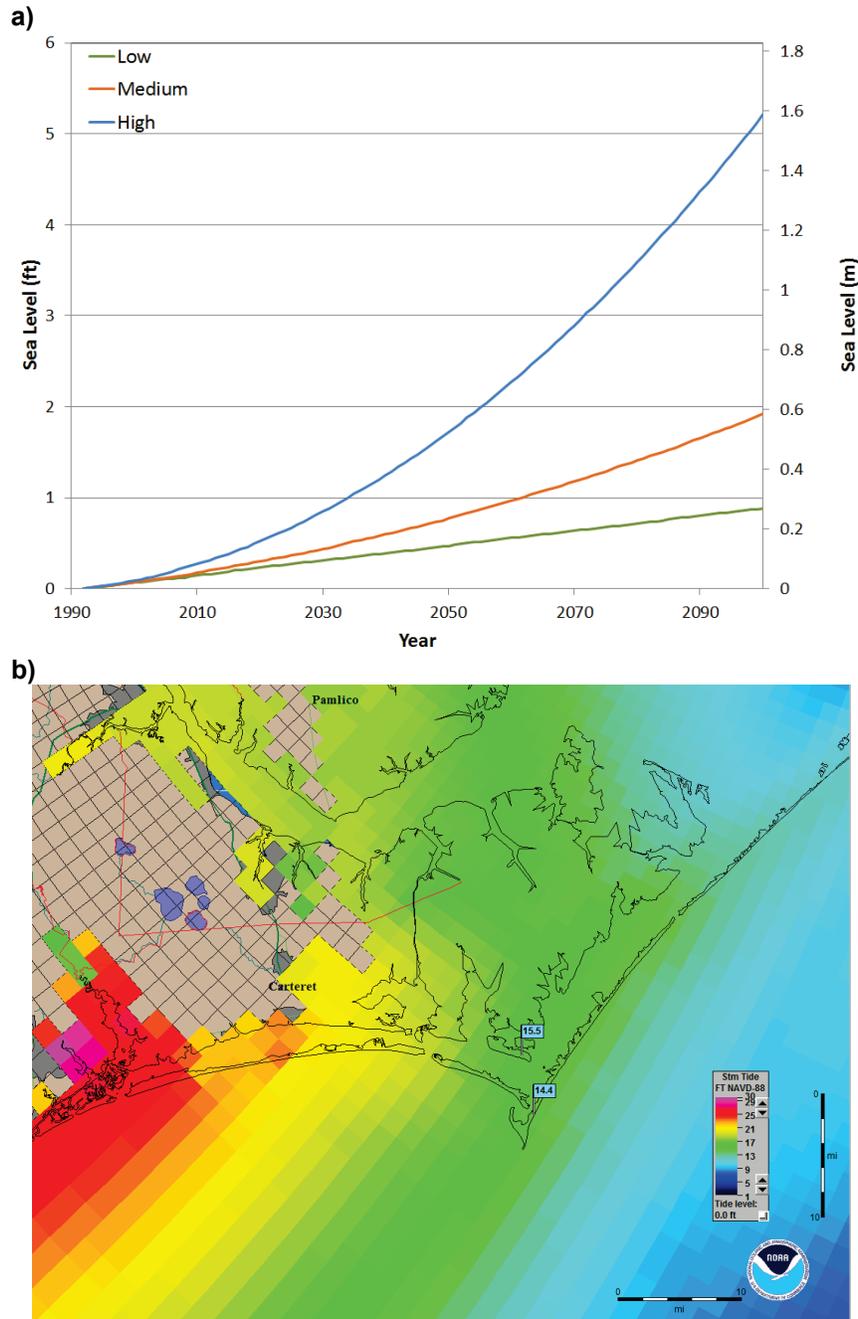
Future climate projections for the area including Cape Lookout NS are from multi-model averaged data ([Kunkel et al. 2013](#)). Mean annual temperature, compared with the 1971–1999 average, is projected to increase 2–4 °F by mid-century and 3–6 °F by the end of the century, depending on the greenhouse gas emissions scenario (see Figure below). This is more than twice the rate of warming experienced during the 20th century. Current greenhouse gas emissions are on a trajectory similar to the higher emissions scenarios (see references in [Fisichelli 2013](#)). Warming by mid-century is projected for all seasons, with the greatest increases likely in summer ([Kunkel et al. 2013](#)). There is wide agreement among individual climate models in the direction and magnitude of warming over the coming decades. Total annual precipitation may increase slightly by mid-century; however, precipitation variability is likely to remain large over the coming decades, and there is greater uncertainty in precipitation than temperature projections ([Kunkel et al. 2013](#)). Sea level will continue to rise, 0.8–1.7 feet by 2050 and 2–5 feet by 2100 (see Figure below and [Caffrey 2013](#)). The rate of sea level rise in the Cape Lookout area is likely to be higher than the global average, and there is a high degree of confidence that both sea level and storm surges will rise in the future.

In addition to warmer mean temperatures and changes in annual and seasonal precipitation, climate change will manifest itself in many other ways. This includes more frequent heat waves, droughts, floods, and an extended frost-free season. The number of days with maximum temperatures > 95 °F is projected to increase 15–20 days/year by mid-century while the number of days with

minimum temperatures below freezing is projected to decrease by approximately 10–15 days (high (A2) emissions scenario 2041–2070 compared with 1980–2000; [Kunkel et al. 2013](#)). Small changes in total precipitation may mask large shifts in the precipitation regime and associated impacts to ecosystems. The annual number of days with heavy rainfall (> 1 inch) is projected to increase by 10–15 %, while the maximum number of days between rain events is likely to increase by a few days (high (A2) emissions scenario, 2041–2070 compared with 1980–2000; [Kunkel et al. 2013](#)). Significantly warmer temperatures and a more variable precipitation regime may lead to both more frequent droughts and more severe flooding and erosion. It can be expected that storm surges will increase as storm intensity increases, however the number of storms and their paths may not change. Presently, storm surges are predicted to reach up to 17.1 ft. at the CALO visitor center if a category 5 storm struck at high tide (see Figure below and [Caffrey 2013](#)).



Historical and projected mean annual temperature and annual precipitation for Cape Lookout NS. Historical data (1893–2012) are from the Morehead City, NC weather station ([cdiac.ornl.gov](#)). Projected climate change (30 year means) for the region including the park (data from [Kunkel et al. 2013](#), see Tables 4, 6 and Figures 26, 37) are for three future time periods centered on 2035 (2021–2050), 2055 (2041–2070), and 2085 (2070–2099). Two greenhouse gas emissions scenarios are presented, the low (B1) and high (A2) scenarios (IPCC 2007). Projected climate boxplots indicate the variability in future projections among 14–15 CMIP3 climate models. Values for the area including Cape Lookout are based on projected changes from individual climate models averaged across the southeast region: the bold horizontal black line represents the mean among all models, the upper and lower bounds of the boxes indicate the 25th and 75th percentile model output values and the whiskers show the minimum and maximum change averaged across the region.



Legend for Figures above: a) projected rate of sea level rise for Beaufort, NC (USACE 2013).
 b) storm surge (ft.) for a category 5 storm at mean tide (prepared by M. Caffrey using NOAA SLOSH).

Resource Brief: Climate change effects, research, and planning for Cape Lookout

Climate change is ongoing at Cape Lookout. The park is in a region already at the extreme warm end of its historical climate (Monahan and Fisichelli *In revision*) and sea level has risen almost 7 inches in the past 60 years (Caffrey 2013). Past greenhouse gas (GHG) emissions, long residence times of these gases in the atmosphere, inherent time lags in the climate system response to GHGs, and our current emissions trajectory suggest that future climate change and related effects will be substantial, even if GHGs are dramatically reduced in the near future (Wigley 2005, Peters et al. 2013). Although the precise magnitude of future changes cannot be predicted, many trends are already detectable and likely changes should be incorporated into park planning.

Warming temperatures manifest not only as increases in average temperature but also as increases in extreme daily high temperatures (Kunkel et al. 2013). A shift of only a couple of degrees from the mid 80s (°F) to lower 90s can move visitors from a “Caution” to “Extreme Caution” zone according to the National Oceanic and Atmospheric Administration’s Heat Index. With higher temperatures

more frequent and occurring over a longer summer season, it is important to educate visitors on the dangers of heat and maintain potable fresh water on-site.

Agriculture dedicated to peach production and other crops is a dominant economic activity and land use upstream of Cape Lookout. More frequent and severe drought is predicted to stress these rain-fed crops. Increases in the use of fertilizers, herbicides, and pesticides, coincident with increases in extreme precipitation events may increase pollution runoff and cause more hypoxic events ([Ingram et al. 2013](#)).

Sea level rise and coastal inundation are likely to impact natural resources. Expected reduction in habitat for juvenile estuarine finfish and crustacean shellfish may decrease fisheries production. Changes in temperature, ocean pH, local acidification, sea level rise, and saltwater intrusion could impact molluscan shellfish and change their distribution. Warmer water may contribute to more harmful algal blooms and increases in pathogens in shellfish that affect humans when they are consumed. ([Ingram et al 2013](#))

As sea level rises, salt water intrusion into coastal fresh water systems will increase. This could impact marsh and terrestrial ecosystems. Research by the Biodiversity and Spatial Information Center and North Carolina State University is tracking transition of marsh areas to open water within Cape Lookout National Seashore.

The combination of sea level rise and increased storm surge could exacerbate shoreline erosion at Cape Lookout National Seashore. The Woods Hole Coastal and Marine Science Center is working to predict large-scale shoreline change at the northern Outer Banks of North Carolina. Sea level rise and erosion could adversely impact beach nesting species on Cape Lookout, such as the American oystercatcher, piping plover, and loggerhead sea turtles. Planting and maintaining native grasses on the beach have been identified as “no regret” ways to adapt beach nest habitat for Sea Turtles (Fuentes et al. 2012). The Woods Hole Coastal and Marine Science Center is also working to track annual marsh loss for the area and may have estimates for Cape Lookout within the year.

Increases in storm surge due to tropical storms, heavy precipitation events, and sea level rise make built resources in coastal areas highly vulnerable ([Ingram et al. 2013](#)). Some historic buildings are highly vulnerable to damage or even loss from storm surge, such as the lighthouse keepers quarters and Portsmouth Village in the park (Peek et al. *In Press*).

Planning for sea level rise is a challenge given the potential high rates of sea level rise and locations of infrastructure and other sensitive assets near the coast. A recent report, released in draft form by the Climate Change Response Program entitled “*Adapting to Climate Change in Coastal Parks: Estimating the Exposure of FMSS-Listed Park Assets to 1m of Sea-Level Rise*” helps parks plan for 1 meter (3.3 ft) of sea level rise by documenting the replacement value of resources should they be lost to climate change related storm events (Peek et al. *In Press*). Future rates of sea level rise cannot be predicted precisely, but 3.3 ft of sea level rise is likely to occur at some point within the next 100-150 years and provides a standard benchmark for use across parks. It is important to begin planning for sea level rise by considering multiple scenarios that, if unfolded, would adversely impact the Park. Effective climate change adaptation requires collaboration across large landscapes and the Landscape Conservation Cooperatives are a forum through which the Park could work with partners to adapt in ways that would offset or mitigate climate-related impacts.

2.2. Cultural Resources

Archeological Resources  web ▶			
Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Knowledge	Percent of sites with known date ranges associated with a research theme		Over 90 percent of the 152 sites listed in ASMIS have known date ranges. Most are historic structures with known construction dates and periods of occupation from historic records and ethnographic interviews. Approximate dates for structural ruins and prehistoric sites have been determined from diagnostic artifacts. Radiocarbon assays have also been obtained for several prehistoric sites on Shackleford Banks. The prehistoric and early historic occupations of Cape Lookout are the least known time periods. Those sites from these time periods which have been identified are the most vulnerable to erosion by storm surges.
Inventory	Percent of park adequately surveyed		The barrier islands are subject to regular overwashing and deposition of sand which buries existing sites. Previous archeological surveys have been limited to the more accessible portions of CALO, such as Portsmouth, Cape Lookout, and Shackleford Banks. These surveys have consisted primarily of pedestrian surveys with very little subsurface testing or use of remote sensing equipment to identify buried archeological sites. The Core Banks between Cape Lookout and Portsmouth remain the least surveyed portion of the park.
Documentation	Percentage of known sites with adequate National Register documentation		Sixty-nine of the sites listed in ASMIS are either listed individually in the National Register (Cape Lookout Lighthouse and Cape Lookout Coast Guard station), and/or are encompassed by NR historic districts at Portsmouth and Cape Lookout. Most of these sites are historic structures dating to the early 20 th century and are listed as contributing members of the Districts. Several of the more significant structures have also been the subject of Historic Resource Studies and Historic Structure Reports.
Condition	Percentage of archeological resources in good condition		Of the 152 sites currently listed in ASMIS, 69 (45%) are listed in Good condition. Another 15% are listed as fair (n=12) or Poor (n=11) condition. Twenty-six percent of the sites are either isolated finds (n=10), destroyed (n=5), or are sites that have been listed in ASMIS as Potential or unsubstantiated sites. These latter are designated as Local Resources requiring no condition assessment.

Resource Brief: Archeological Surveys on a dynamic barrier island

Cape Lookout is a 56-mile-long chain of barrier beach islands that extends from Ocracoke Inlet to Beaufort Inlet. In contrast to the northern Outer Banks, Cape Lookout, which includes Portsmouth Island, the Core Banks, and Shackleford Banks, has been relatively undeveloped since its discovery and settlement by Europeans in the 16th century. The islands formed approximately 4,000 years ago at their present position and current evidence from prehistoric sites suggests that Native American groups were occupying the islands, at least seasonally, from about 500 BC to the arrival of Europeans. Most of these prehistoric sites have been identified along the north shore of Shackleford Banks. This apparent concentration of prehistoric sites on Shackleford may be due, in part, to the limited extent of previous archeological surveys, or lack thereof, on the Core Banks between Portsmouth and Cape Lookout. Only one prehistoric State of the Park Report

artifact has been collected from this area by park personnel from unconsolidated beach deposits. Conversely, prehistoric resources may be lacking on the Core Banks because the islands were obliterated by storms around 900 AD and may have only reformed shortly before the arrival of Europeans, as suggested by some geologists. The opening and closing of inlets may have also obliterated some sites. More survey is needed in this area to determine if prehistoric sites are present, which could, in turn, help confirm what the environment was like at that time. European settlement has been concentrated mainly in Portsmouth Village, established in 1753, to promote the maritime trade in agricultural products from the North Carolina colony. Cape Lookout and Shackleford Banks became a center for shore based whaling by Colonial inhabitants. Later inhabitants engaged in commercial fishing as that industry began to flourish in the late 19th century. The expansion of maritime trade and commercial fishing provided an impetus for the construction of lighthouses along the Outer Banks, including Cape Lookout, and life-saving stations at Portsmouth, Cape Lookout and near Drum Inlet to prevent, or reduce the loss of lives. The Graveyard of the Atlantic also produces large amounts of shipwreck debris on Cape Lookout beaches. Some of this material, like shipwreck timbers and historic Spanish olive jars, has been recorded in ASMIS as isolated objects, which are not considered archeological sites, per se, but may indicate the presence of shipwrecks offshore, or possibly embedded in the beach face. Overall, a diverse range of archeological resources is encountered in the park but they are often difficult to identify along the barrier islands, which are constantly changing under the influence of tides, currents, and storms.

Cultural Anthropology



[web](#) ▶

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Knowledge	Sufficient research exists to understand the relationship of the park's ethnographic resources and the historic contexts		The park needs documentation and analysis of ethnographic information regarding people with traditional and/or historic ties to specific park areas. This information includes resources that help connect people/communities to parks via the stories they tell/share about their association with the park. The park has several oral history recordings completed in the 1980s but many have not been transcribed. The park has one report entitled "Ethnohistorical Description of Four Communities Associated with Cape Lookout National Seashore."
	Appropriate studies and consultations document ethnographic resources and uses with regards to the park.		Although documents and studies completed to date, provide a good foundation for understanding people and communities associated with the park they do not provide the depth and nuance that a cultural anthropological focus on the site would reveal including identifying underrepresented groups and their associations with the park historically and presently.

Cultural Landscapes



[web](#) ▶

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Knowledge	Sufficient research exists to understand the relationship of the park cultural landscapes to the historic contexts of the park.		Cultural Landscape Reports were completed for Cape Lookout Village in 2005 and for Portsmouth Village in 2007. These reports provide sufficient research for the park's cultural landscapes.
	Adequate research exists to document and preserve the cultural landscape of the park.		The Cultural Landscape Reports for Portsmouth Village and Cape Lookout Village provide adequate research and treatment recommendations to preserve the cultural landscapes of Cape Lookout NS.

Inventory	The scope of cultural landscapes in the park is understood and a determination has been made whether or not they are a fundamental resource.		Both Portsmouth Village and Cape Lookout Village have completed CLRs which provide information about the significance and integrity of these historic properties. However, they have not been called out specifically as fundamental resources.
	Percentage of landscapes eligible for the National Register with accurate, complete, and reliable Cultural Landscape Inventory (CLI) data.		Neither Portsmouth Village nor Cape Lookout Village (0%) has complete CLIs.
Documentation	Percentage of cultural landscapes with adequate National Register documentation.		Portsmouth Village was listed in the National Register in 1977, and the nomination needs updating. The NR nomination for Cape Lookout Village needs updating to include additional themes, such as military history as well as further documentation of the 1910 jetty, and a revision of the period of significance.

Historic Structures



[web](#) ▶

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Knowledge	Percentage of historic structures evaluated using appropriate historical contexts.		All of the park's identified historic structures have been evaluated primarily by the park's historic resource study. A variety of other studies have provided additional contextual information that has facilitated evaluation. The park has two large NR historic districts encompassing a lighthouse, two U.S. Life-Saving Stations, and a U.S. Coast Guard Station.
Documentation	Percentage of historic structures with adequate National Register documentation.		Eighty-one percent of the park's identified historic structures have adequate National Register documentation.
	All historic structures have been recorded commensurate with their significance and mandated purposes.		Historic Structure Reports (HSRs) have been developed for the Cape Lookout Lighthouse and the Portsmouth Life-Saving Station, along with ten of the historic residences at Cape Lookout Village, and three historic residences at Portsmouth. The remainder of the park's 38 major structures do not have HSRs, although efforts are currently underway to contract additional HSRs at Portsmouth. Because of the risk of catastrophic loss, additional HABS documentation should be developed for the structures on Portsmouth Island. That process is only just beginning.

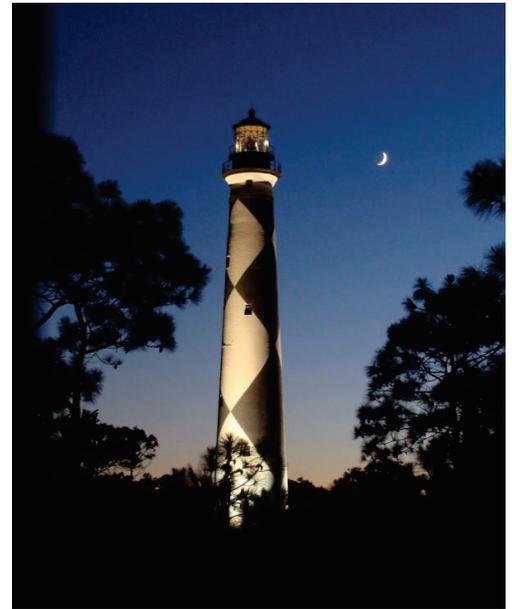
Condition	Percentage of historic structures in good condition		Sixty percent of the park's buildings are in good condition, but regardless of present condition, aging materials, especially ferrous nails and other fasteners, make all but the lighthouse increasingly susceptible to storm damage with each passing year. The park is seeking to develop a plan to prioritize structures that will be maintained based on budget and climate change.
------------------	---	---	--

Resource Brief: Cape Lookout Lighthouse

One of the most iconic structures within Cape Lookout National Seashore is the Cape Lookout Lighthouse. Completed and lit on November 1, 1859, it has stood on the Core Banks through hurricanes, erosion, and wars. This double walled lighthouse was the first of its kind in North Carolina.

On July 14, 2003, the U.S. Coast Guard transferred the tower and surrounding property to the National Park Service in order to allow the lighthouse to be opened for public climbs. Public climbs began and were permitted 4 times a year through 2008. At that point the engineers determined that the condition of the stairs had deteriorated to a point where they became a safety concern. In 2009 the park was able to secure funding and contracted for the stabilization of the stairs and handrails, and the addition of better interior lighting to permit the opening of the lighthouse for weekly climbs.

In July of 2010 the lighthouse was again opened for climbing by the public on a regular basis and it can accommodate up to 270 visitors per day. During the 2010 season and again in the 2011 season (May – September) the lighthouse was open 3 days a week. In 2012 and 2013 seasons the lighthouse was open to climbing 4 day a week, Wednesday – Saturday, and Sundays on the summer holiday weekends.



More than 30,000 visitors have enjoyed the spectacular view from the top of the lighthouse since it first opened for public climbing in 2003.

History  web ▶			
Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Knowledge	Sufficient research is conducted to understand significance of site.		The recently completed Historic Resource Study, especially Chapter 10 of that document “Management, Interpretive, and Research Recommendations,” provides a good foundation for interpretive programs and for updating existing National Register nominations.
	Sufficient research is conducted to establish the reasons for park creation and site history.		Park awaits funding for an Administrative History report.
	Research at the appropriate level precedes planning decisions involving cultural resources.		The park has completed 10 Historic Structure Reports and 4 more have been funded. The park needs to develop a plan for prioritizing historic structures to be maintained and stabilized with ongoing budget concerns and effects of climate change.

Inventory	Percentage of cultural resources listed in appropriate Servicewide inventories, including the National Register.		The Park has 64 structures listed on the List of Classified Structures (LCS).
Documentation	Percentage of historic properties with adequate Nat'l Register documentation or with Determinations of Eligibility.		All of the park's National Register nominations are out of date according to the Southeast Region's Baseline Document Assessment (BDA). Fifteen structures on the LCS "Shadow" database need to be assessed for their eligibility to the National Register. This could be accomplished in conjunction with updates to the existing National Register documentation or through a separate DOE.

Museum Collections



[web](#) ▶

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Inventory	The scope of museum collections in the park is understood. All resources have been surveyed to determine their appropriateness for inclusion in the museum/archive collection.		A Scope of Collection Statement was completed in 2011. It is supported by the Enabling Legislation, resource management goals and objectives, interpretive themes, and the General Management Plan. The park needs a new archives survey (baseline document). The last one was completed in 2006. Archival collections grow at a rate of 100% in 10 years.
	Percentage of objects accessioned and cataloged		The FY 2013 Collections Management Report shows 90.39% of the collections are cataloged, up from 90.23% in FY 2012 (SEAC cataloging archeology collections). The backlog number for the archives has not changed since FY 2008, which shows there has been no accretion of Resource Management records to the collections. It is the same for Natural Resource collections – the backlog number has not changed since FY 2008, which shows that in spite of all the work going on in the park with natural Resources (as described above), none of the deliverables are making their way into the museum collections per Law, Policy, and Regulation.
Documentation	Park has current and appropriate baseline documentation (scope of collections statement, collection management plan, housekeeping plan(s), IPM plans(s), EOP, security and fire safety plan(s), and conservation survey(s).		Baseline documentation for the CALO museum collection requires updating and includes the following documents and completion dates: Collection Management Plan (2005); Emergency Operations Plan (2008 draft); Scope of Collections Statement (signed 2011); Integrated Pest Management Plan (2011); and Archives Survey (2012). A Collection Storage Plan is being planned (collections are stored at CAHA). The park does not have a Housekeeping Plan, which is a critical baseline document for preservation/protection of museum collections and archives.

Condition	Overall condition of the collection based on condition survey and improvements to storage.		CALO stores most of the collection in the multi-park storage facility in Manteo, NC, Cape Hatteras National Seashore. Despite holding four park collections in a coastal facility, none of the parks have a professional collections manager or curator.
------------------	--	---	--

2.3. Visitor Experience

Visitor Numbers and Visitor Satisfaction

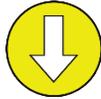
[web](#) ▶

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Number of Visitors	Number of visitors per year		The total of 480,294 visitors to Cape Lookout National Seashore in 2012 was 19% lower than the 5-year average of 597,550 visitors for 2007–2011.
Visitor Satisfaction	Percent of visitors who were satisfied with their visit		Based on the standard visitor satisfaction survey conducted each year, the percentage of visitors satisfied in FY12 was 96.0%, which is similar to the average for the previous five years (96.8%) and ten years (95.2%). Source: 2012 Visitor Survey Card Data Report

Interpretive and Education Programs – Talks, Tours, and Special Events



[web](#) ▶

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Education Programs	Number and quality of programs, and number of participants		The number of schools and number of participants in education programs presented by park staff has increased over the three-year life of the program.
Ranger Programs and Special Events	Number and quality of programs and attendance		The number of participants in formal interpretive programs in 2012 was 10,484, which was the highest in five years. Satisfaction with facilitated programs has been consistently rated high by visitors in the annual surveys. However, with recent reductions in budget and staffing, the park may not be able to sustain this level of service.
Junior Ranger Programs	Number of programs and attendance		In 2009, the park expanded the Junior Ranger program with the addition of a Junior Ranger Adventures program featuring five new exploration booklets, and a park web ranger web site. 1,212 Junior Ranger badges were issued in 2012, which is higher than the number issued in previous years.
Lighthouse Tours	Number of participants		More than 11,000 participants toured the Cape Lookout lighthouse in 2012. In July 2010 the lighthouse reopened after being closed to the public for several years because of safety considerations.

Interpretive Media – Brochures, Exhibits, Signs, and Website



[web](#) ▶

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Wayside Exhibits	Condition and currency of signs		More than 90 interpretive and orientation wayside exhibits have been installed park-wide since 2009. A number of wayside exhibits are showing advanced weathering and rust and will need to be replaced in the next few years.
Park Directional Signs (on-site)	Usefulness, quantity, condition, and placement		The park has installed numerous new way-finding signs in the park during the past several years. The new signs meet the new NPS sign standards. Some of these signs were destroyed with Hurricane Irene/Sandy, funding is available to replace them.
Park Directional Signs (off-site)	Usefulness, quantity, condition, and placement		The existing off-site direction signs are missing, in exceptionally poor condition, and are placed in poor locations for the current highway system. The park has acquired a complete set of replacement signs, but they have not yet been installed by the Department of Transportation.
Exhibits	Harkers Island Visitor Center		New exhibits were installed in 2007 at the Harkers Island Visitor Center, designed to be accessible to visitors with visual and hearing impairments. The exhibits present a good orientation to the park and its themes.
	Keepers Quarters Museum		New exhibits were installed in the Keepers Quarters Museum in 2007 that interpret the lighthouse service and life-saving service and provide a park orientation.
	Light Station Visitor Center Area		The Light Station Visitor Center Area is a primary visitor contact point in the park, but the number of exhibits on natural and cultural resource topics is very limited.
	Portsmouth Village		New exhibits were installed in four historic buildings in 2009 including the Visitor Center, Post Office/General Store, School, and Life-saving Station. The Friends of Portsmouth have opened the Henry Piggot House as a historically furnished space. The Washington Roberts House has recently been restored.
	Beaufort Information Center		New exhibits have been installed in the Beaufort Visitor Information Center which opened in April 2013.
Print Media	Accuracy and availability of primary park publications		The park produces a newspaper and approximately 12 site bulletins each year. The park brochure and map need to be updated. However, reduced funding levels in FY 2013 and beyond may dramatically reduce the number of printed publications at the park. The park is evaluating the print media program to focus on key products.
Cell Phone Tour	Accuracy and volume of use		The park developed a cell phone tour in 2013 that allows visitors to use their cell phones to learn about specific features and locations in the park. The park plans to expand and experiment with the tour to increase its versatility.

Audio-visual Media	Orientation Film		A new park orientation film was developed in 2007, and is fully accessible including open captioning, audio description, and enabled for assisted listening. The film puts the park into a more regional and global context and has been shown nationwide and in other countries.
	AV equipment		Equipment installed with the 2007 exhibits such as the Harkers Island theater projector and seven digital media players are reaching the end of their useful life and need replacement
Websites	Currency and scope of website; number of website visitors		Website content is kept up to date. The number and quality of web pages available to the public has significantly improved in the past five years. The park's website saw over 470,000 page views from February 2013 until August 2013. Budget reductions in FY 2013 and beyond, along with a projected increase in workload, threaten the park's ability to continue actively developing the website.
	Social media: Facebook updates and "likes," overall activity		The park has a Facebook site and a Twitter account. The park uses these media to provide updated current information on a variety of subjects such as lighthouse climbs, resource closures, and emergency situations. The number of followers has increased moderately over the last two years. The park has over 2,500 followers on Twitter and over 1,800 "Likes" on Facebook. Budget reductions in FY 2013 and beyond, along with a projected increase in workload, threaten the park's ability to continue actively developing the website.

Resource Brief: Interpretive Exhibits and Waysides



From the time the park was established in 1976 until 2006, the park had no professionally designed or fabricated exhibits. Since 2007, the park has developed from the ground up a \$1.6 million dollar non-personnel service interpretive program that includes: at the Harkers Island Visitor Center and area: new exhibit space and exhibits; a new 60 seat theater with HD, surround sound to show a new 26 minute park film, Ribbon of Sand; a new and expanded bookstore; and the Sound-Side and Willow Pond Nature Trails; at the Cape Lookout Light Station: the first floor of the Keepers Quarters Museum was restored and new exhibits were installed on the lighthouse, U.S. Life-Saving Service and U.S.

Lighthouse Service; and at the Portsmouth Village Historic District the restored the Life-Saving Station and Washington Roberts house and installed exhibits at the Visitor Center, the Post-Office/General Store, the Schoolhouse and the Life-Saving Station. In addition, the park completed a Wayside Information Plan and installed over 90 exhibits, park wide, including: three-panel orientation exhibits that were strategically placed at ferry departure and all arrival sites to help unify the park and provide safety and place relevant interpretive information, interpretive waysides at Portsmouth Village, the Cape Lookout Light Station, the Cape Village Historic District and at Harkers Island.



Resource Brief: Personnel Services Interpretive Programs

The park's summer interpretive programs have been conducted primarily by a very modest 0.5 full-time equivalent (FTE) of seasonal interpreter support; summer interpretive programs focused on a variety of daily natural and cultural resource interpretive programs including for example: Sea Turtles, Migratory Birds, Life of a Keeper, a discovery cart, and the Cape Lookout Lighthouse. In recent years, the interpretive program benefitted from volunteer assistance to perform programs at the lighthouse and to release park interpreters from coverage of the Harkers Island Visitor Center; increasing number programs provided at the lighthouse and the special event programs from 3 to 7 per year. Sequester-based program cuts resulted in a loss of two positions and elimination of ranger-led interpretive programs at the Lighthouse and at Harkers Island.

Resource Brief: Education Programs

The park initiated an Education Program in 2010 using a 0.5 FTE of seasonal GS-7 Education Technician support. Through a number of Parks as Classrooms Grants totaling over \$100,000, the park developed a number curriculum based teacher resources, one teacher workshop for 23 teachers in 2013, and has sponsored ferry transportation for over 500 school children. This Education Program has made modest gains in 2013 presenting 6 different classroom programs to over 940 students at six schools across Carteret, Craven and Onslow Counties. Five onsite programs were presented to a total of 724 students from 5 schools, and the park participated in Career Days at and presented "Many Hats of a Ranger" to over 230 students in grades 2-8. The park hosted a Teacher Ranger from Onslow County who prepared an education program on the Shackleford Banks horses.



Resource Brief: Volunteer Programs and Visitor Services

As the only visitor center accessible by vehicle from the mainland, the Harkers Island Visitor Center serves as the principal contact point for park visitors. Although modest in size, the visitor center includes orientation and park natural and cultural resource exhibits, children's exhibits, a 27-minute HD film shown in a fully accessible a 60-seat theater, and an expanded Eastern National



bookstore, all newly renovated since 2007. Other visitor centers include Portsmouth Village, the Cape Lookout Light Station, and the Cape Lookout Lighthouse Keepers' Quarters, and the park maintains registration/fee offices at the Long Point and Great Island Cabin Lodging areas on North and South Core Banks. Because the Seashore islands are accessible by private boats and from numerous ferry departure sites, the visitor centers and contact stations on the islands are often the only place that a visitor will encounter park staff and VIPs. With the development of ferry gateways at the Town of Beaufort and Harkers Island, the NPS will be responsible for staffing a new visitor center and will experience increased traffic at Harkers Island.



During the last 13 years, the park's Volunteer-In-The-Park (VIP) program has grown significantly under the management of a long-term VIP. Six duty stations are staffed up to 9 months of the year by pairs of VIPs that work for a duration of 1 to 6 weeks; duty stations include Portsmouth Village, the Light Station Visitor Center, the Keepers' Quarters Museum / Cape Village, the Cabin Camps, and most recently, the Harkers Island Visitor Center. Over 280 volunteers generate between 10-12 FTE of labor for the park, representing a significant percentage of the park's workforce. The park interpretive program is responsible for supporting most of the visitor service VIPs but currently does not have sufficient staff to meet this challenge.

Resource Brief: Cabin Camps at Cape Lookout NS

The Park has two Rustic Cabin Camp areas: Great Island Cabin Camp and Long Point Cabin Camp. Both are located beachfront on the beautiful beaches of Cape Lookout National Seashore. Great Island Cabin Camp is located on South Core Banks and Long Point Cabin Camp is located on North Core Banks, both are within beautiful Cape Lookout National Seashore just off the mainland of North Carolina. The historic camp has been a favorite of fisherman and beach goers for many years.

The camps can only be reached by boat, adding an element of both privacy and adventure. Visitors can travel by personal boats or reserve a spot on one of the three ferries, which cruise across scenic Core Sound to either North or South Core Banks. Long Point Cabin Camp offers 10 rustic, wooden beachfront duplex cabins, visitors can rent one half of a duplex (sleeps six) or the whole duplex (sleeps twelve). Cabins 9–20 have connecting doors between sides. Each unit is approximately 500 sq. feet. And Cabins 9 and 10 are accessible.

Great Island Cabin Camp offers 25 rustic, wooden beachfront cabins for individuals and families or small groups of up to 12 people. Cabins range in size from 288 to 960 sq. ft., and Cabin 2 is accessible. Each cabin contains bunk beds and mattresses, a private bath with sink and shower stall, a hot water heater, a table and chairs. Small kitchens are equipped with cabinets and a propane oven/stove. A grill is just outside each cabin. Bathroom facilities are also centrally located within the camp.

Campers must provide their own linens, bedding, cookware, food and food storage, coolers, first-aid supplies and anything else needed during their stay. Most campers also bring flashlights or gas lanterns. Ice and gas are available at the camp office.



Accessibility



[web](#) ▶

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Mobility	Harkers Island and Town of Beaufort facilities		The visitor center and picnic area are accessible to visitors with limited mobility. The nature trail is partially accessible. There are no accessible connections between facilities or to the Core Sound Waterfowl Museum.
	Light Station area		The boardwalk and facilities provide adequate accessibility, but there is no accessible connection from the ferry to the boardwalk. Mobility barriers exist at the entrance to the Keepers Quarters, where the boardwalk connects to the Lighthouse sidewalk, and also to the ocean-side beach. A beach wheelchair is available for loan.
	Cabin camps		At least one cabin in each area has an accessibility ramp to the nearby sand parking area. The interiors of these cabins are mostly accessible. Beach wheelchairs are available for loan.
	Portsmouth Village		Accessibility is very limited at Portsmouth Village. The historic structures with exhibits have mobility barriers, but modifications that would affect the historical integrity of the structures are not permitted.

Visual and Auditory Accommodation	Current standards met		The park film at Harkers Island is audio-described, and some of the exhibits include tactile elements, but no other exhibits in the park have assisted visual accommodations. The park brochure is not available in braille. The new cell phone tour allows visitors to use their cell phones to learn about specific features and locations in the park. The park film at Harkers Island has assisted listening and captioning, and the park film at the Keepers Quarters is captioned and has an induction loop to assist hearing. Transcripts are available for park interactive exhibits, and podcasts that are posted to the park website have transcripts available.
Ferry Service and Land Transportation	Access to the park		The new concession ferry vessels are accessible. The docks at Harkers Island and in the town of Beaufort are accessible. There are no visual or auditory accommodations on any of the ferries.

Safety  [web](#) ▶

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Visitor Safety	Recordable incidents		The safety of visitors is a park priority. The park works to quickly identify and mitigate potential hazards, and the number of accidents is very low.
Staff Safety	Number of staff trained		Regular safety messages are given and distributed to staff members. The safety committee has been reestablished and is becoming active. The park management team is conducting monthly safety walk-around meetings to document and address safety issues.
Staff Training and Safety Plans	Number of staff trained Currency of safety plans		Operational Leadership Training has been completed by park staff, and CPR, First Aid, and AED training are offered to staff on a space available basis. Job Hazard Analysis is generally conducted. The park is lacking some required safety plans, however technical assistance has been secured through SER Risk Management to prepare and update existing plans in 2014.
Law Enforcement Activities	Number of recordable incidents		The number of recordable incidents has been steadily increasing with about 1,200 incidents in 2012. The Law Enforcement staff is being dispatched through Carteret County 911 Center (24-hour dispatch).

Volunteers and Partnerships



[web](#) ▶

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale Comments
Volunteers	Number of volunteers and number of hours contributed		Virtually all visitor services functions depend on park volunteers, with 279 volunteers contributing more than 20,000 hours of service to the park in 2012. Volunteers help manage the visitor services at Portsmouth Village, Light Station Visitor Center, Keepers' Quarters Museum, and contribute significantly to visitor services at the Harkers Island Visitor Center and the cabin camp areas.
Partnerships	Number of official and unofficial partnerships		The park has 13 formal and 47 informal partnerships, including Core Sound Waterfowl Museum and Heritage Center, Foundation for Shackelford Horses, Town of Beaufort, and Carteret County 911 Center.

2.4. Park Infrastructure

Overall Facility Condition Index



[web](#) ▶

The National Park Service uses a facility condition index (FCI) to indicate the condition of its facilities and infrastructure. FCI is the cost of repairing an asset, such as a building, road, trail, or water system, divided by the cost of replacing it. The lower the FCI number, the better the condition of the asset. The condition of the buildings and other infrastructure assets at each park is determined by regular facility inspections, or “condition assessments”, including daily informal inspections and formal yearly inspections. Deficiencies identified from these assessments are documented in the NPS Facility Management Software System and the cost for each repair determined. Repairs that cannot be completed within the year count against the condition of a structure. The total cost of these deferred repairs divided by the total cost to replace the structure results in the FCI, with values between 0 and 1 (the lower the decimal number, the better the condition). The FCI is assigned a condition category of Good, Fair, Poor, or Serious based on industry and NPS standards. Deferred maintenance projects that require additional funding are identified based on FCI. Planned preventive maintenance on critical components occurs during the year, using a park’s base budget. For additional information about how park managers use information about the condition of facilities and infrastructure to make decisions about the efficient use of funding for maintenance and restoration activities at the park, [Click Here](#).

Asset Category	Number of Assets 2008 / 2012	FCI 2008 / 2012	Condition Status/Trend	Rationale
Buildings	161 / 160	0.321 / 0.103		70 of the 160 structures in the park are historic buildings. Several of the park historic structures date back to the 1800s. The structures within the park include overnight recreational cabins, the Administrative Visitor Center at Harkers Island, Cape Lookout Lightstation, and park housing. Many of our historic structures have significant deferred maintenance, these structures include the Portsmouth Church, The George Dixon House, Cape Lookout Coast Guard Station and Life Saving Station are just a few of the buildings of immediate restoration.

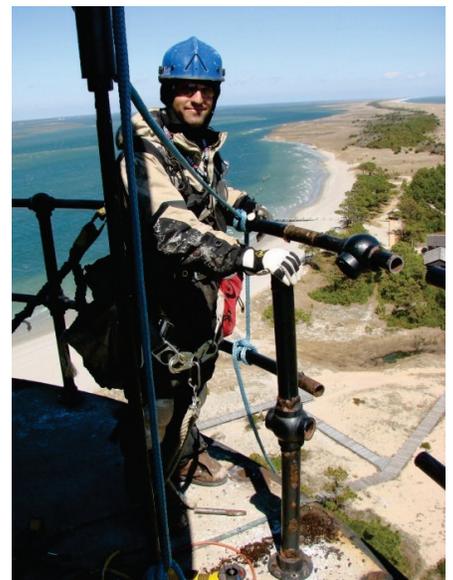
Trails	5 / 6	0.038 / 0.052		The Harkers Island Nature Trail was rebuilt with a new boardwalk and dock after Hurricane Irene; however, many of our boardwalks located at the Cape Lookout Lighthouse visitor center area—which are ADA accessible—are in need of major repair.
Waste Water Systems	53 / 55	0.264 / 0.212		The park maintains 55 septic systems most of which are on the barrier island and in good condition. The septic system for the Administration Visitor Center and housing area is currently in poor condition; however, the park has submitted a funding request to connect to a sewer system in 2014–15.
Water Systems	4 / 4	0.000 / 0.000		The 4 park water systems are wells that provide water for visitors and park operations. They are in good condition with only minimal improvements needed.
Unpaved Roads	5 / 9	0.070 / 0.000		Most of the park’s unpaved roads are sand roads that are in good condition.
Paved Roads, Parking Areas, Bridges, Tunnels	15 / 11	0.073 / 0.080		Overall the paved roads and parking areas in the park are in good condition; however, the parking lots for the visitor center and staff parking, picnic area, the maintenance area, and Cape Point road are in need of repaving. The park has submitted funding requests to complete this work.
All Others	38 / 55	0.080 / 0.006		The all others category includes the park radio systems, electrical generation systems, maintained landscapes, interpretive media and waysides, marine waterways, cemeteries and historic landscapes. The park has received funding to upgrade the Harkers Island marina this year. The park continues to seek funding to upgrade the Harkers Island fuel farm which is essential to provide fuel for park operations.

Resource Brief: Cape Lookout Lighthouse Opening

The 1859 Cape Lookout Lighthouse is listed on the NR of historic places. It, along with its complex, plays a significant role in the visitor appreciation and understanding of the entire park and the surrounding areas. Visible within a 20-mile radius, the Cape Lookout Lighthouse is one of the most recognized symbols of North Carolina, and the lighthouse complex is the centerpiece of the seashore region. The lighthouse has served as a beacon to wayfaring mariners and passing ships through the “Graveyard of the Atlantic.” To this day it is served as a model for all of the tall coastal lighthouses in the state.

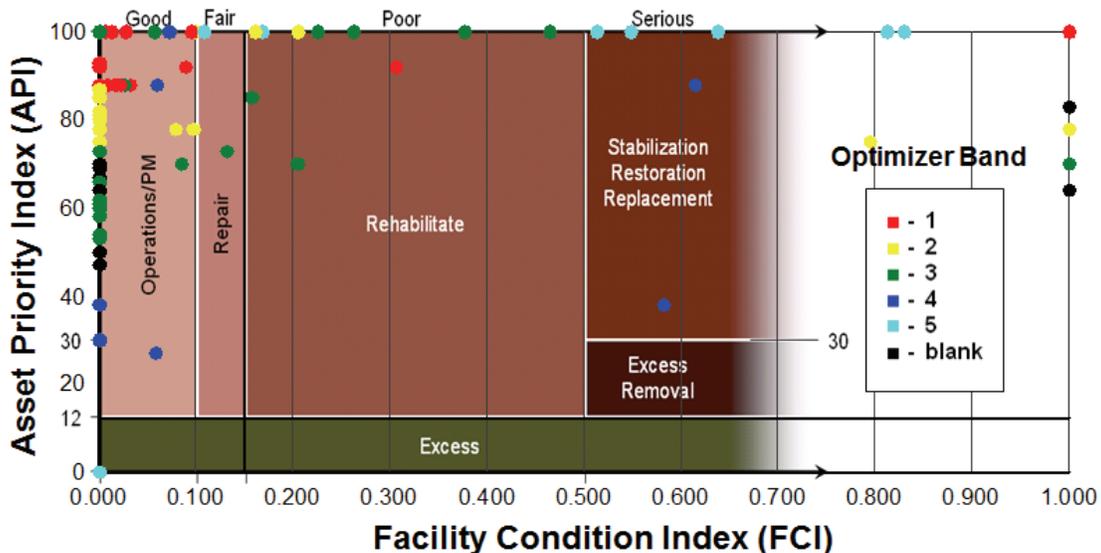
In 2003, the Cape Lookout Lighthouse was transferred from the U.S. Coast Guard to the National Park Service. The lighthouse had begun to deteriorate at a rapid pace in the harsh coastal climate where hurricanes and strong coastal storms occur almost annually.

In 2010, repairs were completed on the Cape Lookout Lighthouse allowing the re-opening of the structure to the public. Replacement of the pipe railings throughout the interior stairway and observation gallery and repairs to the spiral staircase and watch-level stairs were made. Installation of emergency lighting and the interior painting of the metal railing and stairs were also completed.



Another important facilities management planning tool used at a park is the Asset Priority Index (API). It identifies the importance of the various infrastructure components at a park. The API is determined using five criteria, and is calculated out of 100 possible points. The criteria are weighted based on their importance to NPS core priorities. They are distinct to ensure that each aspect of the asset is measured independently. As a result, most assets will not rate high in every category.

The scatterplot (below) for 2012 shows the FCI for each of the infrastructure asset types at Cape Lookout National Seashore. It plots buildings, trails, roads, parking areas, and other infrastructure assets against its Asset Priority Index (API). Park managers and maintenance staff use the FCI and API data for each park asset to focus on preventive maintenance and repairs to facilities that are most critical to their parks.



Optimizer bands—the color of the dots in the scatterplot—are assigned to each facility or asset as a tool to prioritize use of limited funding to maintain park infrastructure. Optimizer Band 1 includes those assets with the highest maintenance priorities. These assets are most important to the park—often linked to the park's enabling legislation or have high visitor use—and usually are in the best condition. Band 1 assets receive the highest percentage of base funding for routine operations, preventive maintenance, and recurring maintenance to keep them in good condition with proactive, planned maintenance. These assets are important to park operations, but because fewer park base dollars are available after maintaining Band 1 assets, Band 2 assets receive a lesser percentage of remaining funds. Assets in the lower priority bands may only receive preventive maintenance for the most critical components or may require special projects or partner funding to maintain them. For additional information about optimizer bands and how park managers use them to make decisions about the efficient use of funding for maintenance and restoration activities at the park, [Click Here](#).

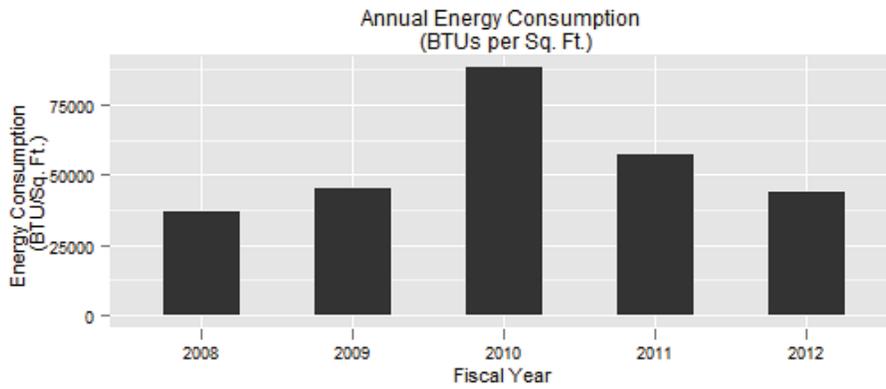
Energy Consumption



[web](#) ▶

The production of energy to heat, cool, and illuminate buildings and to operate water utility systems is one of the largest contributors to greenhouse gas emissions in the United States. The National Park Service is committed to improving facility energy performance and increasing its reliance on renewable energy sources. The National Park Service has a goal to reduce Servicewide building energy consumption per square foot of building space by 35% by 2016 from the baseline set in 2003 ([NPS Green Parks Plan 2012](#)).

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Energy Consumption	BTUs per gross square footage of buildings		Energy usage (BTUs per gross square footage of buildings) at the park in 2012 was 22.9% lower than the average for the previous 4 years (Source: NPS Annual Energy Report).



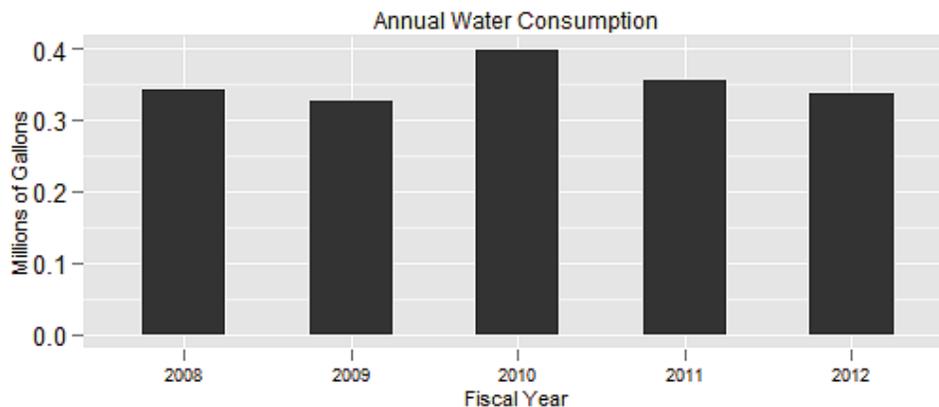
Water Consumption



[web](#) ▶

The national and global supply of fresh water has diminished in recent decades, and this trend is likely to continue due to drought and other climatic changes. To contribute to the responsible use of freshwater supplies, encourage groundwater recharge, and protect water quality, the National Park Service is improving its efforts to conserve water, reuse gray water, and capture rainwater, and has set a goal to reduce non-irrigation potable water use intensity by 30% by 2020 from the baseline set in 2007 ([NPS Green Parks Plan 2012](#)).

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Water Consumption	Millions of gallons		Water consumption at the park in 2012 was 5% lower than the 4-year average for 2008–2011 (Source: NPS Annual Energy Report).



2.5. Wilderness Character

The Wilderness Act of 1964 requires the NPS to maintain Wilderness character, including the qualities of being “...untrammelled by man...undeveloped...natural,” and allowing for “...solitude or primitive and unconfined recreation.” A detailed evaluation of wilderness character is documented in a 2013 report and is summarized below. In 1986, the National Park Service Director signed a recommendation for designating Shackleford Banks a wilderness area; however, no formal designation has been made to date.

Wilderness Character  web ▶		
Wilderness Quality	Condition Status/Trend	Rationale
Natural		There are no roads or bridges to the proposed Shackleford Banks Wilderness Area and the island remains a rare haven of diversity and complexity on the North Carolina coast. Natural processes are central to the visitor experience, and the island’s natural qualities also serve as a natural laboratory to study barrier island dynamics, climate change, and ecological changes over time.
Undeveloped		Except for a dock on the island, a horse pen, two small comfort stations, and an equipment shed, Shackleford Banks is undeveloped. The contrast of extremely limited development within the proposed wilderness compared to neighboring islands and much of the North Carolina mainland exemplifies the undeveloped quality of the area. Visitors are allured by the almost entirely unobstructed views and natural sounds on the ocean side of the island.
Untrammelled		The Shackleford Banks area is characterized by sections of sparsely visited beaches, dunes and dense pockets of maritime forest on the island’s interior that see very few humans. The majority of the islands is untrammelled. Monitoring is indicating that the dredging of the Beaufort Inlet for navigation is causing some impacts to the natural geologic processes. The western side of the island has a rock jetty.
Solitude or Primitive and Unconfined Recreation Opportunity		The outstanding opportunity for solitude and recreation remains a fundamental characteristic of the proposed Shackleford Banks wilderness. Vast views of endless sky and distant ocean horizons elicit a liberating isolation from the urban world. Opportunities for hiking, backpacking, camping, sightseeing, stargazing, nature studying, and wildlife viewing provide visitors with outstanding options for recreation. The most concentrated visitor use exists primarily on the island’s sound side beaches on western end, whereas visitation to the island’s interior remains more limited. The number of people visiting these beaches on western end may diminish the opportunity for some visitors to fully experience the island’s solitude especially during summer months.

Chapter 3. Summary of Key Stewardship Activities and Accomplishments

Activities and Accomplishments

The list below provides examples of stewardship activities and accomplishments by park staff and partners to maintain or improve the condition of priority park resources and values for this and future generations:

Natural Resources

- Continual protection and monitoring of protected animal and plant species including:
 - sea turtle nesting activities since 1990s
 - piping plover nesting activities since 1989
 - American oystercatcher nesting activities since 1995
 - sea beach amaranth since 1992
 - seasonal migration surveys of red knots and Wilson’s plovers since 2006
 - sea turtle and marine mammal strandings since 1989
 - colonial nesting shorebird areas since 2006
- Continued management of horse herd according to federal legislation in partnership with Foundation for Shackleford Horses, Inc.
- Completion of basic natural resource inventories and initiation of long-term monitoring of a subset of the Seashore’s natural resources by the Southeast Coast Inventory and Monitoring Network (SECN).
- Completion of a coastal watershed condition assessment and draft natural resource condition assessment.
- Continued partnership with Dr. Ted Simons (NC State Coop Unit) to study American Oystercatcher population dynamics and distribution.
- Continued partnership with Dr. Stan Riggs (East Carolina University) to study barrier island geomorphology.
- Joint operation of two continuous water quality monitoring stations in partnership with NC DENR and the NC NERR programs.
- Completion of soundscape and military overflight impact study in 2013.
- Completion of the Interim Protected Species Management Plan in 2006.
- Ongoing development of the park’s Offroad Vehicle Management plan.
- Completed a study on raccoon population dynamics and impacts on nesting shorebirds on South Core Banks.

Cultural Resources

- Completed renovations to improve safe access of the Cape Lookout Lighthouse and opened it to the public in 2010.
- Survey of archaeological sites impacted by Hurricanes Irene (2011) and Sandy (2012).
- Completed “Ethnohistorical Description of Four Communities Associated with Cape Lookout National Seashore.”
- Completed 13 historic structure reports.
- Rehabilitation of the interior of the Washington-Roberts House in 2012.
- Stabilized six historic structures within the Cape Lookout Historic District.

Visitor Experience

- Harkers Island Visitor Center Upgrade and Exhibits: The park expanded the Visitor Center and installed new exhibits, a new 60-seat theater with digital and surround sound, and a new Eastern National Bookstore.
- New Seashore film: Completed a new 27-minute HD surround-sound film, “Ribbon of Sand” in 2006 that provides visitors with an overview of the entire seashore and that places the seashore in a regional ecosystem context.
- Sound Side and Willow Pond Nature Trails: In 2006, in cooperation with the Core Sound Waterfowl Museum and Heritage Center and the Master Gardeners the park developed and installed two interconnecting nature trails with a boardwalk and sound side viewing pier.
- Interpretive Waysides and Orientation Waysides: In 2007, the park installed over 90 Orientation Waysides at many ferry departure locations and at all ferry arrival sites, and Interpretive Waysides at Portsmouth Village, the Lighthouse area, Cape Village and at Harkers Island.
- Upgrade of Facilities at the Light Station area: In 2006–7 the park restored the Cape Lookout Light Station Keepers’ Quarters (removing 2 small bathrooms, storage and a visitor contact station) and constructed new accessible bathrooms, a visitor center/bookstore, a large shade shelter, a transportation shelter, and boardwalks connecting these facilities from the dock to the ocean beach. The restored Keepers Quarters received new exhibits on the lighthouse, lighthouse service, life-saving service.
- Upgrade of Restrooms: Facilities were upgraded at Shackleford Banks, the Lighthouse, and the Cape Lookout point resulting in better facilities for park visitors.

- Planning for Ferries: Through Alternative Transportation Program (ATP) funding the park developed a Passenger Ferry Transportation Feasibility Study (2010) and a Passenger Ferry Departure Site Environmental Assessment / Assessment of Effect (3/2011) that established two ferry gateway departure sites, one at the Town of Beaufort and the second at the Harkers Island area. The park will manage ferry transportation from these two sites through a park concessioner that will begin operation in 2014.
- Planning for ORVs: The ORV management planning process is in its final stages; the plan will be completed during the next five year period.
- Portsmouth Village Exhibits: New exhibits were installed in four buildings in 2009, including the Visitor Center, School, Post Office/General Store, and U.S. Life-Saving Station. The exhibits were kicked off by a Historian's Roundtable that was attended by both NPS and academic maritime experts as well as a number of park partners.
- Henry Pigott House opens: Through a partnership with the Friends of Portsmouth Island the Friends renovated and furnished the Henry Pigott house and the park opened the house to the public as a furnished exhibit in 2012.
- Lighthouse Engineering Study and Safety Upgrades: The Cape Lookout Lighthouse was transferred from the U.S. Coast Guard to the NPS in 2003, was opened to the public 4 times per year until 2007, and in 2010 reopened for public access after completion of an engineering/safety study and \$500,000 in historic preservation and safety upgrades.
- Education program start up in 2010.
- Junior Ranger Adventures program and Junior Ranger update.
- VUAs in Cabin Camps: Provide a contact point for the arriving ferries as well as the cabin renters, to disseminate current information, including park management such as resource closures and regulations.
- Staffing in the Camps (LE): Provides 24-hour emergency response as well as general visitor assistance on North and South Core Banks.
- Volunteers in Parks (VIPs): Provide additional staffing, including staffing visitor centers, informational contacts and interpretive programs, as well as maintenance, security and 24-hour emergency contacts.
- Social Media: Since 2011, the park has activated Facebook and Twitter accounts and has worked to do daily releases on both sites. The park has over 1,840 likes and over 2,500 followers.
- Digital Media: The park produced 4 podcasts in 2009, and in 2012 established a cell phone tour which has grown to over 50 stops.
- Education/Teacher Resources: The park established an education program in 2010. Since that time the program has reached over 10 schools in Carteret, Craven and Onslow Counties and over 3,000 students. The park received five grants. Through PAC grants the park has prepared over 15 curriculum based teacher resources. The park provides four Traveling Trunks.
- Urban Youth Grant and Ticket to Ride Grant: The park received grants to bring underserved youth to the park and to provide transportation to allow 500 students to experience the history of the Lighthouse area and the natural and cultural resources of the seashore.
- Through improved law enforcement the park has restored a more family atmosphere in key visitation nodes in the park..
- Cape Lookout Village Historic District, Les and Sally's: With expiration of leases in Cape Village, the park received 14 historic structures in 2010. The park completed the Cape Village Historic Structure Re-Use Implementation Plan for the historic district that determined that the best use of the structures were for visitor facilities, museum space, and overnight rental facilities.

Park Infrastructure

- Water System: The park installed a 4-inch water well at the Lighthouse in 2005 and water treatment facilities to provide potable water to the Cape Lookout Light Station area, Les and Sally's, and in the future to the Cape Lookout Village Historic District.
- Installed power and water utilities at the Les and Sally's complex.
- Work has begun to stabilize and restore the Jetty Worker #1, #2, and the O'Boyle-Bryant house located in the Cape Lookout Historic village.
- The park installation of solar panels to fully power the Cape Lookout Lightstation visitor center will significantly reduce the greenhouse gases by eliminating a gas powered generator.
- Funding has been received to rehab the exterior of the Cape Lookout Lighthouse which will include; stucco work, new windows, and exterior painting.
- The restoration of the Washington Roberts house located in the Portsmouth Village historic district was completed bringing the structure into good condition. The park plans to open the Washington Roberts house to the public in the near future.
- Currently installing a new sustainable dock with concrete decking at the Haulover location in Portsmouth Village. The intent of this new dock is to be able to withstand harsh weather conditions.
- Energy improvements have been made at the Harkers Island Administration and Visitor Center building by installing new energy efficient windows and blinds, along with installation of programmable thermostats, and upgraded HVAC system and insulation to the auditorium which has reduced energy consumption by nearly 20% over the last two years.
- ADA improvements have been made at the Harkers Island Visitor Center to include, electronic door openers and a handicap elevator/lift.

- The park installed new hurricane shutters at the Administration and Visitor Center building to protect the structure in future storms.
- The park has substantially expanded its recycling program to now include the visitor centers, park picnic areas, and is expanding its program to include the Great Island and Long Point cabin areas and other key locations throughout the park.
- Upgrades are planned to the Harkers Island facilities waste water systems to include connecting to a municipal treatment system.
- The park picnic areas were upgraded with new picnic tables that were made out of sustainable recycled materials. A new restroom facility is planned at the Harkers Island picnic area. The building is being constructed using sustainable materials that will significantly reduce long term maintenance while providing enhanced visitor services.
- After hurricanes Irene and Sandy, repairs of the park cabins at Great Island and Long Point were made in addition to restoring both water and waste water systems throughout the cabin areas.

Chapter 4. Key Issues and Challenges for Consideration in Management Planning

Cape Lookout National Seashore is an important conservation area on the Atlantic Coast that preserves a dynamic intact natural barrier island system where natural ecological processes dominate. The park is a relatively narrow ribbon of sand extending from Ocracoke Inlet to Beaufort Inlet. The barrier islands stretch over 56 miles long and encompass approximately 29,000 acres of land and water. As you move from the waves of the Atlantic, you cross broad beaches and climb up and through the dunes. As you move towards the sound you will travel through sparse grasslands, interior marshes or maritime forest, to reach the salt marshes, creeks and the ultimate reach of the sounds that are part of the Pamlico Sound estuary. This chain of islands provides habitat to a variety of species of special concern including an array of birds, such as the piping plover, American oyster catcher and red knot. Four species of sea turtles nest on the beaches of the park. Shackleford Banks, one of three main islands that comprise the Park, is home to a wild horse herd. The marshes and tidal creeks along the Sounds are vital nurseries for the estuary. This maritime landscape includes a long history of human use. The Park preserves two National Historic Districts that include several key structures, including the Cape Lookout Lighthouse, representing over two centuries of federal efforts to protect maritime commerce and human lives.

The National Park Service completed a Foundation Document (2012) that identifies the purpose, significance and fundamental resources and values of the Park. This document is being utilized to guide management to ensure the fundamental resources and values are preserved for future generations. The identification of the fundamental resources and values also included an assessment of the condition, trends, threats and opportunities. Based on this assessment there are several areas that will require continued management attention.

Climate Change / Sea Level Rise

The park is very vulnerable to being impacted by the effects of climate change. The highest elevations in the park are dunes that are approximately 15 feet above sea level. The IPCC has project scenarios showing the region experiencing sea levels rising by over three feet by 2100. If these projections become reality, all Park resources would be significantly impacted in one way or another. Managers will be faced with difficult decision over the preservation of natural and cultural resources. Critical management actions to be considered include:

- Documentation of all existing cultural resources to ensure that knowledge of these historic resources is available for future generations.
- Monitoring for changes to the natural resources is essential, in particular species of special concern.
- Development of a strategy for adaption that identifies the highest priority areas for focusing management efforts.
- Maintaining a dialogue with the public about the future of the park in the context of climate change.
- Utilization of scenario planning to establish strategies/plans for guiding management response to catastrophic events, such as hurricanes.
- Factoring greenhouse emissions into management decisions about park operations and management. Continuing to modify existing facilities, vessels and vehicles to reduce our carbon footprint.

Undeveloped Character

One of the park's most distinguishing values is its primarily undeveloped qualities in contrast to neighboring barrier islands. There are no roads or bridges to the park's islands, which contributes to unique visitor opportunities. Indeed, natural processes are central to the visitor experience here. The ocean's power resonates through the sounds of pounding surf along the Core Banks, for example, while few traces of human use are noticeable within Core Sound marshes. Visitors can witness the vast ocean viewshed by day and enjoy some of the darkest night sky vantages along the East Coast by night. Critical management actions to be considered include:

- Remain engaged in issues outside the park boundary that would impact the viewsheds and night sky.
- Eliminate and mitigate impacts of park facilities to viewsheds and night sky.
- Limit development to those critical to provide for public access and health and safety.

- Remove non-historic structures that are not critical to park operations.
- Remove debris and trash from the park.

Special Status Species

Birds – The park’s location along the Atlantic Flyway provides nesting, resting, and feeding habitat for a diverse assemblage of birds. In 1999, the American Bird Conservancy designated Cape Lookout National Seashore as a Globally Important Bird Area in recognition of the value the park provides to bird migration, breeding, and wintering. The park is home to the federally listed piping plover. In addition, the park provides nesting habitat for several state-listed species, including the common tern, least tern, gull-billed tern, and black skimmer. Solitary nesters, such as the American oystercatcher and Wilson’s plover, also use Cape Lookout National Seashore as a breeding ground, as well as the red knot, which uses the park during spring and fall migrations. Major concerns for conserving this diverse assemblage of birds include recreation management, in particular off-road vehicle management. Critical management actions to be considered include:

- Completion of the ongoing development off-road vehicle management plan and subsequent regulations.
- Continuation of implementation of the Interim Protected Species Management Plan.
- Continuation of ongoing monitoring and management actions to protect habitat.
- Development and implementation of an effective strategy for mitigating the impact of predators of special status species.

Sea Turtles – Cape Lookout National Seashore is used as nesting habitat by four federally listed sea turtles: the loggerhead, green, leatherback, and Kemp’s ridley. Major concerns for conserving this sea turtle nesting include recreation management, in particular off-road vehicle management. Critical management actions to be considered include:

- Completion of the ongoing off-road vehicle management plan and subsequent regulations.
- Continuation of implementation of the Interim Protected Species Management Plan.
- Continuation of ongoing monitoring and management actions to protect turtle nest.
- Development and implementation of an effective strategy for mitigating the impact of predators.

Shackleford Horses – Shackleford Banks, the southwestern-most barrier island within park boundaries, is one of the few places in the eastern United States where visitors can see wild horse herds. The Shackleford horses are protected by federal legislation. As outlined in the legislation the horse herd is co-managed with the Foundation for Shackleford Horses (Foundation). The NPS has worked to ensure a good working relationship with the Foundation. Critical management actions to be considered include:

- Maintaining a good working relationship with the Foundation for Shackleford Horses.
- Maintaining a current horse management plan that focuses on population management in a manner that does not require removal of horses.
- Continuing educational efforts to prevent human-horse conflicts/interactions.

Recreational opportunities and experiences in a remote setting

The park’s recreational opportunities are nationally significant due to the variety and scale afforded by its unique geography and primarily undeveloped character. In addition, multigenerational activities, such as surf fishing, hunting, shelling, and beachcombing celebrate rich cultural traditions. Critical management actions to be considered include:

- Continuing development and implementation of strategies that ensure public access to the park that is convenient and accessible. Securing mainland departure sites for the long-term access to the park is critical.
- Developing strategies for preserving the character of proposed wilderness on Shackleford Banks.
- Completing the ongoing off-road vehicle management plan and subsequent regulations.
- Engaging in a civic dialogue about the future of the park with various stakeholders.
- Continuing to enhance our ability to share information with park visitors through a variety of methods.

National Historic Districts

Portsmouth Village National Historic District – Chartered in 1753 by the North Carolina Colonial Assembly, Portsmouth Village played a critical role in the conduct of maritime commerce in North Carolina from the colonial period until the American Civil War. It remains an intact village, featuring 21 historic buildings and structures. The first floor elevations of most of these structures are one-meter or less above sea-level, which is equal to the 2100 sea-level rise projections by the IUCC. Critical management actions to be considered include:

- Complete the documentation of the historic structures, focusing on the most vulnerable structures first.
- Develop management plan for the district that factors in climate change and establishes management priorities.
- Remove all non-contributing structures and features.
- Continue to implement the recommendations in the cultural landscape report.
- Secure funding that will sustain the preservation as outlined in the management plan.

Cape Lookout Village National Historic District – Structures and sites in the national historic district represent over two centuries of federal efforts to protect maritime commerce and human lives at the Cape, including the 1812 lighthouse (site), 1859 lighthouse and

light station, 1886 U.S. Life-Saving Station, and the 1917 U.S. Coast Guard Station. Critical management actions to be considered include:

- Complete the documentation of the historic structures.
- Revisit the district management plan that factors in climate change and establishes management priorities.
- Remove of non-contributing structures and features.
- Continue to implement the recommendations in the cultural landscape report.
- Secure funding that will sustain the preservation as outlined in the management plan.

Park Infrastructure and Sustainable Practices

The Park currently has over 300 assets, including historic structures, operation facilities, maintained landscapes, water and sewer systems and an array of other structures. The NPS developed a Park Asset Management Plan (PAMP) was completed in 2008. There are several structures that have a low asset priority index (API) rating. These facilities present safety hazards and increase the park's deferred maintenance cost.

The Park has worked to improve sustainable practices with a heavy focus on reducing energy costs and greenhouse gas emissions. Operations on the islands are typically dependent on energy produced by diesel generators which are not sustainable and require a large amount of staff time to deliver fuel to the islands. Cape Lookout has the potential to reduce the dependence on fossil fuels and greenhouse gas emissions.

Management of solid waste from the islands is another labor intensive and expensive effort. Most areas of the park are trash free, meaning that visitors are asked to remove all the trash that they bring to the island. The park administrative site, the Great Island and Long Point cabins and staff/volunteers on the island generate solid waste. The park has begun an effort of recycling at the administrative site.

Critical management actions to be considered include:

- Complete Re-optimization process to ensure API reflects current management direction.
- Update the Park Asset Management Plan.
- Prioritize low priority assets (low API) for demolition and removal from the park.
- Continue efforts to ensure park facilities are energy and water efficient.
- Grow the park's recycling program.

Safety

Safety of park staff, volunteers and visitors is a high priority. The safety program is rebuilding. In 2012, Operational Leadership training was conducted at the park and these principles are factored into day-to-day operations of the park. Staff members are participating in regular tailgate sessions. Several required safety plans need to be updated and/or prepared for the park. Critical management actions to be considered include:

- Continue to train staff and follow the principles of operational leadership.
- Complete and or update required safety plans.
- Continue to develop a culture where safety is a priority.

References

See the [State of the Park Report for the Park website](#) for a more complete list of references to documents and data sets upon which the assessments in this State of the Park report are based. References for several of the key documents cited in this report are as follows:

[Byrne, M. W., S. L. Corbett, and J. C. DeVivo. 2012.](#) Vegetation community monitoring at Cape Lookout National Seashore, 2010. Natural Resource Data Series NPS/SECN/NRDS—2012/258. National Park Service, Fort Collins, Colorado.

[Byrne, M. W., J. C. DeVivo, J. R. Asper, and B. A. Blankley. 2011a.](#) Landbird community monitoring at Cape Lookout National Seashore, 2010. Natural Resource Data Series NPS/SECN/NRDS—2011/301. National Park Service, Fort Collins, Colorado.

[Byrne, M. W., B. D. Smrekar, M. N. Moore, C. S. Harris, and B. A. Blankley. 2011b.](#) Summary of amphibian community monitoring at Cape Lookout National Seashore, 2010. Natural Resource Data Series NPS/SECN/NRDS—2011/166. National Park Service, Fort Collins, Colorado.

[Byrne, M. W., and M. N. Moore. 2011.](#) Incidence of chytrid fungus, *Batrachochytrium dendrobatidis*, in Southeast Coast Network parks. Natural Resource Technical Report NPS/SECN/NRTR—2011/477. National Park Service, Fort Collins, Colorado.

- [Caffrey, M. 2013.](#) Sea level and storm surge trends for the State of the Park Report, Cape Lookout National Seashore. NPS Geologic Resources Division. Lakewood, Colorado. 6 pp.
- [DeVivo, J. C. and M. B. Gregory. 2011.](#) Assessment of benthic macroinvertebrate communities at Cape Lookout and Cape Hatteras National Seashores, 2010. Natural Resource Data Series NPS/SECN/NRDS—2011/395. National Park Service, Fort Collins, Colorado.
- [Dingle, J. L., M. B. Gregory, C. Wright, and E. Thompson. 2012.](#) Fixed station water quality monitoring at Cape Lookout National Seashore: 2010 data summary. Natural Resource Data Series NPS/SECN/NRDS—2012/323. National Park Service, Fort Collins, Colorado.
- [Federal Aviation Administration. 2010.](#) FAA Aerospace Forecast Fiscal Years 2010–2030. U.S. Department of Transportation Federal Aviation Policy and Plans, Washington D.C.
- [Fisichelli, N. 2013.](#) Climate Change Trends for the State of the Park Report, Cape Lookout National Seashore, North Carolina. NPS Climate Change Response Program. Fort Collins, Colorado. 6 pp.
- Fuentes, M. M. P. B., M. R. Fish, and J. A. Maynard. 2012. Management strategies to mitigate the impacts of climate change on sea turtle's terrestrial reproductive phase. *Mitigation and Adaptation Strategies for Global Change* (2012) 17:51–63 DOI 10.1007/s11027-011-9308-8.
- [Gregory, M. Brian, and K. A. Smith. 2011.](#) Assessment of estuarine water and sediment quality at Cape Lookout and Cape Hatteras National Seashores, 2010. Natural Resource Data Series NPS/SECN/NRDS—2011/179. National Park Service, Fort Collins, Colorado.
- [Hymel, S. N. 2009.](#) Inventory of marine and estuarine benthic macroinvertebrates for nine Southeast Coast Network parks. Natural Resource Report NPS/SECN/NRR—2009/121. National Park Service, Fort Collins, Colorado.
- [Ingram, K., K. Dow, L. Carter, J. Anderson, eds. 2013.](#) Climate of the Southeast United States: Variability, Change, Impacts, and Vulnerability. Washington DC, Island Press.
- [Mallin, M. A., V. L. Johnson, and M. R. McIver. 2004.](#) Assessment of coastal water resources and watershed conditions at Cape Lookout National Seashore North Carolina. National Park Service, Water Resources Division, Technical Report NPS/NRWRD/NRTR—2004/322, Fort Collins, Colorado.
- [Kohut, R. J. 2007.](#) Ozone risk assessment for Vital Signs Monitoring Networks, Appalachian National Scenic Trail, and Natchez Trace National Scenic Trail. NPS/NRPC/ARD/NRTR—2007/001. National Park Service, Fort Collins, Colorado.
- [Kunkel, K. E., L. E. Stevens, S. E. Stevens, L. Sun, E. Janssen, D. Wuebbles, M. C. Konrad II, C. E., Fuhrman, B. D. Keim, M. C. Kruk, A. Billet, H. Needham, M. Schafer, and J. G. Dobson. 2013.](#) Regional Climate Trends and Scenarios for the U.S. National Climate Assessment: Part 2. Climate of the Southeast U.S. National Oceanic and Atmospheric Administration Technical Report NESDIS 142–2, Washington, DC.
- Monahan, W. B., Fisichelli, N. A., *In revision*. Climate exposure of U.S. national parks in a new era of change. PLoS ONE. National Weather Service office of Climate, Water, and Weather Services. <http://nws.noaa.gov/os/heat/index.shtml>
- [National Park Service, Air Resources Division. 2013.](#) Air quality in national parks: trends (2000–2009) and conditions (2005–2009). Natural Resource Report NPS/NRSS/ARD/NRR—2013/683. National Park Service, Denver, Colorado.
- [Parman, J. N., J. Petrzalka, and M. Williams. 2012.](#) Regional water quality synthesis for southeast coastal parks. Natural Resource Report NPS/NRSS/WRD/NRR—2012/518. National Park Service, Fort Collins, Colorado.
- Peek, K. P., R. Young, R. Beavers, and C. Hawkins Hoffman. *In Press*. Adapting to climate change in coastal national parks: Estimating the Exposure of FMSS-Listed Park Assets to 1m of Sea-Level Rise. Natural Resource Technical Report NPS/XXXX/NRTR—20XX/XXX. National Park Service, Fort Collins, Colorado.
- Peters, G. P., R. M. Andrew, T. Boden, J. G. Canadell, P. Ciais, C. Le Quéré, G. Marland, M. R. Raupach, and C. Wilson. 2013. The challenge to keep global warming below 2 °C. *Nature Climate Change* 3:4-6.

- [Rasmussen, T. C., J. F. Dowd, R. J. McKinnon, B. M. Price, and R. D. Sherrell. 2009.](#) Southeast Coast Network groundwater monitoring: Protocol development and analysis of existing data. Natural Resource Report NPS/SECN/NRR—2009/126. National Park Service, Fort Collins, Colorado.
- [Riggs, S. R., and Ames, D. V. 2007.](#) Effect of storms on barrier island dynamics, Core Banks, Cape Lookout National Seashore, North Carolina, 1960–2001. U.S. Geological Survey Scientific Investigations Report 2006–5309.
- [Riggs, S. R., S. J. Culver, D. V. Ames, D. J. Mallinson, D. R. Corbett and J. P. Walsh. 2009.](#) North Carolina's Coasts in Crisis: A Vision for the Future. White Paper published by East Carolina University. Available at [http://core.ecu.edu/geology/riggs/Coasts in Crisis Booklet for web.pdf](http://core.ecu.edu/geology/riggs/Coasts%20in%20Crisis%20Booklet%20for%20web.pdf)
- [Rinehart, A., M. B. Gregory and W. Wright. 2013.](#) Fixed-station water quality monitoring at Cape Lookout National Seashore: 2012 data summary. Natural Resource Data Series NPS/SECN/NRDS—2013/493. National Park Service, Fort Collins, Colorado.
- [Smrekar, B. D., M. W. Byrne, M. N. Moore, and A. T. Pressnell. 2013.](#) Amphibian community monitoring at Cape Lookout National Seashore, 2012. Natural Resource Data Series NPS/SECN/NRDS—2013/551. National Park Service, Fort Collins, Colorado.
- [Stockdon, H. F. and D. M. Thompson. 2007.](#) Vulnerability of National Park Service beaches to inundation during a direct hurricane landfall: Cape Lookout National Seashore, U.S. Geological Survey Open-File Report 2007–1376, 8 p., online only. Available at: <http://pubs.usgs.gov/of/2007/1376/>
- [Sullivan, T. J., G. T. McPherson, T. C. McDonnell, S. D. Mackey, and D. Moore. 2011a.](#) Evaluation of the sensitivity of inventory and monitoring national parks to acidification effects from atmospheric sulfur and nitrogen deposition: main report. Natural Resource Report NPS/NRPC/ARD/NRR—2011/349. National Park Service, Denver, Colorado.
- [Sullivan, T. J., G. T. McPherson, T. C. McDonnell, S. D. Mackey, and D. Moore. 2011b.](#) Evaluation of the sensitivity of inventory and monitoring national parks to acidification effects from atmospheric sulfur and nitrogen deposition: Southeast Coast Network (SECN). Natural Resource Report NPS/NRPC/ARD/NRR—2011/375. National Park Service, Denver, Colorado.
- [Sullivan, T. J., T. C. McDonnell, G. T. McPherson, S. D. Mackey, and D. Moore. 2011c.](#) Evaluation of the sensitivity of inventory and monitoring national parks to nutrient enrichment effects from atmospheric nitrogen deposition: main report. Natural Resource Report NPS/NRPC/ARD/NRR—2011/313. National Park Service, Denver, Colorado.
- [Sullivan, T. J., T. C. McDonnell, G. T. McPherson, S. D. Mackey, and D. Moore. 2011d.](#) Evaluation of the sensitivity of inventory and monitoring national parks to nutrient enrichment effects from atmospheric nitrogen deposition: Southeast Coast Network (SECN). Natural Resource Report NPS/NRPC/ARD/NRR—2011/329. National Park Service, Denver, Colorado.
- [Tuberville, T. D., J. D. Willson, M. E. Dorcas, and J. W. Gibbons. 2005.](#) Herpetofaunal Species Richness of Southeastern National Parks. *Southeastern Naturalist* 4(3): 537–569.
- Wigley, T. M. 2005. The climate change commitment. *Science* 307:1766–1769.
- [Wright, W., M. B. Gregory and A. Rinehart. 2012.](#) Fixed-station water quality monitoring at Cape Lookout National Seashore: 2011 data summary. Natural Resource Data Series NPS/SECN/NRDS—2012/388. National Park Service, Fort Collins, Colorado.

See Also:

[Collection of Natural Resource-Related References](#)

[Collection of Cultural Resource-Related References](#)

[Collection of Visitor Experience-Related References](#)

Glossary

See the [State of the Parks home page](#) for a link to a complete glossary of terms used in State of the Park reports. Definitions of key terms used in this report are as follows:

Americans with Disabilities Act (ADA)	Law enacted by the federal government that includes provisions to remove barriers that limit a disabled person's ability to engage in normal daily activity in the physical, public environment.
Archeological Sites Management Information System (ASMIS)	The National Park Service's standardized database for the basic registration and management of park prehistoric and historical archeological resources. ASMIS site records contain data on condition, threats and disturbances, site location, date of site discovery and documentation, description, proposed treatments, and management actions for known park archeological sites. It serves as a tool to support improved archeological resources preservation, protection, planning, and decision-making by parks, centers, regional offices, and the national program offices.
Baseline Documentation	Baseline documentation records the physical condition of a structure, object, or landscape at a specific point in time. A baseline provides a starting point against which future changes can be measured.
Carbon Footprint	Carbon footprint is generally defined as the total set of greenhouse gas emissions caused by an organization, event, product or person.
Climate Friendly Park	The NPS Climate Friendly Park designation requires meeting three milestones: completing an application; completing a comprehensive greenhouse gas (GHG) inventory; and completing a Climate Action Plan, which is the actions, policies, programs, and measures a park will put into place to reduce its GHG emissions.
Cultural Landscape Inventory (CLI)	A Cultural Landscapes Inventory describes historically significant landscapes within a park. The inventory identifies and documents each landscape's location, size, physical development, condition, characteristics, and features, as well as other information useful to park management.
Curation	National parks are the stewards of numerous types of objects, field notes, publications, maps, artifacts, photographs, and more. The assemblage of these materials comprises a museum collection. Curation is the process of managing, preserving, and safeguarding a collection according to professional museum and archival practices.
Exotic Plant Management Team (EPMT)	One of the ways the NPS is combating invasive plants is through the Exotic Plant Management Program. The program supports 16 Exotic Plant Management Teams working in over 225 park units. EPMTs are led by individuals with specialized knowledge and experience in invasive plant management and control. Each field-based team operates over a wide geographic area and serves multiple parks.
Facility Condition Index (FCI)	FCI is the cost of repairing an asset (e.g., a building, road, bridge, or trail) divided by the cost of replacing it. The lower the FCI number, the better the condition of the resource.
Foundation Document	A park Foundation Document summarizes a park's purpose, significance, resources and values, primary interpretive themes, and special mandates. The document identifies a park's unique characteristics and what is most important about a park. The Foundation Document is fundamental to guiding park management and is an important component of a park's General Management Plan.

Fundamental and Other Important Resources and Values	Fundamental resources and values are the particular systems, processes, experiences, scenery, sounds, and other features that are key to achieving the park’s purposes and maintaining its significance. Other important resources and values are those attributes that are determined to be particularly important to park management and planning, although they are not central to the park’s purpose and significance. These priority resources are identified in the Park Foundation Document and/or General Management Plan. The short-cut name that will be used for this will be Priority Resources.
Historic Integrity	Historic Integrity is the assemblage of physical values of a site, building, structure or object and is a key element in assessing historical value and significance. The assessment of integrity is required to determine the eligibility of a property for listing in the National Register.
Indicator of Condition	A selected subset of components or elements of a Priority Resource that are particularly “information rich” and that represent or “indicate” the overall condition of the Priority Resource. There may be one or several Indicators of Condition for a particular Priority Resource.
Interpretation	Interpretation is the explanation of the major features and significance of a park to visitors. Interpretation can include field trips, presentations, exhibits, and publications, as well as informal conversations with park visitors. A key feature of successful interpretation is allowing a person to form his or her own personal connection with the meaning and significance inherent in a resource.
Invasive Species	Invasive species are non-indigenous (or non-native) plants or animals that can spread widely and cause harm to an area, habitat or bioregion. Invasive species can dominate a region or habitat, out-compete native or beneficial species, and threaten biological diversity.
List of Classified Structures (LCS)	LCS is an inventory system that records and tracks the condition of the approximately 27,000 historic structures listed in the National Register of Historic Places that are the responsibility of NPS.
Museum Collection	NPS is the steward of the largest network of museums in the United States. NPS museum collections document American, tribal, and ethnic histories; park cultural and natural resources; park histories; and other aspects of human experience. Collections are managed by professionally-trained NPS staff, who ensure long-term maintenance of collections in specialized facilities.
Native American Graves Protection and Repatriation Act (NAGPRA)	A federal law passed in 1990. NAGPRA provides a process for museums and federal agencies to return certain Native American cultural items (e.g., human remains, funerary objects, sacred objects, objects of cultural patrimony) to lineal descendants and culturally-affiliated Indian tribes and Native Hawaiian organizations.
Natural Resource Condition Assessment (NRCA)	A synthesis of existing scientific data and knowledge, from multiple sources, that helps answer the question: what are current conditions of important park natural resources? NRCAs provide a mix of new insights and useful scientific data about current park resource conditions and factors influencing those conditions. NRCAs have practical value to park managers and help them conduct formal planning and develop strategies on how to best protect or restore park resources.
Priority Resource or Value	This term refers to the Fundamental and Other Important Resources and Values of a park. These can include natural, cultural, and historic resources as well as opportunities for learning, discovery and enjoyment. Priority Resources or Values include features that have been identified in park Foundation Documents, as well as other park assets or values that have been developed or recognized over the course of park operations. Priority Resources or Values warrant primary consideration during park planning and management because they are critical to a park’s purpose and significance.

Project Management Information System (PMIS)	A servicewide intranet application within the National Park Service to manage information about requests for project funding. It enables parks and NPS offices to submit project proposals to be reviewed, approved and prioritized at park units, regional directorates, and the Washington Office.
Resource Management	The term “resources” in NPS encompasses the many natural, cultural, historical, or sociological features and assets associated with parks. Resource management includes the knowledge, understanding, and long-term stewardship and preservation of these resources.
Southeast Coast Network (SECN)	One of 32 I&M networks established as part of the NPS Inventory and Monitoring Program . The Southeast Coast Network comprises 20 parks in Alabama, Florida, Georgia, North Carolina, and South Carolina.
Specific Measure of Condition	One or more specific measurements used to quantify or qualitatively evaluate the condition of an Indicator at a particular place and time. There may be one or more Specific Measures of Condition for each Indicator of Condition.
Visitor and Resource Protection (VRP)	VRP includes, among other responsibilities, protecting and preserving park natural and cultural resources, enforcing laws that protect people and the parks, fire management, search and rescue, managing large-scale incidents, and on-the-ground customer service.
Wilderness	A designation applied to certain federal lands set aside for preservation and protection in their natural condition, in accordance with the Wilderness Act of 1964 .