



Cape Hatteras National Seashore Alternative Transportation Study for Bodie Island District: *Conditions Inventory/Assessment*



From upper left (clockwise): Sign on Old Oregon Inlet Road; Coquina Beach; Bodie Island Lighthouse; Bodie Island Visitor Center.
Source: Volpe Center photographs (January 2010)

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1. Introduction

The National Park Service's (NPS) Cape Hatteras National Seashore (NS) is located along the Outer Banks, a chain of barrier islands stretching approximately 200 miles along the coast of Virginia and North Carolina. The region is a popular tourist destination and is challenged by traffic congestion and parking shortages as well as a dynamic land base that is impacted by storms, coastal processes, and climate change.

1.1 Study area

This study focuses on the Bodie Island District (pronounced like *body*), defined by NPS as the northernmost portion of Cape Hatteras NS. The District stretches approximately ten miles from Whalebone Junction, or the intersection of U.S. 64, U.S. 158, and NC 12, to the Oregon Inlet and the Bonner Bridge, which connects the District to the rest of Cape Hatteras NS (see Figure 1). The District is referred to as an island because historically it was separated from the northern Outer Banks by an inlet that has since filled. The District is located between two other entities: the town of Nags Head and the U.S. Fish & Wildlife Service's Pea Island National Wildlife Refuge. The study documents will use the terms study area, Bodie Island, and Bodie Island District interchangeably. To ensure connections to these other entities and the region, the study area will be considered within the context of the region, defined as Dare County but also referred to in the text as the Outer Banks, and within the context of the entire Cape Hatteras NS.

1.2 Background

Cape Hatteras NS staff submitted a planning grant application to the Federal Transit Administration's Paul S. Sarbanes Transit in Parks (TRIP) Program,¹ formerly the Alternative Transportation in Parks and Public Lands (ATPPL), in early 2007 to request funding to explore alternative transportation improvements for the Bodie Island District, especially in the context of expected increases in visitation to the Bodie Island Lighthouse. The U.S. Department of Transportation's Volpe National Transportation Systems Center (U.S. DOT Volpe Center) began the study in the fall of 2009.

Definitions for alternative transportation systems (ATS) have been provided by TRIP legislation² and by NPS³. For the purpose of this study, alternative transportation to be considered will consist of transit and non-motorized vehicle options, including, but not limited to, streetcars (trams or trolleys), shuttle and local bus, water ferry, and trails, paths or lanes for bicycling, hiking, and walking (and the necessary supporting services, equipment/facilities and infrastructure).

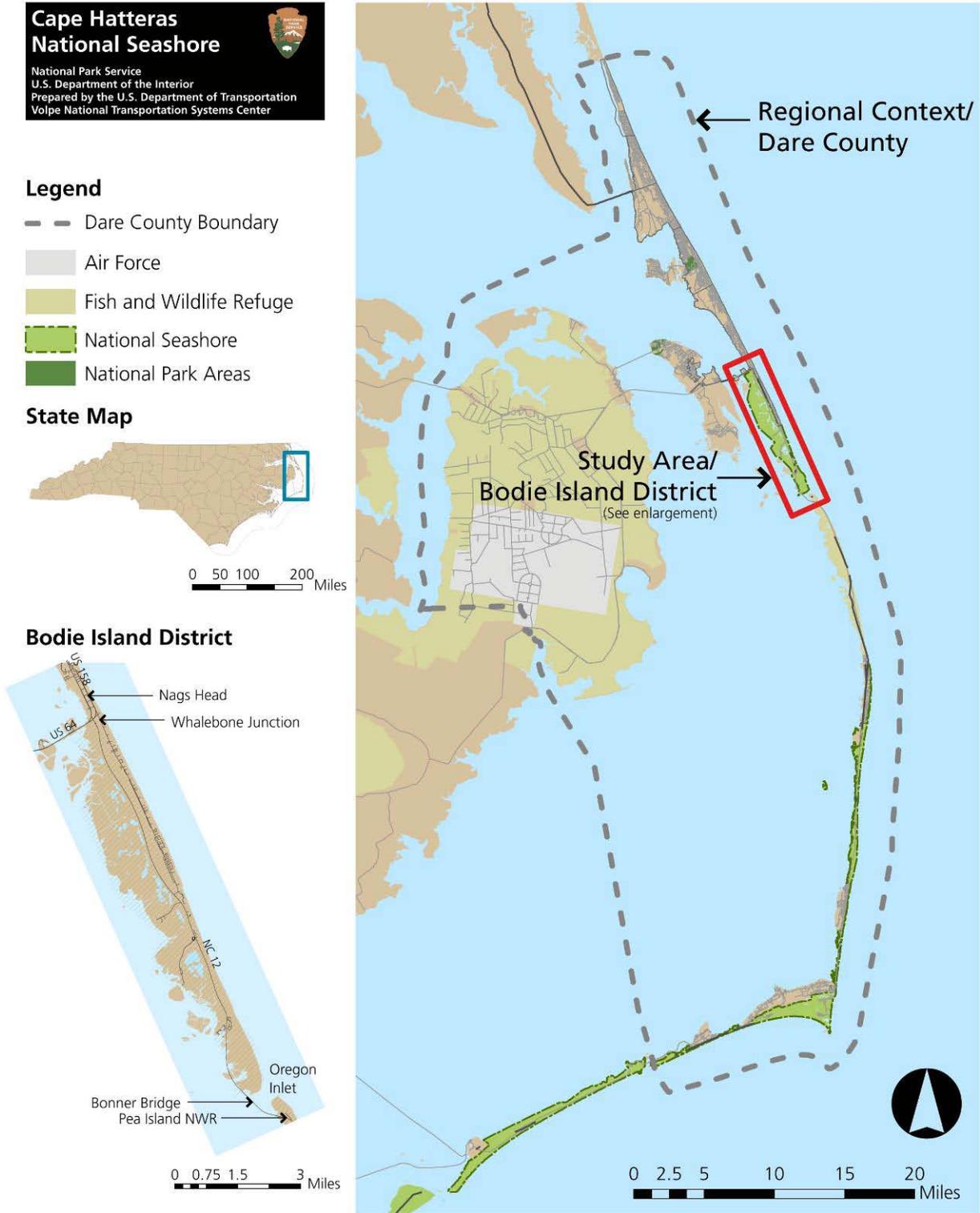
This study is being conducted in the context of two larger, ongoing NPS plans: the Off-Road Vehicle (ORV) Management Plan and the General Management Plan (GMP). The focus of this study is distinct and separate from that of these studies but will reference and acknowledge them. In addition, Dare County will be involved in the development of a 25-year transportation plan with the Albemarle Commission, the region's rural planning organization, and the North Carolina Department of Transportation (NCDOT). This study may also inform that effort.

¹ The TRIP Program began in 2005, under the Safe, Accessible, Flexible, and Efficient Transportation Equity Act – A Legacy for Users (SAFETEA-LU), the most recent transportation authorization bill. It has had an annual funding level of \$20-25 million and has funded 40-50 projects each year.

² "Transportation by bus, rail, or any other publicly or privately owned conveyance that provides to the public general or special service on a regular basis, including sightseeing service. Such term also includes a nonmotorized transportation system (including the provision of facilities for pedestrians, bicycles, and nonmotorized watercraft)."

³ Integration of all modes of travel within a park, including transit, bicycle and pedestrian linkages, and the automobile; and inclusive of a whole range of technologies, facilities, and transportation management strategies.

Figure 1
Study Area and Regional Context
 Source: Volpe Center and NPS



In addition to the three ongoing and future planning efforts, a number of transportation planning studies and related planning documents have been completed for the region that serve to inform this study (see Table 1).

Table 1
Main Planning Studies

Source: Various

Document	Date	Source	Description
Dare County Land Use Plan	2003	Dare County	The Land Use Plan is a tool for local officials and citizens to guide the future development of unincorporated Dare County. It contains goals, demographic and economic information, and strategies and policies for addressing land use and related issues, including transportation.
Value Analysis Study for Preserve / Rehabilitate Bodie Island Lighthouse and Oil House.	2005	Denver Service Center, National Park Service	The purpose of this project is to stabilize, repair, preserve and rehabilitate the lighthouse and oil house in order to interpret them to the public. The value study was conducted to assure that all viable project alternatives were considered, evaluation factors were sound, solutions were cost effective, an independent opinion was provided, and all project objectives were satisfied by the chosen alternative.
Ocracoke Island Public Transit Implementation Study	2005	NCDOT and Hyde County	This plan was developed to guide Hyde County Transit in the implementation of a new transit service for Ocracoke Island. It details projected demand, service plans, and implementation steps.
Dare County Public Transportation Implementation Plan	2006	NCDOT and Dare County	This plan was developed to guide Dare County in the implementation of a new transit service for a segment of Dare County (from Duck to Coquina Beach/Bodie Island Lighthouse and from Whalebone Junction to Manteo and the Fort Raleigh National Historic Site). It details projected demand, service plans, and implementation steps.
Corolla Public Transit Implementation Study	2006	NCDOT, Currituck County, and the ICTA	This plan was developed to guide the Inter-County Public Transportation Authority (ICTA) in the implementation of a new transit service for Corolla. It details projected demand, service plans, and implementation steps.
Roanoke Island Transportation Plan	2006	Roanoke Island Transportation Committee	The plan is a comprehensive transportation plan for the Town of Manteo and northern end of Roanoke Island. It examines the existing and future influences on the transportation system over the next 20 years and identifies potential transportation projects for short-term, mid-term, and long-term planning horizons.
Outer Banks Transportation Study	2006	Outer Banks Transportation Task Force	The study is an outcome of a facilitated public input and planning process that focused on recommendations for transportation improvements to improve mobility and alleviate highway congestion within the Outer Banks such as public transportation, bicycle and pedestrian transportation, traffic solutions, transportation demand management, and institutional/organizational improvements.
Long Range Interpretive Plan	2007	Cape Hatteras NS	The LRIP guides park staff over the next five to seven years in their efforts to orient visitors to the Cape Hatteras NS's recreational opportunities and interpret its natural and cultural history.

Table 2 (continued)
Main Planning Studies

Source: Various

Document	Date	Source	Description
Corridor Management Plan (CMP) for the Outer Banks Scenic Byway	2008	Outer Banks Scenic Byway Advisory Committee	This plan is an update on the original CMP and provides updated byway and community information, describes a vision and goals, and presents detailed recommendations for implementation of strategies to continue to preserve, protect, interpret, and promote the byway.
Cape Hatteras National Seashore Off-Road Vehicle (ORV) Management Plan / Environmental Impact Statement DRAFT	2010	Cape Hatteras NS	The draft plan/EIS evaluates the impacts of a range of alternatives for regulations and procedures that would manage ORV use/access in the Cape Hatteras NS to protect and preserve natural and cultural resources and natural processes, to provide a variety of visitor use experiences while minimizing conflicts among various users, and to promote the safety of all visitors. The alternative selected for implementation will guide NPS management and control of ORVs for the next 10 to 15 years.

1.3 Goals & objectives

The objective of the study is to perform a transportation analysis to identify optimal transportation strategies that serve visitors originating from the villages north and south of Cape Hatteras NS destined for sites within the Bodie Island District of Cape Hatteras NS. The goals of the study will be in line with those of the TRIP program⁴ with a focus on resource protection and enhancement of the visitor experience and will be coordinated with existing, planned, and proposed initiatives by NPS and planning partners and stakeholders, as appropriate.

1.4 Public Involvement

Public involvement for the study has consisted of an initial scoping meeting and the development of a public website on the National Park Service Planning, Environment, and Public Comment (PEPC) site, which provides access to planning and environmental documents for projects at various park units.

Scoping meeting

The initial scoping meeting was held on January 13, 2010, at the Elizabethan Gardens facility at Fort Raleigh National Historic Site in Manteo, adjacent to NPS headquarters. The intent of the meeting was to solicit input from individuals involved in transportation planning or related efforts in the region and from staff familiar with the study area. Participants were comprised of staff and representatives from NPS, U.S. Fish & Wildlife Service, Dare County, North Carolina Department of Transportation, NPS Southeast Region, the Albemarle Commission, the Dare Count Scenic Byways Committee, Oregon Inlet Fishing Center, Outer Banks Visitor Bureau, and the towns of Nags Head, Kill Devil Hills, and Manteo (see Figure 2). Invitations were also extended to Kitty Hawk, the North Carolina Wildlife Resource Commission, and the North Carolina Heritage Program but staff were unable to attend.

At the meeting, the Volpe Center project manager presented the purpose and history of the project, project funding, the meaning of alternative transportation, and the planned study methodology. The group then discussed partnership opportunities, major transportation and planning initiatives, and

⁴ To conserve natural, historical, and cultural resources; to reduce congestion and pollution; to improve visitor mobility and accessibility; to enhance visitor experience; and to ensure access to all, including persons with disabilities.

transportation issues and potential solutions. The input from this meeting is incorporated into both the conditions inventory/assessment and the needs assessment. Minutes from the meeting are provided in Appendix A and the presentation from the meeting has been posted on the PEPC site.

As a result of the meeting, several preliminary goals and objectives for the study were identified by participants, in particular NPS staff (see Table 3). These will be considered, along with the overall study and TRIP program goals, by the study team in the evaluation of various alternative transportation strategies.

Figure 2
Initial Scoping Meeting: January 13, 2010
(Superintendent Mike Murray, shown with NPS staff and other participants)
Source: NPS Southeast Region (January 2010)



**Table 3
Proposed Goals and Objectives**

Goal	Objectives
Improve alternative transportation options within Bodie Island District and the region	Provide an alternative to personal vehicle travel for accessing and experiencing Bodie Island District
	Meet unmet needs of people without access to a vehicle
	Protect natural resources by reducing traffic congestion and motor vehicle emissions
Improve connectivity, safety, and visitor access and circulation within Bodie Island District	Perform a transportation analysis to identify optimal transportation strategies for serving visitors moving from site to site within the Bodie Island District (with a focus on bicycle and pedestrian safety, connections, and access)
	Estimate future visitation for Bodie Island Lighthouse and identify solutions for how to manage increased future visitation, including expanded parking and other means of access
	Identify opportunities for new and improved access to areas throughout the Bodie Island District
Improve connectivity, safety, and visitor access and circulation for regional connections to Bodie Island District	Perform a transportation analysis to identify optimal transportation strategies for serving visitors originating from north and south of the Bodie Island District destined for sites within the District
	Assess transit feasibility for connecting NPS sites within the Outer Banks
	Assess transit feasibility and identify bicycle and pedestrian improvements for connecting Bodie Island District sites and community sites
Move parkwide and regional transportation agendas forward	Coordinate NPS existing and proposed activities with local and regional recommendations and plans (e.g., Outer Banks Scenic Byway Corridor Management Plan, Outer Banks Transportation Study)
	Coordinate with NPS and regional future plans for facilities, services, or other initiatives (e.g., GMP, ORV Management Plan, new Bodie Island District visitor center, Bonner Bridge replacement)
	Identify strategies or processes that may be applicable to other sites within Cape Hatteras NS

PEPC site

NPS maintains a web-based database of projects and activities, known as the Planning, Environment, and Public Comment system (PEPC), which provides NPS with a convenient means for publishing project information to the public and allows for the on-line submittal of public comments. The PEPC site for this Alternative Transportation Study for Bodie Island may be accessed via the url: <http://parkplanning.nps.gov/projectHome.cfm?parkID=358&projectId=30061>. The site provides access to current plans and related documents/information. The site currently contains a description of the study and a copy of the introductory presentation given at the initial scoping meeting (see Figure 3). Additional materials, including this report, and subsequent project documentation and outreach materials, will be posted for public view.

Figure 3
Study PEPC Website

Source: <http://parkplanning.nps.gov/projectHome.cfm?parkID=358&projectId=30061>

Planning, Environment and Public Comment (PEPC)
National Park Service
U.S. Department of the Interior

Fostering conservation-based decision-making through consultation, cooperation and communication

Home | Parks | Plans/Docs | Policy | Links | Search [Go back](#)

Project Home [Cape Hatteras NS](#)

Plan Process [Alternative Transportation Study for Bodie Island in Cape Hatteras National Seashore](#)

Meeting Notices

Links

Document List

Open For Public Comment

Park RSS News

The NPS is conducting an Alternative Transportation Study for Bodie Island District of Cape Hatteras National Seashore. The objective of the Study is to perform a transportation analysis, allowing for the identification of optimal transportation strategies for visitors traveling from and destined for sites within the Bodie Island District (Nags Head to Rodanthe, and adjacent villages to the north and south). The planning effort will be a cooperative process, conducted in coordination with other Federal, state, local government agencies, regional planning organizations, and many other stakeholders.

Transportation alternatives will be supportive of the Federal Transit Administration's "Paul S. Sarbanes Transit in Parks Program" purpose of enhancing the protection of and increasing the enjoyment of those visiting national parks and public lands. The goals of the study will be in line with the Program goals:

- To conserve natural, historical, and cultural resources;
- To reduce congestion and pollution;
- To improve visitor mobility and accessibility;
- To enhance visitor experience; and
- To ensure access to all, including persons with disabilities.

The main elements of the study are:

- Evaluation of the existing transportation network, as well as the existing and future project-forecasted travel conditions;
- Assessment of unmet transportation needs (existing and projected); and
- Identification of alternative, sustainable, integrated transportation strategies to address needs.

The focus of this evaluation will be on transit technology service and non-motorized vehicle options, such as streetcars (trams or trolleys), shuttle and local bus, water ferry, and routes for bicycling, hiking, and walking. The Study will describe the necessary services, equipment, facilities, and infrastructure to support transit technology service and non-motorized vehicle options.

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1.5 Approach

The main elements of the study are as follows:

- Evaluation of the existing transportation network and existing and future project forecasted travel conditions;
- Assessment of unmet transportation needs (existing and projected); and
- Identification of alternative transportation strategies and solutions to address needs.

These elements translate into three deliverables:

- Conditions Inventory/Assessment;
- Needs Assessment; and
- Alternative Transportation Analysis.

Conditions Inventory/Assessment

The Conditions Inventory/Assessment provides an account of existing and forecasted future conditions that characterize the transportation network, travel patterns, and conditions within the study area and within the region, defined as Dare County but also referred to in the text as the Outer Banks. The report will provide the foundation for the analysis to be provided in the Needs Assessment. The report covers

each topic at both the regional and study area level; information on Cape Hatteras NS is included in the regional sections.

Needs Assessment

The Needs Assessment will draw upon the Conditions Inventory/Assessment to conduct select analyses and identify key deficiencies of the transportation system and opportunities for the future for the study area. It will also rely upon the following quantitative and qualitative sources:

- Previous studies;
- Stakeholder and park comments documented during the site visit; and
- Observations made during the site visit.

Recommendations from previous studies that are relevant to the study area and scope of this study will be identified and assessed. A major technical component of the needs assessment will involve a future demand analysis for the Bodie Island Lighthouse. Selected research and analysis of roadway safety, transit, bicycle, pedestrian, watercraft, and other transportation related needs will also be undertaken.

Alternative Transportation Analysis

The Alternative Transportation Analysis will develop and analyze transportation planning alternatives, each consisting of a set of identified alternative transportation strategies informed by the outcome of the preceding tasks. As part of this task, evaluation and prioritization criteria will be developed as a basis for the alternatives analysis from consultation with Cape Hatteras NS staff and stakeholders; such criteria will be developed based on project goals/objectives, such as those outlined above. The analysis will also consider financial feasibility, partnerships, and resource impacts. The alternatives will include a baseline or no-action alternative and several additional alternatives that will incorporate strategies such as non-motorized transportation facilities, enhanced transit service, traveler information, transportation and parking demand management, and other potential strategies (such as visitation management and other planning and policy strategies). The analysis will include consideration of multimodal and intermodal strategies that promote interconnectivity; this may include new systems or expansion or enhancement of existing systems.

2. Project context

2.1 Regional

Cape Hatteras NS

Cape Hatteras NS stretches 74 miles along North Carolina's Outer Banks, varying in width from between one and three miles and encompassing Bodie Island and Hatteras Island in Dare County to the north and Ocracoke Island in Hyde County to the south (see Figure 4). The U.S. Fish & Wildlife Service's (FWS) Pea Island National Wildlife Refuge (NWR) and several incorporated and unincorporated towns lie within or adjacent to the Cape Hatteras NS's 24,470 acres.⁵

Cape Hatteras NS was established in 1953 as the first national seashore. It is part of the National Park Service Outer Banks Group, which includes Fort Raleigh National Historic Site and Wright Brothers National Memorial. Entry to Cape Hatteras NS is free, although there is a fee for climbing the Cape Hatteras Lighthouse (\$7 for adults, and \$3.50 for senior citizens, children, and visitors with a permanent disability).⁶ The Cape Hatteras NS has three lighthouses, four information or visitor centers, and three public swimming areas. Popular visitor activities include camping, bird watching, hunting, fishing, off-road vehicle (ORV) use on the beach, attending interpretive programs, visiting historic sites, and climbing the Cape Hatteras Lighthouse. Major campgrounds within the area include: Cape Point Campground, located near the Cape Hatteras Lighthouse Historic District; Frisco Campground; Ocracoke Campground; and the Oregon Inlet Campground on Bodie Island.

Total recreational visits to Cape Hatteras NS in 2009 were 2.4 million.⁷ Historically, recreational visitation to Cape Hatteras NS has increased steadily except for declines in 1985 and 2003, years in which hurricanes (Gloria and Isabel respectively) heavily impacted the Outer Banks; this trend is fairly consistent with national NPS visitation (see Figure 5). Peak visitation occurs June through August (see Figure 6).

⁵ Cape Hatteras NS website: Park Statistics. <<http://www.nps.gov/caha/parkmgmt/statistics.htm>>

⁶ Cape Hatteras NS website: Fees & Reservations. <<http://www.nps.gov/caha/planyourvisit/feesandreservations.htm>>

⁷ Recreational visits are a sum of counts taken at an inductive loop traffic counter located on NC 12 south of the junction with U.S. 64 and U.S. 158, the number of registered hunters, the number of aircraft observed at Hatteras Island and Ocracoke Island, and the number of vehicles arriving on Ocracoke Island by ferry, where each variable is multiplied by a separate seasonally-adjusted, mode-specific (e.g., automobile, airplane, and bus) multiplier. NPS. Public Use Statistics Office. Accessed 2/22/10. <<http://www.nature.nps.gov/stats/>>

Figure 4
Dare County and Cape Hatteras NS Context Map

Source: Volpe Center and NPS

Cape Hatteras National Seashore



National Park Service
 U.S. Department of the Interior
 Prepared by the U.S. Department of Transportation
 Volpe National Transportation Systems Center

Legend

- Outer Banks Welcome Center
- Aycock Brown Welcome Center
- ▲ Whalebone Junction Information Center
- NC 12
- - - Ferry Route
- - - Dare County Boundary
- Air Force
- Fish and Wildlife Refuge
- National Seashore
- ★ National Park Areas

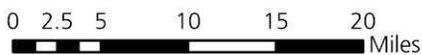


Figure 5
Cape Hatteras NS Total Recreational Visitation 1955-2009
 Source: NPS Public Use Statistics Office

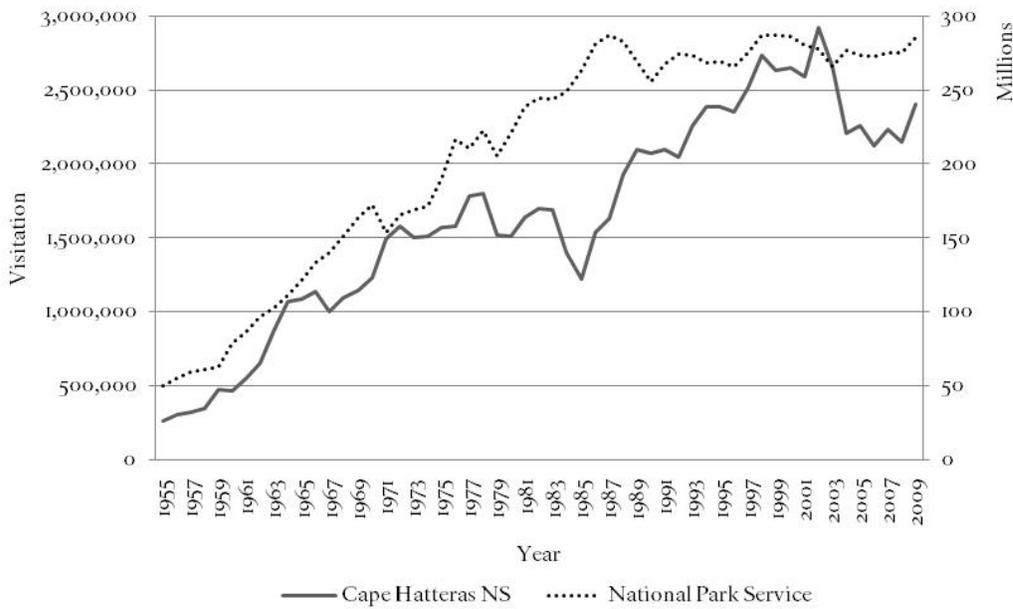
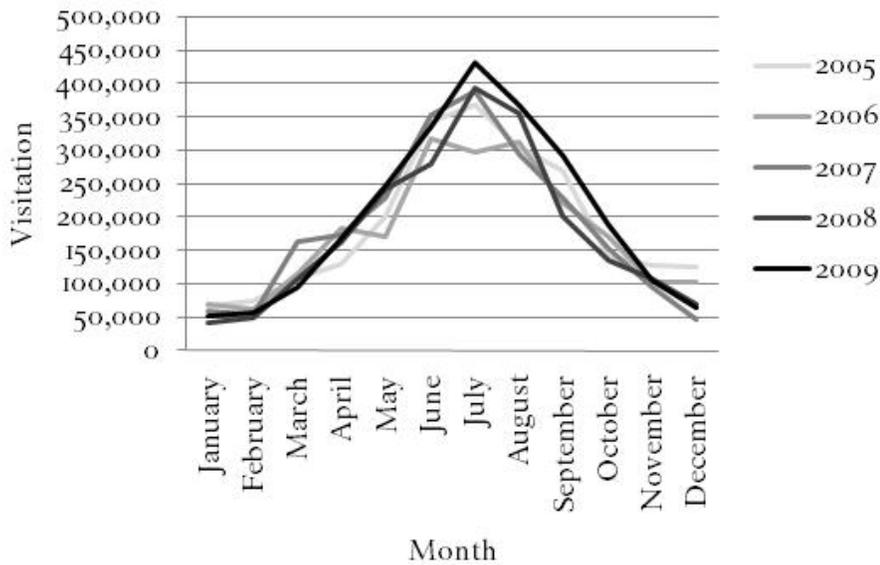


Figure 6
Cape Hatteras NS Monthly Recreational Visitation 2005-2009
 Source: NPS Public Use Statistics Office



Regional attractions

In addition to Cape Hatteras NS, there are several other key federal and municipal destinations in the region that offer recreational and historical sites for visitors and residents (see Figure 4). These include:

Pea Island National Wildlife Refuge – The refuge, located between Bodie and Hatteras islands, was established in 1937 and provides a nesting and wintering habitat for migratory birds as well as wildlife viewing, education, and interpretation programming for the public.⁸ Popular activities within the refuge include photography, kayaking, beach use, and fishing. The refuge receives approximately two million visitors annually, including an estimated 1.2 million who visit for wildlife observation and related activities.⁹ A Memorandum of Understanding was signed in 1975 (and amended in 1987) between the NPS and FWS. The memorandum states that within the refuge, NPS is responsible for interpretation, parking lot maintenance, and law enforcement assistance and the refuge is responsible for habitat management and visitor use.¹⁰ Pea Island NWR and nearby Alligator River NWR, on the mainland of Dare County, west of Roanoke Island, are jointly managed.

Alligator River National Wildlife Refuge – The refuge protects bird and wildlife habitat and provides hiking trails, fishing areas, and canoeing and kayaking opportunities within the refuge and surrounding bodies of water. The refuge surrounds the Dare County Bombing Range, which is used by the Navy and Air Force for target practice.¹¹ The refuge receives approximately 45,000 visitors annually.¹²

Fort Raleigh National Historic Site – Situated on Roanoke Island, Fort Raleigh NHS includes an earthen fort associated with Sir Walter Raleigh, cultural heritage artifacts of Native American, African American, and European Americans who lived on the island, a nature trail and hiking trail, and a visitor center with seasonal interpretive programs.¹³ The Fort Raleigh NHS also hosts two private, non-profit historical attractions: the Lost Colony Outdoor Drama and The Elizabethan Gardens. There is no entrance fee to Fort Raleigh NHS; however, there are fees associated with the private venues. Fort Raleigh NHS received nearly 340,000 visits in 2009. Fort Raleigh NHS is also the location of the headquarters for the NPS Outer Banks Group and for the FWS administrative staff for both the Alligator River and Pea Island NWRs. The FWS offices will soon be replaced by the construction of a new Eastern Carolina National Wildlife Refuge Gateway Visitor Center and administrative office. This effort was a result of a partnership between the Coastal Wildlife Refuge Society¹⁴ and FWS and was funded under the American Recovery and Reinvestment Act of 2009 (ARRA). The 18,000 square-foot facility will house the refuge's staff and educate visitors about the wildlife refuges and conservation areas through the region.¹⁵

Wright Brothers National Memorial – The memorial, dedicated to Wilbur and Orville Wright in 1932, tells the story of the Wright Brothers' first airplane flight in 1903.¹⁶ The memorial's visitor center includes exhibits, educational programs, and a full size reproduction of the glider, flying machine, and wind tunnel. A pedestrian pathway leads to the top of Big Kill Devil Hill, where a monument marks the location where

⁸ U.S. Fish and Wildlife Service. "Pea Island National Wildlife Refuge." <<http://www.fws.gov/peaisland/>>

⁹ Pea Island National Wildlife Refuge Comprehensive Conservation Plan. September 2006.

<http://www.fws.gov/southeast/planning/PDFdocuments/Pea%20Island%20Final/Pea%20Island%20SigsBlocked.pdf>

¹⁰ U.S. Department of the Interior. "Pea Island National Wildlife Refuge Comprehensive Conservation Plan" September 2006.

¹¹ U.S. Fish and Wildlife Service. "Alligator River National Wildlife Refuge Comprehensive Conservation Plan." August 2008.

¹² U.S. Fish and Wildlife Service. "Basic Refuge Facts" <<http://www.fws.gov/alligatorriver/facts.html>>

¹³ Fort Raleigh National Historic Site website. <<http://www.nps.gov/fora/index.htm>>

¹⁴ Coastal Wildlife Refuge Society. <http://www.coastalwildliferefuge.com/roanokecenter.html>

¹⁵ Department of the Interior: Recovery Investments. <http://recovery.doi.gov/press/bureaus/us-fish-and-wildlife-service/pea-island-and-alligator-river-national-wildlife-refuges/>

¹⁶ Wright Brothers National Memorial website. <<http://www.nps.gov/wrbr/index.htm>>

the Wright Brothers experimented with the glider. The memorial charges a fee for entrance (\$4 per individual or \$20 for an annual pass for up to four people) and received over 475,000 visits in 2009.¹⁷

Dare County Tourism Board and Outer Banks Visitor Bureau— One percent of the occupancy tax and one percent of the prepared meals tax collected in Dare County supports a marketing and promotional agency, the Outer Banks Visitor Bureau.¹⁸ The Bureau operates two welcome centers in the region: the *Outer Banks Welcome Center* on Roanoke Island and the *Aycock Brown Welcome Center* in Kitty Hawk. Both welcome centers are open year-round from 9 a.m. to 5 p.m., except for Thanksgiving and Christmas Day, and provide information on accommodations, events, and activities. Both centers also include a rest area, picnic tables, and interpretive trails that are open year-round. The Dare County Tourism Board and the town of Nags Head also co-own a parcel of land off of U.S. 158, 0.8 miles north of the intersection with U.S. 64, on the sound-side, at the site of a former restaurant (Windmill Point), which they are hoping to use for tourism purposes.¹⁹ The county and town issued a request for proposal (RFP) for lease of the site with a deadline of February 1, 2010.²⁰

Local municipalities and attractions

There are several municipalities, each with their own tourism attractions, located on the land masses that make up the North Carolina Outer Banks: Roanoke Island, Northern Beaches, Hatteras Island, and Ocracoke Island.²¹ For Bodie, Hatteras, and Ocracoke islands, NC 12 is the historic north-south road that extends the entire length of the Outer Banks and as such is the main thoroughfare for these communities. (See Figure 4).

Roanoke Island

Roanoke Island, which lies between Bodie Island and the mainland, is surrounded by the waters of the Albemarle, Roanoke and Croatan Sounds and contains the towns of Manteo and Wanchese. Manteo provides a full school system and an emergency operations center for the year-round resident population of 1,000.²² The town hosts summer festivals and has a downtown with several restaurants, accommodations, artist studios, and a boat building museum and shop. Across the bay from Manteo, Roanoke Island Festival Park hosts year-round demonstrations, festivals, and performance spaces in the pavilion. Northwest of Manteo is the Dare County Regional Airport, Fort Raleigh NHS and partner sites, and the North Carolina Aquarium. Wanchese is a larger town, with a population of approximately 1,500, and is primarily residential.

Northern Beaches

The Northern Beaches consist of five incorporated towns that lie within Dare County north of Bodie Island: Nags Head, Kill Devil Hills, Kitty Hawk, Southern Shores, and Duck. The physical peninsula on which they are located extends south from from Virginia and is referred to as the Currituck Banks, historically separated from Bodie Island by an inlet.

Nags Head, which extends south onto Bodie Island, has several recreation and visitor amenities and has a year-round residential population of 2,700.²³ Jockey's Ridge State Park is within Nags Head and is an example of a living sand dune with year-round trails and tours. There are several public beach access points on the ocean and the sound side, some of which provide restrooms, parking, and lifeguard stations.

¹⁷ NPS Public Use Statistics Office. <http://www.nature.nps.gov/stats/>

¹⁸ The Outer Banks of North Carolina: About Us. <http://www.outerbanks.org/about_us/visitors_bureau/>

¹⁹ Kozak, Catherine. Investor sought to keep N.C. restaurant site going. 16 August 2009. <<http://hamptonroads.com/2009/08/investor-sought-keep-nc-restaurant-site-going>>

²⁰ RFP. <<http://www.outerbanks.org/RFP/>>

²¹ Outer Banks Visitors Bureau website. <<http://www.outerbanks.org/>>

²² U.S. Census 2000.

²³ U.S. Census 2000.

Jennette's Pier, the oldest fishing pier within the Outer Banks, is in Nags Head, just northeast of Whalebone Junction. After being almost completely destroyed by Hurricane Isabel in 2003, the pier is currently being redeveloped by the Aquarium Division of the North Carolina Department of Environment and Natural Resources to offer hands-on aquarium exhibits, pier fishing, and beach access by spring of 2011.²⁴

Kill Devil Hills is the largest municipality in Dare County, with nearly 6,000 residents,²⁵ and contains the Wright Brothers National Memorial. Similar to Nags Head, there are several public beach access points and limited facilities along the beach. Kitty Hawk has a population of nearly 3,000²⁶ and includes an older residential area as well as a newer beach community. On the soundside, the town also contains a maritime forest named Kitty Hawk Woods, which contains a diversity of wildlife and plant life and provides visitors with a multi-use trail and parking area.²⁷

Southern Shores, which began as a real estate development by a company in Kitty Hawk, has a population of nearly 2,500.²⁸ Duck, which is also predominantly residential, has a population of approximately 500.²⁹ Both towns have some commercial activity along NC 12 and have single and multi-family homes, many of which are used as vacation rentals throughout the summer.

Hatteras Island

There are seven unincorporated villages on Hatteras Island. They include the following, from north to south:³⁰ Rodanthe, Waves, Salvo, Avon, Buxton, Frisco, and Hatteras. Within each town, development, consisting of residential properties and visitor accommodations and amenities, is primarily located along NC 12. Buxton and Hatteras are the largest of the towns, with additional commercial and public amenities that attract residents and visitors from the other towns. Buxton contains a Coast Guard base, emergency operations center, and is adjacent to the Hatteras Island Visitor Center and Cape Hatteras Lighthouse. Buxton also contains the 968-acre Buxton Coastal Reserve, or Buxton Woods, which is the largest stand of maritime forest remaining in North Carolina.³¹ Hatteras, located at the southern end of Hatteras Island, contains the Hatteras-Ocracoke ferry landing.

Ocracoke Island

Ocracoke Island in Hyde County is an important destination to the south and within Cape Hatteras NS. Half of visitors surveyed by the Outer Banks Visitors Bureau in 2006 reported taking the ferry to Ocracoke Island, most (63 percent) to do a day trip.³² It contains the Ocracoke Lighthouse and Ocracoke Island Visitor Center of Cape Hatteras NS as well as Ocracoke Village, which offers restaurants, shops, and other visitor amenities. The island is accessible only by ferry, private boat, or private plane. Ferries connect from Ocracoke Island to Hatteras to the north and Swan Quarter and Cedar Island on the mainland to the west.

²⁴ Town of Nags Head website. <<http://www.townofnagshead.net/>>

²⁵ U.S. Census.

²⁶ U.S. Census.

²⁷ North Carolina Coastal Reserve: Kitty Hawk Woods. <<http://www.nccoastalreserve.net/About-The-Reserve/Reserve-Sites/Kitty-Hawk-Woods/82.aspx>>

²⁸ U.S. Census 2000.

²⁹ Outer Banks Visitor Bureau. Outer Banks of North Carolina Fact Sheet.

http://www.outerbanks.org/visitor_services/outer_banks_news/outer_banks_of_north_carolina_fact_sheet.asp

³⁰ Outer Banks Visitors Bureau website. <<http://www.outerbanks.org/>>

³¹ North Carolina Coastal Reserve web site. <<http://www.nccoastalreserve.net/About-The-Reserve/Reserve-Sites/Buxton-Woods/84.aspx>>

³² Outer Banks Visitors Bureau. Visitor Research: Wave 4 – 2006. September 2006.

http://www.outerbanks.org/pdf/2005_2006_Year_Long_Visitor_Profile.pdf

2.2 Bodie Island District

Attractions

The Bodie Island District contains several historic landmarks, beach access points, and visitor amenities. These attractions include the following (see Figure 8 and Figure 9):

- *Whalebone Junction Information Station* (see Figure 7) –In partnership with NPS, the Outer Banks Visitor Bureau operates this station on NC 12, immediately south of the junction of NC 12 with U.S. 64. The station includes information for visitors on local activities, attractions, and places to stay and is open year-round from 8:30 am to 5 pm in the spring, summer, and fall, and 8 am to 4:30 pm in the winter. The center is closed for Thanksgiving and Christmas Day. The current station building is small, with separate restroom facilities. The Cape Hatteras NS Long Range Interpretive Plan (2007) proposes expanding the facility and the CMP for the Outer Banks Scenic Byway proposes building a gateway visitor center at the location, but there are also concerns about capacity and environmental constraints at the site.

Figure 7
Whalebone Junction Information Station

Source: Bing Maps.

Whalebone Junction
(US 64, US 158, and
NC 12)



Whalebone Junction
Information Station

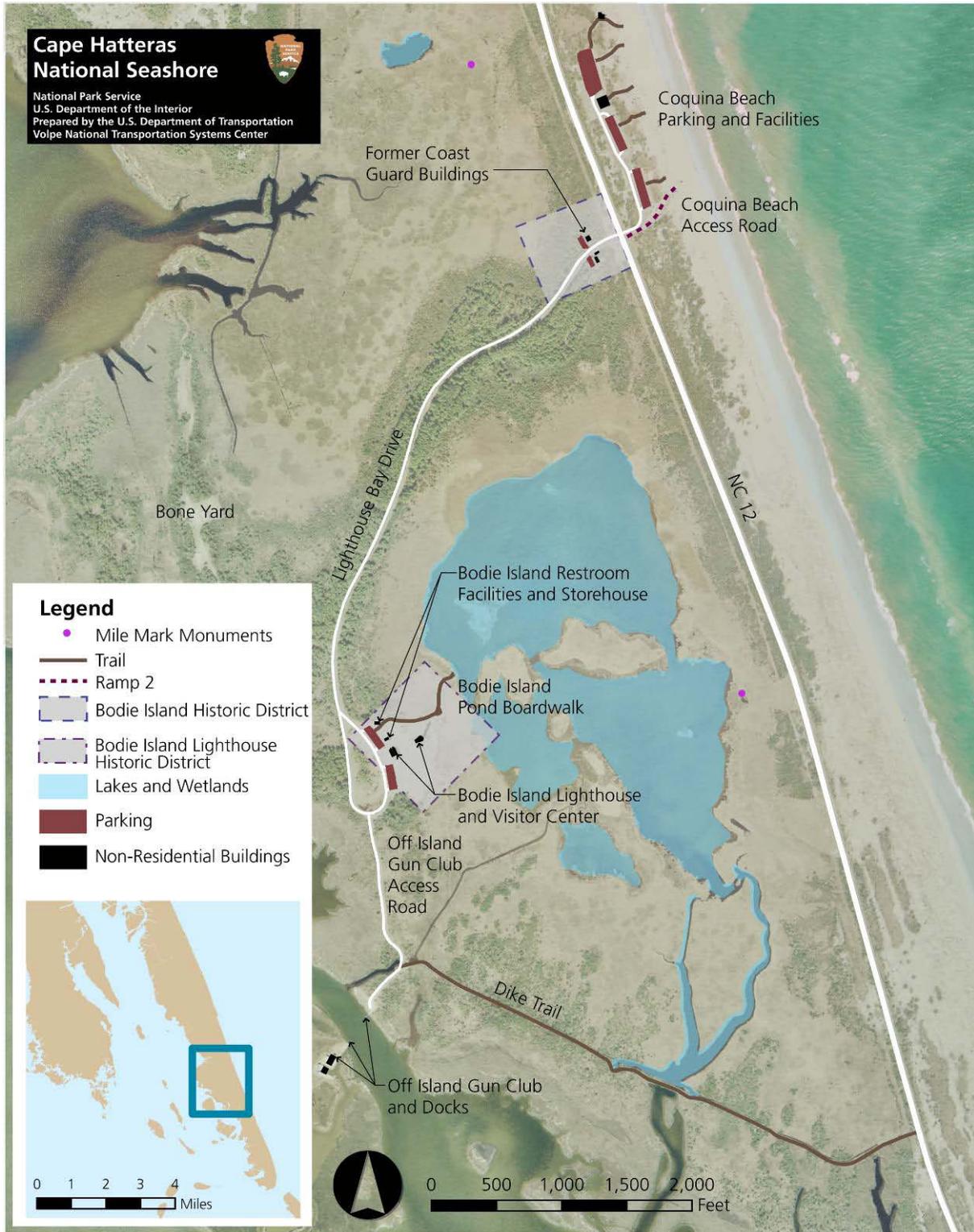
- *NPS maintenance facility, residences, and Ramp 1* –These facilities are at the southern end of secondary road (SR) 1243, Old Oregon Inlet Road, where it connects to NC 12. Due to long-term concerns about erosion, the Cape Hatteras NS is considering relocating the maintenance facility to the Navy Tower area (located west of NC 12 one-quarter (0.25) mile south of the intersection of NC 12 with SR 1243; the access road entrance is located 0.4 miles from the current maintenance facility but it is unclear where along the 0.7 mile access road the proposed maintenance facility would be located). Ramp 1 is closed to ORV access.

Figure 8
Bodie Island District / Study Area

Source: Volpe Center and NPS



Figure 9
Bodie Island Lighthouse Context Map
 Source: Volpe Center and NPS



- *Mile Mark Monuments* – Bodie Island is the site of one of the baselines established by U.S. Coast Survey superintendent A. D. Bache as part of a survey of the eastern coast commissioned by President Thomas Jefferson in 1807.³³ The baseline is approximately 6.75 miles long and marked by six granite monuments which are distributed along the western edge of NC 12 from Whalebone Junction to just south of the access road to the Bodie Island Lighthouse (see Figure 11 for the location of the two southernmost markers). The baseline was not maintained or fully recognized until it was resurveyed in 2002 by a group of volunteers that included surveyors and engineers from NCDOT, the North Carolina Geodetic Survey, and private firms.
- *Coquina Beach and Ramp 2* – Coquina Beach is the primary public beach access point within Bodie Island. Coquina Beach provides beach amenities, such as restrooms and lifeguards, that make it a popular attraction during summer months. *Ramp 2* is at the southern end of the Coquina Beach parking area and shares an access road from NC 12 with Coquina Beach. Ramp 2 is open year-round (unless there are shorebird habitat conflicts)
- *Former Coast Guard facility buildings (bunk house, boathouse, and station)* – These facilities are located on the western side of NC 12 at the entrance of the Lighthouse Bay Drive, the access road to Bodie Island Lighthouse, and across NC 12 from the Coquina Beach access and parking area. The buildings were relocated from sites further north on NC 12 and on the eastern side of NC 12 due to the threat of shoreline erosion and storm damage.³⁴ The buildings have been renovated and are currently vacant; however, the Cape Hatteras NS intends to use these buildings for housing, research, offices, and/or education purposes. An historic district has been designated for the area in which the buildings have been relocated (see Figure 9).
- *Bodie Island Lighthouse and Visitor Center area* – The lighthouse (see Figure 10), which dates from 1872, is currently under renovation in order to repair the Fresnel lens and to reconstruct the stair treads and handrails to accommodate 23 people at a time and 394 people per day.³⁵ Once the renovation is complete, in 2011 or 2012, Cape Hatteras NS plans to open the lighthouse to the public for year-round climbing and may charge a fee, similar to Cape Hatteras Lighthouse.

³³ Brown, Lieca. Redrawing the Line. 24 January, 2003.

<http://www.pobonline.com/Articles/Features/01e1be768d0f60roVgnVCM10000of932a8co>

³⁴ Cape Hatteras NS website: News Archive. <<http://www.nps.gov/caha/parknews/newsarchive.htm>>

³⁵ Denver Service Center, National Park Service. “Value Analysis Study for Preserve/Rehabilitate Bodie Island Lighthouse and Oil House.” November 2005.

Figure 10
Bodie Island Lighthouse and Visitor Center

Source: NPS Southeast Regional Office (December 2009)



The Visitor Center is within the historic Lighthouse Double Keepers' Quarters (see Figure 10) and consists of a small gift/information shop that is operated by Eastern National, the Cape Hatteras NS's cooperating association, and a single room for interpretive/educational displays. The Visitor Center is open year-round, 9am to 6pm mid-June through Labor Day and 9am to 5pm for the rest of the year. Due to the limited space for programming, interpretation, and expansion, the Cape Hatteras NS has expressed a need for a new/improved Visitor Center within the Bodie Island District.

An Historic District surrounding the lighthouse is defined by four 19th century marker stones and includes the lighthouse, visitor center, restroom facilities, storehouse, interpretive walk and boardwalk, and a portion of the parking lot (see Figure 9).

To the north of the lighthouse and visitor center is the *Bodie Island Pond Boardwalk*, a short boardwalk trail that leads to a wildlife observation deck inland. To the south, accessible from an access road described below, the *Bodie Island Dike Trail* is an unpaved trail that follows the adjacent water body east towards NC 12 (See Figure 9).

North of the lighthouse and visitor center, accessible by a dirt access road, is an area Cape Hatteras NS staff refers to as the "Bone Yard." The area is used to store surplus equipment, stockpile road materials, and house a 40-yard dumpster.

- *The Off Island Gun Club* - This is a private membership organization that has a facility located on a small island off-shore Bodie Island in the Roanoke Sound. The club owns a dock and access road on Bodie Island, which is accessible by a wooden entry gate from the south end of the loop portion of Lighthouse Bay Drive (see Figure 11).

Figure 11

Off Island Gun Club: docks and facility (left) and entry gate and access road (right)

Source: US DOT Volpe Center (January 2010)



- *Oregon Inlet Fishing Center* (see Figure 12) –The Center provides a sound-side marina and inlet with access to the Atlantic Ocean. Since 1962, the Wilmington District of the U.S. Army Corps of Engineers has maintained navigable channels through Oregon Inlet and Roanoke Sound by dredging.³⁶ Most of the boats docked at the marina are charter boats. The center serves an important economic role within Dare County by providing facilities and access for the commercial and recreational fishing, seafood packing and processing, and boat building industries.³⁷ Sound access for private, non-motorized craft is available at the boat launch and at the southern end of the center. A portion of the southern parking lot currently serves as a staging area for the Bonner Bridge repairs and is closed to public parking.

To the west of the center, the U.S. Coast Guard has a station that is a subordinate unit of Coast Guard Group Cape Hatteras, located in Buxton, 40 miles south. The Oregon Inlet facility was built in 1990 and has 31 enlisted personnel on site, who conduct search and rescue, boating safety, law enforcement, and marine environment protection operations.³⁸

³⁶ U.S. Army Corps of Engineers. Manteo – (Shallowbag) Bay, North Carolina.

http://www.saw.usace.army.mil/oregon_inlet/Executive_Summary.htm

³⁷ A Study of the Benefits of Oregon Inlet to the Economy of Dare County and the Surrounding Region. Prepared by Moffatt & Nichol for the County of Dare. July 2006.

³⁸ U.S. Coast Guard. Sector North Carolina: Station Oregon Inlet. <http://www.uscg.mil/d5/sectnorthcarolina/StaOregonInlet.asp>

Figure 12
Oregon Inlet Fishing Center and U.S. Coast Guard Station

Source: Bing Maps.



- *Oregon Inlet Campground and Ramp 4* (see Figure 13) – The campground and Ramp 4 are located on the ocean side of Bodie Island, across from the Oregon Inlet Campground. The campground, which is open from April through October, contains 120 sites that are available on a first-come, first-served basis and cost \$20/night. Ramp 4 provides ORV and equine access to the beach and Bodie Island Spit to the south. However, this ramp is frequently closed during the summer for habitat protection.

Figure 13
Oregon Inlet Campground and Ramp 4

Source: Bing Maps



- *Oregon Inlet Bridge South Parking Lot* - The parking lot to the south of Bonner Bridge, located on Pea Island NWR, although owned and maintained by NPS, is well used for fishing. To the northeast of the parking lot, Dare County has recently restored a former Coast Guard Lifesaving Station building; its future use is unknown.

Figure 14
Oregon Inlet Bridge South Parking Lot
Source: NPS Southeast Region (January 2010)



Visitation

For this study, it is assumed that visitation patterns to Cape Hatteras NS, described above, reflect visitation patterns to the Bodie Island District. The main source of visitation data for the Bodie Island District is information collected by traffic counters and by the visitor center. A 2002 visitor survey indicated that nearly half of visitors to Cape Hatteras NS visited a site within the Bodie Island District, and traffic and ferry data shows that two-thirds (66%) percent of Cape Hatteras NS visitors enter from the north and thus must pass through Bodie Island District. Additional information on traffic counts for Bodie Island Lighthouse is provided in the Transportation Network section.

Monthly visitation to the Bodie Island Visitor Center reflects monthly visitation to Cape Hatteras NS, with the peak in July, but indicates additional visitation in May and September as compared to the overall visitation (see Figure 15). NPS visitation data for all four of the visitor centers within Cape Hatteras NS indicate that the Bodie Island Visitor Center is the second-most visited and Whalebone Junction Information Station, the least (see Figure 16).³⁹

³⁹ The vehicle count for the Bodie Island Lighthouse is a combination of actual vehicle count and an estimate generated from actual people counts into the Bodie Island VC. During the fall and winter months, the visitor center is staffed by Eastern National employees and not NPS employees. Eastern National employees do not read the traffic counter, but rather count the actual people entering the VC, which may or may not accurately reflect the number of vehicles entering the lighthouse area. The estimate is generated using the methodology outlined on the WASO website and calculating backwards.

Figure 15
Bodie Island Visitor Center Monthly Visitation 2005-2009

Source: NPS Public Use Statistics Office

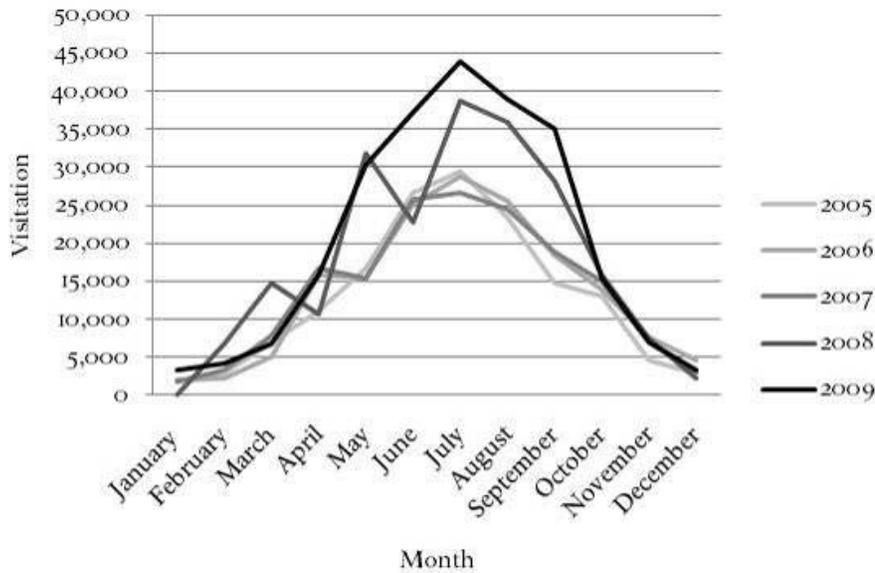
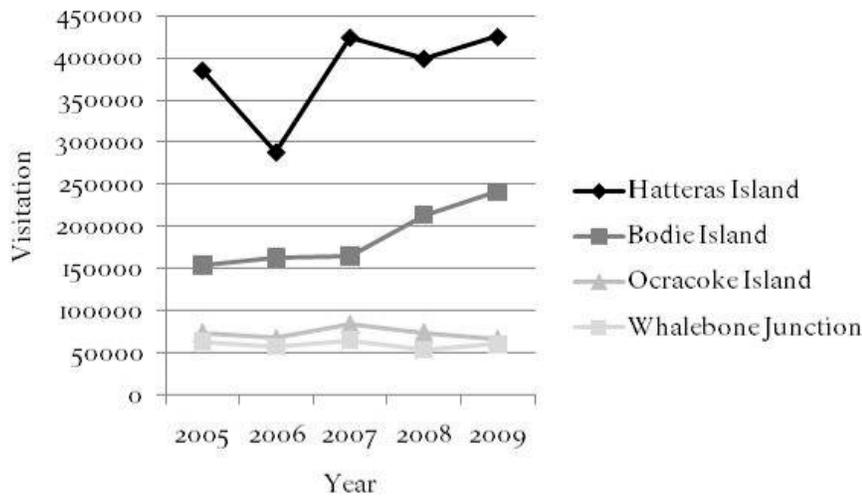


Figure 16
Cape Hatteras NS Visitor Center Visitation 2005-2009

Source: NPS Public Use Statistics Office



Visitor demographics

The most recent visitor information for Cape Hatteras NS is detailed in three reports: the University of Idaho Visitor Services Project (2002); the Outer Banks Visitors Bureau visitor survey (2006); and the Cape Hatteras NS Long Range Interpretation Plan (2007). The key findings of these reports are summarized below.

In 2002, the University of Idaho conducted a visitor study at Cape Hatteras NS during a six-day period in July. Though the study does not provide transportation-specific data (e.g., the mode of transportation to visit the Cape Hatteras NS, distance traveled, and exact origin and destination), it does provide demographic and use characteristics of visitors to Cape Hatteras NS, including the Bodie Island District. These data help to provide a picture of visitor behavior and expectations. The following are significant highlights from the report:

- The majority of visitors surveyed came from either Virginia (24 percent), North Carolina (20 percent), or Ohio (10 percent), and most visit lengths were between 1-4 hours, 5-8 hours, and 21-24 hours. This information suggests that many visitors come from within a day's drive of the Cape Hatteras NS, though some are willing to travel from farther locations, and that most visits to the Cape Hatteras NS are day trips.
- The average group size was 4.4, and only one percent of groups were traveling with organized tours.
- The two most popular activities listed were sunbathing/swimming (78 percent) and visiting historic sites (70 percent); however, other activities included walking, bicycling, beach driving, and canoeing/kayaking (see Figure 17).
- The three most important reasons for visiting Cape Hatteras NS were lighthouses, swimming and uncrowded/solitude/low population.
- Almost half (48 percent) of visitor groups visited Bodie Island, defined as the Bodie Island Lighthouse, the Bodie Island Visitor Center and restrooms, Whalebone Junction Information Station, and Oregon Inlet boat ramp.
- With regard to the use and importance of the Bodie Island Lighthouse facilities, visitors mostly used the lighthouse (77 percent), and the restrooms (65 percent) (see Figure 17), but rated most important the restrooms (95 percent) and then the lighthouse (88 percent).

Figure 17
2002 Survey Results

Source: Outer Banks Group Parks Visitor Survey, University of Idaho

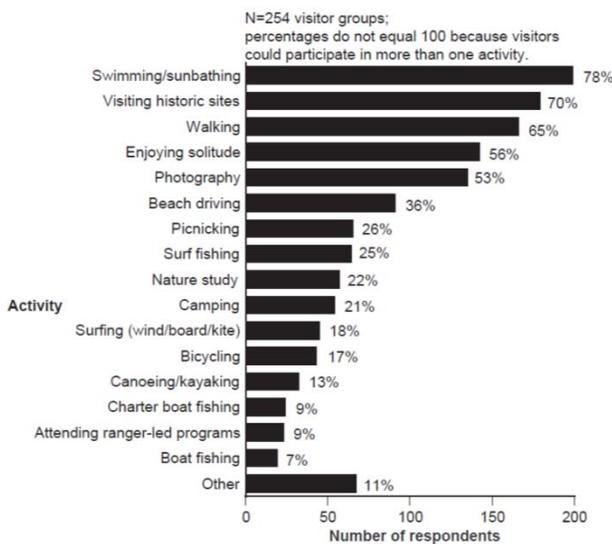


Figure 7: Visitor activities on this visit

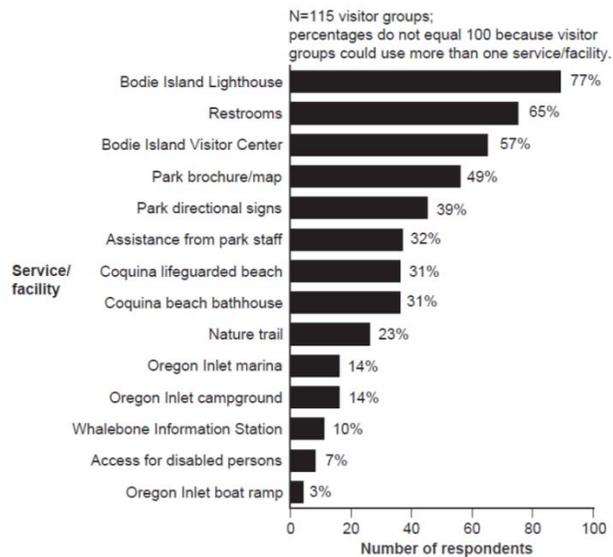


Figure 10: Services and facilities used at Bodie Island

The Outer Banks Visitors Bureau conducted a series of visitor surveys in 2006 that aimed to assess visitor perception of and satisfaction with the Outer Banks, visitor demographics and origin by season, and trip characteristics. Findings are similar to those found in 2002 by the University of Idaho and include:

- The main motivation cited for the visit for those surveyed was beautiful beaches (40%) although clean and safe environment, interesting historic sites/landmarks, and scenic areas or scenic drives were also main reasons. The most popular activities were visiting the beach, enjoying the scenic beauty, and eating at restaurants unique to the area.
- Overall, Washington, DC, Norfolk-Portsmouth-Newport News, VA, and Philadelphia, PA generated the highest percentage of visitors.
- Demographically speaking, the “average” visitor was white, 50 years of age, affluent, married, and college educated.
- Approximately one third (30 percent) of visitors surveyed reported visiting each year for the past three or four years while more than a third (40 percent) were first timers.
- Average stay was 5.7 nights and average travel party size was 6.3 people. Over half of visitors in summer brought children, compared to a third or less (20 to 30 percent) for the rest of the year.

The 2007 Cape Hatteras NS Long Range Interpretation Plan provides an analysis of three main visitor group types, including information about each group’s activities and the challenges each group present to NPS staff for improving visitor experience. The first group of visitors was mostly made up of residents of states along the east coast as well as of states further away, such as Ohio. This group generally stayed on the Outer Banks for one to two weeks during the summer and engaged in typical tourist activities, including sightseeing, lighthouse tours, sunbathing, and beachcombing. Challenges that pertained to this group included their understanding of the Cape Hatteras NS as a natural resource that is part of the NPS, and providing them with adequate orientation information about Cape Hatteras NS facilities. Another group was composed of residents of the various surrounding towns and villages of the Outer Banks. This group was mostly concerned with access to the beaches. Challenges for this group included park management objectives for user groups and resource protection. The final group was composed of national and international internet visitors seeking information about Cape Hatteras NS on the NPS website. Challenges related to this user group relate to the time required for Cape Hatteras NS staff to update existing website materials and to create new educational content as visitation to the site, and user expectations of the site, increase.⁴⁰

⁴⁰ Cape Hatteras Long Range Interpretation Plan. 2007. P.17

3. Transportation network

This section describes existing transportation characteristics of Dare County and Bodie Island District, including significant roadways, bridges, parking, information systems, public transportation, private transportation, bicycle and pedestrian facilities, and recreational and other infrastructure. The transportation data in this section were compiled from the best sources available. In some cases, historical data for areas just outside of the study area were used in place information for within the study area, due to lack of available current or comprehensive data.

According to a series of visitor surveys conducted by the Outer Banks Visitor Bureau in 2006, the majority (93 percent) of visitors use private vehicles to access the Outer Banks and move between the various sites and attractions.⁴¹ However, some visitors use other means to move around, such as bicycle and pedestrian facilities and public and private transportation.

No information exists on the number of bicyclists or pedestrians, either at the regional or study area level, but anecdotal information supports the idea that biking and walking are popular for both transportation and recreation. According to the Cape Hatteras NS Long Range Interpretive Plan (2007), “bicycling is a popular form of recreation and transportation on the Seashore. However, with no bike paths or trails, it can be dangerous, especially for the inexperienced.” Visitor surveys also provide evidence of bicycle and walking activity; in the 2002 survey, more than half (65 percent) reported walking as an activity while approximately one fifth (17 percent) reported bicycling while in the 2006 visitor surveys, a third (34 percent) of visitors surveyed reported hiking or biking.⁴² Anecdotally, NPS and local municipal staff have reported that casual family bicycling and walking is popular along SR 1243 and NC 12 from Kitty Hawk to Nags Head, that amateur or serious bicycling for exercise is popular along NC 12 within the Bodie Island District, and that walking and bicycling between sites within Bodie Island District is uncommon, in part due to distance and the lack of facilities (e.g. designated paths) to accommodate such modes.

In addition to sometimes biking and walking for recreation, the majority of visitors (75 percent) also reported taking scenic drives along the coast for recreation.⁴³ In addition, visitors engage in ORV use, horseback riding, and nonmotorized water transportation. Though these are primarily recreational activities and not employed as a means of transportation, each has the potential to act as a mode of transportation between destinations, or could grow to become a more significant mode of transportation in the future.

3.1 Regional

Roadways

The primary highways that serve the Outer Banks are 1.) NC 12, which runs north-south from Corolla, in Currituck County to the north of Duck, to Ocracoke; 2.) U.S. 158/Bypass/Croaton Highway, which runs north-south from Southern Shores to Whalebone Junction; and 3.) U.S. 64, which runs east-west and connects the Outer Banks to mainland North Carolina via Roanoke Island(see Figure 4).

⁴¹ Outer Banks Visitors Bureau. Visitor Research: Wave 4 – 2006. September 2006. http://www.outerbanks.org/pdf/2005_2006_Year_Long_Visitor_Profile.pdf

⁴² Outer Banks Visitors Bureau. Visitor Research: Wave 4 – 2006. September 2006. http://www.outerbanks.org/pdf/2005_2006_Year_Long_Visitor_Profile.pdf

⁴³ Outer Banks Visitors Bureau. Visitor Research: Wave 4 – 2006. September 2006. http://www.outerbanks.org/pdf/2005_2006_Year_Long_Visitor_Profile.pdf

NC 12

Under the Dare County and NCDOT Functional Classification System, NC 12 is considered a major collector route, which collects traffic from local roads and connects them to arterials.⁴⁴ As part of the National Highway System, NC 12 is designated an Intermodal Terminal Connector because it contains a location where people or goods transfer from one mode (highway) to another (ferry).⁴⁵ An approximately 138 mile segment of NC 12, from Whalebone Junction south to Carteret County, is designated the Outer Banks Scenic Byway under the U.S. Department of Transportation Federal Highway Administration's National Scenic Byways Program.⁴⁶ As a scenic byway, NC 12 has a corridor management plan and advisory committee that works on future improvements to the roadway and adjacent amenities. Funding is available for selected projects. The right-of-way of NC 12 through Bodie Island and to the south is under the control of NCDOT although a 5.3-mile segment from Whalebone Junction south is owned and managed by NPS.⁴⁷

NC 12 is highly vulnerable to ocean overwash and potential damage to the roadway infrastructure from storms as well as larger-scale and longer term changes in the shoreline (see Appendix B). There have been several storms in the past ten years that inflicted significant damage to the transportation infrastructure and property in the Outer Banks including NC 12. Two examples are Hurricane Isabel in 2003 and the nor'easter in November 2009.

Hurricane Isabel impacted the coastline of Virginia and North Carolina in September 2003 as a Category 2 storm and caused strong wind, rain, flooding, and power outages throughout the region.⁴⁸ The hurricane created an inlet and eliminated a portion of NC 12 (see Figure 18). As a result, NC 12 was closed for two months while the inlet was filled in with sand and the road was rebuilt. During this time ferry access was the only method of transportation to Hatteras Island.

In November of 2009, the Atlantic coast was impacted by a nor'easter formed when tropical storm Ida collided with a pressure system.⁴⁹ The storm caused significant flooding, overwash, and beach erosion along the Outer Banks and resulted in the loss of approximately 800 feet of NC 12 on Hatteras Island, immediately north of Rodanthe.⁵⁰ NC 12 remained closed for several days, preventing emergency vehicle access and resident movement until the Ocracoke-Hatteras ferry resumed and NCDOT developed a detour route across the sand to bypass the damaged roadway⁵¹ (see Figure 19).

⁴⁴NCDOT Functional Classification of Highways.

<<http://www.ncdot.org/doh/preconstruct/tpb/PDF/FunctionalClassification.pdf>>

⁴⁵ NCDOT. Strategic Highway Corridors Glossary of Terms. 22 April 2005. <http://ncdot.org/doh/preconstruct/tpb/shc/PDF/U.S.64-NC49_Corridor_Study_Report_glossary.pdf>

⁴⁶ Outer Banks Scenic Byway Advisory Committee. Corridor Management Plan for the Outer Banks Scenic Byway. December 1, 2008.

⁴⁷ Bonner Bridge Replacement SDEIS, NCDOT TIP Project Number B-2500. P.1-9

⁴⁸ U.S. Army Corps of Engineers and Federal Emergency Management Agency. Hurricane Isabel Assessment. March 2005. <http://www.csc.noaa.gov/hes/docs/postStorm/Isabel_PostStorm_Summary.pdf>

⁴⁹ USGS Coastal Change Hazards: Hurricanes and Extreme Storms. <<http://coastal.er.usgs.gov/hurricanes/norida/>>

⁵⁰ Hampton Roads "N.C. 12 washes out at Mirlo Beach; third house collapses" November 15, 2009.

⁵¹ N.C. 12 washes out at Mirlo Beach; third house collapses. Accessed 2/24/10 <<http://hamptonroads.com/2009/11/nc-12-washes-out-mirlo-beach-third-house-collapses>>

Figure 18
Hurricane Isabel Impact on Hatteras Island

Source: Coastal Change Hazards: Hurricanes and Extreme Storms <http://coastal.er.usgs.gov/hurricanes/isabel/>



Figure 19
Nor'easter Impact on Hatteras Island

Source: Hampton Roads website. <<http://hamptonroads.com/2009/11/one-lane-nc-12-reopens-all-traffic-rodanthe#rfq>>



Because of such storms, and more regular overwash issues, NCDOT maintains an active project for NC 12 on the Outer Banks to ensure the continued operation of the transportation network with the least interruption to area residents. NCDOT considers NC 12 the lifeline for the communities along the Outer Banks from Whalebone Junction south to Hatteras. Residents rely heavily on NC 12 for services that are

located off the islands, like hospitals, emergency response services, and garbage collection. NC 12 is also the main evacuation route for all residents of the villages on the Outer Banks.⁵²

Regional Traffic Patterns

Routes to reach Cape Hatteras NS from the surrounding areas are limited because of the geography. From the north, visitors travel southbound along U.S. 158 over the Wright Memorial Bridge to U.S. 158 or along NC 12. From the west, visitors travel eastbound along U.S. 64. Visitors from the south access Cape Hatteras NS by ferry. According to the 2006 visitor surveys, over half (59 percent) of visitors access the Outer Banks from the north with the remainder equally split between the south (19 percent) and west (22 percent).⁵³ Other than these main access routes, travel patterns in Dare County are dependent on the location of visitor accommodations and attractions that were described in Section 1 and on seasonal visitation.

Origin-destination studies that provide specific travel patterns for the Outer Banks are not available. However, many towns and villages along the Outer Banks are characterized as a combination of year-round residential areas as well as seasonal resort destinations, which provides some indication of the type of trips made from these areas. For example, a resort area would generate trips to tourist-oriented areas, as opposed to middle schools, grocery stores, or hospitals. However, such generation of trips is dependent on seasonal visitation.

During peak seasonal visitation, demands increase on the existing transportation network. The Corridor Management Plan for the Outer Banks Scenic Byway (2008), a designation which covers NC 12 south of Whalebone Junction, states that peak season traffic occurs during the months of June, July, and August, which also corresponds to Cape Hatteras NS peak seasonal visitation patterns.

One source of information that provides some indication of the traffic patterns are the Annual Average Daily Traffic (AADT) counts, which NCDOT provides for locations throughout Dare County. The AADT represents the average annual daily traffic volume for all lanes in both directions passing a point on the highway system.⁵⁴ AADT is thus a straightforward measure of how busy a road or intersection is on average though it does not provide insight into daily, weekly, monthly or seasonal variations. Figure 20 illustrates the intensity of traffic count data throughout Dare County for 2008, where dark purple markers indicate traffic volumes of 20,000-56,000 AADT. The AADT patterns do correspond with the areas of higher population and higher visitor accommodation. According to the 2006 visitor surveys, the most popular overnight destinations were Nags Head, Kill Devil Hills, Kitty Hawk, and Duck (54 percent of visitors surveyed) and the AADT in those towns reflect higher traffic volumes. AADT is also higher at the two major north and west access points.

⁵² NCDOT NC 12 Transportation Improvements. Accessed 2/24/10 <http://www.ncdot.org/projects/NC_12/>

⁵³ Outer Banks Visitors Bureau. Visitor Research: Wave 4 – 2006. September 2006. http://www.outerbanks.org/pdf/2005_2006_Year_Long_Visitor_Profile.pdf

⁵⁴ NCDOT Traffic Survey Group. Accessed 3/11/10 <http://www.ncdot.org/doh/preconstruct/tpb/traffic_survey/>

Figure 20
Dare County 2008 AADT

Source: U.S. DOT, Volpe Center and NPS

Cape Hatteras National Seashore



National Park Service
 U.S. Department of the Interior
 Prepared by the U.S. Department of Transportation
 Volpe National Transportation Systems Center

Legend

2008 NCDOT AADT

- 0 - 1,000
- 1,000 - 5,000
- 5,000 - 10,000
- 10,000 - 20,000
- 20,000 - 56,000 (AADT #)

- NC 12 and I-158
- Roads
- Air Force
- Fish and Wildlife Refuge
- National Seashore
- National Park Areas



Bridges

The barrier island geography of Dare County necessitates that bridges are key infrastructure, providing the only vehicular means of access to the area. The exception to this is at the southern end of Hatteras Island, which is accessed by ferry service from Ocracoke Island.⁵⁵ The Outer Banks are connected by bridges to the mainland at two points: across the Albemarle Sound on the Wright Memorial Bridge/U.S. 158, east-west, and across the Roanoke Sound on the Virginia Dare Trail/ Washington Baum Bridge/U.S. 64, east-west. A third bridge has been proposed twenty miles to the north of Wright Memorial Bridge, in Currituck County, to better serve the town of Corolla, north of Duck, and to relieve some of the volume on the Wright Memorial Bridge.⁵⁶

The Herbert C. Bonner Bridge links NC 12 on Bodie Island to Hatteras Island and is the only roadway connection for vehicles to and from Hatteras Island and destinations such as Pea Island NWR and Cape Hatteras Lighthouse.

Parking

Regionally, there are a number of public parking areas that may have potential to serve as satellite parking lots if regional public transportation service was implemented and remote off-site parking was desired. The two other NPS sites that make up the NPS Outer Banks Group, Wright Brothers Memorial and Fort Raleigh NHS, both have on-site parking for the public as well as employees. The local towns each have public parking areas, including schools and beach access areas. The major parking areas are listed in Table 4 with the exception of beach access parking areas. Most of the listed areas are used for recreational or educational purposes throughout the year, but may have surplus parking during certain times of the year or days of the week.

For beach access, Nags Head has 31 public beach access parking areas, for a total of over 700 spaces, distributed along 11 miles of NC 12. The parking areas range in size from five to 70 spaces. Most are concentrated north of Whalebone Junction but there are seven parking areas south of Whalebone Junction, including a separate, 60-space public parking area adjacent to the NPS maintenance facility. Kill Devil Hills has 19 public beach access parking areas, for a total of over 600 spaces, and Kitty Hawk has three public beach access parking areas, with over 100 spaces.⁵⁷

⁵⁵ Dare County Land Use Plan. P.45

⁵⁶ North Carolina Turnpike Authority: Mid-Currituck Bridge. http://www.ncturnpike.org/projects/Mid_Currituck/

⁵⁷ The Coastal Explorer website (<http://www.thecoastalexplorer.com/>) and research via Google Maps.

Table 4
Primary Regional Public Parking Areas

Source: Cape Hatteras NS staff, field observations, and research via Google Map

Parking Site	Location	Number of Spaces	Utilization
Wright Brothers Memorial Visitor Center Parking	Kill Devil Hills	100 spaces (3 ADA)	Year-round, 9am-5pm (9am-6pm during the summer)
Fort Raleigh National Historic Site	Manteo	569 spaces (14 ADA)	Varies (see below)
<i>Visitor Center</i>		37 spaces (2 ADA)	<i>Year-round, daylight hours</i>
<i>Waterside Theater Parking</i>		494 spaces (10 ADA)	<i>Performance nights during spring and summer</i>
<i>Elizabethan Gardens</i>		38 spaces (2 ADA)	<i>Year-round, daylight hours</i>
Jockey's Ridge State Park	Nags Head	106 spaces	Year-round, daylight hours
Roanoke Island Festival Park	Manteo	~130 spaces 8 bus spaces	Year-round, daylight hours, with special events
Outer Banks Welcome Center	Manteo	~60 spaces	Year-round, 9am-5pm
Dare County Justice Center	Manteo	~150 spaces	Weekdays, 9am-5pm
First Flight High School	Kill Devil Hills	~450 spaces	Weekdays; some evening and weekend events
Nags Head Elementary School	Nags Head	~140 spaces	Weekdays; some evening events
Kitty Hawk Elementary School	Kitty Hawk	~50 spaces	Weekdays; some evening events
Dare County Airport	Manteo	Unknown	Unknown
Aycock Brown Welcome Center	Kitty Hawk	67 spaces (5 ADA) 6 bus spaces)	Year-round, 9am-5pm

Intelligent transportation systems / traveler information systems

Intelligent transportation systems (ITS) encompass a broad variety of electronic technologies used to collect, process, communicate, and disseminate information that may benefit the traveling public. ITS often work in tandem with, or provide information to, traveler information systems (TIS) to communicate travel conditions or specific attractions along a route. For example, these systems may provide travelers with information related to traffic and weather conditions, road construction or closures, or parking availability. The effective use of ITS allows travelers to make better decisions about when, where, and how to travel to minimize both their own inconvenience, or additional impacts on a strained transportation network.

Dare County has recently started to provide 24-hour real-time road condition information on its main webpage, including information related to ocean overwash, soundside flooding, traffic accidents, ice and snow hazards, temporary road closures and fire scenes on streets and highways around the county.⁵⁸ Additionally, on the Outer Banks, NCDOT uses ITS to monitor traffic and flooding and inform travelers of travel conditions and emergencies. NCDOT maintains a variable message sign (VMS) and highway advisory radio communications antennae at Whalebone Junction to communicate emergency roadway information and Ocracoke ferry operations status. Several webcams exist in the region, including one on US-158 north of Whalebone Junction to monitor traffic and one at Rodanthe on NC 12 to monitor an area vulnerable to flooding. The existing webcam feeds are posted online by TrafficLand, a private company,

⁵⁸ The Virginian-Pilot. Check out Dare County, N.C., road conditions. Catherine Kozak. 3/2/10. Accessed 3/3/10 <http://hamptonroads.com/2010/03/check-out-dare-county-nc-road-conditions-web-site>

at no charge to the municipality, county or state.⁵⁹ When flooding or a traffic incident occurs, NCDOT is able to act, such as closing the road and deploying law enforcement officers to direct traffic.⁶⁰

Public transportation

There is limited public transportation within the region, consisting of a county-run demand-response system and the NCDOT ferries. However, FWS has recently begun to use a tram trailer for visitors and there is a precedent by NPS and NCDOT for using transit for a special event.

Dare County Transportation System

The Dare County Transportation System (DCTS) is a single-county community transit system⁶¹ that serves both clients of human service agencies and the general public (residents of Dare County) through subscription and demand-response. DCTS is funded by FTA grants from the NCDOT Public Transportation Division and funds from Dare County.⁶² DCTS operates out of Manteo and has four full-time employees.⁶³

DCTS service must be requested two days in advance. There are no eligibility requirements and no fee for the service. Repeat service (same rider, same destination, same time) is limited to 36 one-way or 18-round trips per calendar year except for dialysis patients.⁶⁴ The service provides public transportation within Dare County on weekdays; out-of-county service to designated medical destinations⁶⁵ is provided Tuesday, Thursday, and Fridays.⁶⁶ The DCTS office is open on weekdays from 8:30 am to 5 pm; service may start before and end after these hours but efforts are made to complete as much service as possible by 5pm. Out-of-country appointments are not allowed to be scheduled for after 1:30pm. The DCTS FY08 operating characteristics are provided in Table 5. The service has seven service vehicles, four of which are lift-equipped, two of which are standard vans, and one of which is a minivan; one vehicle is based out of Buxton, approximately 60-70 miles from the DCTS office.⁶⁷

Table 5
DCTS FY08 Operating Characteristics

Source: The Albemarle Rural Planning Organization and Public Transportation Division, North Carolina Department of Transportation. *Coordinated Public Transit & Human Service Transportation Plan*. May 2009. <<http://www.ncdot.gov/nctransit/download/Plans/LocallyCoordinatedPlan.pdf>>

FY08 Operating Characteristics	Hours/Miles/Trips
Total Vehicle Service Hours	11,300
Total Vehicle Service Miles	234,259
Total Revenue Miles	163,913
Total Passenger Trips	13,050

⁵⁹ Trafficland. Accessed 12/22/10. <<http://www.trafficland.com/city/OBX/index.html>>

⁶⁰ Personal communication with NCDOT (June 2009).

⁶¹ In NC, “community” transit refers to rural transit.

⁶² Dare County Transportation System. <http://www.darenc.com/General/transportation.htm>

⁶³ The Albemarle Rural Planning Organization and Public Transportation Division, North Carolina Department of Transportation. *Coordinated Public Transit & Human Service Transportation Plan*. May 2009.

<<http://www.ncdot.gov/nctransit/download/Plans/LocallyCoordinatedPlan.pdf>>

⁶⁴ Dare County Transportation System: DCTS Van Policy. <<http://www.darenc.com/General/DCTSPolicy.htm>>

⁶⁵ NC: Elizabeth City, Edenton, Greenville, Chapel Hill, & Duke; VA: Chesapeake, Virginia Beach, Norfolk, Portsmouth, Newport News, Suffolk, Hampton.

⁶⁶ Dare County Transportation System. <<http://www.darenc.com/General/transportation.htm>>

⁶⁷ The Albemarle Rural Planning Organization and Public Transportation Division, North Carolina Department of Transportation. *Coordinated Public Transit & Human Service Transportation Plan*. May 2009.

<<http://www.ncdot.gov/nctransit/download/Plans/LocallyCoordinatedPlan.pdf>>

Other counties in North Carolina have regionalized community and human service transportation to provide coordinated and consolidated service.⁶⁸ The closest regional community transportation system to Dare County is the five-county Inter-County Public Transportation Authority (ICPTA), which serves Camden, Chowan, Currituck, Pasquotank and Perquimans counties. ICPTA is a subsidiary of Albemarle Regional Health Services and began in 1978.⁶⁹

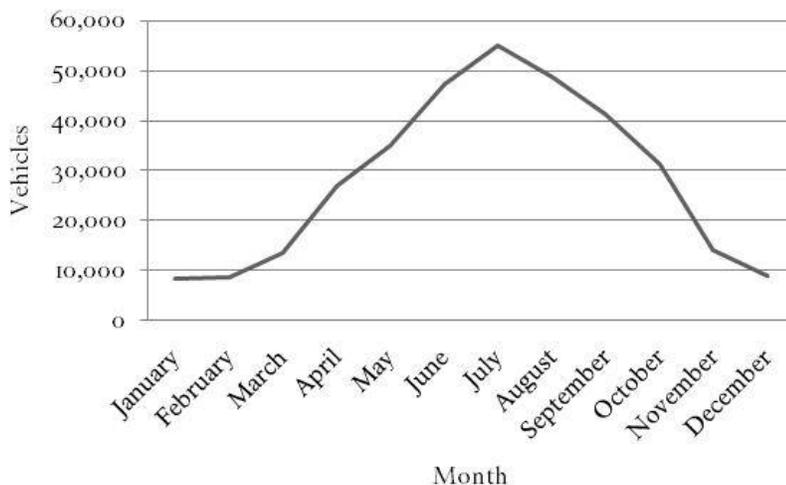
NCDOT ferries

The NCDOT Ferry Division provides a network of ferry services, including seven routes and 21 ferries, which each year transport over 1.1 million vehicles and more than 2.5 million passengers.⁷⁰ Three ferry routes operate at the southern end of Cape Hatteras NS, one that operates between Hatteras and Ocracoke and two that operate between Ocracoke and the mainland (Cedar Island in Carteret County and Swan Quarter in Hyde County) (see Figure 4). The 40-minute Hatteras-Ocracoke service is free and operates every hour during the off-season (September to March) and every half an hour during the summer (April to August) from 5am to midnight. The Ocracoke-Cedar Island and Ocracoke-Swan Quarter services are over 2 hours in length, cost \$15 for a single vehicle (under 20 feet), and operate twice a day in the off-season and four times a day during the summer.⁷¹

Figure 21 illustrates the seasonal variation of the number of vehicles traveling via the Hatteras Island ferry each month (both directions). These trends nearly mirror the Cape Hatteras NS visitation peaks during the months of June, July, and August (see Figure 6).

Figure 21
2009 NCDOT Hatteras-Ocracoke Ferry Vehicle Counts

Source: Cape Hatteras NS staff



Alligator River National Wildlife Refuge Tram

Alligator River National Wildlife Refuge and the Coastal Wildlife Refuge Society partnered to purchase an open-air tram trailer (see Figure 22) and offer guided interpretive tours on Alligator River National

⁶⁸ NCDOT. North Carolina's Community, Regional Community, Urban and Regional Urban Transportation Systems. <<http://www.ncdot.gov/nctransit/download/TransSystems.pdf>>

⁶⁹ The Albemarle Rural Planning Organization and Public Transportation Division, North Carolina Department of Transportation. *Coordinated Public Transit & Human Service Transportation Plan*. May 2009. <<http://www.ncdot.gov/nctransit/download/Plans/LocallyCoordinatedPlan.pdf>>

⁷⁰ NCDOT Ferry Division. <<http://www.ncdot.org/ferry/>>

⁷¹ NCDOT Ferry Division. <<http://www.ncdot.gov/download/transit/ferry/ferryschedule.pdf>>

Wildlife Refuge. The tram trailer is universally accessible and equipped with a speaker system. The refuge conducted the first tour on March 20, 2010. FWS plans to provide a narrated interpretive tour of Wildlife Drive using the tram trailer every Thursday June through August from 1:30-3:30pm. The tram trailer will also be used to conduct tours for special events.⁷²

Figure 22
FWS Tram Trailer

Source: FWS (<http://www.fws.gov/Alligatorriver/news/2010%20News/news-Tram.html> and <http://www.coastalwildliferefuge.com/pr/pr031510.pdf>)



Wright Brothers Centennial Transportation Services

NPS, in partnership with NCDOT, has been involved in the short-term provision of public transportation in the Outer Banks for one special event in the past. It is useful to describe this effort because it identifies resources and strategies that could be used in the future for short or long term public transportation.

NCDOT sponsored free public transportation services during the 6-day First Flight Centennial Celebration, from December 12 to 17, 2003, at the Wright Brothers National Memorial in Kill Devil Hills.⁷³ No public parking was provided at Wright Brothers so the plan was “designed to get attendees to and from the events as efficiently as possible and minimize the impact to local residents” according to the NCDOT press release. NCDOT hired Transportation Management Services (TMS), a company based in Vienna, VA that specializes in transportation planning and management for special events to help develop the transportation plan. Service characteristics of the service are detailed in Table 6. According to an issue of the Transportation Research Board’s TR News, the transportation services met with much success and served 30,000 visitors of the 35,000 visitors (86%) per day.⁷⁴

⁷² Alligator River National Wildlife Refuge: New!!! Guided Tram Tours at Alligator River National Wildlife Refuge. <http://www.fws.gov/Alligatorriver/tram.html>

⁷³ NCDOT. “NCDOT Announces Transportation Plan for First Flight Centennial Celebration.” 7 November 2003. <http://www.firstflightcentennial.org/news_releases.htm>

⁷⁴ Transportation Research Board of the National Academies. Transportation in the Parks: Serving Visitors, Preserving Site. TR News, Number 233, July-August 2004. <<http://onlinepubs.trb.org/onlinepubs/trnews/trnews233.pdf>>

Table 6

Service Characteristics of Wright Brothers Centennial Transportation Services

Source: NCDOT. "NCDOT Announces Transportation Plan for First Flight Centennial Celebration." 7 November 2003. http://www.firstflightcentennial.org/news_releases.htm

Fare	Service provided for free but event ticket required to board
Routes	<ul style="list-style-type: none"> ▪ Park and ride shuttles (see parking lots below); start service 30 minutes prior to opening of Wright Brothers ▪ Circulator shuttle <ul style="list-style-type: none"> ▪ Fixed route NC 12 (Beach Road) from Whalebone Junction at NC 12/U.S. 158/64 to Southern Shores at U.S. 158/NC 12 and on Colington Island ▪ Service will begin 30 minutes prior to opening of Wright Brothers ▪ Stops ½ mile apart and designated by a sign (33 stops on NC 12 and four on Colington Island) ▪ On-demand shuttle (lift-equipped vehicle) in same service area (3-hour advance notification required) ▪ Extended service to north (Southern Shores, Duck, Corolla) and south (Salvo, Rodanthe, Hatteras)⁷⁵ <ul style="list-style-type: none"> ▪ Limited schedule: morning and evening at gate opening and closing ▪ Stops by town: <ul style="list-style-type: none"> • Corolla: Ocean Club Ventures • Pine Island: Hampton Inn • Duck: Sanderling Inn, Norbanks Sailing Center, Duck Ridge/Wee Winks Square, Duck Soundside Shoppes • Southern Shores: Hillcrest Beach Access Parking Lot, Southern Shores Crossing (adjacent to Southern Shores Town Hall), Marketplace Shopping Center (pick-up in Parking Lot off U.S. 158) • South of Whalebone Junction: Salvo Day Use Area and KOA Cape Hatteras
Parking	<ul style="list-style-type: none"> ▪ Open 1 hour prior to opening of Wright Brothers ▪ All attendees <ul style="list-style-type: none"> ▪ U.S. 158 in Currituck County (on the mainland) about 3 miles north of the Wright Memorial Bridge ▪ Dare County Airport on Roanoke Island ▪ Along NC 12 on Bodie Island (RV parking also available at this site) ▪ Attendees who require special assistance (i.e., a lift-equipped vehicle) <ul style="list-style-type: none"> ▪ Kitty Hawk Elementary School on U.S. 158 in Kitty Hawk; and ▪ Dare County Justice Center on Roanoke Island. ▪ Private charter buses and school buses <ul style="list-style-type: none"> ▪ Right lane of U.S. 158 East south of main entrance to the Memorial ▪ First Flight High School (Veterans Drive and Sixth Street)
Vehicles	Contracted services from charter companies for 140 coaches and 30 smaller buses ⁷⁶
Media	<ul style="list-style-type: none"> ▪ First Flight Foundation (www.firstflightcentennial.org) ▪ Dare County Government T.V. Channel 20 and local radio stations ▪ NCDOT ▪ Outer Banks Visitor Bureau

Private transportation

Private transportation, like public transportation, is limited throughout the Outer Banks; however, the following commercial tours, private vehicle services, and water services are available.

Commercial Tours

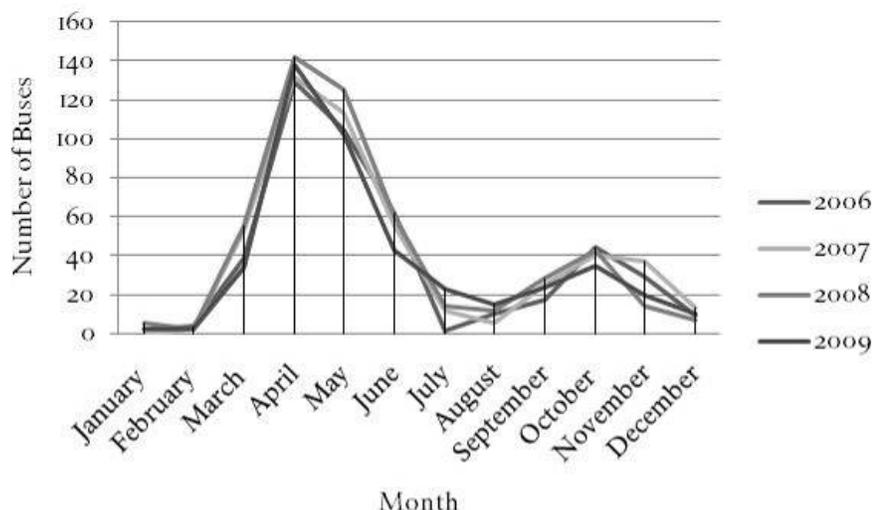
A limited number of visitors access Cape Hatteras NS by organized tour. However, regional tour companies from surrounding vacation destinations like Ocean City, MD, Virginia Beach, VA, and Myrtle Beach, VA or more remote locations may travel to Cape Hatteras NS during the peak vacation season.

⁷⁵NCDOT. "Update on Transportation Information for First Flight Centennial Celebration." 2 December 2003. <http://www.firstflightcentennial.org/news_releases.html>

⁷⁶Transportation Research Board of the National Academies. Transportation in the Parks: Serving Visitors, Preserving Site. TR News, Number 233, July-August 2004. <<http://onlinepubs.trb.org/onlinepubs/trnews/trnews233.pdf>>

Cape Hatteras NS does not collect information on tour bus visitation while the Wright Brothers National Monument started collecting data in 2006 (see Figure 23). Based on its monthly counts, peak monthly tour bus visitation is during the months April, May, and June and falls to an average of less than a quarter of the peak visitation through December.

Figure 23
NPS Wright Brothers National Monument Monthly Tour Bus Visitation 2006-2009
 Source: NPS Public Use Statistics Office



The Outer Banks Visitors Bureau lists two companies that provide private bus or shuttle tours to locations throughout the Outer Banks for various occasions. These companies are described below.

Hatteras Tours offers four tour shuttle routes, the Hatteras/Cape tour, the Kinnakeet/Cape tour, the Chicamacomico tour, and the Ocracoke tour (see Table 7 for schedules).⁷⁷ Each tour lasts approximately 2 and ½ hours, with the exception of the Ocracoke Tour, which lasts 6 hours. The Ocracoke tour bus has a priority status for entry onto the Ocracoke-Hatteras ferry. All tours leave from the Graveyard of the Atlantic Museum parking lot in Hatteras Village, near the NC DOT Ferry docks at the end of NC 12. The 27-foot shuttle bus accommodates 25 passengers.

Table 7
Hatteras Tours Schedule

Source: Hatteras Tours. <<http://www.hatterastours.com/>>

Tour Name	Day(s)	Time(s)
Hatteras/Cape	Thursday and Friday	2 pm
Kinnakeet/Cape	Thursday and Friday	10 am
Chicamacomico	Monday	10 am
Ocracoke	Tuesday and Wednesday	8:45- 1:45-Leaves twice daily

⁷⁷ Hatteras Tours. Accessed 2/24/10. <<http://www.hatterastours.com/>>

Sandy Beach Tours offers chauffeured transportation, with available guide services, throughout the Outer Banks on a rental agreement basis.⁷⁸ Four vehicle types with various capacities are offered for rental. Table 8 describes rental vehicle types and their associated capacities.

Table 8
Sandy Beach Tours Vehicle Type and Capacities

Source: Sandy Beach Tours. <<http://www.sandybeachtours.com/contact-us>>

Vehicle type	Capacity
Executive limo coach	15
Luxury tour bus	35
Ford shuttle	14
Dodge shuttle	12

Private transportation

There is no regional bus service that serves the Outer Banks. The closest Greyhound route runs from Norfolk to Kinston, passing 100 miles to the west of the Outer Banks. The *Coordinated Public Transit & Human Service Transportation Plan* for the Albemarle Rural Planning Organization (RPO) region identified the following small private operators offering service in the region:

- Ar Taxi, Kill Devil Hills
- Airport –the-Connection, Kill Devil Hills
- Atlantic Cab Company, Kill Devil Hills
- Bayside Cab, Kill Devil Hills
- Beach Cab, Kill Devil Hills
- Coastal Cab Company, Kill Devil Hills
- Island Shopper Shuttle, Buxton
- Manteo Cab Company, Manteo
- Outer Banks Limousine Service, Manteo
- Roanoke Island Taxi Service, Manteo

Most of these services are offered on a per-trip basis for shopping, airport, and other trips.

Water taxis

Currently, water taxi services are limited on the Outer Banks. For example, research found only one condominium complex in Manteo that offers a free water taxi service to its residents to waterfront shopping destinations. There is no established company or larger-scale service. However, stakeholders and planning documents continue to express interest in developing water taxi services and connections for the area.

Multi-use (bicycle and pedestrian) facilities

Shared bike lanes are on-road facilities designated by striping, signing and pavement marking for the exclusive use by bicyclists. Shared bike lanes within the Outer Banks are typically considered to be appropriate for experienced bicyclists only; however, there are some off-road facilities and roadways that are safe for inexperienced bicyclists. A description of the bicycle facilities for Dare County and a map of the primary trails (Figure 24) are provided below; in addition, a comprehensive map is available on the

⁷⁸ Sandy Beach Tours. Accessed 2/24/10. <<http://www.sandybeachtours.com/contact-us>>

NCDOT website⁷⁹ and Appendix C contains the section of the NCDOT map that covers the Bodie Island District.

There are several national, state, and regional multi-use trails that pass through the Outer Banks. The *North-South Atlantic Coast Bikeway* extends from Maine to Florida and offers two routes within North Carolina, one along the Outer Banks on NC 12, and one further inland. The state-designated *Mountains-to-Sea Trail*⁸⁰ is intended to extend from the Great Smoky Mountains National Park, west of Asheville, to Jockey's Ridge State Park, in Nags Head. Over 450 miles of the 1000-mile route are currently open for use.

The *Wright Brothers Bikeway* runs for 45 miles from Corolla, in Currituck County in the north, to South Nags Head, and then continues on for another 60 miles to Ocracoke.⁸¹ The northern 45-mile portion of the bikeway consists of a combination of wide paved shoulders, separate multi-use paths, and quiet neighborhood streets which are shared between bicyclists and pedestrians and are intended for slow, leisurely family riding. The remaining 60 miles are along the shoulder of NC 12.

In addition to the more formal, designated trails described above and illustrated in Figure 24, NCDOT's Division of Bicycle and Pedestrian Transportation has designed a system of bicycle highways, which offer alternatives to major highways.⁸² In addition to these trails, each town within the region offers some extent of facilities that are described below, from north to south.^{83,84}

In the northern end of Dare County, Duck contains a 10-foot-wide bicycle path that runs parallel to NC 12 and is part of the Wright Brothers Bikeway Trail. The Duck path varies in width and placement from an off-road asphalt path in the northern part of the city to two bicycle lanes on either side of NC 12 in the south. The town of Southern Shores contains a single paved off-road path parallel to NC 12.

"Share the road" signs are posted on U.S. 158; however, because the bicycle lane is only two feet wide in the eastbound (or southbound) direction and six feet wide in the westbound (or northbound) direction, travel is not recommended for inexperienced bicyclists.

⁷⁹ See Dare County maps under Regional and Local Maps at <http://www.ncdot.org/travel/mappubs/bikemaps/>.

⁸⁰ Source: North Carolina State Parks web site. "Mountains-to-Sea Trail." <http://www.ncparks.gov/About/trails_mst.php>

⁸¹ Source: the Outer Banks of North Carolina web site. "Bicycling on the Outer Banks." <http://www.outerbanks.org/activities/land_activities/bicycling_in_the_outerbanks.asp>

⁸² NCDOT Division of Bicycle and Pedestrian Transportation: Bike Maps and Routes. <<http://www.ncdot.gov/travel/mappubs/bikemaps/default.html>>

⁸³ Source: the Outer Banks of North Carolina web site. "Bicycling on the Outer Banks." <http://www.outerbanks.org/activities/land_activities/bicycling_in_the_outerbanks.asp>

⁸⁴ NCDOT Division of Bicycle and Pedestrian Transportation: The Outer Banks - Dare County Bicycle Map

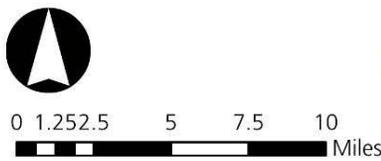
Figure 24
Major Designated Bicycle Routes
 Source: Volpe Center (January 2010)

Cape Hatteras National Seashore
 National Park Service
 U.S. Department of the Interior
 Prepared by the U.S. Department of Transportation
 Volpe National Transportation Systems Center



Legend

- Unincorporated town or attraction
- Municipal Boundary
- Wright Brothers Bikeway
- - - Mountains-to-Sea-Trail/ NC Bike Route 2
- North-South Atlantic Coast Bikeway



In Kitty Hawk, there is a paved shoulder along NC 12 that is affected by sand overspill and the paved shoulder is, therefore, considered appropriate for experienced bicyclists, only. Kitty Hawk also contains the Wright Brothers Bikeway Trail, which is safer and more accessible to inexperienced users. The trail is 16 miles long and follows a mix of multi-use trails and lightly traveled roads. The northern portion of this trail is a six-foot wide asphalt path that runs parallel to Woods Road. Along Woods Road there is also a paved shoulder that can be used by experienced bicyclists. This path leads to Kitty Hawk Road, which contains a paved shoulder, and then onto Moore Shore Road. The Wright Brothers Bikeway Trail connects several beach access locations; visitor amenities within the towns; and recreation sites such as Jockey's Ridge State Park, Nags Head Woods Ecological Preserve, and Wright Brothers National Memorial.

Kill Devil Hills contains a paved shoulder along NC 12 that is also affected by sand overspill. This shoulder varies in width from a narrow shoulder in the north to a wider shoulder in the south. Bicyclists also commonly follow Bay Drive along the sound side, which connects to the Wright Brothers Memorial. The memorial contains a ten-foot wide bicycle trail around the park.

Nags Head contains an on-road multi-use path along NC 12 from the border with Kill Devil Hills to Whalebone Junction and a sidewalk that accommodates bicyclists and pedestrians along SR 1243, south of Whalebone Junction, that extends to the NPS maintenance area and residences (see Figure 25). In addition, there are segments of a multi-use bicycle trail along the west side of U.S. 158 between 8th Street and Carolinian Circle and there are plans to extend the trail to Jockey's Ridge State Park.⁸⁵

Figure 25

Nags Head Multi-use Path

(left: looking north from Whalebone Junction, right: looking north from the terminus in South Nags Head)

Source: Volpe Center (January 2010)



While the Bonner Bridge is designated by NCDOT as a bicycle route, it currently only has a two-foot wide shoulder and as such is not considered appropriate for inexperienced bicyclists. The May 2010 Environmental Assessment for the replacement of the Bonner Bridge states that the new bridge,

⁸⁵ Town of Nags Head website: Town of Nags Head Annual Report, fiscal year 2008-2009. <<http://www.townofnagshead.net/>>

regardless of design or alignment, will have eight-foot wide shoulders to provide safer conditions for bicycle and pedestrian traffic.⁸⁶

From Pea Island south, pedestrian and bicycle access is typically limited to the roads within each town and along the NC 12 shoulder. However, there is an existing bicycle and pedestrian path that runs along a roadway parallel to NC12 in Buxton⁸⁷ and there are plans for additional facilities. The Outer Banks Scenic Byway Committee has applied for a nearly \$2 million grant from the National Scenic Byways program to build off-road paved pathways in Avon, Rodanthe, Waves, and Salvo by 2012.⁸⁸ The program requires a 20% match, which will be provided through business, nonprofit, and agency contributions and the Hatteras Island Pathways Fund, established by the Dare County Tourism Board. In 2008, NPS completed the environmental assessment for a new, 3-mile multi-use trail for Ocracoke to connect Ocracoke Village to the NPS campground. The trail will be 10 feet wide with two-foot shoulders, asphalt-paved, and will be parallel but separate from NC 12. The project received funding from the American Recovery and Reinvestment Act in 2009 and is expected to be completed by August 2010.⁸⁹ Planning has also been undertaken for a trail from the NPS Ocracoke Campground to the Ocracoke Island pony pen, but funding for design and implementation has not yet been identified.

Pedestrian-only facilities

While there are limited pedestrian-only facilities throughout the Outer Banks, each town provides some sidewalks within the downtown and residential areas. As described above under regional parking, Kitty Hawk, Kill Devil Hills, and Nags Head each have public access points to the beach that vary in size and design although most contain signage, a pathway, and parking. In addition, there are recreational trails in Jockey's Ridge in Nags Head, the Wright Brothers Memorial in Kill Devil Hills, and the Pea Island NWR.

Recreational transportation

ORVs

Residents, property owners, and commercial fisherman may require the use of ORVs to access areas of the county that are not accessible by paved roads. Townships north of Cape Hatteras NS have separate requirements for ORV use on beaches. Table 9 describes ORV use regulations associated with each town and the Cape Hatteras NS.

⁸⁶ NC 12 Replacement of Herbert C. Bonner Bridge: Environmental Assessment. May 2010.
<http://www.ncdot.org/projects/bonnerbridgerepairs/download/EA.pdf>

⁸⁷ Albemarle & Associates, Ltd. News and Resources: Buxton Back Road Pathway.
<http://www.albemarleassociates.com/cms/pages/news/buxton-back-road-pathway.shtml>

⁸⁸ Morris, Rob. The Outer Banks Voice. "Hatteras byways project to seek \$1.95 million grant"
<<http://outerbanksvoice.com/2010/04/05/byway-project-to-see-1-95-million-grant/>>

⁸⁹ NCDOT News Releases: ARRA Funding Provides a New Multi-Use Trail for Ocracoke Island. 19 February 2010.
<<https://apps.dot.state.nc.us/pio/releases/details.aspx?r=3349>>

Table 9
Outer Banks ORV Beach Use Regulations

Source: North Carolina Outer Banks. <<http://www.outer-banks.com/visitor-info/offroad.asp>>

Town/ Jurisdiction	Regulation
Kill Devils Hills	Permitted October 1 and April 30. No permit required.
Nags Head	Permitted October 1 and April 30. \$25 permit required.
Kitty Hawk	Prohibited
Southern Shores	Prohibited
Duck	Permitted on the beach between October 1 and April 30. No permit required. No public access to beach available.
Cape Hatteras NS	Permitted year round, exceptions include: nighttime ORV use is prohibited from 10 p.m. to 6 a.m. from May 1 - September 15 and from September 16 to November 15 a permit is required for night driving from 10 p.m. to 6 a. m. to protect nesting sea turtles. November 16 to April 30 night driving is allowed. All vehicles must be removed from the beach by 10 p.m. and may not enter the beach until 6 a.m.
Pea Island NWR	Prohibited
Currituck County	Prohibited, except for residents, property owners, and commercial fisherman.

Horseback

Several area companies offer recreational horseback riding tours along the beaches in Dare County. As a means of transportation, horseback riding on beaches and roadways is regulated by the municipalities. Within Cape Hatteras NS, horseback riding along beaches is permitted, however riders must stay off of the dunes and away from turtle or bird nesting areas.

Non-motorized water activities

According to the 2006 visitor surveys, ten percent of visitors reported canoeing or kayaking during their visit to the Outer Banks;⁹⁰ the 2002 Cape Hatteras NS visitor survey found a similar percentage (13 percent) reporting such activity. There are a number of private vendors that publicly rent water crafts and conduct water craft tours in the area. Kayaking and other non-motorized methods of water travel represent a method to access sites within the Bodie Island District via the Off Island Gun Club dock or the Oregon Inlet boat ramp. An annual, 6-day event, Wings Over Water, which is held during November, provides a variety of wildlife viewing and waterway paddling opportunities to highlight the natural resources of Dare, Currituck, Tyrell and Hyde counties. Organized events include kayak and canoe trips through the back waters, sounds and the ocean along the Outer Banks.⁹¹

Currently, there are numerous designated trails within Dare County and there are several efforts underway to increase water craft access to sites throughout the North Carolina coastal system. Existing nearby trails include several trails within the Alligator River NWR and the 14-mile Palmetto-Peartree Preserve Paddle Trail,⁹² just to the west of the Alligator River NWR. In 2001, the North Carolina State University developed a website and North Carolina Coastal Plain Paddle Trails Guide, which illustrate designated paddleways by region.⁹³ According to the Paddle Trails Guide, there are no designated trails within the Outer Banks Region.

⁹⁰ Outer Banks Visitors Bureau. Visitor Research: Wave 4 – 2006. September 2006.

http://www.outerbanks.org/pdf/2005_2006_Year_Long_Visitor_Profile.pdf

⁹¹ Wings Over Water. Accessed 4/3/10. <<http://www.wingsoverwater.org/paddling.html>>

⁹² The Conservation Fund: Palmetto-Peartree Preserve Paddle Trail.

http://www.palmettopeartree.org/sites/palmettopeartree.org/files/P3_Paddletrail_Brochure.pdf

⁹³ North Carolina Coastal Plain Paddle Trails. <http://www.ncsu.edu/paddletrails/index.html>

Current efforts to improve paddling access along North Carolina's coast include efforts by the NPS Rivers, Trails, and Conservation Assistance Program to develop the Southeast Coast Saltwater Paddling Trail, a multi-state project from Georgia to Virginia with canoe and kayak access sites and camping/overnight accommodations that will connect to the Florida Circumnavigation Saltwater Paddling Trail to the south and the Captain John Smith National Historic Trail to the north. The efforts include plans for a database and website that will provide information in one centralized location.⁹⁴ Another effort at the state level is the North Carolina Blueways (NC Blueways), a cooperative effort by the North Carolina State Parks System, North Carolina State University, and North Carolina Paddle Trails Association to provide safe and sustainable paddle trails and access sites throughout the waterways of the state, through the designation of paddle trail access sites and paddle trails that meet criteria to ensure they are safe, sustainable, and supported by local communities.⁹⁵

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⁹⁴ National Park Service Rivers, Trails, and Conservation Assistance Program Southeast Region. Georgia News. 2009. www.nps.gov/ncrc/programs/rtca/whatwedo/projects/GA.pdf

⁹⁵ NC Blueways. Accessed 3/10/10. < http://www.ncsu.edu/ncblueways/ncblueways_faqs.html>

3.2 Bodie Island District

Roadways

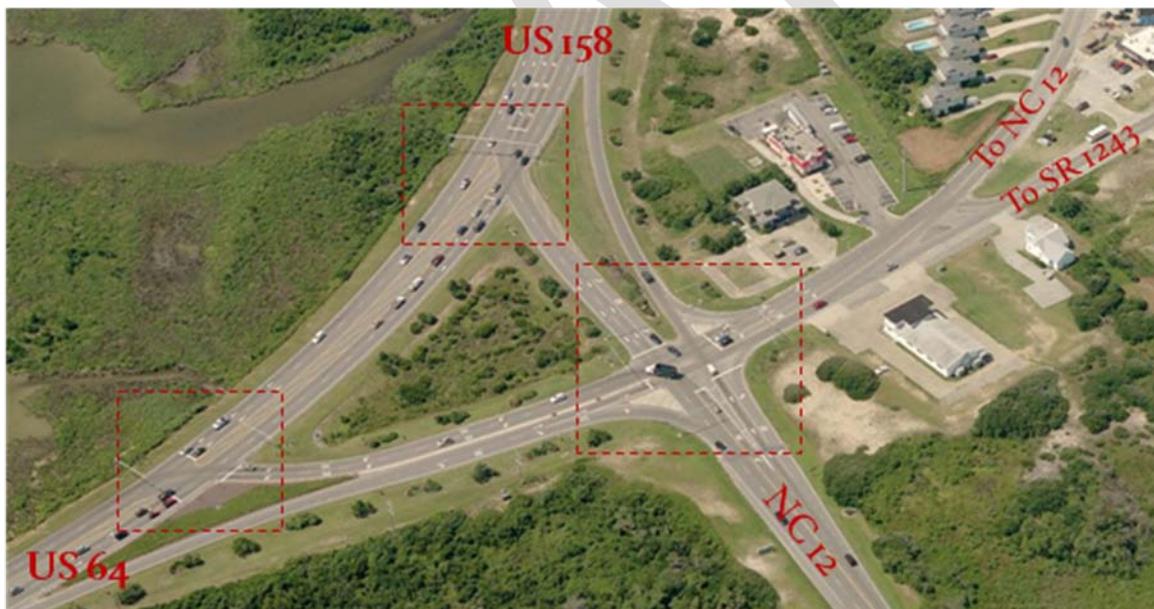
On Bodie Island the transportation network is centered on NC 12, intersected by access roads that provide motor-vehicle entry to most parts of the area. The most significant of these access roads is Lighthouse Bay Drive, the access road to the Bodie Island Lighthouse and Visitor Center. In addition, SR 1243/Old Oregon Inlet Road, splits from NC 12 at Whalebone Junction and runs parallel to NC 12 for five miles before reconnecting with it.

Whalebone Junction

Whalebone Junction is the colloquial name for the intersection of the terminus of U.S. 64, a four-lane highway, and the beginning of NC 12, a two-lane highway, and U.S. 158, a five-lane highway. At the intersection, green highway signs direct travelers to Nags Head beaches and Roanoke Island destinations, and brown NPS highway signs direct travelers to Cape Hatteras NS in the south. Whalebone Junction is a large intersection with several traffic signals that direct vehicles to the east, west, north, and south. Figure 26 illustrates the Whalebone Junction intersection, and the location of traffic signals. The only traffic controls within the study area are located at Whalebone Junction. There are no pedestrian facilities within the intersection. The NPS Whalebone Junction Information Station is located approximately one tenth of a mile south of the Whalebone Junction.

Figure 26
Whalebone Junction Traffic Signals

Source: Bing Maps, modified by the Volpe Center study team



NC 12

Information for NC 12 within the study area is primarily drawn from the 2008 NCDOT bicycle safety study,⁹⁶ which focused on the 5.3 miles of NC 12, also called the Cape Hatteras National Park Road, which is owned by NPS and runs south of Whalebone Junction.

Table 10 summarizes the roadway characteristics and traffic data from NC 12, from the northern limits at the intersection with U.S. 64/U.S. 264 to the southern limits at the intersection with Coquina Beach Ranger Station Access Road (NPS Route 404).

Table 10
NC 12 Roadway Characteristics

Source: Project PRA-CAHA 10(2). CAPE HATTERAS NATIONAL SEASHORE Overlay and Replace Culverts on NPS Route 010, NC State Route 12. Description: Feasibility of Improving Vehicle-Bicycle Safety by Adding Bike Lanes. January 2008. P.4

Roadway Geometry (feet)	
Travel Lane Width	11
Paved Shoulder Width	2
Turf Shoulder Width	12+
Roadside recovery width outside of travel lane	15-20
Roadway Speed (mph)	
Posted speed limit	55
Average speed	56
85 th percentile speed ⁹⁷	63
Roadway Volume (vehicles per day)	
Average Annual Daily Traffic (AADT)	4,500
Seasonal Average Daily Traffic	7,450
Vehicle Composition	
Passenger cars	93%
Small (light-duty) trucks	4%
Large trucks/tractor trailers/buses	3%
Vehicular turning maneuver points	
Southbound left-turn lanes	SR 1243, Coquina Beach, and Oregon Inlet Campground
Southbound right-turn lanes	Oregon Inlet Fishing Center
Northbound left-turn lanes	Oregon Inlet Fishing Center, Bodie Island Lighthouse
Pedestrian facilities (e.g., crosswalks)	None

As shown in Table 10, the posted speed limit along NC 12 on Bodie Island is 55 mph; however, during the summer, the speed limit for the section of road adjacent to the Oregon Inlet Campground and Fishing Center is reduced to 45 mph. Also as listed above, currently NC 12 through Bodie Island has a very narrow shoulder (approximately two feet). However, NPS and NCDOT have plans to extend the two-foot shoulder by three feet on both sides of NC 12 to provide a five-foot wide shoulder, approved by the American Association of State Highway and Transportation Officials (AASHTO), to facilitate bicycling⁹⁸ or other vehicular needs for a “breakdown” lane or passing of emergency vehicles.

The NPS maintains a traffic counter on NC 12 south of Whalebone Junction. Vehicle traffic counts at this location are one-way vehicles traveling south and may include travel to any of the sites within the Bodie

⁹⁶ Project PRA-CAHA 10(2). CAPE HATTERAS NATIONAL SEASHORE Overlay and Replace Culverts on NPS Route 010, NC State Route 12. Description: Feasibility of Improving Vehicle-Bicycle Safety by Adding Bike Lanes. January 2008.

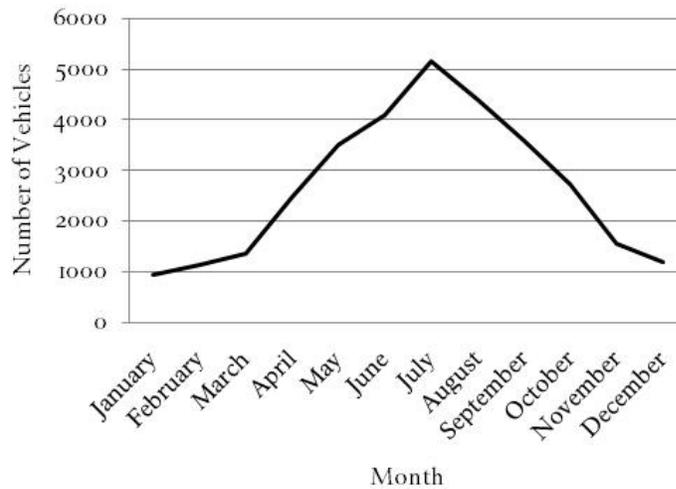
⁹⁷ 85 percent of all vehicles are traveling at this speed or slower

⁹⁸ Project PRA-CAHA 10(2). CAPE HATTERAS NATIONAL SEASHORE Overlay and Replace Culverts on NPS Route 010, NC State Route 12. Description: Feasibility of Improving Vehicle-Bicycle Safety by Adding Bike Lanes. January 2008.

Island District, or through travelers to the southern destinations outside of the district. Figure 27 illustrates the average daily traffic (ADT) and seasonal variation of vehicles to the site in 2009, with peak visitation levels beginning in May and tapering off in September.

Figure 27
2009 NC 12 ADT

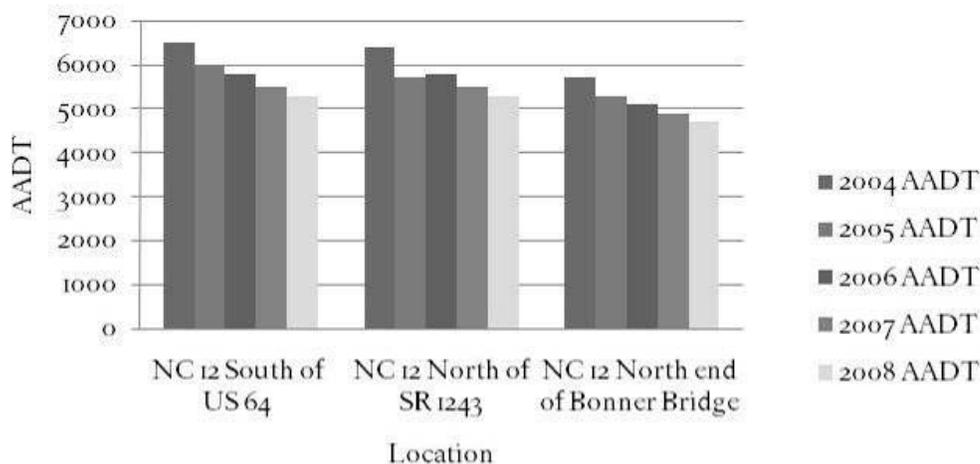
Source: Cape Hatteras NS staff



According to NCDOT, the AADT volume for the intersection of Whalebone Junction is 25,600 vpd and the traffic volume decreases as one travels south into Cape Hatteras NS. On Bodie Island, there are three traffic count location along NC 12. Figure 28 illustrates the decline in traffic counts as one travels south as well as the decline in vehicle volume over the past five years.

Figure 28
NC 12 AADT on Bodie Island 2004-2008

Source: NCDOT



Current level of service (LOS) information and forecasts for AADT and LOS for the Bodie Island District were not available to analyze for this report. However, the Bonner Bridge Supplemental Draft Environmental Impact Statement (SDEIS) (2005), developed for the proposed replacement of the Bonner

Bridge, provides traffic analysis, including projected traffic volumes and LOS, for NC 12 from Bonner Bridge south to Rodanthe. The SDEIS predicts a uniform growth rate of 2.5 percent per year, selected to be consistent with the analysis used in the initial 1993 Bonner Bridge draft environmental impact statement, forecasts performed in nearby projects, population growth trends, historic traffic growth, area visitor estimates, and the potential for development opportunities on Hatteras Island⁹⁹ at the time the SDEIS was prepared. Table 11 provides projected traffic volumes on NC 12 at the Bonner Bridge in 2025 based on this 2.5 percent growth rate.¹⁰⁰

Table 11
NC 12 Projected Traffic Volumes 2025, Based on an Anticipated Growth Rate of 2.5 Percent per Year

Source: Bonner Bridge SDEIS (2005)

Time Period	Northbound [vehicle per day (vpd)]	Southbound (vpd)	Total (vpd)
Annual Average Daily Traffic (AADT)	4800	4800	9600
Annual Average Weekday Traffic	4400	4600	9000
Annual Average Weekend Traffic	5800	5400	11200
Summer Average Daily Traffic	7700	7700	15400
Summer Average Weekday Traffic	6900	7300	14200
Summer Average Weekend Traffic	10100	9100	19200
Summer Average Saturday Traffic	11200	11100	22000
Peak Day Traffic	14000	11200	25200

The uniform growth rate predictions above provide a best estimate of potential future traffic volumes. Yet, consideration of actual traffic volumes at the three count locations on Bodie Island during 2004-2008, detailed in Figure 32 and in Table 12 below, illustrate actual percent changes in traffic volumes compared to the uniform growth rate employed by NCDOT. Actual numbers indicate considerable fluctuations in traffic volumes on Bodie Island as opposed to a steady increase over time. This fluctuation may be attributable to a variety of factors including seasonal weather variations, road closures, gas prices, and a waning economy. Overall, historic AADT data indicate an average decrease in volume of 5.0 percent per year for 2004-2008.

The SDEIS also estimated the future level of service (LOS) for this same section of NC 12 based on the same growth rate (see Table 13). The study used the methodology described in the Transportation Research Board's *Highway Capacity Manual* (2000). LOS is a qualitative measure of the operating characteristics of moving traffic and the perceptions of traffic conditions by drivers and passengers. The LOS system assigns the letters A through F to describe conditions of traffic flow, where A is the best experience (e.g. unobstructed free flowing traffic in all lanes, with speeds at or above the posted speed limit) and F is the worst experience (e.g. traffic flow is slow and dependent on the surrounding vehicles—bumper to bumper congestion). If LOS was computed based on more recent data, based on actual volumes, the LOS ratings in Table 13 would likely improve.

⁹⁹ Bonner Bridge SDEIS. P.1-14 NCDOT TIP Project Number B-2500.

¹⁰⁰ Ibid.

Table 12
NC 12 AADT - Percent Change Per Year, 2004-2008

Source: NCDOT data compiled and analyzed by U.S. DOT/Volpe Center project staff

Location on NC 12	2004	2005		2006		2007		2008	
	AADT	AADT	% change (04 to 05)	AADT	% change (05 to 06)	AADT	% change (06 to 07)	AADT	% change (07 to 08)
South of US 64	6500	6000	-8%	5800	-6%	5500	-5%	5300	-4%
North of SR 1243	6400	5700	-11%	5800	2%	5500	-5%	5300	-4%
North end of Bonner Bridge	5700	5300	-7%	5100	-4%	4900	-4%	4700	-4%
Average	6200	5667	-8.5%	5567	-2.7%	5300	-4.8%	5100	-4%

Table 13
 NC 12 South of the Bonner Bridge and Bonner Bridge - Projected LOS 2025
 (Based on an Anticipated Growth Rate of 2.5 Percent)

Source: Bonner Bride SDEID (2005)

Location	Time Period	Peak Hour Traffic Volume [vehicle per hour (vph)]	Average Travel Speed (mph)	Percent Time Spent Following	LOS
Bonner Bridge	Average Weekday	790	48.4	65.4%	C
	Average Weekend	1060	46.6	73.4%	D
	Peak Season Weekday	1210	45.6	76.7%	D
	Peak Season Weekend	1810	40.6	86.9%	E
	Peak Season Saturday	2080	40.6	86.9%	E
NC 12 S of Bonner Bridge	Average Weekday	790	51.2	61.6%	C
	Average Weekend	1060	49.3	70.3%	D
	Peak Season Weekday	1210	48.1	74.1%	D
	Peak Season Weekend	1810	42.9	85.8%	E
	Peak Season Saturday	2080	40.5	89.0%	E

Lighthouse Bay Drive

Lighthouse Bay Drive is a two-way, two-lane access road on the west side of NC 12 that leads to the Bodie Island Lighthouse. The characteristics for this roadway are summarized in Table 14.

Table 14
Lighthouse Bay Drive Road Characteristics
Source: Cape Hatteras NS staff

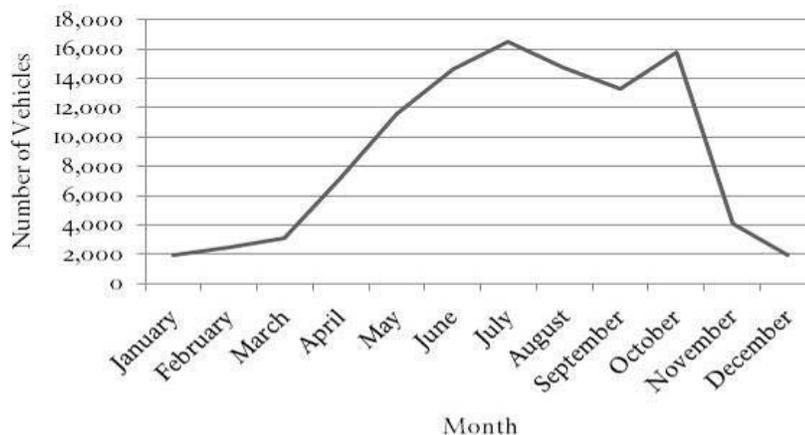
Roadway Geometry	
Travel Lane Width (feet)	9
Paved Shoulder Width (feet)	None
Lane Striping	None
Roadway Speed	
Posted speed limit – inbound (mph)	15
Posted speed limit – outbound (mph)	25 until last quarter mile; 15 thereafter
Roadway Volume	
Average Daily Traffic (vehicles per day)	298
Seasonal Average Daily Traffic (June, July, August) (vehicles per day)	510
Length (miles)	1.21

Approximately 0.75 miles from the west side of the Lighthouse Bay Drive is a gated service road, closed to the public, that extends 0.5 miles northward to the sound to provide access to the “Bone Yard” maintenance area. The road is an unimproved, two-track dirt road through vegetation.

The NPS maintains a vehicle counter located at the entrance of Lighthouse Bay Drive, the access road to Bodie Island Lighthouse, off of NC 12. Vehicle traffic counted entering the site may include visitors to the Bodie Island Visitor Center, the Off-Island Gun Club dock, or the Dike Trail. Figure 29 illustrates the seasonal variation of traffic to the site in 2009. During this time, the Bodie Island Lighthouse has been closed to the public for renovations.

Figure 29
2009 Bodie Island Lighthouse Vehicle Counts

Source: Cape Hatteras NS staff.



Bonner Bridge

The Bonner Bridge (see Figure 30) has a total structural length of approximately 12,865 ft (2.4 miles), and navigational vertical clearance of approximately 65 feet to accommodate mean high tides. The roadway is approximately 28 feet wide, with two 12-foot travel lanes and two-foot shoulders on each side. The posted speed limit on the bridge is 55 mph and passing is permitted in areas with sufficient sight distance.¹⁰¹ In 2006, Bonner Bridge was determined to be structurally deficient and received a sufficiency rating of four out of 100 due to three main factors: soil erosion around the southern pilings; bridge width relative to traffic volume; and length of detour required if the bridge had to be taken out of service (100 miles).¹⁰² The erosion is a result of the inlet and channel dynamics (see Appendix B). NCDOT has been actively conducting repair work on the bridge as well as developing an environmental assessment for the replacement of the bridge. A preferred alignment for the new span has not been decided but the new bridge will have a significant impact on the Bodie Island District and Pea Island NWR.¹⁰³

Figure 30
Bonner Bridge

Source: NPS Southeast Region (January 2010)



¹⁰¹ Bonner Bridge Replacement SDEIS, NCDOT TIP Project Number B-2500. P.1-10.

¹⁰² NCDOT: Bonner Bridge. <http://www.ncdot.org/projects/bonnerbridgerepairs/>

¹⁰³ Delay in replacement of Bonner Bridge stirs anger. The Virginian-Pilot. 3/7/10. Accessed 3/12/10. <<http://hamptonroads.com/2010/03/delay-replacement-bonner-bridge-stirs-anger>>

Parking

Public parking facilities in the Bodie Island District are limited to public NPS sites that provide access to the various attractions such as Coquina Beach (see Figure 31). There are also a few private parking areas for use by Cape Hatteras NS and the Off Island Gun Club. Table 15 provides the characteristics of public and private parking areas throughout Bodie Island and Figure 32 shows the location of these areas. No parking areas within the District charge a parking fee for use.

Parking utilization data is not currently collected so existing information is available from staff experience only. According to Cape Hatteras NS staff, the parking areas that either reach capacity, or are subject to off-pavement parking, are Bodie Island Lighthouse, the Oregon Inlet Fishing Center, and Coquina Beach. These situations occur intermittently on a few major holiday weekends (Memorial Day, July 4th, and Labor Day), but do not pose significant safety, circulation, or environmental issues. Non-public parking areas include the Ramp 1 / NPS maintenance facility and residences parking lot and the Off-Island Gun Club informal parking lot, which is small (approximately 5-8 spaces) and unpaved. During the peak hunting season, hunters often park on the southern edge of the Bodie Island Lighthouse parking lot, closest to the access road leading to the Off-Island Gun Club dock and parking. Cape Hatteras NS staff has not identified this as an issue that negatively impacts resource, safety, or vehicular circulation.

Figure 31
Coquina Beach Parking Area and Facilities

Source: NPS Southeast Region (January 2010)



Table 15
Bodie Island Parking Area Characteristics

Source: Cape Hatteras NS staff, site visit observations, and research via Google Maps (2010 Imagery)

Location	Capacity	Amenities	Utilization
PUBLIC PARKING			
Whalebone Junction Information Station	10 spaces (1 ADA space)	Cape Hatteras NS information, restrooms, telephone, water	High turnover
Bodie Island Lighthouse	53 spaces (2 ADA spaces)	Bodie Island LH, Bodie Island LH Visitor Center, and gift shop, restrooms, telephone, water	Rarely fills except during summer holiday weekends (Memorial Day, July 4 th , and Labor Day)
Ramp 2/Coquina Beach	180 spaces (8 ADA spaces)	Beach access and ORV ramp access Restrooms, bathhouse, water, and lifeguards	Peaks during the summer between 10AM-2PM. On Memorial Day, July 4 th , and on Labor Day some overflow parking on the grass towards the west side of the lot occurs. Parking for standard vehicles, buses, and RVs. NPS closes the two northernmost lots during the winter.
Oregon Inlet Fishing Center	285 spaces consisting of the following : <ul style="list-style-type: none"> ▪ 180 spaces (main lots) ▪ 70 spaces (store) ▪ 35 spaces (fuel station) 	Boat launch access and parking, bait, ice, fuel, oil, camping supplies, fishing tackle, boating equipment, clothing, food, beverages	Parking often reaches capacity in summer months. Parking for standard vehicles, buses, and RVs. A portion of the southern parking lot currently serves as a staging area for the Bonner Bridge work and is closed to public parking.
Oregon Inlet Campground	12 spaces (at entrance kiosk) Additional spaces per campsite	120 campsites	Parking only intended for campers
Oregon Inlet Bridge South Parking Lot (located within Pea Island NWR, but owned and maintained by NPS)	80 spaces	Access to fishing areas below the Bonner Bridge Recently restored former Coast Guard Lifesaving Station building; future use to be determined	Well used but does not reach capacity
PRIVATE PARKING			
Ramp 1 / NPS Maintenance overflow	75 spaces (employee only)	Storage/maintenance area	Well used by Cape Hatteras NS staff
Former Bodie Island Coast Guard Station parking	6 spaces (no longer in use)	None	None (paved roads connecting parking to NC 12 will be removed)
Current U.S. Coast Guard Complex parking	15 spaces (3 ADA spaces)	Re-located Coast Guard Station and Lifesaving station	Expected regular use by Cape Hatteras NS staff for administrative and educational purposes
Off-Island Gun Club	10 spaces (club members only)	Boat dock	Well used by members

Figure 32
Bodie Island Parking Map
 Source: Volpe Center and NPS



The current draft of the NPS Cape Hatteras NS ORV Management Plan¹⁰⁴ recommends multiple additional parking facilities to be added throughout the Cape Hatteras NS to accommodate visitor parking. One of the Plan's alternatives proposes a new Ramp 3, north of the Coquina Beach Campground, if Ramp 4 is closed due to the Bonner Bridge replacement and another alternative calls for expanding parking at Ramp 1 and Ramp 2 and the implementation of a water taxi for Bodie Island Spit.

Intelligent transportation systems / traveler information systems

The use of ITS and TIS within the Bodie Island District is limited, similar to regional use. Several websites (e.g., Outer Banks Visitor Bureau and the NPS Cape Hatteras NS website) offer static traveler information on the Cape Hatteras NS and the surrounding locations. The Cape Hatteras NS website provides a Beach Access Report, issued every Thursday, and a link to Google Earth with information on current access, updated up to five times a week during shorebird breeding season. However, there is not a unified web presence for traveler information on the Outer Banks that is specific to Cape Hatteras NS or the Bodie Island District.

The Cape Hatteras NS does not own any VMS. For non-traffic information, Highway Advisory Radio is used on Cape Hatteras NS to communicate to the public, e.g. riptide advisories. However, the range of the service is poor, so the system is considered ineffective by Cape Hatteras NS staff.

Public transportation

No public transportation serves the Bodie Island District.

Bicycle facilities

There are no roadway bicycle facilities within the Bodie Island District other than the shoulders of NC 12, which due to their narrow width and the high travel speeds are unsafe for inexperienced riders. NPS and NCDOT are currently working on expanding the paved shoulder from two to five feet on both sides of NC 12 in part to better accommodate cyclists. NPS is responsible for constructing the shoulder segment 5.2 miles south from Whalebone Junction and NCDOT is responsible for the shoulder segment south of that point to Bonner Bridge.

There is one bicycle rack at the Bodie Island Lighthouse parking area. The rack is designed to hold a very limited number of bicycles (see Figure 33).

¹⁰⁴ National Park Service. Cape Hatteras National Seashore Off-Road Vehicle Management Plan / Environmental Impact Statement. March 2010.

Figure 33

Bodie Island Lighthouse Bicycle Rack

Source: NPS Southeast Regional Office (December 2009)



Pedestrian facilities

There are several pedestrian trails within Bodie Island District; however, most trails do not connect to one another. Between the Whalebone Junction Information Station and the Bodie Island Lighthouse, there are approximately six wildlife viewing and hunting trails west of NC 12. These trails start in the turnouts along NC 12 and lead to the wetland areas in the center of Bodie Island. These trails are marked at each turnout with a small brown and white sign. On the east side of NC 12, pedestrians are allowed along the beach; however walking across the sand dunes where there are no designated trails is prohibited by NPS.

South of the Bodie Island Lighthouse, pedestrians can use the gravel access road to the Off Island Gun Club to access the Bodie Island Dike Trail and the Sound. The Bodie Island Dike Trail is maintained by NPS and provides equine and pedestrian access to the wetland/lowland areas traversing southeastward towards NC 12 (see Figure 34). Bicycling is prohibited along the Dike Trail. The Dike Trail is part of North Carolina's Mountain to Sea Trail.¹⁰⁵ The Cape Hatteras NS is considering extending the trail from its intersection with NC 12 north, parallel to NC 12 but within the power line right-of-way, to Lighthouse Bay Drive; however, there are significant wetlands just north of the intersection of the Dike Trail with NC 12 that may require the trail to be constructed as a boardwalk in that area (see Appendix D). This trail is one of three NPS nature trails within Cape Hatteras NS; the other two trails are in Buxton and Ocracoke.

The *Bodie Island Pond Boardwalk* is a recently completed, ADA-accessible, boardwalk trail north of the lighthouse, that provides access to water and wildlife views inland (see Figure 34). It was developed in partnership with the North Carolina Wildlife Resources Commission.

¹⁰⁵ Friends of the Mountain to Sea Trail. "Maps and Trip Planning." <<http://www.ncmst.org/map.html>>

Figure 34
Bodie Island Dike Trail (left) and Bodie Island Pond Boardwalk (right)

Source: US DOT Volpe Center (January 2010)



Recreational transportation

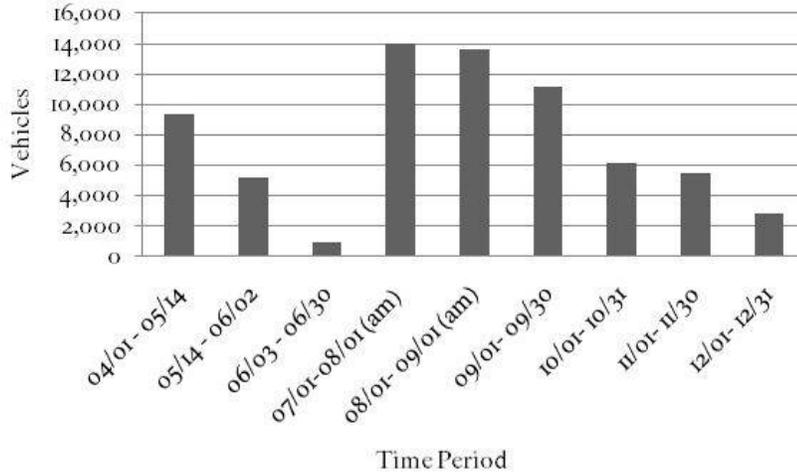
Beach access ramps and boat docks provide a means of access to parts of the Cape Hatteras NS and adjacent areas within the Bodie Island District. Beach access ramps are used by visitors to drive onto the beach by ORV. Figure 8 illustrates the location of beach access ramps and boat ramps located on Bodie Island.

Ramp 2 and Ramp 4 are the two open ORV beach access ramps within the Bodie Island District. Ramp 2 is located adjacent to Coquina Beach. Figure 35 illustrates the vehicle counts on Ramp 2 during several months in 2009. The low vehicle counts in the month of June were likely a result of the ramp being closed to traffic to protect nesting seabirds and turtles. Ramp 4 is located on the ocean-side of NC 12, between the Oregon Inlet Campground and the Bonner Bridge (across from the Oregon Inlet Fishing Center) and provides ORV and equine access to the beach and Bodie Island Spit to the south. In 2009, Ramp 4 was closed during the summer for resource protection and management purposes. However, in 2008 before the ramp was closed for summer, vehicle counts on the ramp were approximately 61,000 vehicles during the months of May, June, and July.¹⁰⁶

¹⁰⁶ Cape Hatteras NS staff.

Figure 35
2009 Cape Hatteras NS Vehicle Counts Ramp 2

Source: Cape Hatteras NS staff



Two marine docks, one located on the southern end of the Bodie Island Lighthouse and one located at the Oregon Inlet Fishing Center, provide access to the Roanoke Sound. The Off Island Gun Club dock, located to the south of the Bodie Island Lighthouse at the end of the gated gravel access road, is a privately owned and maintained dock that provides member access to a small off-island facility. The public may use the area to launch personal nonmotorized craft if carried by hand down the access road. At the Oregon Inlet Fishing Center, there is a public boat launch facility as well as an NPS-maintained nonmotorized boat launch site, both of which are free to use.

4. Transportation safety

4.1 Regional

Vehicle safety

According to the CMP for the Outer Banks Scenic Byway (2008), from January 2005 to June 2008, 329 total crashes occurred on the Byway (NC 12), including ten fatal crashes. Most accidents occurred on weekends in June, July, and August, at almost any hour from 9 a.m. to midnight; the highest number occurred between 3pm and 5 p.m. The most common crashes (105 out of 329 total crashes) involved a rear end collision while the second-most common involved a left turn collision (29 out of 329 total crashes).

To provide a regional comparison, Table 16 shows the number of reported crashes, or incidents, and number of people injured for 2004-2008 in Dare County.

Table 16
Reported Crashes and Injured Persons in Dare County 2004-2008

Source: NCDOT Dare County Crash Profile 2004-2008 (www.ncdot.gov/doh/preconstruct/traffic/safety/data/profiles.html)

	2004		2005		2006		2007		2008		5 Year Average	
	C	I	C	I	C	I	C	I	C	I	C	I
Reported Crashes												
Fatal	4	8	9	9	5	6	5	5	4	4	5	6
Non Fatal Injury	293	485	324	529	232	373	208	318	203	332	252	407
Property Damage Only	658	-	582	-	525	-	516	-	459	-	548	-
Total	955	493	915	538	762	379	729	323	666	336	805	414

C = Number of Reported Crashes/Incidents, I = Number of People Injured

Table 17 provides the total crash rate per 100 million vehicle miles for all roadways in North Carolina and Dare County between 2004-2006. In comparison, the Outer Banks Scenic Byway experiences a crash rate of 71.47 according to the CMP for the Outer Banks Scenic Byway (2008).

Table 17
North Carolina State Highway and Dare County Crash Rates per 100 Million Vehicle Miles 2004-2006

Source: NCDOT

Rate Type (per 100 million vehicle miles traveled)	North Carolina	Dare County
Total Crash Rate	250.98	140.75
Fatal Crash Rate	1.5	0.97
Injury Crash Rate	82.88	46.41

Pedestrian and bicycle safety

Pedestrian and bicycle crash data are collected by the NCDOT Division of Bicycle and Pedestrian Transportation and are available for each incorporated towns of Dare County and the unincorporated regions (or non-city areas) as a whole.¹⁰⁷ The counts are defined as crashes in which at least one pedestrian was involved (See Table 18) or one bicycle was involved (see Table 19). No major trends are apparent from the data; more crashes occur in certain towns than others but these towns may have higher numbers of pedestrians and bicyclists. In comparison to the data provided below, the Outer Banks Scenic Byway (NC 12) experienced ten crashes involving bicyclists and three crashes involving pedestrians from January 2005 to June 2008 according to the CMP for the Outer Banks Scenic Byway (2008).

Table 18
Reported Pedestrian Crash Data 2003-2007

Source: NCDOT Division of Bicycle and Pedestrian Transportation. "North Carolina Bicycle and Pedestrian Crashes." <http://www.pedbikeinfo.org/pbcat/>

Geographic Area	2003	2004	2005	2006	2007	Total
Duck	0	0	0	3	0	3
Southern Shores	0	1	0	0	0	1
Kitty Hawk	5	2	2	4	0	13
Kill Devil Hills	3	2	3	4	3	15
Nags Head	2	1	3	1	2	9
Manteo	1	1	0	1	2	5
Unincorporated region	3	5	6	2	0	16
Total	14	12	14	15	7	62

Table 19
Reported Bicycle Crash Data 2003-2007

Source: NCDOT Division of Bicycle and Pedestrian Transportation. "North Carolina Bicycle and Pedestrian Crashes." <http://www.pedbikeinfo.org/pbcat/>

Geographic Area	2003	2004	2005	2006	2007	Total
Duck	7	0	3	0	1	11
Southern Shores	0	0	1	2	2	5
Kitty Hawk	2	1	3	2	1	9
Kill Devil Hills	7	2	4	4	7	24
Nags Head	5	1	1	0	1	8
Manteo	0	0	2	0	2	4
Unincorporated region	2	3	3	5	6	19
Total	23	7	17	13	20	80

¹⁰⁷ NCDOT Division of Bicycle and Pedestrian Transportation "North Carolina Bicycle and Pedestrian Crashes"
<<http://www.pedbikeinfo.org/pbcat/>>

4.2 Bodie Island District

Vehicle safety

The NCDOT bicycle safety study provided limited pre-2006 crash data for NC 12 on Bodie Island. NCDOT data from 2003 to 2006 and NPS accident data from 1999 to 2006 for NC 12 from the U.S. 64/U.S. 264 intersection with NC 12 to the intersection of NC 12 with SR 1243 was reviewed as part of the NCDOT study. The total number of reported crashes was 16. Key findings regarding crash types and characteristics follow¹⁰⁸:

- Most reported crashes were due to driver error and animal-vehicle collisions.
- The main factors in crashes related to driver error included failure to give full time and attention, improper backing or turning maneuvers, and following too closely.
- Several crashes related to driver error involved multi-vehicle left turn and rear end collisions.
- Only one crash resulted in a fatality when a driver made a left turn by U-turn on the roadway; all other reported crashes were property damage or incidents without injuries.
- No accidents involving bicycles or pedestrians were noted in the crash reports.

Along Lighthouse Bay Drive, a low-speed, head-on collision in April 1999 resulted in a fatality and three serious injuries.¹⁰⁹

Pedestrian and bicycle safety

While there are bicycle and pedestrian crash data available for the incorporated towns north of Bodie Island, there are no detailed data for Bodie Island, Pea Island NWR, or the unincorporated towns on Hatteras Island.

There are no crosswalks or pedestrian crossing signs within the Bodie Island District, including at Whalebone Junction. Pea Island, just south of the District, has one painted crosswalk and a pedestrian crossing sign located adjacent to the crosswalk that is visible to motorists.

¹⁰⁸ Project PRA-CAHA 10(2). CAPE HATTERAS NATIONAL SEASHORE Overlay and Replace Culverts on NPS Route 010, NC State Route 12. Description: Feasibility of Improving Vehicle-Bicycle Safety by Adding Bike Lanes. January 2008. P.4

¹⁰⁹ Cape Hatteras National Seashore. Relocation of the Bodie Island U.S. Coast Guard Station Complex: Environmental Assessment. November 1, 2008.

5. Demographics and land development

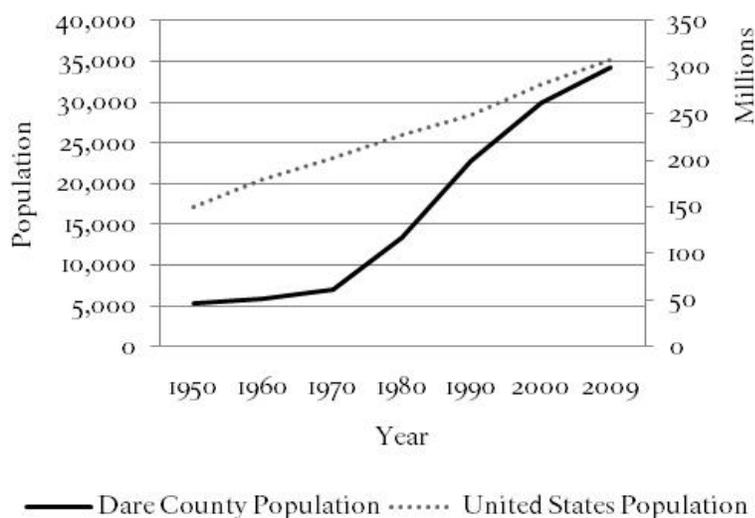
This section describes demographics, land use, economic characteristics, and visitation trends in Dare County and the Bodie Island District. These characteristics provide a context in which to assess the feasibility of alternative transportation options considered as part of this study. For example, the impacts of Dare County's substantial seasonal population surge and low-density land use patterns on the limited transportation network are important issues to consider in relation to improving access to Bodie Island, in particular in considering the feasibility of transit.

Resident population

The estimated 2009 total population of Dare County was 34,296.¹¹⁰ Historically, Dare County experienced significant population growth between 1970 and 1990, nearly tripling its population with an average growth rate of 11 percent per year, compared to 1.1 percent nationally.¹¹¹ Since 1990, population growth in Dare County has slowed to 2.7 percent per year, compared to 1.2% nationally.¹¹² (See Figure 36). The Dare County Land Use Plan estimates that the population will increase at a slower rate in the future and projects that the population will be approximately 47,535 by 2025, assuming an annual growth rate of 2%¹¹³

Figure 36
Dare County and U.S. Population Growth 1950-2009

Source: US Census Bureau



The 2000 U.S. Census reports that the median age in Dare County (40.4) was higher than the state's (35.3),¹¹⁴ and U.S. Census data from 2006 to 2008 show that the county's median age increased (42.4).¹¹⁵ These data indicate that Dare County has a relatively older population that is likely to continue to grow.

¹¹⁰ U.S. Census Bureau, Population Finder. Accessed 2/22/10. <<http://factfinder.census.gov>>

¹¹¹ U.S. Census Bureau. <<http://factfinder.census.gov/servlet/SAFFPopulation>>

¹¹² U.S. Census Bureau. <http://factfinder.census.gov/servlet/SAFFPopulation>, and Dare County Land Use Plan (2003). P.11

¹¹³ Dare County Land Use Plan (DRAFT). Section 1, P.21

¹¹⁴ Census 2000 Demographic Profile Highlights: Dare County, North Carolina, Fact Sheet. <http://factfinder.census.gov/>

¹¹⁵ 2006-2008 American Community Survey 3-Year Estimates: Dare County, North Carolina, Fact Sheet. <http://factfinder.census.gov/>

Seasonal population

According to the Planning Department for Dare County, peak seasonal population in Dare County is estimated at approximately 225,094¹¹⁶, assuming a ratio of 6.5:1 (seasonal residents/visitors to permanent residents). According to the Dare County Land Use Plan, the peak population period is from the beginning of summer (Memorial Day) through Labor Day; however, shoulder seasons (from Easter through Thanksgiving) have become increasingly popular times to visit locations in the Outer Banks, and three-day weekends (such as President's Day) are also often popular visitation times. Despite the information available on seasonal visitation, it is difficult to physically locate the seasonal residential population given the variety of seasonal and part-time accommodations.¹¹⁷

The Dare County Land Use Plan (2003) notes that seasonal population influxes affect the design of, and can place strain on, the delivery of public services (e.g., emergency response, law enforcement, and parks and recreation) and existing infrastructure (e.g., solid waste systems, electrical services, and transportation networks). Major roadways are often oversubscribed during times of high visitation and motorists experience highway traffic congestion in certain areas within the county, such as the Wright Memorial Bridge, which leads to popular northern destinations like Duck.¹¹⁸

Housing

The 2000 U.S. Census lists a total of 26,671 housing units in Dare County, approximately half of which were identified as vacant due to seasonal or recreational rental or use (50.1%); in comparison, statewide, the percentage is less than four percent (3.8%); this supports the data on the large seasonal population influx. Furthermore, Dare County Planning Department indicates that 57% of the residential units in Dare County are owned by non-residents, implying that these are mostly used for seasonal rentals and remain vacant in the off-season.¹¹⁹ Housing unit density (see Figure 37) provides a way to measure population distribution and relative density of land development within the county. The Dare County Land Use Plan (2010 draft) explains that currently, unlike during the decades of the 80's and 90's, the area is experiencing a surplus in housing availability as the recession has forced many families to move.¹²⁰

Development and land use

The Dare County Planning Department has jurisdiction over the unincorporated communities of Martins Point, Colington, the Hatteras Island villages of Rodanthe, Waves, Salvo, Avon, Buxton, Frisco, and Hatteras, and the mainland villages of Manns Harbor, East Lake and Stumpy Point, and Roanoke Island, including Wanchese. Dare County has six broad categories of land classification (limited conservation, community, rural, other federally owned property, and conservation).¹²¹ The incorporated towns of Kitty Hawk, Southern Shores, Kill Devil Hills, Nags Head, and Manteo prepare separate zoning and land use plans. The type and extent of land use varies by town. For example, Nags Head defines seventeen land uses¹²² while Martins Point in Southern Shores defines two.¹²³ (See Appendix E for local existing land use within Nags Head).

Dare County's development patterns are constrained by its coastal barrier island geography and the existence of protected federal lands like Cape Hatteras NS, Alligator River NWR, and Pea Island NWR. Development patterns vary by town or village, though access to beaches, land conservation, and preservation of open spaces are common to all areas. Retail development is characterized as low density

¹¹⁶ Ibid., P.14

¹¹⁷ Ibid, P.12

¹¹⁸ Ibid.

¹¹⁹ Dare County Land Use Plan (DRAFT). Section 1, P.15

¹²⁰ Ibid, P.20

¹²¹ Dare County Planning website. <www.co.dare.nc.us/depts/planning/>

¹²² Town of Nags Head, Existing Land Uses. Accessed 2/22/10. <<http://www.townofnagshead.net>>

¹²³ Dare County Planning website. www.co.dare.nc.us/depts/planning/

along major thoroughfares, or in village commercial districts. Residential development is characterized as low, medium, and high density, ranging from single-family detached homes to subdivisions of medium to large multiple family beach cottages.

Though population increase has slowed in Dare County, housing development has continued. According to the Dare County Land Use Plan, from the late 1990s to the early 2000s, the construction and real estate sectors boomed in the area. In the past ten years, many subdivision lots have been developed into either single-family homes or into seasonal resort rentals or investment homes.¹²⁴ The trend towards development of multifamily rentals coupled with limited residential, beach, and commercial parking has implications for traffic congestion, parking, and demand for and feasibility of alternative transportation options to be considered as part of this study.

Economy

Dare County residents have relatively higher income on average than that the state average for North Carolina: the 1999 per capita income for Dare County (\$23,614) was slightly greater than the state (\$20,307) and the 2007 median household income in Dare County (\$51,748) was greater than that of the state (\$44,772).¹²⁵

Tourism is an important aspect of the economies of the Outer Banks, which underscores the importance of providing transportation alternatives that enhance visitor experience and preserve the region's extensive natural resources. The tourism sector employs over 11,000 people throughout Dare County, or over a third of the population.¹²⁶ According to the North Carolina Department of Commerce, the top two occupational categories in the county are Food Preparation and Serving-Related Occupations and Sales and Related Occupations.¹²⁷ In addition to employment created by tourism, Dare County receives revenue from tourists in the form of taxes on room occupancy, prepared meals, and retail sales. In 2008, sales and property tax revenue from "travel-generated and travel-supported businesses" created about \$37 million in local tax collections.¹²⁸ In 2009, room taxes on overnight accommodations generated over \$343 million in revenue in Dare County.¹²⁹ Such revenues vary by municipality, with the larger and incorporated towns receiving higher amounts of revenue due to their larger capacity and higher number of businesses.

Other key economies of Dare County include those associated with the Oregon Inlet Fishing Center and other fishing piers: commercial and recreational fishing, seafood processing, and boat building. According to a 2006 study,¹³⁰ these industries provide a total annual economic benefit of 9,851 jobs and \$682.7 million to Dare County and the region.

¹²⁴ Dare County Land Use Plan. P.22

¹²⁵ U.S. Census Bureau, Fact Sheet. Accessed 2/22/10 <<http://factfinder.census.gov>>

¹²⁶ The Outer Banks Visitors Bureau. Accessed 2/22/10.

<http://www.outerbanks.org/visitor_services/press_room/press_releases/2008_Dare_County_Tourism_Figures.pdf>

¹²⁷ State of North Carolina. Department of Commerce. Accessed 2/22/10. <<https://edis.commerce.state.nc.us/EDIS/business.html>>

¹²⁸ The Outer Banks Visitors Bureau. Accessed 2/22/10

<http://www.outerbanks.org/visitor_services/press_room/press_releases/2008_Dare_County_Tourism_Figures.pdf>

¹²⁹ Ibid.

¹³⁰ A Study of the Benefits of Oregon Inlet to the Economy of Dare County and the Surrounding Region. Prepared by Moffatt & Nichol for the County of Dare. July 2006.

Figure 37
Dare County Housing Density Map
 Source: Volpe Center and NPS



Legend

Housing Units Per Acre

- 0 - 0.25
- 0.26 - 0.50
- 0.51 - 1.0
- 1.01 - 5.0
- 5.01 - 10.0

- Air Force
- Fish and Wildlife Refuge
- National Park Service land
- - Dare County Boundary



0 2.5 5 10 15 20 Miles



6. Transportation and development projects

There are a number of planned, ongoing, and newly proposed transportation and development projects in the region and within the study area that have relevance to the study. This section describes both those projects that have been planned and programmed and projects that have only been proposed conceptually and lack an identified funding source, or have not yet reached the preliminary engineering, design or construction phases.

6.1 Regional

At the regional level, there are several planned and proposed transportation and development projects that have been identified by NPS, NCDOT, and local and regional entities that have relevance to the study.

The NPS employs Project Management Information System (PMIS), a servicewide intranet application to manage information about requests for project funding. The Cape Hatteras NS has entered a number of transportation projects into the NPS Project Management Information System (PMIS), which is required before any projects are considered for funding. The relevant PMIS projects for Cape Hatteras NS outside of Bodie Island District are described in Table 20 with their status; the PMIS projects for the study area are described in Table 22 below and are shown in Figure 38.

Table 20
NPS Projects for Cape Hatteras NS (outside of Bodie Island District)

Source: Cape Hatteras NS staff

PMIS Title and Description	Status
Alternative Transportation Implementation Study for Ocracoke Island in Cape Hatteras National Seashore (PMIS 90596) – Comprehensive study to determine best method of moving visitors around Ocracoke Island.	Formulated but not funded.
FY 2006-2011 Implementation of an Alternative Transportation System (PMIS 115679) – Implementation of shuttle system on Ocracoke Island, addition of visitor and pedestrian accommodation at the Ocracoke Lighthouse, and ADA compliance improvements throughout the Island.	Park worked with NCDOT to explore feasibility of an alternative transportation system 4-5 years ago but proposal was later dismissed due to environmental concerns and lack of suitable parking. Project to be re-reviewed by park management.
Construct Salvo Multi-Modal Connector Trail (PMIS 136272) - Construction of an off-road multi-use trail from Salvo to the Salvo Day-Use Area.	Park approved but not yet reviewed or approved by the region/currently unfunded.

Within the region, all roadway and bridge transportation projects must be programmed in the statewide transportation improvement program (STIP). The incorporated towns, Dare County, and the Albemarle Commission work with NCDOT to identify and program such projects. Appendix F provides tables listing the projects currently identified for the STIP within Dare County along with key characteristics. Table 1 includes NCDOT projects that are in the planning and /or design phase, generally less than 10 years from right-of-way acquisition or construction. Table 2 describes Dare County projects referenced in Table 1 that are currently in NCDOT's 5-Year Work Program, which stipulates the projects are funded. Table 3 lists NCDOT projects under construction that have been awarded contracts and are considered active. Projects consist primarily of paving and bridge repair.

Development projects are also relevant to transportation because of the impact on traffic to the area as well as to circulation in the immediate area. Three development projects in the region have been identified and previously mentioned:

- Potential tourism site at former site of the Windmill Point Restaurant in Nags Head;
- Redevelopment of Jennette’s Pier in Nags Head; and
- The new Eastern Carolina National Wildlife Refuge Gateway Visitor Center and administrative office for the Alligator River and Pea Island NWRs on Roanoke Island, adjacent to the Fort Raleigh National Historic Site.

Two of the transportation planning documents listed in Table 1 provided recommendations or proposed regional transportation projects that could have relevance to the study area (see Table 21). These recommendations will be considered by this study in the development of potential strategies for Bodie Island District. Most of these recommendations are only conceptual, with no funding defined, but others are in the process of being addressed as has been mentioned previously in this report, such as bicycle accommodations on Bonner Bridge¹³¹ and bicycle facilities and connectivity in Avon, Rodanthe, Waves, and Salvo through a National Scenic Byways grant submission.¹³²

Table 21
Recommendations and Proposed Projects from Major Transportation Planning Studies for the Outer Banks

Sources: Outer Banks Scenic Byway Advisory Committee, *Corridor Management Plan for the Outer Banks Scenic Byway*, December 1, 2008, and Lawrie, Jud and Cook, Thomas, North Carolina State University, *Outer Banks Transportation Study: Final Report*, Outer Banks Transportation Task Force, February 2006.

Category	Outer Banks Scenic Byway Corridor Management Plan	Outer Banks Transportation Study
Bicycle / pedestrian access	<ul style="list-style-type: none"> • Add crosswalks where needed for pedestrian safety • Construct boardwalks to facilitate walking along the shoreline • Establish a nature trail from Whalebone Junction that accesses the US Coast Survey monument 	<ul style="list-style-type: none"> • Develop local and regional bicycle plans • Provide for bicycle connectivity on west to east corridors • Provide adequate bicycle parking • Provide new bicycle facilities that meet AASHTO guidelines • Improve pedestrian safety with crosswalk markings and signals. • Add bicycle accommodations at NC12 and US64 intersection (Whalebone Junction) • Add paved shoulders on SR 1243 • Provide bicycle accommodations on Bonner Bridge
Transit	None	<ul style="list-style-type: none"> • Develop two bus loops between Whalebone Junction and Southern Shores, including a route from Whalebone Junction to Roanoke Island and another route to Duck that is coordinated with planned Corolla Service. Loops would serve hotels, commercial areas, and beach access. • Develop several bus loops between Whalebone Junction and Southern Shores, including two routes that serve the entire length and three routes that serve smaller loops.
Wayfinding / marketing	<ul style="list-style-type: none"> • Map the Mountains to Sea Trail • Add new markers for the scenic byway • Provide new directional signs for interpretive facilities and sites • Develop a driving and bicycling tour for the Scenic Byway • Add gateway signs at communities 	None.

¹³¹ NC 12 Replacement of Herbert C. Bonner Bridge: Environmental Assessment. May 2010. <http://www.ncdot.org/projects/bonnerbridgerepairs/download/EA.pdf>

¹³² Morris, Rob. The Outer Banks Voice. “Hatteras byways project to seek \$1.95 million grant” <http://outerbanksvoice.com/2010/04/05/byway-project-to-see-1-95-million-grant/>

Table 21 (continued)

Recommendations and Proposed Projects from Major Transportation Planning Studies for the Outer Banks

Sources: Outer Banks Scenic Byway Advisory Committee, *Corridor Management Plan for the Outer Banks Scenic Byway*, December 1, 2008, and Lawrie, Jud and Cook, Thomas, North Carolina State University, *Outer Banks Transportation Study: Final Report*, Outer Banks Transportation Task Force, February 2006.

Category	Outer Banks Scenic Byway Corridor Management Plan	Outer Banks Transportation Study
Other	<ul style="list-style-type: none"> • Add public docking facilities in established harbors • Add gateway facilities at north and south entrances to the Outer Bank Scenic Byway 	<ul style="list-style-type: none"> • Change rental turnover days • Add left turn lanes at communities on NC12 from Whalebone Junction to Hatteras • Add traffic calming on NC12 from Whalebone Junction to Hatteras

6.2 Bodie Island District

Within the Bodie Island District, there are a couple of relevant ongoing projects, all of which have been previously mentioned in this report (see Figure 38). These include:

- Repair of the Bodie Island Lighthouse to accommodate climbing.
- Expansion of shoulders of NC 12 from two to five feet.
- Replacement of the Bonner Bridge, to include expansion of shoulders from two to eight feet to better accommodate bicycle and pedestrian traffic.

In addition, Cape Hatteras NS has submitted a project in PMIS proposing bicycle accommodation along the Lighthouse Bay Drive. Table 22 describes this proposal as well as the project referenced above to expand the shoulders of NC 12.

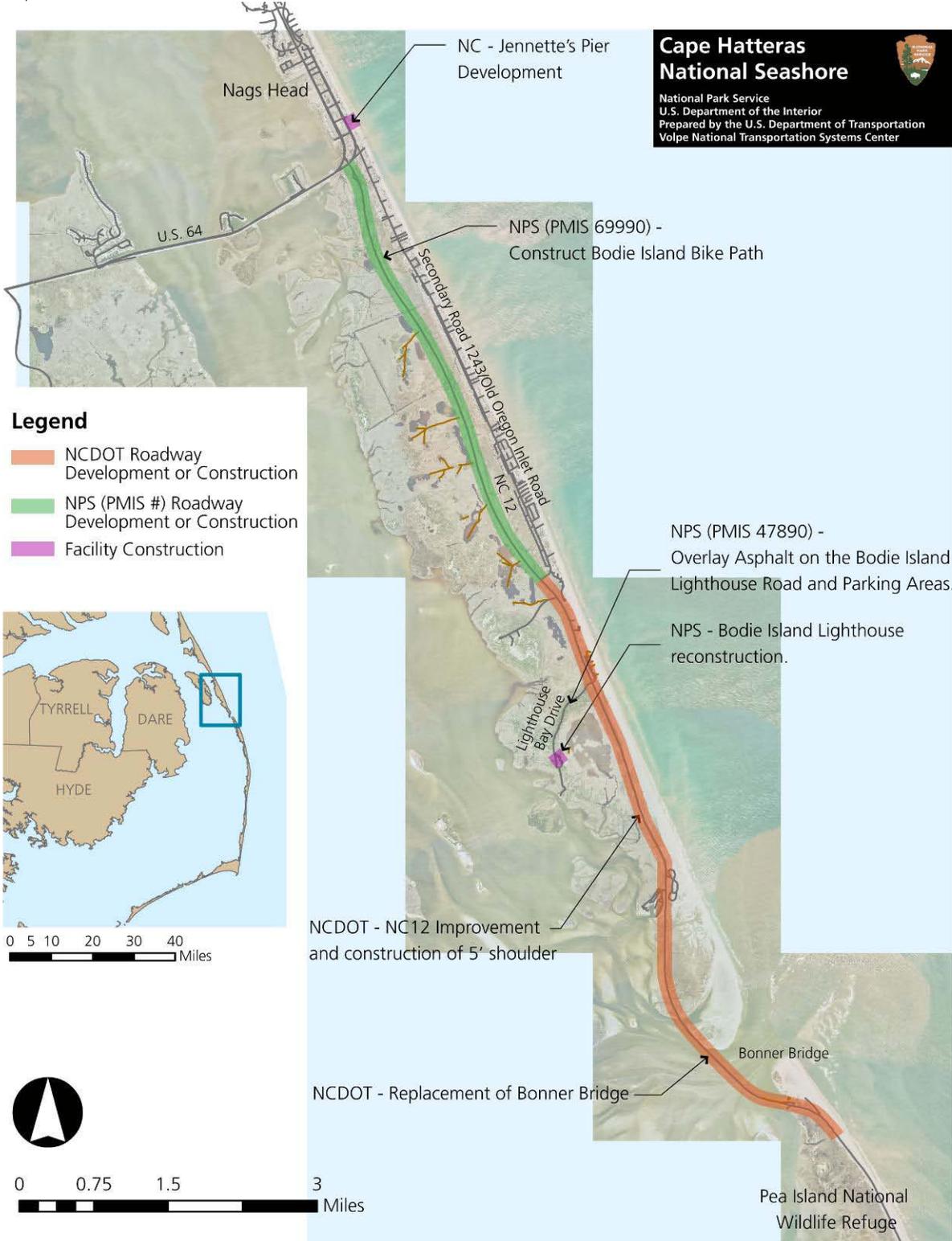
Table 22
NPS Projects for Bodie Island District

Source: Cape Hatteras NS staff

PMIS Title and Description	Status
Overlay Asphalt on the Bodie Island Lighthouse Road and Parking Areas (PMIS 47890) – Resurfacing of Lighthouse Bay Drive and parking areas, widening of Lighthouse Bay Drive traffic lanes, bicycle accommodation to be provided either by a separate, off-road paved path on top of the water line right-of-way as part of the water line relocation project or by a widened shoulder as part of a repaving project.	Awaiting park submission/approval. Project not formulated or funded.
Construct Bodie Island Bike Path (PMIS 69990) - Expansion of the shoulder from two to five feet to provide safer bicycle accommodation.	Formulated but not funded. Project is no longer to be completed as separate path but rather as a widened shoulder.

Figure 38
Bodie Island District Project Map

Source: Volpe Center and NPS



7. Findings

This report identifies and assesses existing and planned conditions to provide a characterization of the transportation network, travel patterns, and conditions within the study area and within the region. The region is defined as Dare County but also referred to in the text as the Outer Banks. Such information will provide a foundation for the Needs Assessment and Alternative Analysis. Key information provided by this report includes the following:

- *Previous studies:* There have been a number of transportation-related and other planning studies that have been conducted in the region that will be important to consider in the solutions presented by this study.
- *Regional destinations:* There are a number of other federal, state, city, and privately owned destinations within the region that may be important to consider for connections with the Bodie Island District.
- *Visitation:* The Cape Hatteras NS has over two million visitors a year and an estimated half of all visitors go to destinations within the Bodie Island District. Visitation to these sites, namely the Bodie Island Lighthouse, will likely increase once the lighthouse is open to climbing in 2011 or 2012.
- *Population:* Dare County has a small (~30,000) year-round population, however, during the summer the seasonal population reaches 200,000. This seasonal fluctuation has implications for the delivery of public services and existing infrastructure.
- *Economy:* Tourism is an important aspect of the economies of the Outer Banks and the Cape Hatteras NS, including the attractions of Bodie Island.
- *Bodie Island Access:* Visitors primarily use private vehicles to access the Bodie Island District and move between the sites and various amenities within the District.
- *Vehicular circulation:* Traffic and parking are not current issues for the Bodie Island District, with the exception of the three major summer holidays (Memorial Day, July 4th, and Labor Day), however, this is expected to change once the lighthouse renovation is complete and it is open for climbing, in 2011 or 2012.
- *Bicycle and pedestrian facilities:* The region has a number of bicycle and pedestrian facilities in place or under development, but there may be opportunities to improve connectivity and accessibility to/within the Bodie Island District.
- *Public transportation:* Limited county-wide, demand-response public transportation and private tour and transportation services exist that would require further investment and expansion to provide additional transit options for visitors, if transit expansion were determined to be feasible and could be self-sustaining.
- *Environmental changes:* As highlighted by the impact of Hurricane Isabel and the November 2009 nor'easter on NC 12, climate change, increased storm intensity, and sea-level rise are likely to impact the infrastructure and significant natural, historic, and cultural resources within Bodie Island District as well as the coastal communities along the Outer Banks. Plans and investments in infrastructure for the Cape Hatteras NS should consider these changes.
- *Development:* There are several projects that are being planned or proposed that will impact transportation within Bodie Island in the near future (namely, the replacement of Bonner Bridge and the opening of Bodie Island Lighthouse to climbing).

The Needs Assessment, based on the findings above and further analysis, will identify key deficiencies of the transportation system and opportunities for the future. Particular attention will be given to impacts of future projects and opportunities for improved and increased access options, including transit, bicycle, pedestrian, and other modes.

Appendix A: Minutes from Scoping Meeting on January 13th, 2010

CAPE HATTERAS NATIONAL SEASHORE ALTERNATIVE TRANSPORTATION STUDY – *Scoping Meeting Minutes*

January 13, 2010

Elizabethan Gardens Meeting Room, Elizabethan Garden
Fort Raleigh National Historic Site
1401 National Park Drive, Manteo, NC

Purpose

The purpose of the meeting was to inform key stakeholders, identified by park staff, of the study purpose and approach and to solicit information in four areas: ongoing transportation and other major initiatives; partnership opportunities; transportation-related issues and concerns for the study area and region; and transportation ideas and solutions.

Participants

Name	Affiliation
Jon Anglin	NPS
Billy (William) Brown	Oregon Inlet Fishing Center
Charlotte Burger	US DOT Volpe Center
Donna Creef	Dare County
Jason Davidson	NCDOT
Mary Doll	NPS
Darrell L. Echols	NPS
Lee Edwards	NPS Southeast Region
Mary Helen Goodloe-Murphy	Dare County Scenic Byways Committee
Elisabeth Hahn	NPS Southeast Region
Ellen Hand	NPS
Kirsten Holder	US DOT Volpe Center
Steven Lambert	Albemarle Commission
Scott Lanier	FWS
Robin Leatherman	NPS
Dennis McGinnis	NPS
Minta Meekins	Oregon Inlet Fishing Center
Lindsey Morse	US DOT Volpe Center
Michael Murray	NPS
Lee Nettles	Outer Banks Visitor Bureau
Hugh (Butch) Osborne	Nags Head
Paul Stevens	NPS
Doug Stover	NPS
Laura Sturtz	NPS
Ray Sturza	Kill Devil Hills / Dare County
Erin Trebisacci	Manteo

Introduction

Superintendent Mike Murray introduced the study by highlighting the anticipation of increased visitation to the Bodie Island Lighthouse once renovations are complete and the lighthouse re-opens. He also noted that the study provided the opportunity to diversify and improve access options to the Bodie Island District. Introductions were then made by each meeting participant. Lindsey Morse, Volpe Center project manager, then presented the purpose and history of the project, project funding, the meaning of alternative transportation, and the planned study methodology. The concept of “alternative transportation” was clarified as the following:

- Provides an alternative to personal vehicle travel
- Meets the unmet needs of people without access to a vehicle
- Protects natural resources by mitigating congestion and pollution
- Allows an alternative to automobile use to arrive and experience the park
- Enhances visitor experience and resource protection

Partnerships

Opportunities

Stakeholders identified the following potential opportunities to partnering with NPS:

- Less fragmented planning: the Outer Banks are divided into 7 different governments, which sometimes makes feasibility, cooperation, and planning of initiatives difficult.
- Connection and cross-promotion of sites within the study area and to the north
- Branding opportunity: several of the local jurisdictions have already started pursuing efforts to become “green” in part to attract tourism; increasing and improving “alternative travel options” would strengthen the area’s image as “green”.

Major Initiatives and Concerns

Each stakeholder identified major initiatives, concerns, and opportunities that related to NPS and transportation.

The Albemarle Commission / Rural Planning Organization (RPO)

- NCDOT will be commencing the long term regional transportation plan for the next 25-year period in the fall for Dare County. NCDOT is currently completing the plan for Currituck County. NCDOT will complete the plan, and the Albemarle Commission will be a prominent stakeholder and coordinator. NPS planning efforts should align with these larger regional transportation-planning efforts.

Town of Nags Head

- The widening of US 64 has been a major goal for the Outer Banks in terms of safety, and congestion.
- There is a definite need to integrate all the existing bicycle/pedestrian paths in the area.
- New Oceanside development near Whalebone Junction, at Jennette’s Pier, will be opening spring 2011 and will feature an aquarium and other educational exhibits and programs.

Outer Banks Visitor Bureau

- The Bureau purchased land in Nags Head (Windmill Point) for a possible visitor center but the future of the site is currently unknown.

Town of Manteo

- There is a need for water taxi service in the area and Manteo (or Wanchese) is a good candidate for siting the service. There may be opportunities to connect to NPS and the Pea Island NWR from the waterfront and other areas within the park.

Pea Island National Wildlife Refuge (NWR)

- A 2006 proposal was submitted by the NWR to FHWA to look at non-motorized access within the NWR, but since has fallen to the wayside. There may be opportunities to partner with FWS on access issues.
- The replacement of the Bonner Bridge by the NCDOT will affect the future access to Pea Island. Currently, the preferred alignment of the bridge redevelopment is unknown.

Oregon Inlet Fishing Center

- There is a need to dredge and maintain the Oregon Inlet channel and access to the marina in order for the charter businesses to continue operations. The marina is a key source of revenue for Dare County.
- According to Fishing Center and Park staff, bicyclists are often seen on NC12 in the area of the Oregon Inlet Fishing Center alongside with tractor trailer traffic. This poses a safety concern.

Scenic Byway Committee

- Whalebone Junction is a top priority for the Byway Committee.
- The Committee can apply for funds to which the park may not have direct access and may be able to provide political support for implementation of projects.
- The committee is interested in a shuttle oriented towards commerce and moving people to/from area beaches.

Additional stakeholders/potential partners

Park staff and stakeholders identified the following additional stakeholders and potential partners that should be considered by the study.

- Park staff indicated that NC state senator, Marc Basnight, has been a supporter of many local environmental initiatives, including some within CAHA, such as the turbine power system at Coquina Beach. He is a possible proponent of using the existing Bonner Bridge for pedestrian and bicycle recreation and/or access.
- NC Blueways is a cooperative effort by the NC State Parks System, NC State University, and NC Paddle Trails Association to provide safe and sustainable paddle trails and access sites throughout NC (<http://www.ncsu.edu/ncblueways/index.html>).
- Dare County Transit.
- User groups (historical site visitors vs. beach goers).
- Beach cottage rental agencies.
- NC Division of Parks and Recreation (in particular for transit destinations/parking).
- Concessionaires who can provide bike and small boat rentals or a water taxi service operating out of Roanoke Island.

Issues

Parking

- Bodie Island Lighthouse may not be able to accommodate additional parking. There is a desire to accommodate increased use without increasing the parking footprint.
- Coquina Beach does not frequently reach capacity; parking capacity is considered adequate. The northernmost lot is considered to be underutilized and a suggestion was made, by the Park, to add

an access point at the north end of the parking area to increase use of the northernmost lot (the only existing access point is at the very southern end of the parking area).

- At Oregon Inlet Fishing Center, there is a need for more parking. People park at the center to access the charter boats, consolidate into a 4-wheel drive for ORV use of the beach, park cars and horse trailers, access the Sound via kayak or personal motorized boat, visit the Center's store, and to be spectators of the marina and its activities, including the arrival of boats with freshly-caught fish.

Bicycle and Pedestrian Access

- Nags Head has a complete bike trail from the NPS maintenance area past Whalebone Junction to Kill Devils Hill, where there is a bike lane to Kitty Hawk. There is a need to fill the gap at the south end (near Ramp 1 / NPS maintenance facility) to NC12 and at Whalebone Junction from NC1243 to NC12. There is also a need to provide facilities/amenities (e.g. bike racks, lockers, and water and food) for bicyclists at major destinations.
- Connections with Coquina Beach and Nags Head. One possible location is the power line ROW on the west side of NC12.

A potential bicycle/pedestrian connection at Nags Head Beach Rd. /maintenance road to Coquina Beach along the power line right of way should be considered.

Bonner Bridge

- The impact of the bridge replacement on the Oregon Inlet, the Pea Island NWR, the NPS campground, and ramps is unclear. Ramp 4 remains closed much of the time in order to protect endangered species.

Regional shuttle system

- Potential routes/stops
 - A shuttle system to the Fort Raleigh, Wright Brothers Memorial, and Bodie Island Lighthouse, and that offers longer or shorter loops.
 - Other suggested stops included:
 - Jennette's Pier;
 - Outer Banks Visitor Center;
 - Downtown Manteo / Festival Park;
 - Ocracoke Ferry Terminal in Hatteras;
 - Coquina Beach;
 - Oregon Inlet Campground; and
 - Oregon Inlet Fishing Center.
- Goals/objectives
 - There is a need to move people from Wanchese, Manteo, etc. and the residential areas to the seashore and beach access points.
 - There is a need to connect significant destinations; people want to go to Roanoke Island to see the aquarium and go through downtown Manteo.
 - There is a need for a larger regional transit system- a "hub and spoke" system in the major centers, i.e. Manteo, Ft. Raleigh, etc. that could incorporate real time arrival information.
- Previous transit efforts
 - Northern Banks (Corolla) had a shuttle plan (2006) that has not yet moved forward.

- Outer Banks Transportation Study (2006) proposed several transit routes within the area between Kitty Hawk and Manteo but did not move forward.
- Private beach shuttle service in Nags Head area attempted but unsuccessful.
- Ocracoke Shuttle System has had good partnerships and good ideas but system has not moved forward due to a number of constraints, including:
 - Narrow road width and inability to provide pull-off areas for shuttle (resulting in concern that shuttles would worsen traffic congestion);
 - Tight access, especially turning radius, in accessing the Ocracoke Lighthouse;
 - Limited parking on Ocracoke; and
 - Concern that visitors would not want to leave cars on Hatteras or the mainland.
- Important implementation factors
 - Marketing of any shuttle system is essential to its success; people need to know what it is and where it goes.
 - Shelter.
 - Reliability.
 - Communication of real-time information on schedule and delays (GPS, displays, etc.).
 - Orientation toward high-density areas (nodes where population is concentrated) and/or there would have to be big parking lots to collect people.
 - Demand.
 - Funding considerations, such as:
 - NPS can obtain capital funding;
 - Operations and maintenance costs – partnerships are needed; and
 - Most important thing for NPS is the financial feasibility.
 - Incentives, such as:
 - Encourage visitors to leave the car parked at the hotel or house;
 - Limit parking expansion/availability as an incentive to use transit or bikes;
 - Provide convenient, low cost, transit coupled with a scarcity of parking; and
 - Area parking policies that complement, rather than work against, other elements of the transportation system – i.e. policies should provide incentives, in terms of both cost and availability of parking, to use any proposed shuttle systems.
 - Private tour operators are considered a good way to transfer the financial risks away from the County or Park. The private tour service offered by Danny Couch is an example of such a service.

Next Steps

Park staff and stakeholders discussed possible future next steps in terms of stakeholder and public involvement. Proposed ideas included:

- Use of identified stakeholders as a focus group to keep informed and request feedback from;
- Issue of press release;
- Posting of study information online;
- Potential presentation to the County Board of Commissioners and/or other local government entities; and
- Open house/public meeting to present ideas to which public can respond.

The Park will determine an appropriate approach and schedule and will communicate these to the attending stakeholders at a later date (e.g. via email or project website).

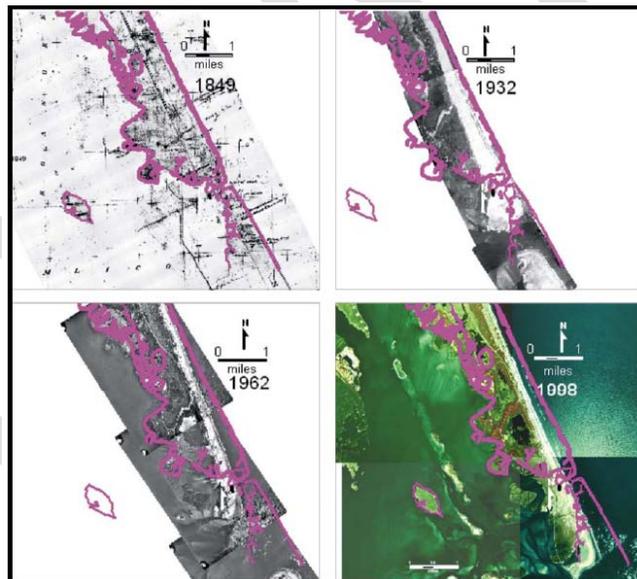
Appendix B: Shoreline Change, Storms, and Climate Change

The barrier islands have a long history of weather and climate impact, which contribute to shoreline erosion and infrastructure damage. The NPS has gone to great lengths to preserve existing infrastructure within the Cape Hatteras NS. In 1999, in response to severe storms and changes in the coastal shoreline, the NPS moved the 205-foot Cape Hatteras Lighthouse 2,900 feet inland to prevent further erosion, avoid subsequent collapse/failure and preserve the historic structure.¹³³ In addition to the impact on existing buildings, storms impact the roads and cause erosion, poor drainage, safety hazards, and road instability.

Geographic studies of the string of parks along the barrier islands (including Cape Hatteras NS, Cape Lookout National Seashore, Wright Brothers National Historic Monument, Fort Raleigh NHS, Pea Island NWR, and Jockey's Ridge State Park) using historic aerials show significant change in the shoreline and inlet location over time. For example, analysis shows that the Oregon Inlet moved approximately 200 feet south between 1849 and 1998, after which the inlet was stabilized (Figure 39).¹³⁴ Scientists study the change in landforms along the barrier islands. Coastal geologist Dr. Stanley Riggs of the East Carolina University studies mitigation efforts in order to slow the shoreline change.¹³⁵ While alternatives include the construction of sea walls and man-made structures, these methods are found to cause additional erosion along the shoreline. Another alternative is the replenishment of sand from another location along the shoreline, which protects the beaches but is expensive and temporary.

Figure 39
Oregon Inlet Movement

Source: U.S. Geological Survey Scientific Investigations Report



¹³³ Cape Hatteras NS website: Moving the Cape Hatteras Lighthouse.

<<http://www.nps.gov/caha/historyculture/movingthelighthouse.htm>>

¹³⁴ Riggs, Stanley and Dorothea V Ames. "Geomorphic Framework of the North Carolina Outer Banks" U.S. Geological Survey Scientific Investigations Report 2007.

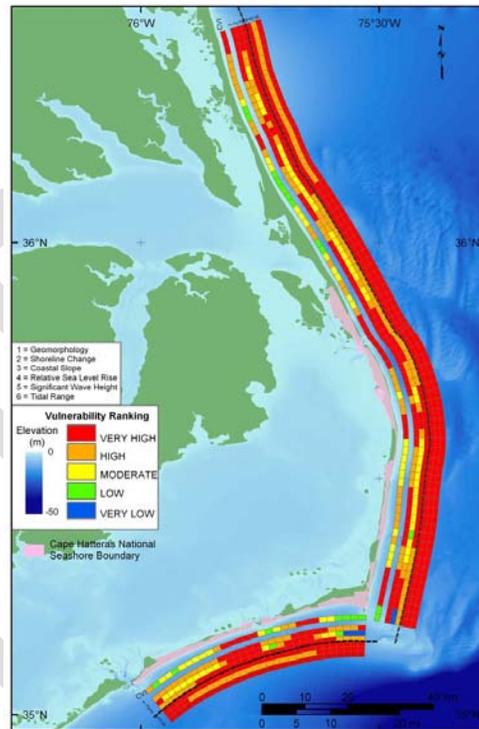
¹³⁵ Shepart, Andrew. "Fighting the Tide: Cape Hatteras Lighthouse Retreats from Rising Sea." August 24, 2004.

<<http://www.nurp.noaa.gov/Spotlight/Lighthouse.htm>>

The National Undersea Research Council, working with the National Oceanic and Atmospheric Administration, states that if present trends continue, sea-level will rise up to 0.5 feet in the Outer Banks region.¹³⁶ Further, the shoreline in parts of the Cape Hatteras NS is forecasted to retreat 400 feet inland by the year 2018 and over one-half mile by 2088.¹³⁷ A 2010 conference in Raleigh, North Carolina, brought together scientists who agreed that the annual increase in sea level rise is currently 4 mm a year and this rate of increase is likely to increase.¹³⁸ These statistics help inform land managers as they decide where and how to develop along the barrier islands.

In 2004, the U.S. Geological Service (USGS) and Department of the Interior studied the Coastal Vulnerability Index (CVI) to determine where the effects of sea level rise are greatest for Cape Hatteras NS.¹³⁹ The CVI considers geomorphology, coastline, sea-level rise, historical shoreline change, tidal range, and wave height (Figure 40). The study shows the most vulnerable locations along the barrier islands and is intended to be used as a planning tool for the Cape Hatteras NS. The report states that there are several areas that already receive over wash and shoreline change, these areas will continue to be of largest concern.

Figure 40
Coastal Vulnerability Index
Source: U.S. Geological Survey



¹³⁶ Shepart, Andrew. "Fighting the Tide: Cape Hatteras Lighthouse Retreats from Rising Sea" <<http://www.nurp.noaa.gov/Spotlight/Lighthouse.htm>>

¹³⁷ Ibid.

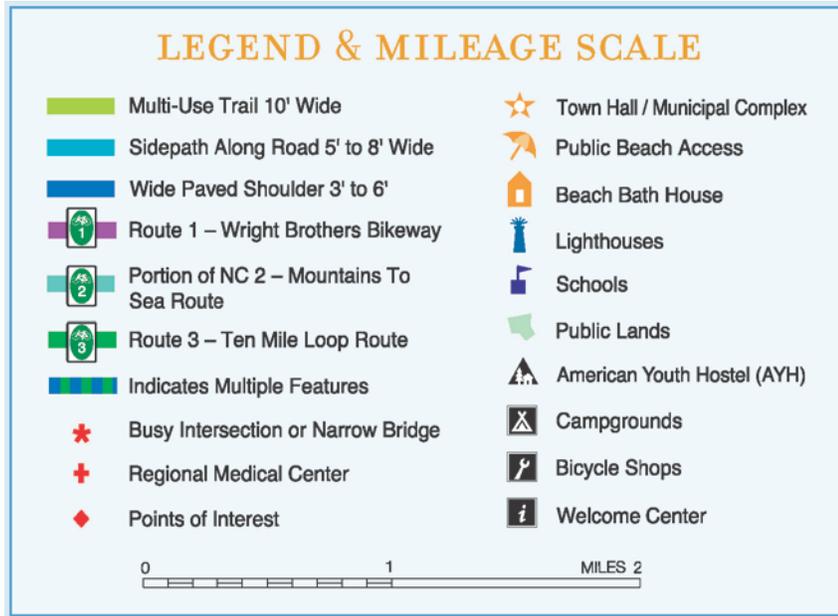
¹³⁸ North Carolina Department of Environment and Natural Resources: NC DENR and NC DCM Sea Level Rise Science Forum. <<http://dcm2.enr.state.nc.us/slr.html>>

¹³⁹ Pendleton, Elizabeth E., Robert Thieler, and S. Jeffres Williams. "Coastal Vulnerability Assessment of Cape Hatteras National Seashore to Sea Level Rise"

Appendix C: NCDOT Bodie Island Bicycle Legend and Map

Figure 41
NCDOT Bicycle Map Legend

Source: NCDOT Division of Bicycle and Pedestrian Transportation. <http://www.ncdot.org/travel/mappubs/bikemaps/> (July 2, 2010).

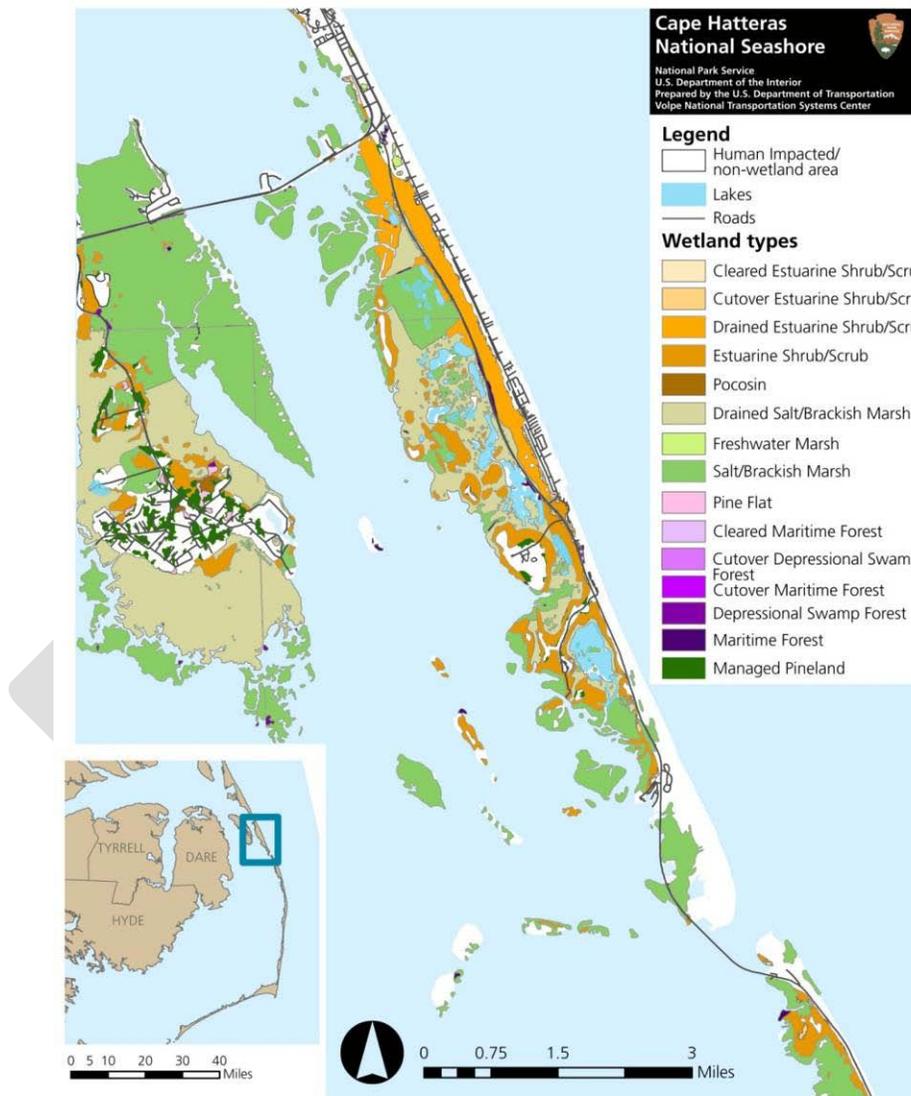


Appendix D: Bodie Island District Wetlands

There is an extensive network of wetlands on Bodie Island and adjacent to the Bodie Island Lighthouse area. These wetland areas are categorized into several shrub/scrub areas, marsh, and forest areas (Figure 44 and Figure 45). The most common wetland types within Bodie Island are the salt/brackish marsh, which is subject to occasional tidal and wind flooding, and the drained estuarine shrub/scrub area, subject to tidal flooding.¹⁴⁰

Figure 43
Bodie Island Wetland Map

Source: North Carolina Department of Environment and Natural Resources, Division of Coastal Management (<http://dcm2.enr.state.nc.us/Wetlands/download.htm>)

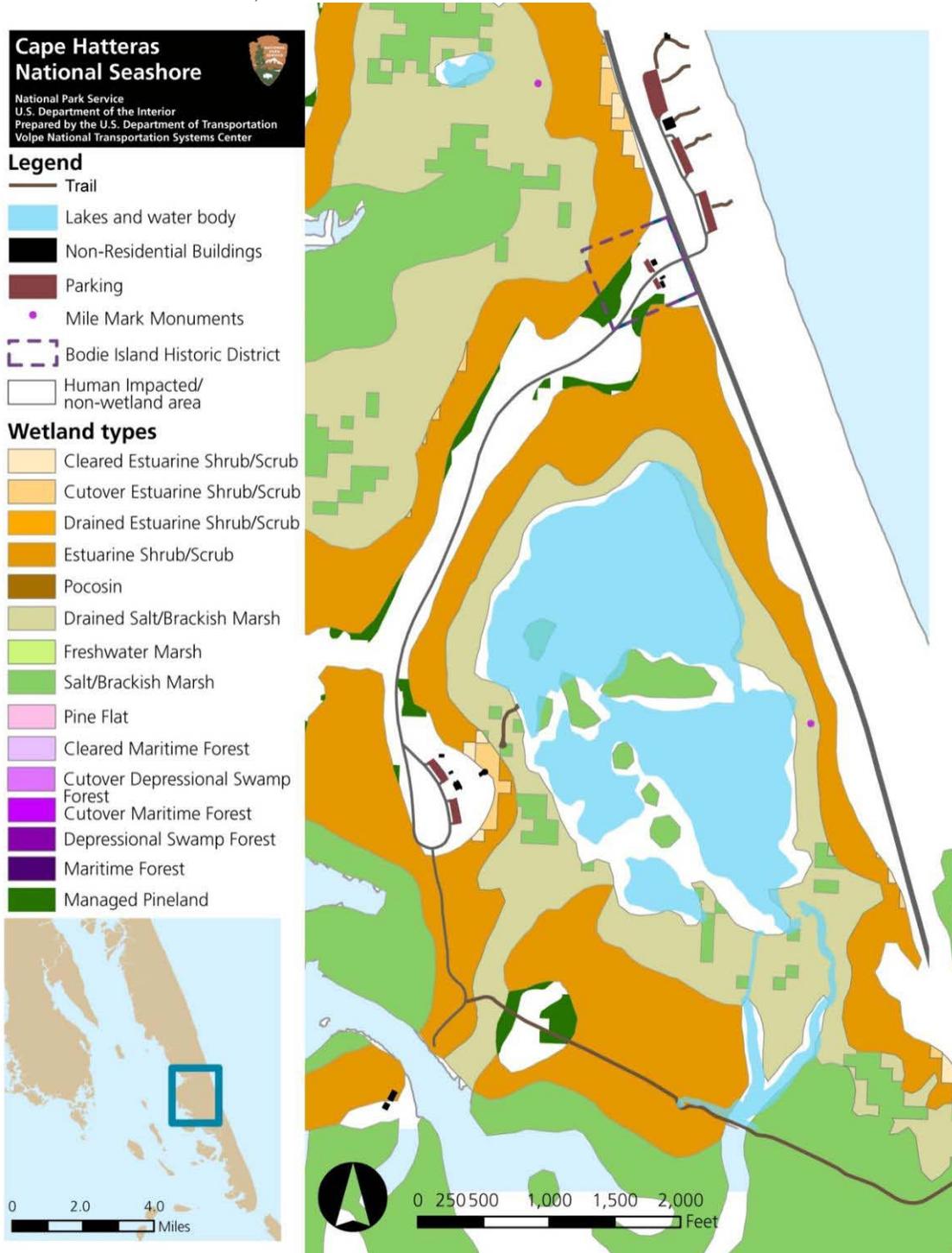


¹⁴⁰ North Carolina Department of Environment and Natural Resources; Division of Coastal Management. <<http://dcm2.enr.state.nc.us/Wetlands/download.htm>>

Figure 44

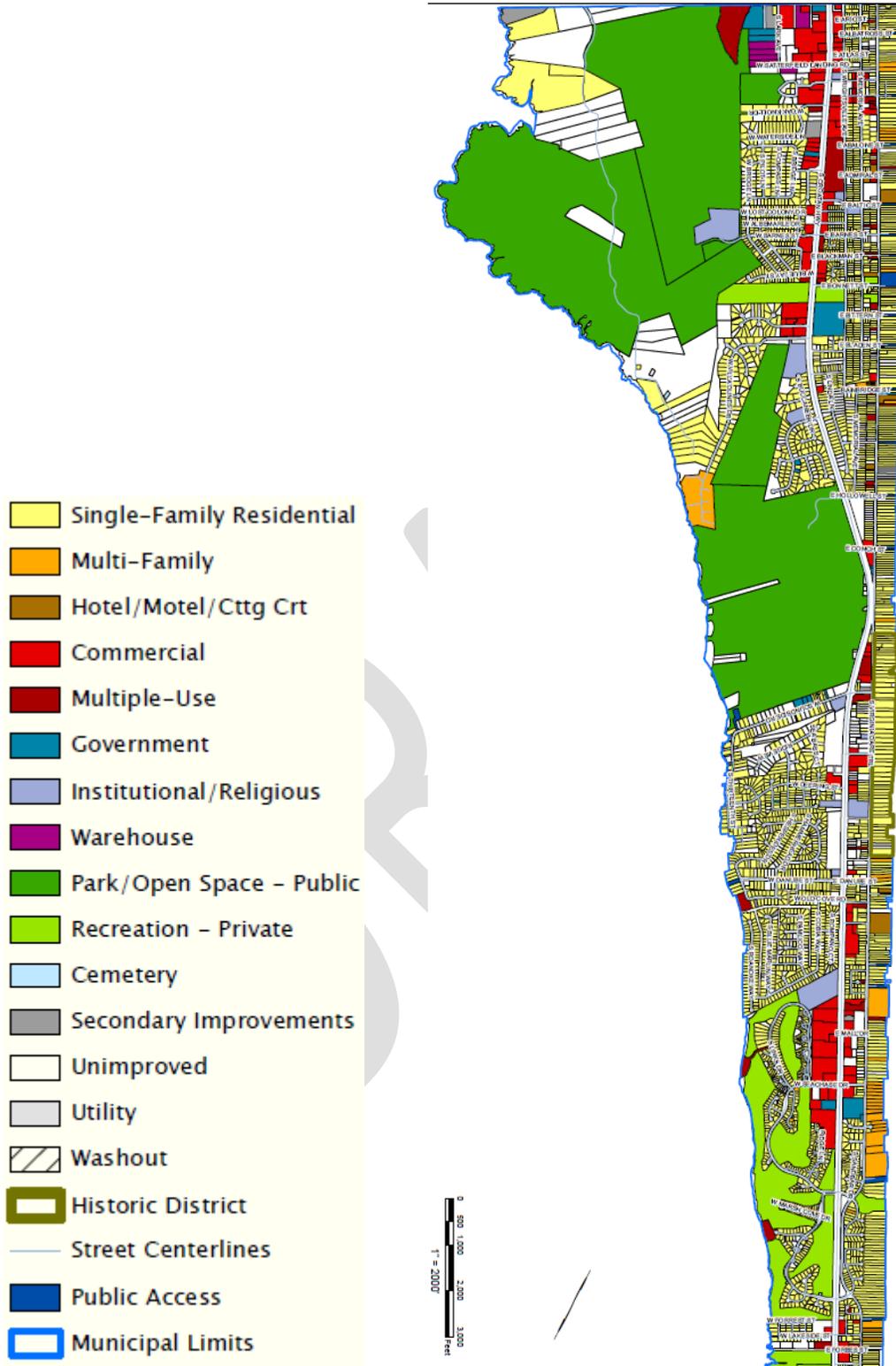
Bodie Island Lighthouse Area Wetland Map

Source: Volpe Center, NPS and North Carolina Department of Environment and Natural Resources, Division of Coastal Management (<http://dcm2.enr.state.nc.us/Wetlands/download.htm>)

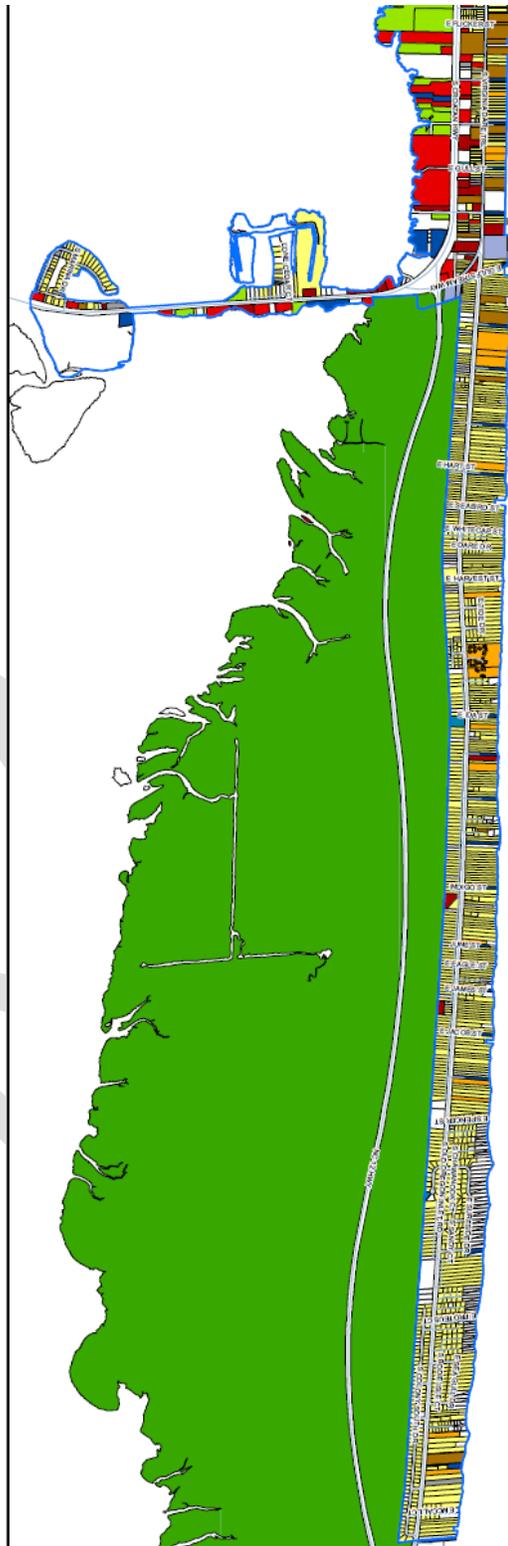


Appendix E: Nags Head 2006 Land and Water Use Plan

Source: <http://www.townofnagshead.net>



- Single-Family Residential
- Multi-Family
- Hotel/Motel/Cttg Crt
- Commercial
- Multiple-Use
- Government
- Institutional/Religious
- Warehouse
- Park/Open Space - Public
- Recreation - Private
- Cemetery
- Secondary Improvements
- Unimproved
- Utility
- Washout
- Historic District
- Street Centerlines
- Public Access
- Municipal Limits



Appendix F: STIP Projects

Table 1
NCDOT Development Projects

Source: NCDOT. <<https://apps.dot.state.nc.us/projects/search/Default.aspx>>

Prefix	Program	Funding Source
RS, R	Rural Special	NHS, Surface Transportation Program (STP), State Highway Trust Fund (T)
EE	Mitigation	State, Federal, and other
U	Urban	NHS,STP, and T
F	Ferry	Ferry, State, and Federal

Note: information is provided where available; otherwise, cell is left blank.

Route	Project type	Project location	Project description	Status	NCDOT Work Plan	Contract amount
Colington Rd	R	Kill Devil Hills, US 158 (Croaton Highway) to dead end	Operational-safety improvements.		N	
Duck	BP	Duck	Bicycle/pedestrian facility improvements.	Scheduled for feasibility study	N	
Manteo	E	Sir Walter Raleigh Street and Bidford Street	Landscaping and related amenities in roundabout.		N	
Manteo	NOT LISTED	Manteo	Saltwater stormwater wetland in Manteo.		Y	\$250,000
Nags Head	E	Barnes Street south to the town-county recreational complex.	Construct a multi-use facility.		N	
NC 12	HIGHWAY	Oregon Inlet	Oregon Inlet. Replace Bridge No. 11		Y	\$300,000,000
NC 12	FB	Oregon Inlet	Oregon Inlet. Repair Bridge No. 11		N	
NC 12	F	Manns Harbor maintenance facility	Phase 3: construct a paint building for ferry fleet.	Under construction	N	
NC 12	F	Hatteras Inlet	Four 180' double ended ferry for Hatteras		N	

			Inlet.			
NC 12	F	Hatteras south dock	Hatteras south dock basin refurbishment		Y	\$850,000
NC 12	R	Ocracoke Island	Ocracoke Island hotspot. Interim improvements. Programmed for planning and environmental study only.	In progress	N	
NC 12	R	Hatteras Village	Hatteras Village hotspot. Interim improvements. Programmed for planning and environmental study only.	In progress	N	
NC 12	R		Ocracoke to south terminal of Oregon Inlet bridge. Planning and environmental studies for maintaining roadway. Joint NCDOT-US Corps of Engineers study.	Underway	N	
NC 12	R	Buxton to Avon	Planning and environmental studies for maintaining roadway. Programmed for planning and environmental study only.	Planning / design in progress	N	
NC 12 / NPS Route 10	R	CAHA 10(2). NC 12 (NPS Route 10) near Cape Hatteras National Seashore entrance	Overlay roadway and replace 4 culverts and headwalls.	Construction by FHWA	N	
NC 12	U	Kitty Hawk, in the vicinity of SR 1206	Roadway improvements.		N	
NC12 & US 70	RS		Outer Banks Scenic Byway, update of the 2003 Corridor Management Plan and prepare a national byway application.	Implementation in progress	N	
SR 1217	R	Kill Devil Hills, US 158 (Croaton Highway) to dead end	Operational-safety improvements.		N	
US 158	R	US 64-NC 12 to Putter Lane	Add additional lanes.		N	
US 158	R	Southern Shores, US 158 at NC 12	Convert existing at-grade intersection to an interchange. Programmed for planning and environmental study only.	Planning / design in progress	N	
US 158	HE	SR 1206 (Kitty Hawk Road)	Intersection improvements. under construction		N	
US 264	FB	Deep Creek	Replace Bridge No. 3		N	
US 64	HIGHWAY	Bridge No. 9	Bridge painting		Y	\$3,529,350

US 64	R	East of the Alligator River to US 264	Widen to multi-lanes.	Planning / design in progress	N	
US 64	R	East of Columbia to east of the Alligator River	Widen to multi-lanes.	Planning / design in progress	N	
US 64	HIGHWAY	West of Alligator River to east of Alligator River	West of Alligator River to east of Alligator River.		Y	\$240,000,000
Various	M		Ecosystems enhancement program for Division 1 project mitigation.	In progress	N	
Various	R	Stormwater pilot program, Dare, New Hanover and Brunswick counties	Develop new and innovative technologies and filtering mechanisms to "clean up" discharges from NCDOT maintained outfalls and associated outlets.	In progress	N	

DRAFT

Table 2
NCDOT Development Projects on 5-year Work Program (cost and funds in millions)

Source: NCDOT. <https://apps.dot.state.nc.us/projects/search/Default.aspx>

Route	Start Date	State FY	Project description	Total cost	Traditional funds	Stimulus funds	Garvee funds	Work program category	Goal	Tier	Mode
NC 12	2/1/2010	2010	Oregon Inlet replace Bridge No. 11	\$300	\$230		\$70	Product	Infrastructure health	Statewide	Highway
US 64	7/1/2009	2010	Bridge No. 9. Bridge painting	\$3.5		\$3.5		Product	Infrastructure health	Statewide	Highway
NC 12	6/1/2011	2011	Hatteras south dock basin refurbishment	\$0.85	\$0.85			Product	Infrastructure health	Statewide	Ferry
Manteo	11/1/2009	2010	Saltwater stormwater wetland in Manteo	\$0.25		\$0.25		Operational			
US 64	3/1/2014	2014	West of Alligator River to east of Alligator River	\$240	\$240			Product	Mobility	Statewide	Highway

Table 3
NCDOT Highway Projects under Construction

Source: NCDOT. <https://apps.dot.state.nc.us/projects/search/Default.aspx>

Route	Project type	Project location	Description of project	Contract amount
NC-12	Highway	NC-12 from Bias Lane to Seabreeze Drive	Grading, drainage, and paving	\$1,063,825.50
NC-12	Highway	Herbert C. Bonner Bridge at the Oregon Inlet on NC-12	Repair existing pile caps, columns, caps, girders, & decks	\$14,676,325.00
NC-12	Highway	NC-12	Resurfacing	\$506,342.20
NC-12	Highway	Adjacent and east of NC-12 near Rodanthe	Mining, hauling & placing sand on beach, & sprigging dunes	\$1,420,287.50
Multiple	Highway	SR-1347, SR-1523, SR-1355, SR-1177, SR-1143, SR-1168, SR-1144, and SR-1531.	Paving and resurfacing	\$298,298.56
SR-1169	Highway	12 sections of secondary roads (SR-1111, SR-1169, SR-1321, SR-1329, SR-1334, SR-1502, SR-1503, SR-1505, SR-1508, SR-1512, SR-1521, SR-1532)	Paving	\$256,581.30
US-158	Highway	US-158	Kitty hawk rest area renovation	\$181,769.00
US-17	Highway	Division-wide	Raised pavement markers	\$151,578.00
US-64	Highway	Multi-use path adjacent to US-64 from NC-345 to Croatan Sound Bridge	Patching and resurfacing	\$338,154.80
US-64	Highway	Bridge #9 over the Croatan Sound on US-64	Bridge painting	\$3,069,000.00
US-64	Highway	Bridge #7 over Alligator River on US-64	Bridge preservation	\$1,178,600.00