Archie Carr National Wildlife Refuge

Comprehensive Conservation Plan

U.S. Department of the Interior
Fish and Wildlife Service
Southeast Region

November 2008

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ARCHIE CARR NATIONAL WILDLIFE REFUGE

COMPREHENSIVE CONSERVATION PLAN

Brevard and Indian River Counties, Florida

U.S. Department of the Interior
Fish and Wildlife Service

Southeast Region
Atlanta, Georgia

November 2008

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I. Background

INTRODUCTION

Archie Carr National Wildlife Refuge is managed by the U.S. Fish and Wildlife Service (Service) as part of the Merritt Island National Wildlife Refuge Complex and co-managed with Pelican Island National Wildlife Refuge (Figure 1). Archie Carr NWR is located along Florida's southeast coast between Melbourne Beach and Wabasso Beach in Brevard and Indian River counties (Figure 2). The refuge was authorized in 1989 and established in 1991 to conserve threatened and endangered wildlife, especially sea turtles. The refuge was named after the famed sea turtle researcher, Dr. Archie F. Carr. The over 258 acres (104 hectares [ha]) of the refuge support hundreds of wildlife and plant species. In addition, the refuge provides protection for terrestrial listed species and native wildlife and habitat diversity through a mix of habitats, including maritime hammock and coastal scrub. The refuge consists of four segments, spanning 20.5 miles (33 kilometers [km]) (Figure 2) and protects historical and archaeological sites. A growing human population, along with ongoing development and other human activities, currently threaten the refuge.

The Archie Carr National Wildlife Refuge and barrier island protection effort is a unique multiagency partnership dedicated to integrating endangered species and ecosystem protection with sustainable development and human recreation use. Colloquially referred to as the Archie Carr Refuge, the conservation land ownership and management within the area of the refuge represent an integrated partnership with federal, state, and local governments and private entities under multiple jurisdictions with different management perspectives, philosophies, and directives (Figures 3-1 through 3-5). Hence, the larger Archie Carr Refuge partnership extends beyond the Service's management and acquisition boundaries for the refuge to protect and manage wildlife and habitat and provide visitor services throughout this barrier island ecosystem. In response to the substantial development pressures experienced by this area, these governmental entities participated in a coordinated land acquisition effort, which has resulted in the purchase of approximately 1,324.77 acres (536.12 ha) within the refuge's acquisition boundary and 2,668.56 acres (1,079.93 ha) within the larger Archie Carr Refuge partnership (as of 2007). In 1994, a formal partnership called the Archie Carr Working Group was formed to enhance coordination, cooperation, and communication among these diverse interest groups involved in the refuge and the barrier island protection effort. Representing land acquisition and management agencies, conservation groups, nonprofit organizations, educational and research institutions, homeowner associations, and the local community, the Archie Carr Working Group provides a forum to guide and coordinate current and future management needs of the larger Archie Carr Refuge partnership. This unique multiagency public and private partnership that has emerged to support the refuge demonstrates the national significance of this effort as a model for future conservation collaboration.

While the Archie Carr Working Group includes over 27 partnerships, the Service, Brevard County (Parks and Recreation Department and the Environmentally Endangered Lands Program), Indian River County (Parks Division and the Conservation Lands Program), the State of Florida (Florida Park Service and Division of State Lands), and Hubbs-SeaWorld Research Institute are the individual entities that own and manage conservation lands within the larger Archie Carr NWR partnership (Figures 3-1 through 3-5).

Figure 1. Merritt Island NWR Complex.

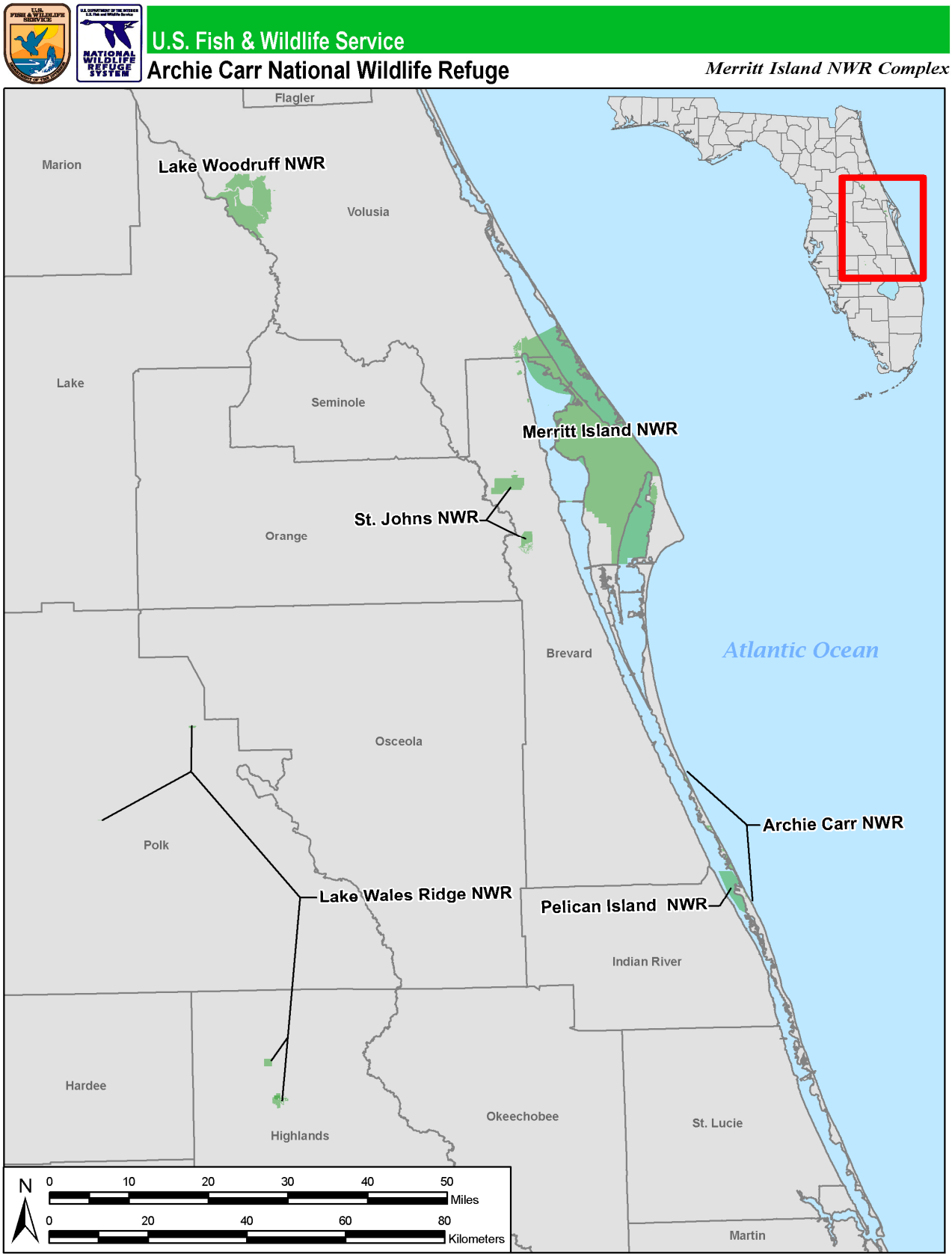


Figure 2. Archie Carr NWR location and acquisition boundary.

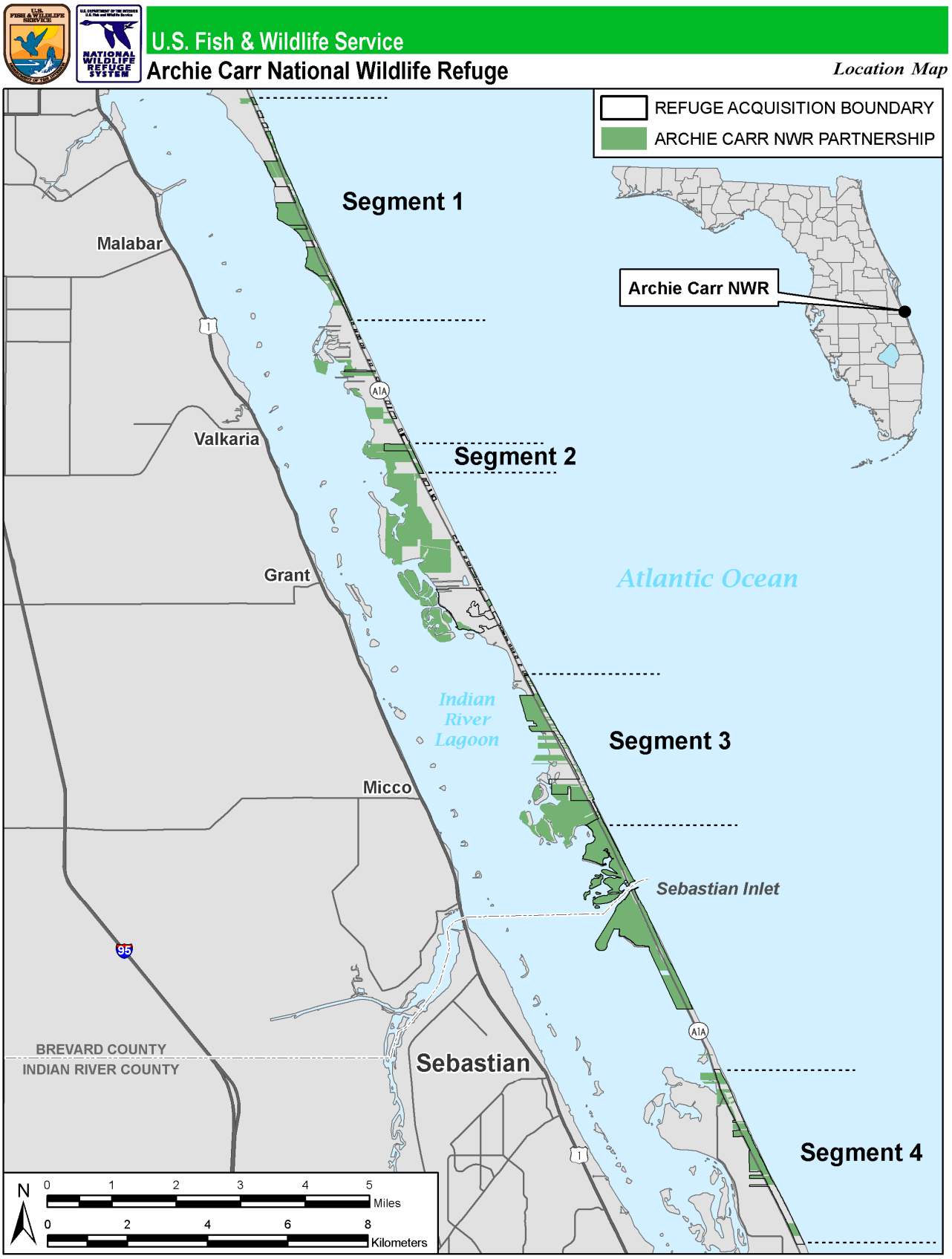


Figure 3-1. Larger Archie Carr partnership, Segment 1.

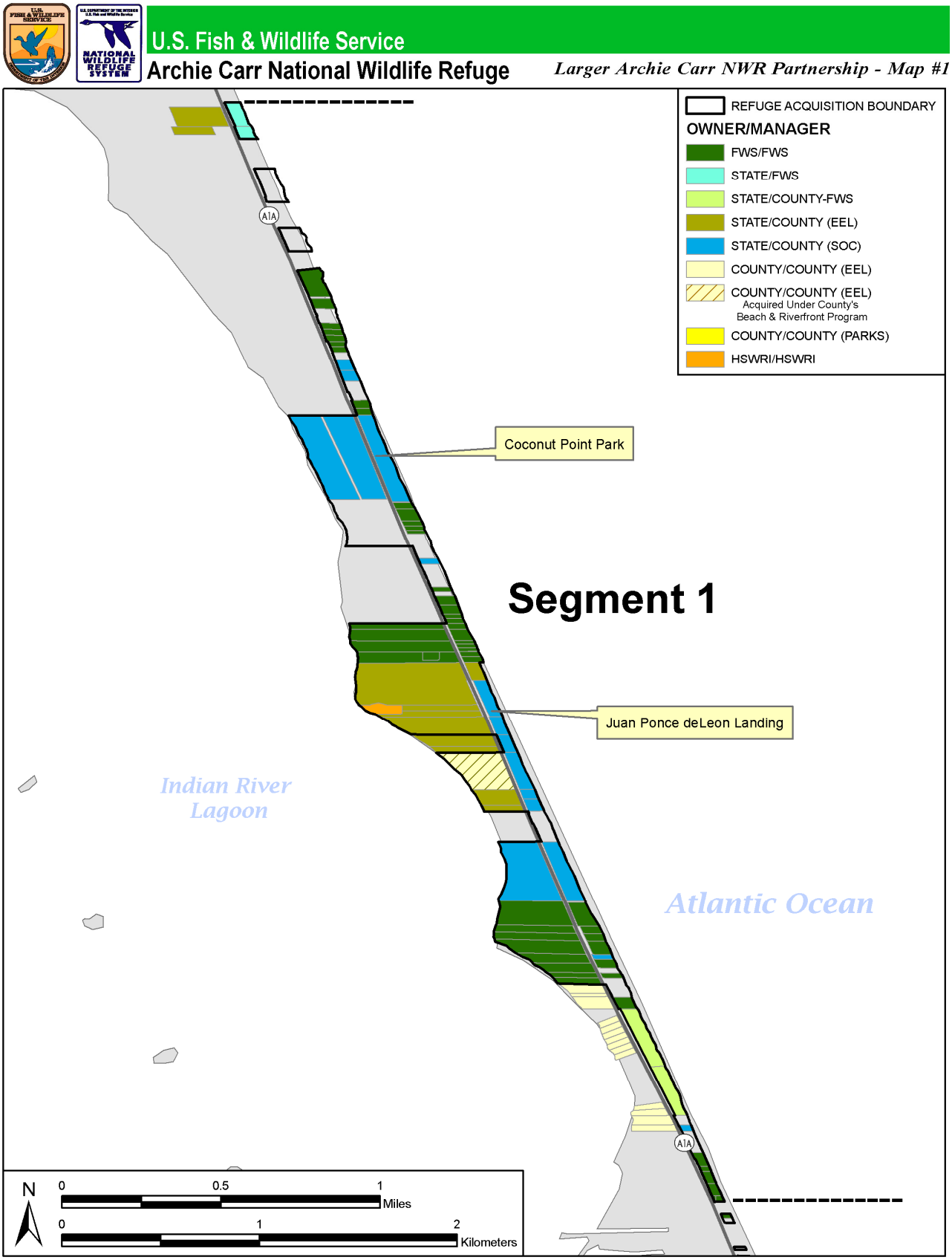


Figure 3-2. Larger Archie Carr partnership, Segment 2.

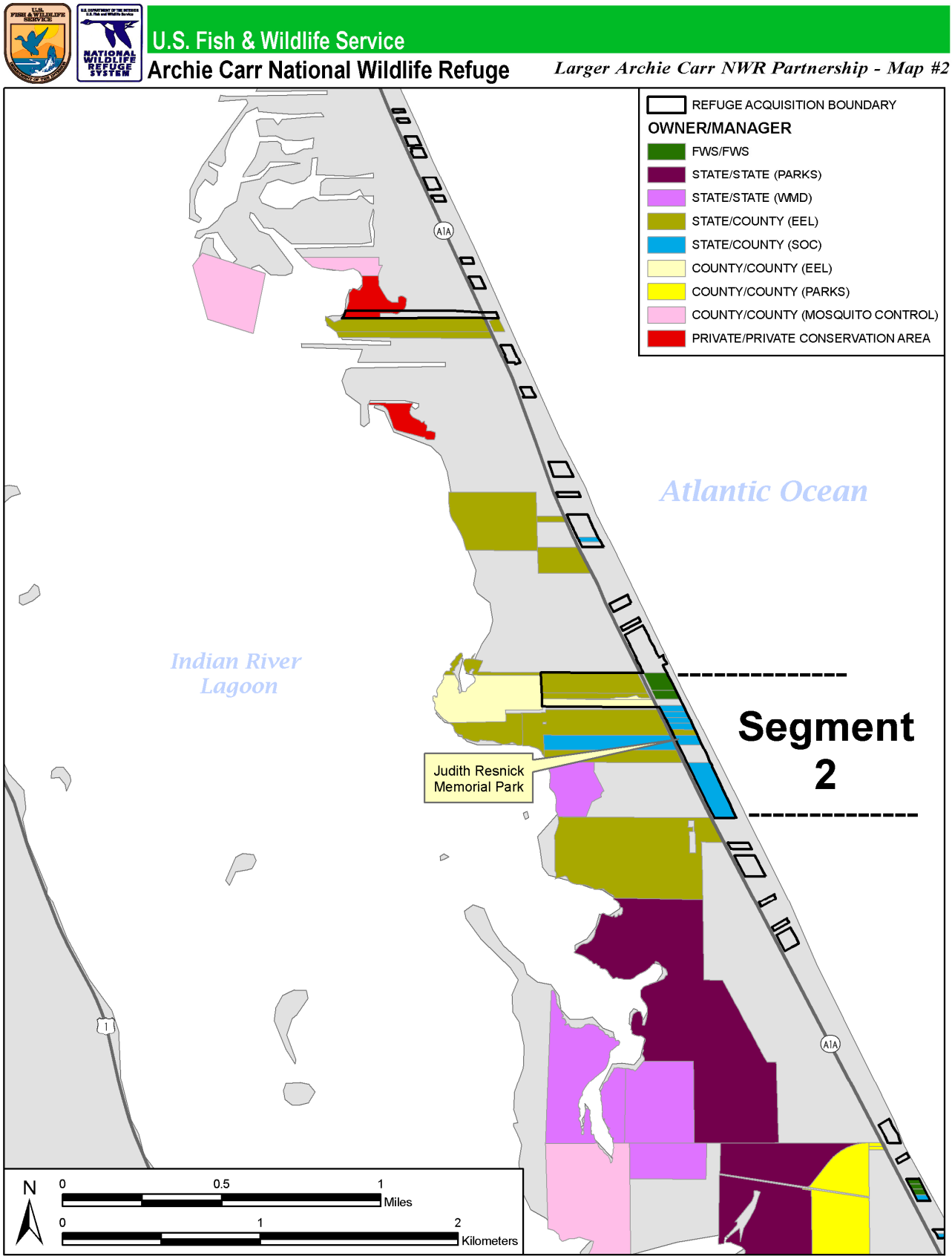


Figure 3-3. Larger Archie Carr partnership, Segment 3 North.

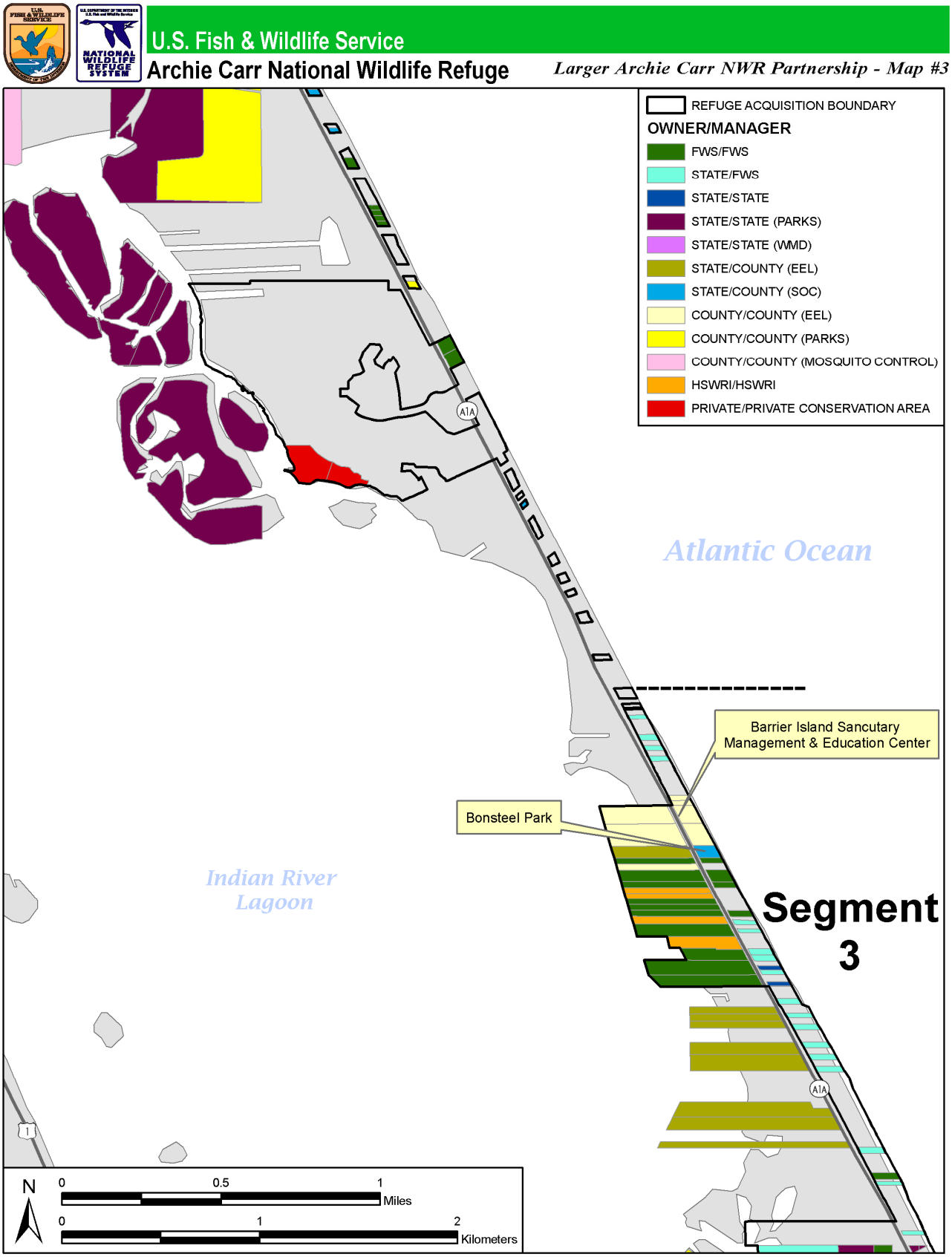


Figure 3-4. Larger Archie Carr partnership, Segment 3 South.

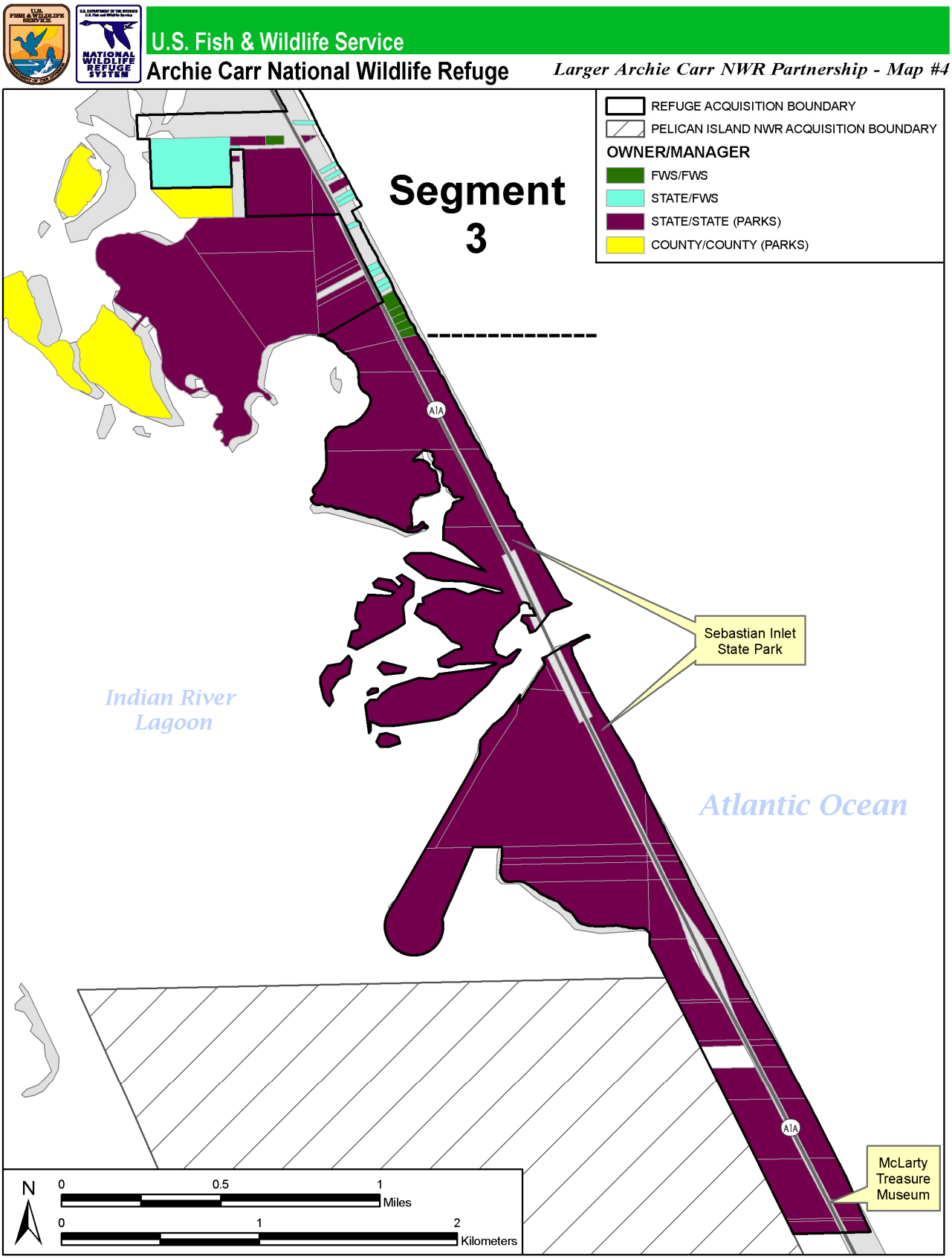
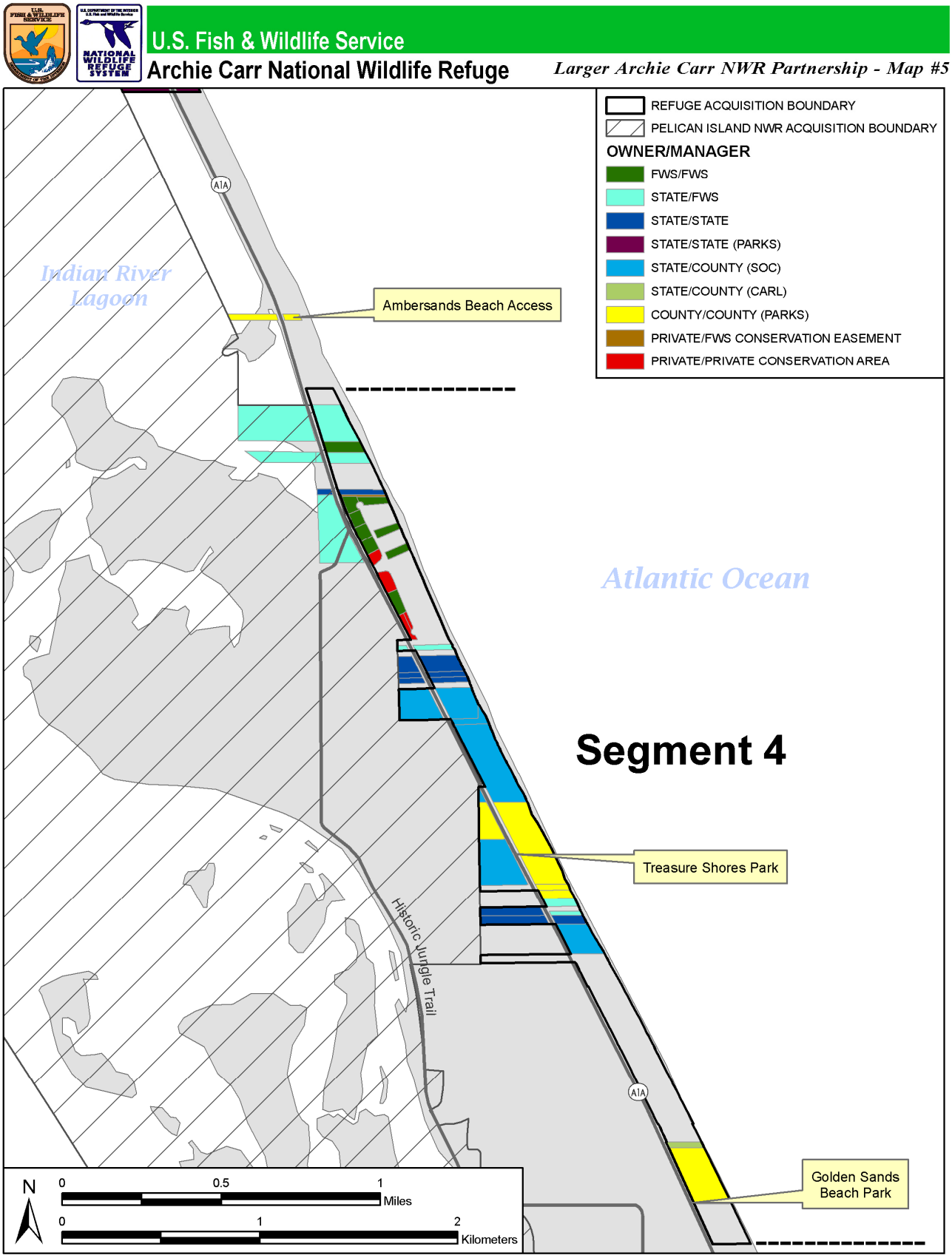


Figure 3-5. Larger Archie Carr partnership, Segment 4.



Lands acquired primarily for public access and recreation that currently provide visitor services within the refuge include Brevard County (Parks and Recreation Department and the Environmentally Endangered Lands Program), Indian River County Parks and Recreation Department, and the State of Florida (Sebastian Inlet State Park). Other major outreach and education partners include the Caribbean Conservation Corporation, Friends of the Carr Refuge, the Ocean Conservancy, and the Sea Turtle Preservation Society.

Major wildlife research partners include the Florida Fish and Wildlife Conservation Commission, Hubbs-SeaWorld Research Institute, the University of Central Florida and the University of Florida.

This Comprehensive Conservation Plan (CCP) for Archie Carr National Wildlife Refuge (ACNWR) was prepared to guide management actions and direction for the refuge. Fish and wildlife conservation will receive first priority in refuge management; wildlife-dependent recreation will be allowed and encouraged as long as it is compatible with, and does not detract from, the mission of the refuge or the purposes for which it was established.

A planning team developed a range of alternatives that best met the goals and objectives of the refuge and that could be implemented within the 15-year planning period. The Draft Comprehensive Conservation Plan and Environmental Assessment (Draft CCP/EA) described the Fish and Wildlife Service's proposed plan, as well as the other alternatives that were considered and their effects on the environment. This Draft CCP/EA was made available to state and federal government agencies, conservation partners, and the general public for review and comment in June 2008. Comments from all entities were considered in the development of this Final CCP. Substantive comments and the Service's responses to them are provided in Appendix IV, Public Involvement.

PURPOSE AND NEED FOR THE PLAN

The purpose of the CCP is to develop a proposed action that best achieves the refuge purpose; attains the vision and goals developed for the refuge; contributes to National Wildlife Refuge System (Refuge System, NWRS) mission; addresses key problems, issues and relevant mandates; and is consistent with sound principles of fish and wildlife management.

Specifically, the plan is needed to:

- Provide a clear statement of refuge management direction;
- Provide refuge neighbors, visitors, and government officials with an understanding of Service management actions on and around the refuge;
- Ensure that Service management actions, including land protection and recreation/education programs, are consistent with the mandates of the National Wildlife Refuge System; and
- Provide a basis for the development of budget requests for operations, maintenance, and capital improvement needs.

U.S. FISH AND WILDLIFE SERVICE

The U.S. Fish and Wildlife Service is responsible for conserving, enhancing, and protecting fish and wildlife and their habitats for the continuing benefit of people through federal programs relating to wild birds, endangered species, certain marine mammals, fisheries, aquatic resources, and wildlife management activities.

As part of its mission, the Service manages more than 540 national wildlife refuges covering over 95 million acres (38 million ha). These areas comprise the National Wildlife Refuge System, the world's

largest collection of lands set aside specifically for fish and wildlife. The majority of these lands, 77 million acres (31 million ha), are in Alaska. The remaining acres/hectares are spread across the other 49 states and several United States territories. In addition to refuges, the Service manages thousands of small wetlands, 69 national fish hatcheries, 64 fishery resource offices, and 81 ecological services field stations. The Service enforces federal wildlife laws, administers the Endangered Species Act, manages migratory bird populations, restores nationally significant fisheries, conserves and restores wildlife habitat, and helps foreign governments with their conservation efforts. It also oversees the Federal Aid program that distributes hundreds of millions of dollars in excise taxes on fishing and hunting equipment to state fish and wildlife agencies.

NATIONAL WILDLIFE REFUGE SYSTEM

The first national wildlife refuge, Pelican Island National Wildlife Refuge, was established in Florida in 1903 by President Theodore Roosevelt for the protection of colonial nesting birds from plume hunters and egg poachers. Following suit for much needed wildlife protection, western refuges were established for American bison (1906), elk (1912), prong-horned antelope (1931), and desert bighorn sheep (1936) after over-hunting, competition with cattle, and natural disasters decimated once abundant herds.

National wildlife refuges in the first decades of the 20th century were true sanctuaries. Many were guarded by citizen wardens who protected them from poachers and plume hunters, while visitors were rare: an occasional scientist, photographer, or bird watcher. During the drought conditions of the 1930's "Dust Bowl", breeding populations of ducks and geese plummeted and a waterfowl crisis ensued. The Duck Stamp Act of 1934 provided a much needed stimulus to the System by using hunting license proceeds to establish "Waterfowl Production Areas" to recover breeding populations of waterfowl. As the System grew under the Duck Stamp Act, some refuges were opened to hunting and fishing. Interest in using refuges for other recreation gained popularity with the post-WW II generation of the 1950s. Americans loved to travel the nation's back roads, and there, amidst the hot prairies and plains and the salt marshes of the south, they discovered their National Wildlife Refuge System. In 1951, the first year visitor use records were totaled, refuges hosted 3.4 million people. By the end of that decade, 10 million people visited refuges. Some came to fish and hunt, but most came to share with family and friends the sights and sounds of wildlife and the wonders of the living world. Many came to recreate in other ways: sail, swim, camp, water ski, bicycle, ride horses, sun bathe, and rock climb. Although these lands were dedicated to wildlife conservation, incomplete policies and an uncertain mission resulted in uses that were not always in harmony with a refuge's wildlife conservation purpose. Refuge staff, so well-trained and equipped to manage habitat and wildlife, faced new challenges with the task of managing an eager and active public. The Refuge Recreation Act of 1962 and the Refuge Administration Act of 1966 helped bring refuges together, but both laws were more concerned with how refuges would be used rather than how they should function as a system. This all changed, in 1997, with President Clinton's signing of the National Wildlife Refuge System Improvement Act. The Act established, for the first time, a clear legislative mission of wildlife conservation for the National Wildlife Refuge System.

The mission of the National Wildlife Refuge System (Refuge System), as defined by the National Wildlife Refuge System Improvement Act of 1997 is:

> "...to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife and plant resources and their habitats within the United States for the benefit of present and future generations of Americans."

The wildlife and habitat vision for national wildlife refuges stresses that wildlife comes first; that ecosystems, biodiversity, and wilderness are vital concepts in refuge management; that refuges must be healthy and growth must be strategic; and that the refuge system serves as a model for habitat management with broad participation from others.

Actions were initiated in 1997 to comply with the direction of this new legislation, including an effort to complete comprehensive conservation plans for all refuges. These plans, which are completed with full public involvement, help guide the future management of refuges by establishing natural resources and recreation/education programs. Consistent with this Act, approved plans will serve as the guidelines for refuge management for the next 15 years. The Act states that each refuge shall be managed to:

- Fulfill the mission of the National Wildlife Refuge System;
- Fulfill the individual purposes of each refuge;
- Consider the needs of wildlife first;
- Fulfill requirements of comprehensive conservation plans that are prepared for each unit of the refuge system;
- Maintain the biological integrity, diversity, and environmental health of the refuge system;
- Recognize that wildlife-dependent recreation activities including hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation are legitimate and priority public uses; and
- Allow refuge managers authority to determine compatible public uses.

National wildlife refuges connect visitors to their natural resource heritage and provide them with an understanding and appreciation of fish and wildlife ecology to help them understand their role in the environment. Wildlife-dependent recreation on refuges also generates economic benefits to local communities. According to the report, *Banking on Nature 2004: The Economic Benefits to Local Communities of National Wildlife Refuge Visitation*, approximately 37 million people visited national wildlife refuges in 2004, generating almost $1.4 billion in total economic activity and creating almost 24,000 private sector jobs producing about $454 million in employment income. Additionally, recreational spending on refuges generated nearly $151 million in tax revenue at the local, county, state, and federal level. As the number of visitors grows, significant economic benefits are realized by local communities. In 2001, 82 million people, 16 years and older, fished, hunted, or observed wildlife, generating $108 billion. In a study completed in 2002 on 15 refuges, visitation had grown 36 percent in seven years. At the same time, the number of jobs generated in surrounding communities grew to 120 per refuge, up from 87 jobs in 1995, pouring more than $2.2 million into local economies. The 15 refuges in the study were Chincoteague (Virginia); National Elk (Wyoming); Crab Orchard (Illinois); Eufaula (Alabama); Charles M. Russell (Montana); Umatilla (Oregon); Quivira (Kansas); Mattamuskeet (North Carolina); Upper Souris (North Dakota); San Francisco Bay (California); Laguna Atacosa (Texas); Horicon (Wisconsin); Las Vegas (Nevada); Tule Lake (California); and Tensas River (Louisiana) the same refuges identified for the 1995 study. Other findings also validate the belief that communities near refuges benefit economically. Expenditures on food, lodging, and transportation grew to $6.8 million per refuge, up 31 percent from $5.2 million in 1995. For each federal dollar spent on the Refuge System, surrounding communities benefited with $4.43 in recreation expenditures and $1.42 in job-related income (Caudill and Laughland, unpublished data).

Volunteers continue to be a major contributor to the success of the Refuge System. In 2005, approximately 38,000 refuge volunteers donated more than 1.4 million hours. The value of their service was more than $25 million.

The National Wildlife Refuge System Improvement Act of 1997 stipulates that comprehensive conservation plans be prepared in consultation with adjoining federal, state, and private landowners and that Service develop and implement a process to ensure an opportunity for active public involvement in the preparation and revision (every 15 years) of the CCPs.

All lands of the Refuge System will be managed in accordance with an approved comprehensive conservation plan that will guide management decisions and set forth strategies for achieving refuge unit purposes. Each CCP will be consistent with sound resource management principles, practices, and legal mandates including Service compatibility standards and other Service policies, guidelines, and planning documents (602 FW 1.1).

LEGAL AND POLICY CONTEXT

Administration of national wildlife refuges is guided by the mission and goals of the National Wildlife Refuge System, congressional legislation, presidential executive orders, and international treaties. Policies for management options of refuges are further refined by administrative guidelines established by the Secretary of the Interior and by policy guidelines established by the Director of the Fish and Wildlife Service. Appendix III provides a complete listing of the relevant legal mandates.

Treaties, laws, administrative guidelines, and policy guidelines assist the refuge manager in making decisions pertaining to soil, water, air, flora, fauna, and other natural resources; historical and cultural resources; research; and recreation on refuge lands, providing a framework for cooperation between Archie Carr National Wildlife Refuge and other partners, especially those involved in the Archie Carr Working Group.

Selected legal summaries of treaties and laws relevant to administration of the National Wildlife Refuge System and management of the Archie Carr National Wildlife Refuge are provided in Appendix III.

Lands within the National Wildlife Refuge System are closed to public use unless specifically and legally opened. No refuge use may be allowed unless it is determined to be compatible. A compatible use is a use that, in the sound professional judgment of the refuge manager, will not materially interfere with or detract from the fulfillment of the mission of the refuge system or the purposes of the refuge. All programs and uses must be evaluated based on mandates set forth in the National Wildlife Refuge System Improvement Act. Those mandates are to:

- Contribute to ecosystem goals, as well as refuge purposes and goals;
- Conserve, manage, and restore fish, wildlife, and plant resources and their habitats;
- Monitor the trends of fish, wildlife, and plants;
- Manage and ensure appropriate visitor uses as those uses benefit the conservation of fish and wildlife resources and contribute to the enjoyment of the public; and
- Ensure that visitor activities are compatible with refuge purposes.

The Act further identifies six priority wildlife-dependent recreational uses: hunting, fishing, wildlife observation, wildlife photography, environmental education, and interpretation. As priority public uses of the refuge system they receive priority consideration over other public uses in planning and management.

NATIONAL AND INTERNATIONAL CONSERVATION PLANS AND INITIATIVES

Multiple partnerships have been developed among government and private entities to address the environmental problems affecting regions. A large amount of conservation and protection information defines the role of the refuge at the local, national, international, and ecosystem levels. Conservation initiatives include broad-scale planning and cooperation between affected parties to address declining trends of natural, physical, social, and economic environments. The conservation guidance described below, along with issues, problems, and trends, were reviewed and integrated, where appropriate, into this CCP.

This CCP supports, among others, the Western Hemisphere Shorebird Reserve Network, the North American Bird Conservation Initiative, and the National Oceanic and Atmospheric Administration's (NOAA's) Marine Debris Removal Program.

WESTERN HEMISPHERE MIGRATORY SPECIES INITIATIVE

The Western Hemisphere Migratory Species Initiative (WHMSI) seeks to contribute significantly to the conservation of the migratory species of the Western Hemisphere by strengthening communication and cooperation among nations, international conventions, and civil society and by expanding constituencies and political support. The initiative includes all migratory species, covering taxa as diverse as birds, marine turtles, marine and terrestrial mammals, fishes, and invertebrates. Objectives include, among others, to maintain a compilation of pertinent conservation resources; promote the adoption of best management practices; mitigate primary threats; restore populations of threatened species; facilitate the generation of key information; produce a catalog of areas of importance for migratory species; articulate ongoing and planned conservation efforts; communicate and raise awareness of the ecological, economic and cultural importance of migratory species; and increase the constituency that supports the conservation of migratory species, including through the promotion of local initiatives. The refuge will help contribute toward meeting the objectives outlined in the WHMSI, especially with regard to the conservation of sea turtles.

NORTH AMERICAN BIRD CONSERVATION INITIATIVE

Started in 1999, the North American Bird Conservation Initiative (NABCI) is a coalition of government agencies, private organizations, academic institutions, and private industry leaders in the United States, Canada, and Mexico working to ensure the long-term health of North America's native bird populations by fostering an integrated approach to bird conservation to benefit all birds in all habitats. The four international and national bird initiatives include the North American Waterfowl Management Plan, Partners-in-Flight, Waterbird Conservation for the Americas, and the U.S. Shorebird Conservation Plan. ACNWR plays a part in meeting the bird conservation objectives of the NABCI initiatives.

NORTH AMERICAN WATERFOWL MANAGEMENT PLAN

The North American Waterfowl Management Plan is an international action plan to conserve migratory birds throughout the continent. The plan's goal is to return waterfowl populations to their 1970s levels by conserving wetland and upland habitat. Canada and the United States signed the plan in 1986 in reaction to critically low numbers of waterfowl. Mexico joined in 1994, making it a truly continental effort. The plan is a partnership of federal, provincial, state, and municipal governments; nongovernmental organizations; private companies; and many individuals, all working towards achieving better wetland habitat for the benefit of migratory birds, other wetland-associated species, and people. The plan's projects are international in scope, but implemented at regional levels. These projects contribute to the protection of habitat and wildlife species across the North American landscape.

PARTNERS IN FLIGHT BIRD CONSERVATION PLAN

Managed as part of the Partners in Flight Plan, the South Florida physiographic area represents a scientifically based land bird conservation planning effort that ensures long-term maintenance of healthy populations of native land birds, primarily nongame land birds. Nongame land birds have been vastly underrepresented in conservation efforts, and many are exhibiting significant declines. The Partners in Flight Plan is voluntary and nonregulatory, and focuses on relatively common species in areas where conservation actions can be most effective, rather than the frequent local emphasis on rare and peripheral populations.

U.S. SHOREBIRD CONSERVATION PLAN

The U.S. Shorebird Conservation Plan is a partnership effort throughout the United States to ensure that stable and self-sustaining populations of shorebird species are restored and protected. The Shorebird Plan was developed by a wide range of agencies, organizations, and shorebird experts for separate regions of the country and it identifies conservation goals, critical habitat conservation needs, key research needs, and proposed education and outreach programs to increase awareness of shorebirds and the threats they face.

NORTHERN AMERICAN WATERBIRD CONSERVATION PLAN

The Northern American Waterbird Conservation Plan provides a framework for the conservation and management of 210 species of waterbirds in 29 nations. Threats to waterbird populations include destruction of inland and coastal wetlands, introduced predators and invasive species, pollutants, mortality from fisheries and industries, disturbance, and conflicts arising from abundant species. Particularly important habitats of the southeast region include pelagic areas, marshes, forested wetlands, and barrier and sea island complexes. Fifteen species of waterbirds are federally listed, including breeding populations of wood storks (*Mycteria americana*), Mississippi sandhill cranes (*Grus canadensis pulla*), whooping cranes (*Grus americana*), interior least terns (*Sterna antillarum athalassos*), and gulf coast populations of brown pelicans (*Pelecanus occidentalis*). A key objective of this plan is the standardization of data collection efforts to better recommend effective conservation measures.

NOAA'S MARINE DEBRIS REMOVAL PROGRAM

The National Oceanic and Atmospheric Administration's Marine Debris Program was launched in 2005 after the NOAA's Office of Response and Restoration received a budget line titled "Marine Debris" for $5M. On December 22, 2006, President Bush signed into law the Marine Debris Research, Prevention, and Reduction Act, which legally establishes the NOAA Marine Debris Program. To date, the program has (1) reviewed and inventoried existing debris projects in NOAA; (2) conducted two workshops with internal and external partners focused on the activities and needs of NOAA and the marine debris community; (3) developed a two-year implementation plan; (4) established bi-weekly marine debris meetings with representatives from over ten offices across five NOAA line offices; (5) identified regional coordinators to promote the program's objectives; (6) established an outreach program; and (7) created three competitive grant programs for distributing funds. The refuge can contribute towards the outreach/education goals of this program which aims to reduce injury and mortality to a wide range of marine species.

RELATIONSHIP TO STATE WILDLIFE AGENCY

A provision of the National Wildlife Refuge System Improvement Act of 1997, and subsequent agency policy, is that the Service shall ensure timely and effective cooperation and collaboration with other state fish and game agencies and tribal governments during the course of acquiring and managing refuges. State wildlife management areas and national wildlife refuges provide the foundation for the protection of species, and contribute to the overall health and sustainability of fish and wildlife species in the State of Florida.

For Archie Carr NWR, the state agency partners include the Florida Fish and Wildlife Conservation Commission (FWC); Florida Department of Environmental Protection (FDEP); Florida Division of Forestry (FDOF); and St. Johns River Water Management District (SJRWMD). Management of the state's fish and wildlife is administered by the Florida Fish and Wildlife Conservation Commission and the Florida Department of Environmental Protection. These state agencies are charged with enforcement responsibilities relating to migratory birds, trust species, and fisheries, as well as with management of the state's natural resources. Both FWC and FDEP manage state lands and waters. FWC manages 4.3 million acres (1.7 million ha) of public lands and 220,000 acres (89,030 ha) of private lands for recreation and conservation purposes. FDEP manages 150 state parks covering nearly 600,000 acres (242,811 ha) and 57 coastal and aquatic managed areas, totaling over 5 million acres (2 million ha) of submerged lands and coastal uplands. The SJRWMD is one of Florida's five water management agencies. It is responsible for managing ground and surface water supplies in all or part of 18 counties in northeast and east-central Florida. The SJRWMD owns or manages nearly 700,000 acres (280,000 ha) of land, acquired for the purposes of water management, water supply, and the conservation and protection of water resources. These lands largely consist of wetlands or historically wet areas. Of less acreage, but not of less importance, are upland areas. These areas preserve wetlands, waters, and wildlife and provide critical buffers between rapidly encroaching development and important wetland areas.

Various agencies within the state government have participated in a mix of refuge projects, including the planning process to develop a 15-year management plan for the refuge. The State of Florida's participation and contribution throughout this comprehensive conservation planning process provide for ongoing opportunities and open dialogue to improve the ecological sustainability of fish and wildlife in Florida. An integral part of the comprehensive conservation planning process is integrating common mission objectives, where appropriate.

II. Refuge Overview

INTRODUCTION

While sea turtles are threatened with extinction throughout the world, the Archie Carr NWR hosts the largest nesting population of loggerhead (*Caretta caretta*) and green (*Chelonia mydas*) sea turtles in the U.S., with a quarter of all loggerhead sea turtle nests and a third of all green sea turtle nests. Loggerheads at the refuge annually produce between 8,000 to 21,000 nests (averaging 400-1,000 nests per mile/1.6 km). Green sea turtles at the refuge annually produce between 100 to 4,000 nests and leatherback sea turtles (*Dermochelys coriacea*) annually produce between 1 to 70 nests. Peak nesting totals for green sea turtles have increased over 600% since 1990. Peak nesting totals for leatherbacks have increased over 900% since 1990. Both greens and leatherbacks reached all-time highs in 2007, with over 4,460 green turtle nests and 74 leatherback nests. After 1990, loggerhead nesting totals increased until 1998, but have since decreased, reaching an all-time low in 2007 with 7,905 nests. Overall, loggerhead nesting totals have decreased by 50%. The Archie Carr NWR rivals the beaches of Masirah Island at the Sultanate of Oman as the most important loggerhead nesting beach in the world. About 90% of the world's loggerhead population nests in Florida and Oman. Further, the refuge provides connectivity to the Indian River Lagoon and Pelican Island NWR, which provide very important foraging habitat for juvenile sea turtles.

Encroaching development, increasing pollution, degrading and disappearing habitat, an expanding human population, and the prevalence of invasive exotic species threaten to undermine all refuges. Concurrently, the demand to use refuges in varying ways has increased dramatically, especially in Florida (Lenze 2002) where over 18 million people reside (U.S. Census Bureau 2007) and over 77 million annually visit (Florida Department of Transportation 2006).

Archie Carr NWR is a fragmented, linear refuge located along a 20.5-mile (33-km) stretch of barrier island in southeast Florida (see Figure 2). It includes beaches and dunes, maritime hammock, coastal scrub, mangrove swamps, and borders the most diverse estuary in the U.S. as well as rare, nearshore sabellariid reefs. The refuge partnership contains 45 archaeological sites (including 39 Ais Indian shell middens, four burial mounds, and two historic sites). There are also 12 submerged shipwreck sites in the nearshore waters of the Atlantic Ocean adjacent to the refuge.

REFUGE HISTORY AND PURPOSES

In the early 1970s, Archie F. Carr, Ph.D, recognized the importance of the south Brevard beaches for sea turtle nesting. In 1982, Llewellyn Ehrhart, Ph.D, began rigorous, systematic surveys and studies on loggerhead and green turtle nesting and compiled a compelling database to show that the south Brevard beaches were in fact the highest density nesting beach for loggerheads in the western hemisphere and for green turtles in the U.S. In 1988, the State of Florida approved two acquisition projects (one in Brevard County and one in Indian River County) under the Conservation and Recreation Lands (CARL) program to protect important coastal habitat. In 1988, the U.S. Fish and Wildlife Service, Southeast Region, approved a Preliminary Project Proposal to establish the Sea Turtle National Wildlife Refuge in Brevard and Indian River Counties. In 1989, the proposed refuge was renamed the Archie Carr National Wildlife Refuge in honor of the significant contributions to sea turtle research and conservation by Dr. Archie F. Carr (1909-1987), a world-renowned zoologist, naturalist, and author. The proposed refuge garnered the support of U.S. senators and congressmen, the Governor of the State of Florida, the Boards of County Commissioners from

Brevard and Indian River Counties, and over 100,000 citizens from across the country. In recognition of its global ecological importance and of the exceptional number of sea turtle nests and in response to increasing concern regarding over-exploitation of sea turtles, incidental sea turtle mortality in fishing gear, and loss of sea turtle nesting sites to coastal development, Archie Carr NWR was authorized by Congress in 1989 and established in 1991 "to conserve fish, wildlife, and plants, including those which are listed as endangered species or threatened species" [16 USC §1534 (Endangered Species Act)] and "to protect sea turtle populations and their nesting habitat along the central Atlantic coastline of Florida" (from the Final Environmental Assessment for the Proposed Archie Carr National Wildlife Refuge, August 1990).

Secondary purposes have also been applied to the refuge, as listed:

> "...for the development, advancement, management, conservation, and protection of fish and wildlife resources..." 16 USC §742f(a)(4) "...for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude..." 16 USC §742f(b)(1) (Fish and Wildlife Act of 1956)
>
> "..the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions..." 16 USC §3901(b), 100 STAT. 3583 (Emergency Wetlands Resources Act of 1986)

SPECIAL DESIGNATIONS

The refuge is officially designated a Candidate Marine Protected Area and is located in the Coastal Barrier Resources System.

CANDIDATE MARINE PROTECTED AREA

Internationally recognized for conserving natural, historical, and cultural marine resources, marine protected areas (MPAs) are intended to protect marine species and habitats, while also providing for sustainable recreation, sustainable commercial activities, enhanced research opportunities, and expanded educational opportunities. On December 1, 2000, the refuge was listed as a Candidate MPA, as defined under Executive Order 13158 (signed May 26, 2000). Under this Executive Order, an MPA is defined as "any area of the marine environment that has been reserved by federal, state, territorial, tribal or local laws or regulations to provide lasting protection for part or all of the natural and cultural resources therein". Areas meeting this definition are intended to serve as the building blocks for a national MPA system. Such a system will form a network for addressing marine issues through pooled funding from the mix of MPA entities, shared research, increased available data, and enhanced protection across a system or throughout a species' range. The MPA system is expected to benefit marine species that utilize the refuge, especially sea turtles.

COASTAL BARRIER RESOURCES SYSTEM

The Coastal Barrier Resources Act (CBRA), Public Law 97-348 (96 Stat. 1653; 16 U.S.C. 3501 et seq.), enacted October 18, 1982, designated various undeveloped coastal lands and barrier islands, depicted by specific maps, for inclusion in the Coastal Barrier Resources System (CBRS). The CBRS is a collection of specific units of land and associated aquatic habitats that serve as barriers protecting the Atlantic, Gulf, and Great Lakes coasts. Undeveloped coastal barriers were mapped by the Department of the Interior using specific criteria, and were then enacted by Congress as units of the CBRS. The affected areas are

delineated on maps enacted by Congress and entitled, "John H. Chafee Coastal Barrier Resources System." The CBRS currently includes 585 units, which comprise nearly 1.3 million acres (526,091 ha) of land and associated aquatic habitat. An additional 271 otherwise protected areas are also designated under a category of coastal barriers already held for conservation purposes that include an additional 1.8 million acres (728,434 ha) of land and associated aquatic habitat. Areas so designated are made ineligible for direct or indirect federal financial assistance that might support development, including flood insurance, except for emergency life-saving activities. The CBRA is the essence of free-market natural resource conservation; it in no way regulates how land can be developed, but it instead transfers the full cost from federal taxpayers to the individuals who choose to build.

ECOSYSTEM CONTEXT

Archie Carr NWR spans two Service ecosystems: the Peninsular Florida Ecoregion and the South Florida Ecoregion (Figure 4). The refuge's northern portion (i.e., segments 1-3 in Brevard County) is located within the Peninsular Florida Ecoregion. The vision of the North Florida Ecosystem Management Plan is a working definition of ecosystem management:

> Ecosystem management is an integrated, flexible approach to management of North Florida's biological and physical environments – conducted through the use of tools such as planning, land acquisition, environmental education, regulation, and pollution prevention – designed to maintain, protect, and improve the ecosystem's natural, managed, and human communities.

The goals of the North Florida Ecosystem Management Plan are to:

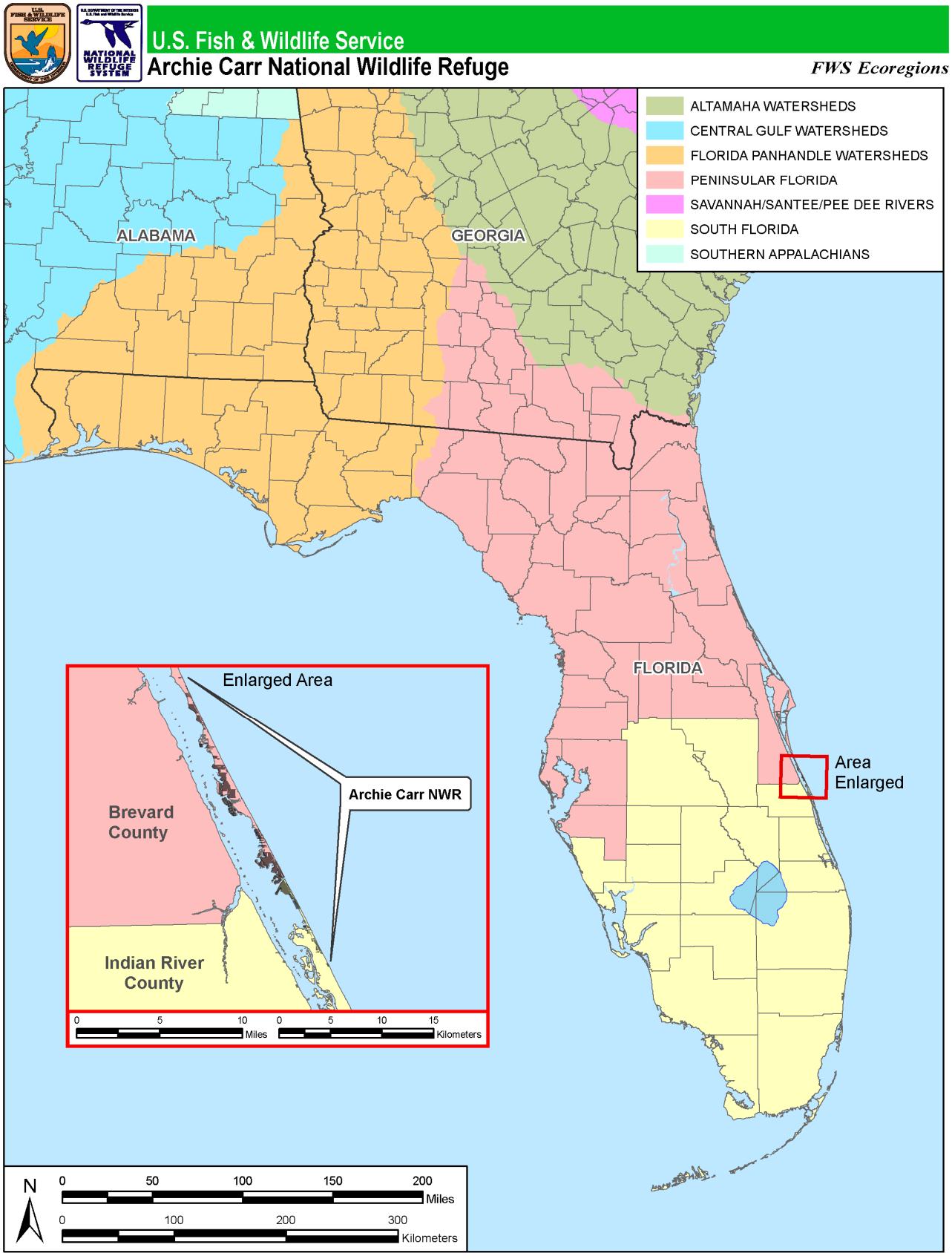
- Protect, conserve, and enhance migratory birds and their habitats in the North Florida Ecosystem;
- Protect, conserve, recover, and restore fish, aquatic species, and their habitats in the North Florida Ecosystem;
- Protect, conserve, and enhance wetlands in the North Florida Ecosystem;
- Protect, conserve, enhance, and recover listed and candidate threatened and endangered species and their habitats; and
- Protect and manage units of the National Wildlife Refuge System and the National Fish Hatchery System.

The southern portion of Archie Carr NWR (i.e., Segment 4 in Indian River County) is located within the South Florida Ecoregion. The seven goals of the South Florida Ecosystem Plan are to:

- Protect and manage National Wildlife Refuge System units and other national interest lands;
- Protect migratory birds and protect, restore, and manage their habitats;
- Protect, restore, and manage candidate, threatened, and endangered species and their habitats;
- Protect, restore, and manage wetlands and other freshwater habitats;
- Protect, manage, and restore fish and other aquatic species, and their habitats;
- Protect, restore, and enhance coastal and estuarine habitats; and
- Protect, restore, and manage for biodiversity.

Archie Carr NWR is a vital component of the Peninsular Florida and South Florida ecoregions, especially with regard to the conservation of sea turtles.

Figure 4. Peninsular Florida and South Florida Ecoregions.



REGIONAL CONSERVATION PLANS AND INITIATIVES

A variety of regional conservation plans and initiatives were reviewed in preparation of this CCP, including recovery plans for federally listed species as well as state and local plans. Other applicable plans, initiatives, and programs include the State Wildlife Action Plan, the St. Johns River Water Management District's Surface Water Improvement and Management Plan, National Estuary Program, the Save Our Coasts Program, Florida Natural Areas Inventory, Preservation 2000, Florida Forever Program, Brevard County's Environmentally Endangered Lands Program, and Indian River County's Environmental Lands Program. Several of these plans address management of conservation lands. Figure 5 shows conservation lands in the vicinity of the refuge.

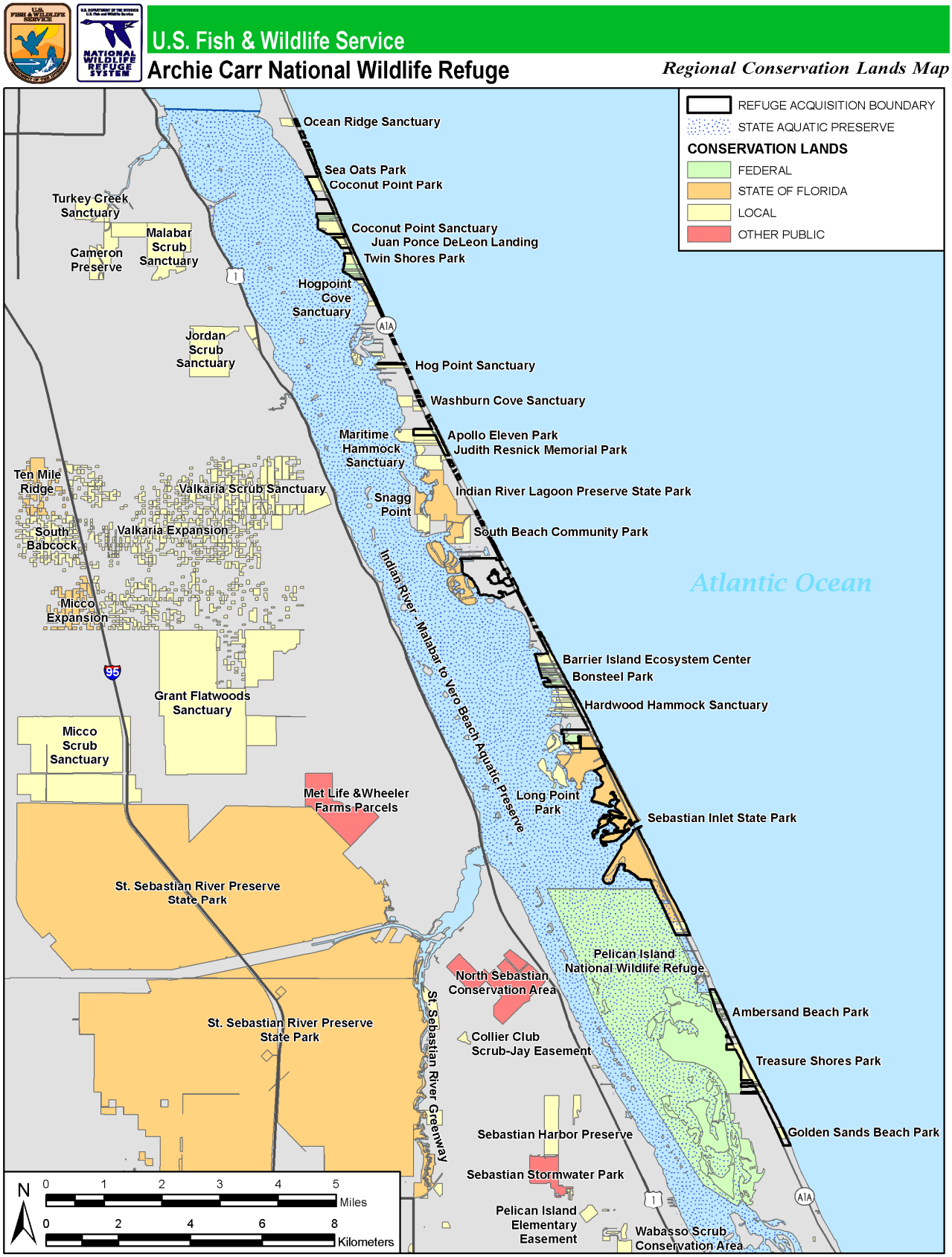
RECOVERY PLANS

Under the Endangered Species Act, the Service and/or National Marine Fisheries Service (NMFS) develop a recovery plan for each federally listed species. Archie Carr NWR is included in the recovery plans for three species: the loggerhead sea turtle, the green sea turtle, and the Southeastern beach mouse (*Peromyscus polionotis nivieventris*). Each recovery plan delineates, justifies, and schedules the research and management actions necessary to support recovery of a species. If successfully undertaken, recovery actions are likely to permit reclassification or delisting of the species. As strategy documents, recovery plans do not commit manpower or funds for recovery actions, nor do they have the legal force of laws and regulations. Instead, they are used in setting regional and national federal conservation priorities for funding and implementation. The recovery plans provided a wealth of information that was used in developing the CCP. The area that encompasses much of Archie Carr NWR was specifically identified in the Loggerhead and Atlantic Green Turtle Recovery Plans (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1991) in terms of its important role in protecting of nesting habitat.

STATE WILDLIFE ACTION PLAN

As a requirement for participating in the federal government's State Wildlife Grants Program, each state and territory has created a Comprehensive Wildlife Conservation Strategy for conservation of a broad array of fish and wildlife. Throughout the development process, the objectives were to identify species of greatest conservation need and their habitats and to develop high-priority conservation actions to abate problems for those species and habitats. These objectives have been developed in a prudent effort to prevent declines before species become imperiled, thereby saving millions of tax dollars. In addition, the matching requirement has encouraged partnerships and cooperation among conservation partners. To meet the intent of the Service's State Wildlife Grants Program, the FWC created Florida's Wildlife Legacy Initiative (Initiative). The goal of the Initiative was to develop a strategic vision for conserving all of Florida's wildlife. Florida's Comprehensive Wildlife Conservation Strategy (FCWCS) was completed and approved in 2005. The FCWCS emphasizes the building of partnerships with other agencies and the private sector, uses a habitat-based conservation approach, incorporates a broad definition of wildlife (to include invertebrates, aquatic species, and other species), and favors nonregulatory methods in its effort to reach conservation goals and objectives, many of which provided useful guidance in developing CCP benchmarks. A variety of species and habitats found on the refuge are listed in the FCWCS as needing special management protection.

Figure 5. Area conservation lands.



SURFACE WATER IMPROVEMENT AND MANAGEMENT PLAN

In the late 1980s, it was determined that Florida had to do more to protect and restore its surface waters. While point sources (sewage and industrial wastes) were being controlled, nonpoint sources (pollutants that enter water bodies in less direct ways) were still a major concern. In 1987, the Florida Legislature created the Surface Water Improvement and Management (SWIM) program to address nonpoint pollutant sources. The SWIM program is the only program that addresses a waterbody's needs as a system of connected resources, rather than isolated wetlands or water bodies. To accomplish this, SWIM meshes across governmental responsibilities, forging important partnerships in water resource management. While the state's five water management districts and the Florida Department of Environmental Protection are directly responsible for the SWIM program, they work in concert with federal, state, and local governments, as well as with the private sector. The Indian River Lagoon (IRL), an estuary that borders the western boundary of the refuge, is on the SWIM waterbody priority list. The St. Johns River Water Management District administers the SWIM Program for the IRL. The undeveloped lands of the refuge contribute to the long-term water quality of the Indian River Lagoon.

NATIONAL ESTUARY PROGRAM

In 1991, the Indian River Lagoon became a part of the National Estuary Program (NEP), which is administered by the U.S. Environmental Protection Agency. The program manager for the IRL NEP is also the St. Johns River Water Management District. Efforts under the IRL program focus on improving water and sediment quality to restore or enhance seagrass and on rehabilitating impacted wetlands to recover as many of their natural functions as possible.

SAVE OUR COASTS PROGRAM

In 1982, the State of Florida established the Save Our Coasts (SOC) program, appropriating $275 million over a decade to purchase beaches and barrier islands. The SOC program was implemented as part of Florida's Land Acquisition Trust Fund Program. Several large tracts were acquired under the SOC program on the barrier islands in Brevard and Indian River counties. These state-owned lands formed the core areas that provided a basis for future land acquisition in the refuge.

FLORIDA NATURAL AREAS INVENTORY

The Florida Natural Areas Inventory (FNAI) is a nonprofit organization dedicated to gathering, interpreting, and disseminating information critical to the conservation of Florida's biological diversity. The FNAI was founded in 1981 as a member of The Nature Conservancy's international network of natural heritage programs. The databases and expertise of FNAI facilitate environmentally sound planning and natural resource management to protect the plants, animals, and communities that represent Florida's natural heritage. The FNAI is the primary source of information on Florida's conservation lands. The inventory's databases include boundaries and statistics for more than 1,600 federal, state, local, and privately managed areas, all provided directly by the managing agencies. The FNAI's databases and project evaluations provided the basis for establishing priorities and boundaries for the Florida Conservation and Recreation Lands (CARL) Program (Preservation 2000).

PRESERVATION 2000

In 1990, the State of Florida took measures designed to conserve significant natural resources that might otherwise be subject to development. The state legislature enacted Preservation 2000, a ten-year, $3 billion statewide program of public land acquisition for natural area conservation and compatible public recreation purposes. Land acquisition and management activities are funded primarily by the Conservation and Recreation Lands Trust Fund. The Archie Carr Sea Turtle Refuge CARL project was designed principally to protect sea turtle nesting habitat. Lands acquired under this project were leased to the refuge. The Maritime Hammock Initiative CARL project was designed to protect several of the best maritime hammocks left, adding to existing conservation areas whenever possible. This project was added to the Archie Carr Sea Turtle Refuge CARL project. Archie Carr NWR complements these state acquisition projects and participates in the management of many of the properties acquired by the state.

FLORIDA FOREVER PROGRAM

The Florida Forever Program, created by the state legislature in 1999, follows in the footsteps of earlier successful land acquisitions programs in the State of Florida by continuing to focus land acquisition efforts in several resource categories: Natural Communities; Forest Resources; Plants; Fish and Wildlife; Fresh Water Supplies; Coastal Resources; Geologic Features; Historical Resources; and Outdoor Recreational Resources.

BREVARD COUNTY ENVIRONMENTALLY ENDANGERED LANDS PROGRAM

The Environmentally Endangered Lands (EEL) Program was established in 1990 to protect the natural habitats of Brevard County by acquiring environmentally sensitive lands for conservation, passive recreation, and environmental education. This was made possible by citizens who voted to tax themselves up to $55 million dollars for the acquisition and maintenance of Brevard County's natural areas. Residents reaffirmed the EEL Program in 2004 under a second referendum to use the same tax that is currently being collected for the Beach and Riverfront Program to protect the natural habitats within Brevard County by the acquisition of environmentally sensitive lands through a willing seller program for the purposes of conservation, passive recreation, and environmental education. The EEL sanctuaries are managed to preserve native habitats and the plants and animals that utilize them. Each sanctuary or management area has a site-specific Comprehensive Management Plan developed by EEL staff and the Selection and Management Committee. The EEL Program strives to maintain a regional approach to managing the EEL Sanctuary Network through the guidance provided in the Sanctuary Management Manual and through management partnerships with local, state, regional, and federal conservation agencies and private-sector conservation programs. The EEL Program adopts and implements an ecosystem approach to environmental management. Ecosystem management is defined as an integrative, flexible approach to the management of natural resources. Key themes of ecosystem management include: adaptive management, partnerships, human influences, values, and holistic approach. Several EEL properties border refuge lands, and EEL has compiled much-needed natural resource data on ACNWR (EEL 1995).

INDIAN RIVER COUNTY ENVIRONMENTAL LANDS PROGRAM

Indian River County adopted objectives and policies in its 1990 Comprehensive Plan that resulted in the establishment of the Indian River County Environmental Lands Program, subsequently funded in 1992 by a $26 million ad valorem tax bond referendum supported by a majority of Indian River County voters. Residents reaffirmed the Environmental Lands Program in 2004 under a second

referendum to authorize the spending of $50 million to protect the natural habitats within Indian River County. The primary purpose and objective of the County Environmental Lands Program is to protect, restore, and sustain endangered ecosystems and associated rare and endangered species in Indian River County. Secondary objectives of the program include provision of public passive recreation; preservation of open space; protection of groundwater quality; provision of flood protection; protection of historic and cultural resources; and general preservation of quality of life.

ECOLOGICAL THREATS AND PROBLEMS

Archie Carr NWR faces numerous threats and various challenges. The major threats include increasing land development, beach armoring, beach lighting, erosion, and the effects of climate change. Climate change may exacerbate shoreline erosion due to rising seas (Doyle et al. 1998; Natural Resources Defense Council 2001; Graeme et al. 2003; Zhang et al. 2004; Fish et al. 2005; Bindoff et al. 2007; Holland and Webster 2007; Nicholls et al. 2007) and an increase in the intensity and frequency of tropical cyclones (Emanuel 1987; Emanuel 2005; Webster et al. 2005; Mann and Emanuel 2006). Issues relating to a growing population are likely to increase, as Brevard and Indian River counties had growth rates of 12.2% and 15.2%, respectively in 2006 (U.S. Census 2007).

Many lands located within the refuge's proposed acquisition boundary have already been developed, predominantly for residential and commercial use. Scrub habitat in the area of the refuge has declined such that only one family of Florida scrub-jays (*Aphelocoma coerulescens*) remains. Much of the foredune, important Southeastern beach mouse habitat, has eroded. As a result of this and other factors, the Southeastern beach mouse population is declining and is near extirpation from the area. Human disturbances are intensifying and include a substantial increase in lighting along the beach, nighttime public use of the beach, commercial and residential development, commercial fishing and shellfishing, recreational boating (including jet skis), additional sea walls and other types of armoring, and elevated nutrient loading and pollution in the waterways. These threaten the protected natural resources located within and benefiting from the refuge, including threatened and endangered species such as the loggerhead sea turtle, green sea turtle, leatherback sea turtle, eastern indigo snake (*Drymarchon corais couperi*), Atlantic salt marsh snake (*Nerodia clarkii taeniata*), Southeastern beach mouse, West Indian manatee (*Trichechus manatus*), Florida scrub-jay, wood stork, and piping plover (*Charadrius melodus*).

PHYSICAL RESOURCES

CLIMATE

The climate of the refuge is subtropical and humid with average annual temperatures in the mid 70°s Fahrenheit (°F) or 20° Celsius (°C), ranging from an average of about 60°F (16°C) in midwinter to about 80°F (27°C) in summer. January is typically the coldest month, with low temperatures averaging 50.7°F (10.4°C) and high temperatures averaging 72.5°F (22.5 °C). Occasionally, winter low temperatures fall several degrees below freezing. Average summer temperatures range from 72°F (22°C) to 90°F (32°C), but may top 100°F (37.7°C). Rainfall averages about 54 inches (in) or 137 centimeters (cm), with 50 to 60 percent of it falling from June to September (Southeast Regional Climate Center 2007). High rainfall may also occur during late summer and early fall in association with tropical storms and hurricanes. Tropical storms and hurricanes have the potential to significantly impact the refuge. High winds exceeding 100 miles per hour (mph) or 161 kilometers per hour (kph) can topple trees and damage infrastructure. Heavy rains can cause flooding and drastically lower the lagoon's salinity. More than 7 in (18 cm) fell in one day during Hurricane Frances in 2004 (NOAA 2007), and following Tropical Storm Fay in August 2008, salinities in the IRL near the refuge fell to 12 part per thousand, potentially damaging seagrass

beds (L. Hall, SJRWMD, pers. comm., 26 Aug 2008). The high waves and storm surge associated with tropical cyclones can severely erode beaches. The official Atlantic hurricane season extends from June 1 through November 30, but storms sometimes develop outside this timeframe.

GEOLOGY AND TOPOGRAPHY

According to Bock et al. (1969), the geology of South Florida presents a picture of a slowly subsiding plateau, warm tropical waters, and a great accumulation of carbonate sediments. The structure of the area is comparatively simple, but very difficult to examine. Almost all that is known is based on cores from oil or artesian well drillings.

The area's geology creates minimal gradients, resulting in sufficient time for the percolation, soil saturation, and slow runoff that occasionally creates the very-poorly defined first-order streams and high-water sheetflow patterns typical of these counties. Where hardpan is present, water moves slowly vertically relative to horizontal movement, through horizons above and below the hardpan layer. Soils can become waterlogged and poorly aerated during the rainy season, which can result in the saturated soils typical of unaltered, undrained mesic pine flatwoods. However, the elevated soils of scrub environments typically remain well drained. During the dry season, high evapotranspiration draws most of the water out of the upper soil horizons, drying them. Soil moisture becomes depleted in the upper soil layers, above the hardpan, and a persistent drought condition frequently prevails through the dry season. As a result, during the dry season, groundwater can be inaccessible for plants that cannot penetrate hardpan (Florida Natural Areas Inventory 1989).

SOILS

The following series comprise most of the soil types found on the refuge: Canaveral-Captive-Palm Beach and McKee-Quartzipamments-St. Augustine (Huckle et al. 1974; Wettstein et al. 1987). With the exception of McKee soils, most of the soils are found in dune habitats and consist of sand and shell fragments, with little organic material. McKee soils are found in tidal areas of the lagoon, especially in the mangrove swamps.

HYDROLOGY

Water Quantity
With the exception of some ditches and mosquito-control impoundments, little surface freshwater exists on the refuge and partner lands. At lower elevations, the water table is high, often at or close to the surface and although many of the soils are sandy and porous, rainwater does not percolate deep into the ground. In dune habitats, soil water can quickly be depleted in the upper layer during very dry conditions.

Water Quality
The waters surrounding the refuge are salt or brackish. Nearshore marine waters are generally of good quality, although toxic algae blooms that kill fish, birds, and other wildlife are believed to be increasing in frequency due to nutrient loading (Anderson et al. 2002). In general, water quality of the IRL has shown improvements during the last decade, with levels of nitrogen, phosphorus, and suspended solids being significantly reduced. However, certain sections of the IRL, including areas near the refuge, are still being impacted by agricultural and urban runoff, as well as by sewage treatment effluents. Reduced salinities and elevated nutrient levels can foster algal blooms, which result in lower dissolved oxygen levels. In addition, elevated levels of suspended solids can smother benthic organisms and create anoxic mucks (SJRWMD 2002).

AIR QUALITY

The air pollutants of major concern in Florida are carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter, and sulfur dioxide (Florida Department of Environmental Protection 1999a). The primary sources of these pollutants are vehicle emissions, power plants, and industrial activities. In 2004, all areas of Florida were air quality attainment areas (Florida Department of Environmental Protection 2004). The Indian River Lagoon area is considered to have good air quality. However, occasional temperature inversions, lasting up to 48 hours, can temporarily degrade local air quality below acceptable levels.

BIOLOGICAL RESOURCES

HABITAT

Major refuge habitats are described in the following section and shown in Figures 6-1 through 6-5. Natural habitat types are covered in the order that they are generally found on refuge and partner lands, beginning at the edge of the Atlantic Ocean and moving inland across the barrier island towards the Indian River Lagoon. Nonnative and anthropogenic habitats are covered last. Table 1 lists the approximate size of each major habitat type on refuge and partner lands. Much of the habitat information presented here is based on descriptions in the Characterization Report for the Archie Carr National Wildlife Refuge (EEL 1995), the 2005 Florida Wildlife Legacy Initiative Comprehensive Wildlife Conservation Strategy, and GIS data provided by the St. Johns Water Management District (FLUCCS 2000 Photointerpretation Key).

Beach and Dunes

Included are the surf zone and beach and dune system.

Surf Zone. This area comprises the narrow strip of sand and shell between tides. Daily flooding by salt water and moderate to high energy waves prohibit plant growth, except for some inconspicuous algae. Mole crabs (*Emerita talpoida*); coquina clams (*Donax* spp.); and other specialized, burrowing invertebrates inhabit these areas and are preyed upon by fish and shorebirds. The surf zone is also an important nursery and feeding habitat for many species of fish, including permit (*Trachinotus falcatus*) and Florida pompano (*T. carolinus*). Additionally, it provides habitat to juvenile sea turtles (particularly greens) that utilize the nearshore Sabellariid worm rock reefs. This habitat is adjacent to refuge properties, but are state-owned and outside the jurisdiction of the Service because refuge boundaries do not extend below the mean high water mark. The National Marine Fisheries Service (NMFS) consults with the state on projects affecting this habitat. The Service coordinates with the NFMS when sea turtle impacts are anticipated.

Beach and Dune. Closest to the coast, the upper beach is regularly disturbed by waves of high tides or storms and regularly recolonized by driftline annuals and trailing perennials, such as railroad vine. Above the reach of annual wave action is the foredune, built by coarse, rhizomatous grasses (primarily sea oats), that thrive under constant burial from sand blown off the beach. Florida beaches are vital nesting sites for five federally listed species of sea turtles: green turtle, hawksbill (*Eretmochelys imbricate*), leatherback, loggerhead, and Kemp's Ridley (*Lepidochelys kempi*). Beaches are also important nesting sites for several species of shorebirds and wintering grounds for others, including the federally listed piping plover. Beaches also support numerous other mammals and invertebrates that depend upon or utilize the beach dune community, such as the federally listed Southeastern beach mouse.

Table 1. Approximate sizes of major habitat types of the refuge's acquisition boundary, Service-owned and managed lands, and partner lands.

Habitat	Acquisition Area (acres / hectares)	FWS Owned or Managed Lands (acres / hectares)	Partner Lands (acres / hectares)
Australian Pine	14.25 / 5.76	-	109.12 / 44.16
Beach and Dunes	100.05 / 40.49	19.20 / 7.77	42.22 / 17.09
Cabbage Palm Hammock	21.79 / 8.82	-	158.54 / 64.16
Citrus Groves	-	-	207.65 / 84.03
Coastal Strand	376.16 / 152.23	122.75 / 49.68	320.65 / 129.76
Developed	212.91 / 86.16	4.99 / 2.02	16.43 / 6.65
Estuaries	169.11 / 68.44	24.52 / 9.92	269.92 / 109.23
Golf Courses	64.78 / 26.21	-	-
Mangrove Swamps	374.51 / 151.56	26.52 / 10.73	632.43 / 255.94
Maritime Hammock	330.35 / 133.69	55.93 / 22.63	398.14 / 161.12
Ocean	9.48 / 3.84	2.17 / 0.88	4.64 / 1.88
Open Field	11.56 / 4.68	0.12 / 0.05	10.64 / 4.31
Park Improvements	76.98 / 31.15	0.02 / 0.01	106.83 / 43.23
Reservoirs/Retention Ponds	7.84 / 3.17	-	6.31 / 2.55
Ruderal	10.21 / 4.13	1.61 / 0.65	34.36 / 13.90
Salt Marsh Ponds	34.86 / 14.11	-	52.98 / 21.44
Salt Water Marshes	9.92 / 4.01	-	14.54 / 5.88
Shrub Wetland	-	-	22.23 / 9.00
Streams and Waterways	2.41 / 0.98	0.22 / 0.09	2.90 / 1.17
Totals	**1,827.16 / 739.42**	**258.04 / 104.43**	**2,410.52 / 975.50**

Beach dunes are mounds of windblown sand that are periodically inundated by seawater during extreme high tides and storms. Vegetation on beach dunes is restricted to a few highly specialized terrestrial plants. The beach dune community is a predominantly herbaceous community of wide-ranging coastal specialists. It occurs on the upper beach and foredune, or first dune above the beach, which is built by perennial rhizomatous grasses growing upward from year to year as they are buried by sand blown inland off the beach. Sea oats (*Uniola paniculata*) are the most commonly encountered dune-builder, a tall coarse grass capable of rapid lateral spread, forming a relatively sparse stand of tillers with internodes up to one foot apart (Wagner 1964). Two less common dune-forming grasses are beach cordgrass (*Spartina patens*) and bitter panicum (*Panicum amarum* var. *amarulum*). Beach sunflower (*Helianthus debilis*), beach tea (*Croton punctatus*), inkberry (*Scaevola plumieri*), and beach elder (*Iva imbricata*) can often be found growing between the widely spaced leaves in a patch of sea oats, along with two less frequent coastal shrubs, sea lavender (*Argusia gnaphalodes*) and bay cedar (*Suriana maritime*).

The upper beach in front of the sea oat foredune is a less stable habitat, being disturbed by seasonal or storm high tides annually or at least every few years. It is colonized by: railroad vines (*Ipomoea pes-caprae*) and beach morning glory (*I. imperati*); low, spreading, halophytic grasses, such as Virginia dropseed (*Sporobolus virginicus*); and driftline annuals, such as sea rocket (*Cakile lanceolata*), saltwort (*Salsola kali*), and sand atriplex (*Atriplex pentandra*) (Johnson and Muller 1993).

Coastal Strand/Scrub

Included with these habitats are shrub and brushland plant communities dominated primarily by wax myrtle (*Myrica cerifera*), saw palmetto (*Serenoa repens*) and occasionally scrub oak (*Quercus* spp.). Dwarf trees and shrubs occur beyond the zone of constant sand burial, kept at a low stature by salt spray which limits growth by inhibiting root and stem development. This coastal strand community is a commonly encountered community occurring landward of the herbaceous dune in long, narrow bands along high-energy shorelines, parallel to the open waters of the ocean. This habitat encompasses dunes as well as areas that may be described as upper beach and coastal rock formations.

Shrub and Brushland. This cover class consists of upland nonagricultural, nonforested uplands with no evidence of cattle grazing. Cover is greater than 67 percent shrub cover and less than 33 percent herbaceous. Native brush and shrubland is considered rangeland, and includes saw palmetto, gallberry, wax myrtle, and coastal scrub plants. Generally, saw palmetto is the most prevalent plant cover intermixed with a wide variety of other woody scrub plant and various types of short herbs and grasses. Coastal scrub vegetation includes pioneer herbs and shrubs composed of sea purslaine (Sesuvium portulacastrum), sea grape (Coccoloba uvifera), and sea oat with no dominant preference. Natural forest regeneration of hardwoods or conifers after clear-cutting or fire occurs in this cover class with tree heights exhibiting growth no greater than 20 feet [6 meters (m)]. Shrub and brushland occur throughout southern Florida rangelands in low, flat transitional landscapes, or in patches throughout urban areas.

Figure 6-1. Land cover, Segment 1.

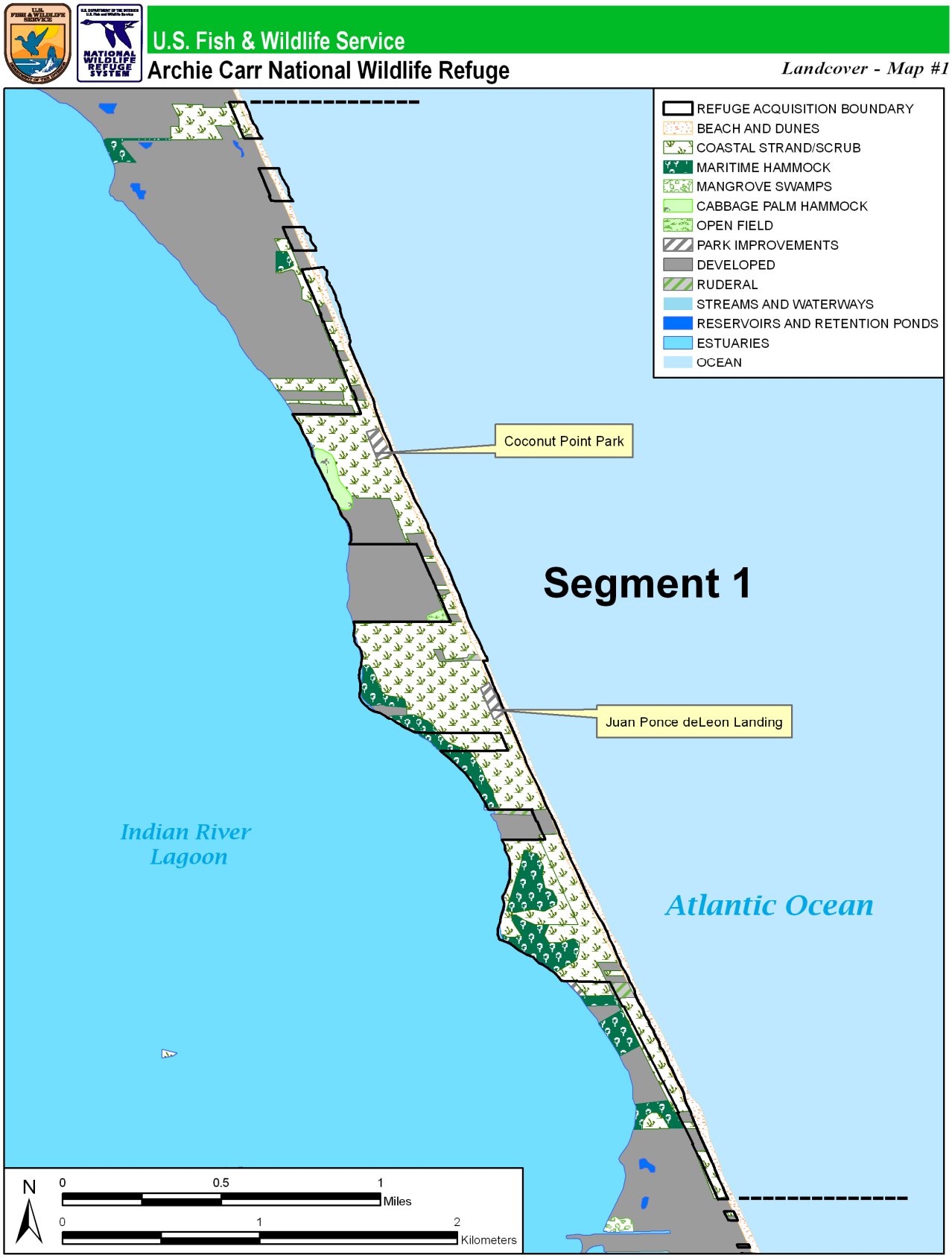


Figure 6-2. Land cover, Segment 2.

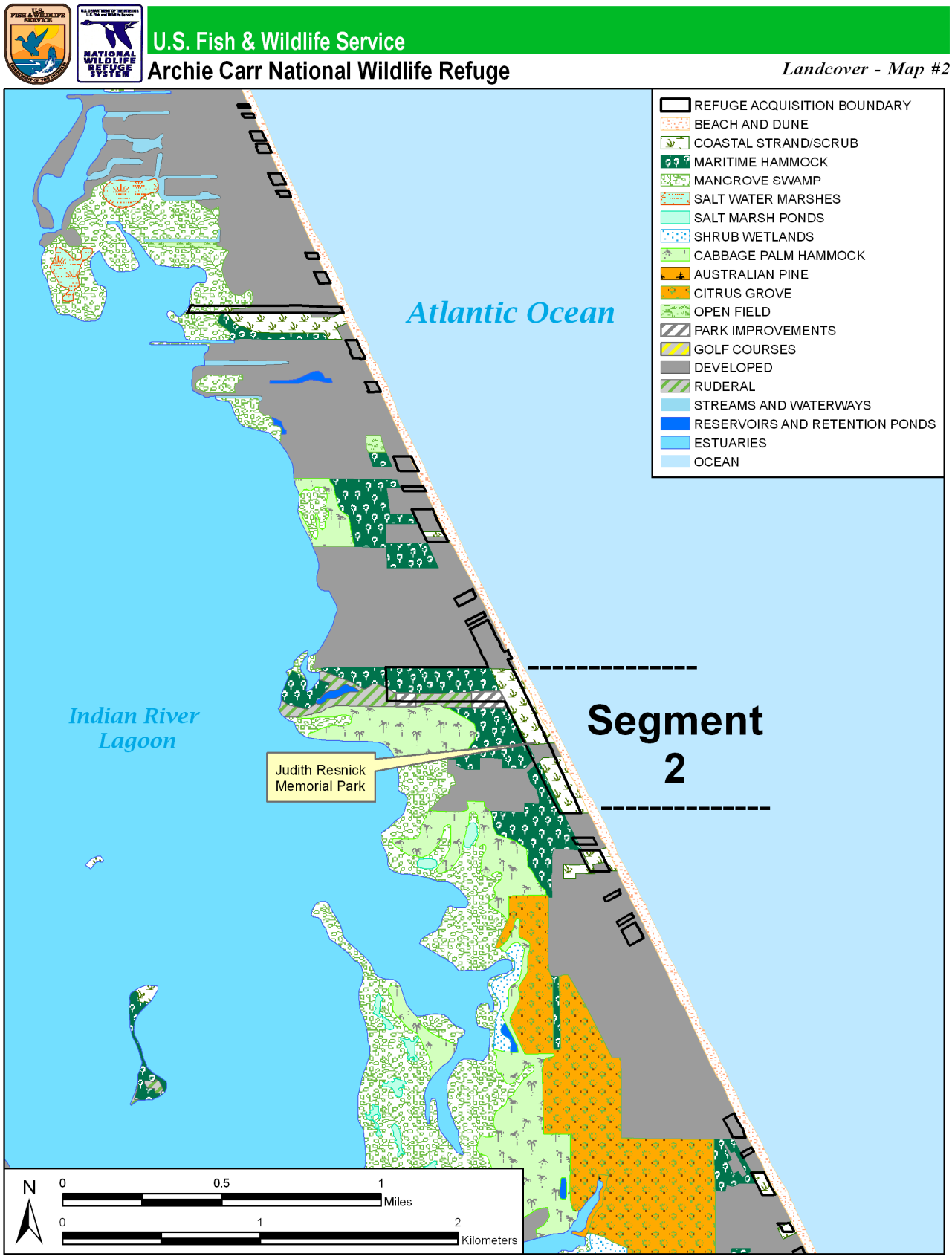


Figure 6-3. Land cover, Segment 3 North.

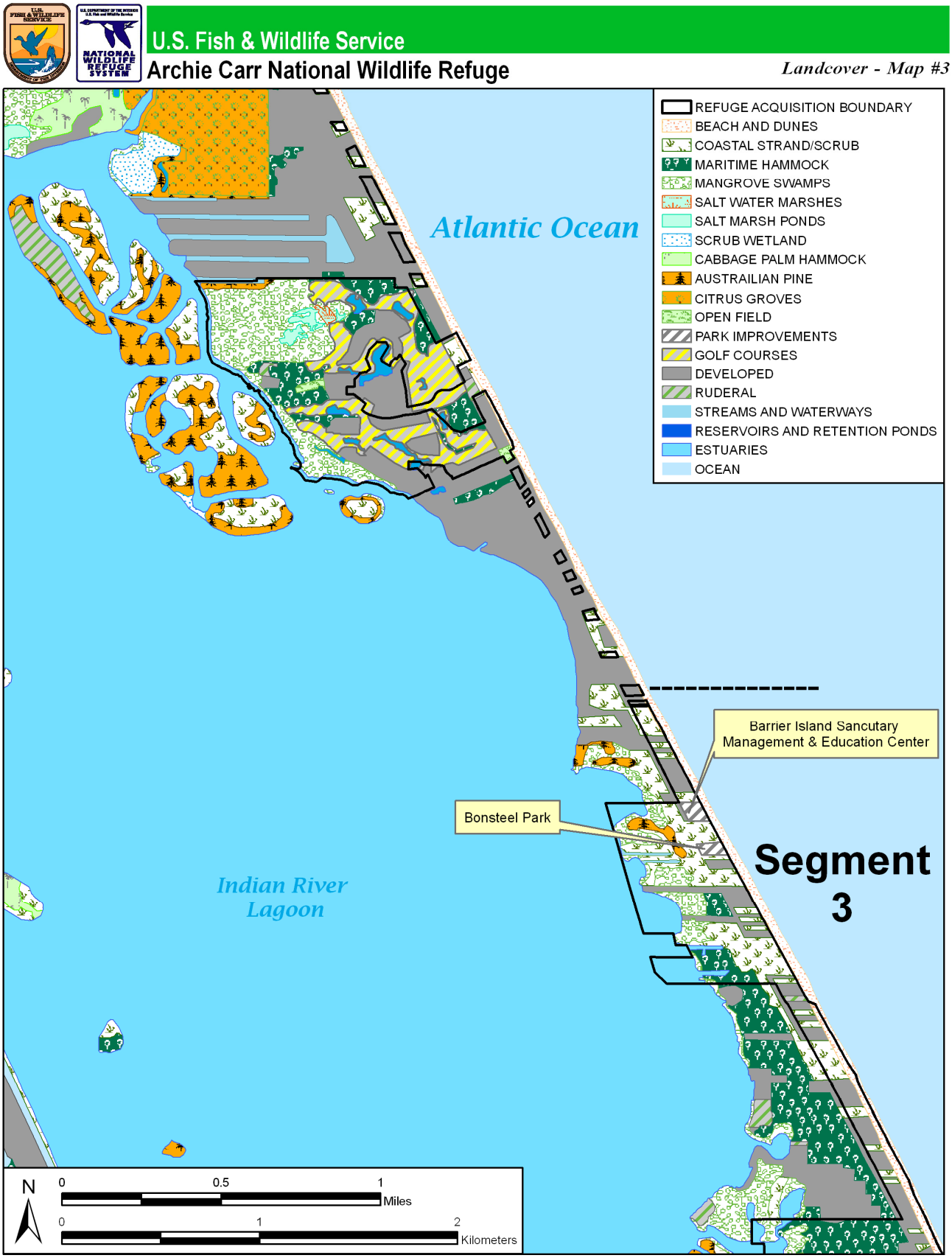


Figure 6-4. Land cover, Segment 3 South.

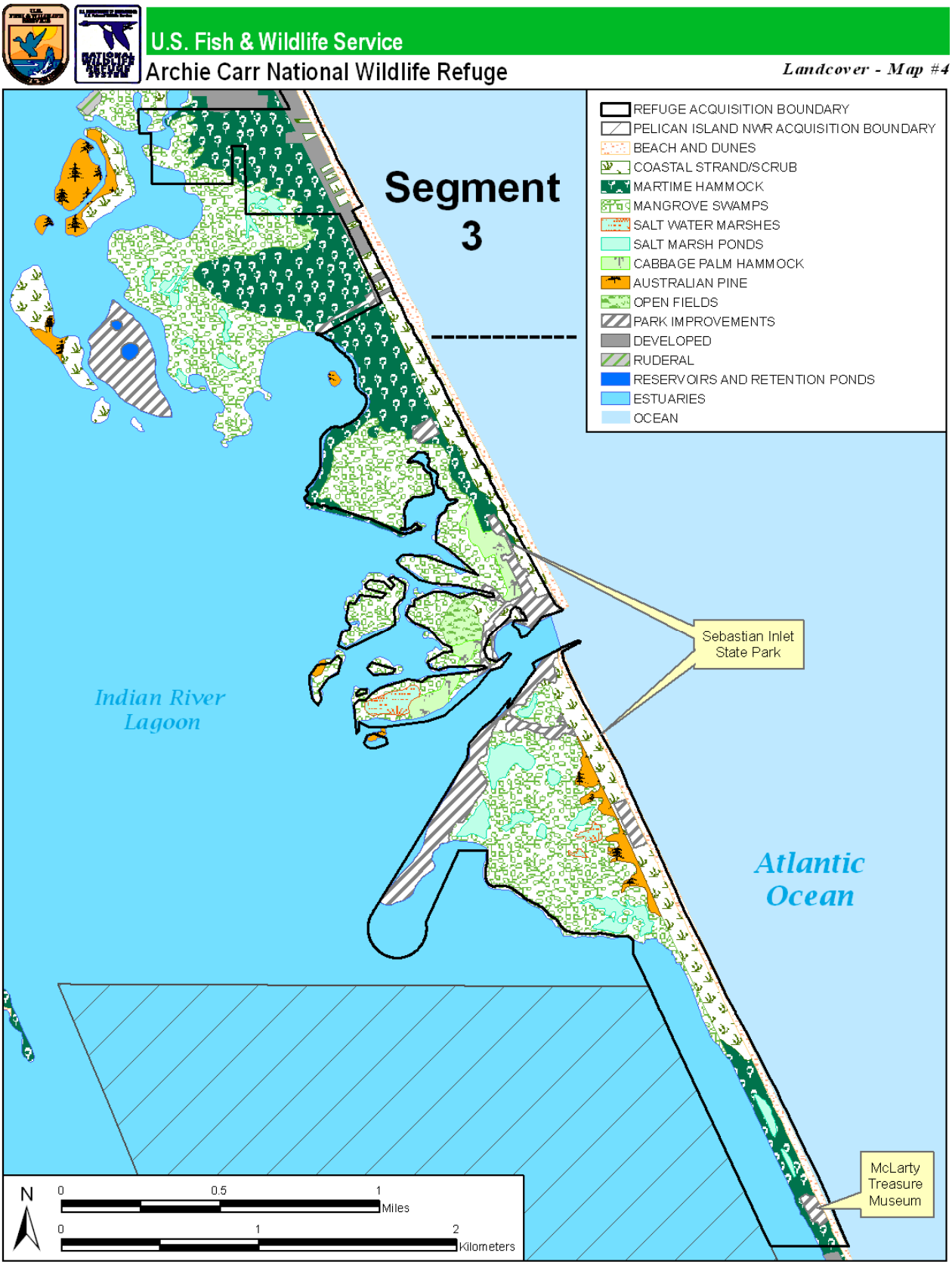
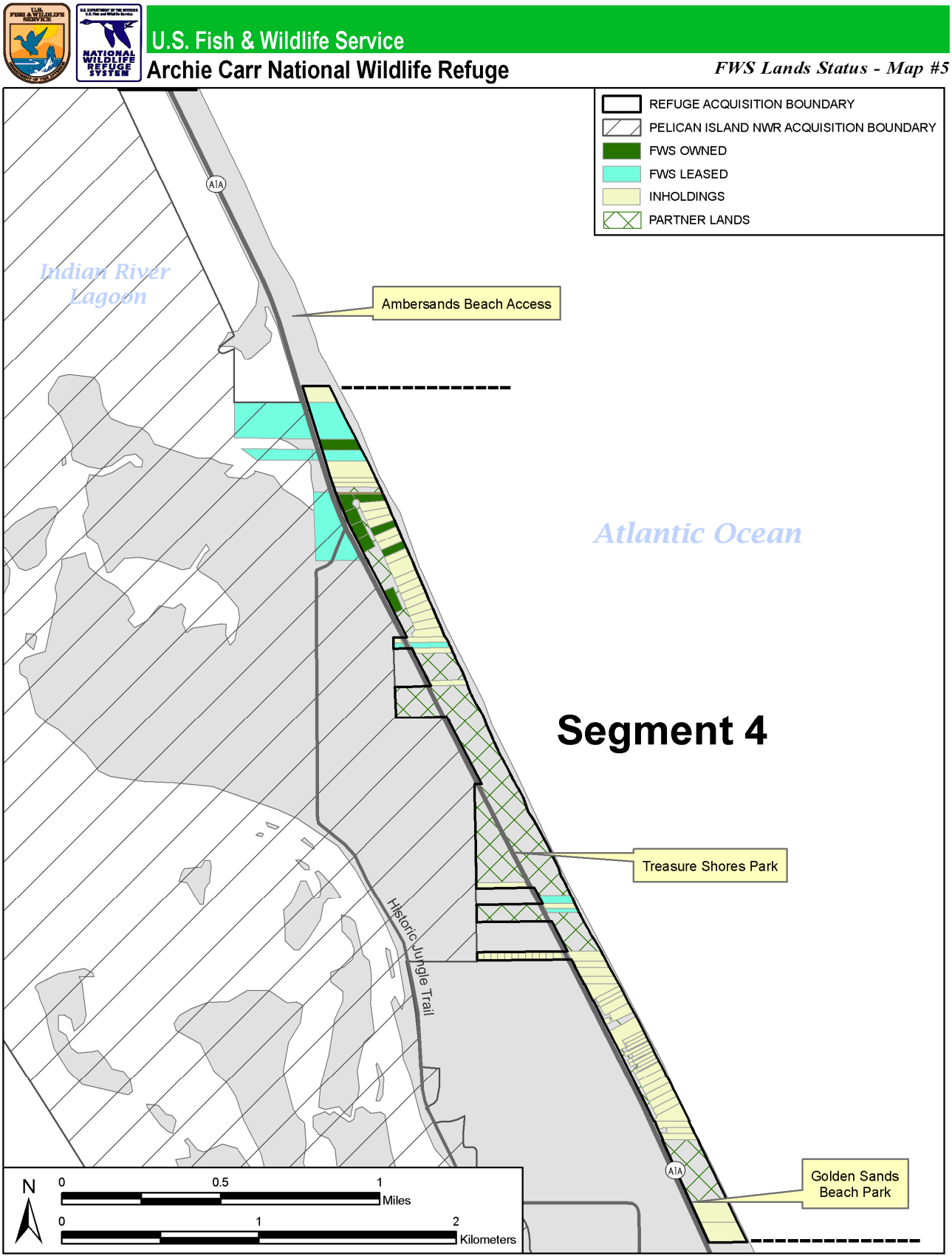


Figure 6-5. Land cover, Segment 4.



Coastal Strand. This habitat occurs on deep, well-drained, sandy soils that are largely wind-deposited and washed or sorted by wave action to some extent. Vegetation in this habitat is strongly affected by wind, wave action, and salt spray and consists of low-growing vines, grasses, and other herbaceous plants and salt-tolerant shrub species that form dense thickets in some cases. Pioneer or early successional herbaceous vegetation characterizes foredune and upper beach areas with a gradual change to woody shrub species on the more protected and stabilized settings farther landward. Typical plant species of coastal strand include beach morning glory, railroad vine, sea oats, saw palmetto, Spanish bayonet (*Yucca aloifolia*), yaupon holly (*Ilex vomitoria*), wax myrtle, sea grape, cocoplum (*Chrysobalanus icaco*), and nickerbean (*Caesalpinia bonduc*), while other more tropical species are present on southern portions of the refuge. Federally listed animal species that are known to utilize the coastal strand community in South Florida include Southeastern beach mouse, eastern indigo snake, and Florida scrub-jay. The state-listed gopher tortoise (*Gopherus polyphemus*) is also found in this community.

Scrub. This habitat typically occurs on areas of deep, well-drained and infertile sandy soils that are typically white or near white. This habitat is fire-dependent, typically maintained by intense, hot fires, optimally occurring at 5 year intervals according to unpublished data from Cape Canaveral Air Force Station and Kennedy Space Center (T. Foster, Dynamac, pers. comm., 8 Jan 2008). Generally, scrub is dominated by evergreen, or nearly evergreen, oaks and/or Florida rosemary (*Ceratiola ericoides*), with or without a pine overstory. A relatively large suite of plants are endemic to scrub and some species of wildlife are endemic or largely restricted to scrub habitat (e.g., Florida scrub-jay). Several types of scrub are recognized: oak scrub; sand pine scrub; rosemary scrub; and scrubby flatwoods. At the refuge, oak scrub exists in small patches distributed on the western side of the barrier island. Oak scrub is a hardwood community typically consisting of clumped patches of low growing oaks interspersed with patches of bare, white sand. Native pines are uncommon or absent. Oak scrub is dominated by myrtle oak (*Q. myrtifolia*), Chapman's oak (*Q. chapmanii*), sand-live oak (*Q. geminate*), inopina oak (*Q. inopina*), scrub holly (*Ilex cumulicola*), scrub plum (*Prunus geniculata*), scrub hickory (*Carya fioridana*), rosemary (*Rosmarinus officinalis*), scrub palmetto (*Sabal etonia*), and saw palmetto. Additionally, temporary wetlands are found in the scrub landscape and are an integral part of scrub habitat, providing breeding and foraging opportunities for wildlife. (Florida's Wildlife Legacy Initiative Comprehensive Wildlife Conservation Strategy, 2005).

Maritime Hammock

This habitat includes upland hardwood forest, upland mixed coniferous/hardwood forest, and xeric oak forests. This cover class is represented by 25-66 percent dominant canopy cover of either hardwoods or conifers or a combination, greater than 20 feet (6 m) tall (FLUCCS 2000 Photointerpretation Key, FDOT 1999).

Maritime hammock habitat includes major upland hardwood and xeric oak associations occurring on fairly rich sandy soils. Variations in species composition and local or spatial distributions of hammock communities are due in part to differences in soil moisture regimes, soil type, and geographic location. Mesic and xeric variations are included in this habitat type. Mesic hammock community represents hammock habitat typically represented in coastal areas. It is considered a climax habitat type in many areas of northern and central Florida. Trees in the xeric oak class are low in height and coverage density with various xeric shrubs and herbs present including wire grasses , bluestem grasses (*Poacea* spp.), saw palmetto, rusty lyonia (*Lyonia lucida*), and prickly pear cactus (*Opuntia* spp.). Xeric oak cover is similar to pine dominated cover classes but for the lack of pine regeneration after historic timber harvests, leaving the xeric oak mid story as the dominant cover class. Xeric oak communities exist on excessively drained infertile soils of former dunes and ridges and commonly occur where old geologic sand dunes occur.

Hammocks at the refuge are low forests [39 to 47 feet (ft)/12 to14 m] of evergreen broadleaved trees found inland from coastal strand communities. The canopy may be composed of live oak, cabbage palm, and red bay (*Persea borbonia*), gumbo limbo, (*Bursera simaruba*), strangler fig (*Ficus aurea*), and seagrape. In south Florida, the understory of maritime hammock is composed primarily of subtropical shrubs and small trees regardless of affinity designation – temperate or subtropical. The structurally diverse understory of woody species includes small trees and tall and short shrubs which do not form clear layers. Commonly encountered species include marlberry (*Ardisia escallonioides*), myrsine (*Rapanea punctata*), Simpson's stopper (*Myrcianthes fragrans*), wild lime (*Zanthoxylum fagara*), Hercules' Club (*Z. clava-herculis*), white stopper (*Eugenia axillaris*), Spanish stopper (*E. foetida*), wild coffee (*Psychotria nervosa*), and saw palmetto (Johnson et al. 1992). Although they share some widespread coastal trees, forests on nearby tropical coasts of the Bahamas, Cuba, and the Yucatan Peninsula do not appear to have the same structure and composition as tropical hammocks in south Florida (Correll and Correll 1982; Sauer 1967; Moreno-Casasola and Espejel 1986), which makes this refuge habitat unique.

Cabbage Palm Hammock/Mixed Wetland Hardwood
Cabbage palm (*Sable palmetto*) hammocks are elevated sites above deeper wetlands and forested depression and are lower than surrounding uplands. Canopy cover is 25-50 percent closure where cabbage palms are the most dominant tree species. These habitat types are dominated by a mixture of broadleaved evergreen and deciduous trees with cabbage palm as the dominant variant. The hammocks are seldom inundated but have saturated soils during much of the year. Soil composition includes sand and organic matter with shallow or outcropping limestone present. Understory vegetation consists of hydrophytic shrubs, grasses, and herbaceous cover including saw palmetto and gallberry (*Ilex glabra*). In the absence of fire or as a result of selective forest management practices, understory or associated species may eventually dominate these sites.

Mixed Wetland Hardwood. This classification includes bottomlands and floodplain communities dominated by hardwoods, willow swamps, and mixed hardwoods where cabbage palms are not a dominant. This cover class may have species mixtures ranging from relatively homogeneous stands dominated by red maple (*Acer rubrum*) or willow (*Salix* spp.) to a wide diversity of different species including black gum (*Nyssa sylvatica*), water oak (*Q. nigra*) sweetgum (*Liquidambar styraciflua*), and cabbage palm. Wetland hardwood forests can occur on a range of different landforms and hydrologic regimes, including floodplains, bottomlands, basins and depressions, lake and coastal fringes, and disturbed wetland areas (FLUCCS 2000 Photointerpretation Key, FDOT 1999).

Mangroves
Mangroves form dense, brackish-water swamps along low-energy shorelines and in protected, tidally-influenced bays of southern Florida. This community type is composed of freeze-sensitive tree species, including red mangrove (*Rhizophora mangle*), black mangrove (*Avicennia germinans*), and white mangrove (*Laguncularia racemosa*). Depending on slopes and amounts of disturbance, mangrove swamps may progress in zones of single species from seaward (red mangrove) to landward (white mangrove) areas. Green buttonwood (*Conocarpus erectus*) usually occurs in areas above high tide. The availability of fresh water and nutrients influences the location, size, structure, and productivity of mangrove communities on the refuge. Fluctuations in sea-level rise along the Florida peninsula can limit the distribution of mangroves, particularly if the rate of sea-level rise exceeds the rate of mangrove forest growth and substrate accretion, and if the landward slopes provide no suitable habitat for forest retreat as sea-level rises (Wanless 1998). Areas with seawalls behind mangrove habitat prevent such shoreline adjustment.

Mangrove forests of South Florida are a vital component of the estuarine and marine environment, providing a major detrital base to organic food chains; important habitat for arboreal, intertidal, and

subtidal organisms, nesting sites, and provide crucial cover and foraging grounds for birds, reptiles, and mammals. The value and central role of mangroves in the ecology of South Florida has been well established by numerous scientific investigations directed at primary productivity, food web interactions, listed species, and support of sport and commercial fisheries (Odum et al. 1982; Nagelkerken et al. 2001). The relationship between mangroves and their associated marine life cannot be overemphasized. The mangrove forests on the refuge provide protected nursery areas for fishes, crustaceans, and shellfish that are important to both commercial and sport fisheries. Mangroves are important in recycling nutrients and the nutrient mass balance of the estuarine ecosystem. They are one of the highest primary and associated secondary biologically productive ecosystems in the world. Mangroves provide one of the basic food chain resources for arboreal life and nearshore marine life through their leaves, wood, roots, and detrital materials. Mangroves also provide important habitat for endangered and threatened species and species of special concern. For several of these species, the habitat is vital to their continued survival. In addition, mangroves serve as storm buffers by functioning as wind breaks and through prop root baffling of wave action. Mangrove roots stabilize shorelines and fine substrates, reducing turbidity and enhancing water clarity. They improve water quality and clarity by filtering upland runoff and trapping waterborne sediments and debris. Unaltered mangroves contribute to the overall natural setting and visual aesthetics of Florida's estuarine waterbodies. Through a combination of the above functions, mangroves contribute significantly to the economy of the coastal counties of South Florida and the State of Florida (Odum et al. 1982; Nagelkerken et al. 2001).

Shrub Wetland
This cover class includes mixed scrub-shrub wetlands dominated by woody vegetation that grows less than 20 feet (6 m) in height, and are commonly found in transitional or disturbed communities on drier sites. Persistent examples of shrub wetlands include shrub bogs and willow swamps.

The cover class is dominated by trees less than 20 feet (6 m) tall. Willows and buttonbush, or shrubby vegetation pioneering historic bayhead communities as a result of fire or human induced disturbance, or dominated by transitional shrubby vegetation such as wax myrtle and saltbush (*Baccharis halimifolia*) at upland margins of wetter community types are typical indicators. The habitat also develops on wet prairie sites which have been protected from fire. Brazilian pepper (*Schinus terebinthifolius*) also occurs in this class when found on wetland sites. Hydrology is similar to that of cypress, hardwood swamp, bayhead, and transitional upland margins (FLUCCS 2000 Photointerpretation Key, FDOT 1999).

Saltwater Marshes
Also called salt marsh, this cover class is represented by wetland communities with a suite of salt-tolerant plants including smooth cordgrass (*Spartina alternaflora*) and black needlerush (*Juncus roemerianus*). Periods or inundation are dictated by tidal fluctuations with landscape positions ranging from estuarine tidal flats to near upland boundaries.

The salt marsh habitat is among the most productive communities in the world. Primary production is greatly affected by soil salinity and tidal frequency. Salt marshes vary in extent and species composition throughout Florida and support diverse local faunas (Florida's Wildlife Legacy Initiative Comprehensive Wildlife Conservation Strategy 2005; FLUCCS 2000 Photointerpretation Key, FDOT 1999). Saltwater marsh (salt marsh) is vegetated almost completely by herbaceous plants, primarily grasses, sedges, and rushes. This community type occurs within the intertidal zone of coastal areas and may be infrequently (high marsh) too frequently (low marsh) inundated by salt or brackish water. Salt marsh develops where wave energies are low and where mangroves are absent. The refuge lies in a zone that represents the southern extent of the salt marsh range, which is one reason why this habitat type is rare. Mangroves may extirpate shade-intolerant marsh species. The size of a salt

marsh depends on the extent of the intertidal zone in which it occurs. Salt marshes of larger sizes are usually dissected by numerous tidal creeks. Areas that have low topographic relief and relatively high tidal ranges are likely to have larger salt marsh extents. Within salt marsh habitats, plant species are often distributed unevenly, especially in transitional areas. Species distributions are affected by biotic and abiotic variables such as elevation, substrate type, slope, wave energy, competing species, and salinity.

Smooth cordgrass typically occupies the lower elevations and is usually adjacent to tidal creeks and pools. Needlerush dominates the slightly less frequently inundated zone. Vegetation at the higher elevations forms transitional areas to uplands and may contain species such as glassworts (*Salicornia virginica*), saltwort (*Batis maritima*), sea ox-eye daises (*Borrichia* spp.), and saltbush (*Baccaris halimifolia*) as well as many poacea (grass) species.

Estuaries (Indian River Lagoon)
This cover class includes bays and estuaries which are non-isolated inlets or arms of the sea that extend into the land, ranging up to 10 nautical miles in width (1.85 to 18.5 kilometers). Bays and estuaries have hydrologic connection to coastal waters (FLUCCS 2000 Photointerpretation Key, FDOT 1999).

Australian Pine
This class is used for upland or wetland Australian pine (*Cassurina equisitifolia*) communities exhibiting greater than 25 percent canopy closure with at least 66 percent dominance by Australian pine. Trees in this cover class average at least 20 feet (6 m) tall. Contrary to its name, this species is actually a hardwood that is also evergreen. Its name is derived from its needle-like leaves and its characteristic cone-shaped crown structure. Australian pine is considered a noxious exotic plant that invades native habitats, outcompeting native plants and provides little to no habitat value for native wildlife. Every effort to eradicate this invasive species should be exercised (FLUCCS 2000 Photointerpretation Key, FDOT 1999).

Citrus Groves
This class is represented by active or abandoned citrus groves, such as oranges, grapefruits, and tangerines. The cover class includes all facilities that are related to the citrus operation or located within the operational boundary of the enterprise (FLUCCS 2000 Photointerpretation Key, FDOT 1999).

Developed Areas
These areas include residential, commercial, community recreational facilities, sewage treatment facilities, institutional uses, electrical power facilities, marinas and fish camps, and water supply plants (FLUCCS 2000 Photointerpretation Key, FDOT 1999).

Golf Courses
The cover class includes all facilities that are involved with the operation of a golf course and associated recreation, including club houses, storage buildings and parking lots. This class does not include adjacent land uses not directly related to recreation including water features and wetlands in and around the courses (FLUCCS 2000 Photointerpretation Key, FDOT 1999).

Open Field
This classification represents herbaceous and mixed, forested and nonforested uplands where shrub cover is less than or equal to 66 percent and herbaceous cover reaches 100 percent. The cover class describes nonforested urban open areas, natural areas where hardwoods and/or conifers are regenerating after fire or clear-cutting, but are less than 20 feet (6 m) tall, or where farming practices

have been abandoned. The habitat is typically found in the margins between marsh and upland forested areas and no dominant overstory species exists (FLUCCS 2000 Photointerpretation Key, FDOT 1999).

Park Improvements
This class covers the operational facilities that make up the active service areas of various outdoor and recreational land uses. The class includes improvements on public parks, such as driveways, parking lots, sidewalks, restrooms, picnic pavilions, kiosks, life guard stations, administration buildings, ranger stations, quarters, guard shacks, campgrounds, trailer pads, play facilities, athletic fields, exhibit areas, swimming pools, monuments and fountains, gardens and other facilities. This class does not include the surrounding open and natural areas, even though they may be associated and/or on the same properties, unless they are an active, accessible part of the operations (FLUCCS 2000 Photointerpretation Key, FDOT 1999).

Reservoirs and Retention Ponds
Reservoirs are artificial impoundments of water, or water bodies that have been significantly modified from the natural state. They are used for irrigation, flood control, municipal and rural water supplies, stormwater treatment, recreation and hydro-electric power generation. They often contain a man-made structure on at least one side of water body. Others may be created wetlands for wildlife. Generally, all or part of the shorelines are straight or regular shapes, and do not appear to follow the surrounding topography. Linear shapes are uncommon (FLUCCS 2000 Photointerpretation Key, FDOT 1999).

Ruderal Areas
These are areas that have been cleared for development, agriculture, demolition, or habitat restoration. Some have no positive indicators of the intended land use. The grounds appear scraped and worked, usually with angular or geometric boundaries. Little to no vegetation exists in these settings or the vegetation is in a state of transition without a stable community structure. Land classes can include reclaimed land, abandoned agricultural lands, open lands, and spoil areas (FLUCCS 2000 Photointerpretation Key, FDOT 1999).

Salt Marsh Ponds
This cover class was created by the St. Johns River Water Management District and is not a Florida Land Use Cover Class category. It is for natural or artificially enclosed areas of open water within saltwater marshes with a minimum mapping unit of 2.0 acres (0.8 ha), an exception to the 0.5-acre (0.2-ha) water standard (FLUCCS 2000 Photointerpretation Key, FDOT 1999).

Streams and Waterways
This category includes rivers, creeks, canals and other linear water bodies that are 30 ft (10 m) or greater in width and includes both natural and modified waterways as well as human made canals and channels (FLUCCS 2000 Photointerpretation Key, FDOT 1999).

WILDLIFE

Habitats on the refuge are utilized by a variety of invertebrate, fish, amphibian, reptile, bird and mammal species as described below. The Brevard County Endangered Lands Program has been a valuable source of information used to generate the species accounts and lists (EEL 1995). A variety of research activities have taken place on the refuge, especially with regard to sea turtles, including reproductive, morphometric, and orientation studies (Ehrhart et al. 1999; Ehrhart et al. 2006; Witherington and Koeppel 2000). The effects of beach armoring, renourishment, and lighting on sea turtles has also been investigated. With regards to mammals, population demographics and monitoring studies have been performed (Weidlich 2002). Several bird studies have been conducted

on the refuge and/or partner lands and have been summarized (Diaz 1994). Occasionally, bird carcasses are sent to various laboratories for histopathology studies; usually in response to die-offs of pelagic birds that wash up on area beaches (P. Tritaik, USFWS, pers. comm., Oct 2007).

Invertebrates

Marine and estuarine invertebrate species that inhabit tidal areas and deeper waters surrounding the refuge number in the thousands. Prominent groups include squid, crabs, shrimp, clams, oysters, sea-slugs, gastropods, worms, and jellyfish. Several invertebrate species have been identified as Species of Greatest Conservation Need for these habitats in Florida's State Wildlife Action Plan (FCWCS). Mangrove swamps and saltwater marshes support several priority crustaceans, such as great land crabs (*Cardisoma guanhumi*), mangrove crabs (*Aratus pisonii* and *Goniopsis cruentata*), mud fiddler crabs (*Uca pugnax*), red-jointed fiddler crabs (*U. minax*), and sand fiddler crabs (*U. pugilator*). Species in beach/surf habitats are ghost crabs (*Ocypode quadrata*) and mole crabs (*Emerita benedicti*). These crustaceans are food sources for other wildlife and some provide other ecologically important functions through their burrowing activities. In addition, several of these species are utilized for human consumption or as bait. One unique invertebrate, the horseshoe crab (*Limulus polyphemus*), is found in the IRL along the western shore of the refuge. This species lays its eggs at the water's edge and provides an important food source for migrating shorebirds. The juveniles and adults are eaten by some sea turtle species, particularly loggerheads. Horseshoe crabs have undergone a dramatic decline due to harvesting for bait and biomedical uses, habitat loss, and pollution (Berkson and Schuster 1999). Several nonnative species are known to have become established in the IRL, including Asian green mussels (*Perna viridis*), striped barnacles (*Balanus amphitrite*), green porcelain crabs (*Petrolisthes armatus*), Australian spotted jellyfish *(Phyllorhiza punctata)*, Charru mussels (*Mytella charruana*), and serrated swimming crabs (*Scylla serrata*).

Terrestrial invertebrates include many species of insects and arachnids, several of which have been identified on the refuge and are listed in Appendix IX, Refuge Biota. Invertebrates are important sources of food for humans and wildlife, and many insect species are essential plant pollinators, including native bees and butterflies. European honey bees (*Apis mellifera*) were used historically in citrus groves and other agricultural areas. Their numbers have been reduced due to removal of citrus groves and the impact of mites. Native sweat, carpenter, and bumble bees (*Bombus* spp.) are also valuable pollinators and are still common. The most common butterflies found at the refuge include great Southern white (*Ascia monuste*), zebra longwing (*Heliconius charitonius*), mangrove skipper (*Phocides pigmalion*), giant swallowtails (*Papilio cresphontes*), and common buckeyes (*Junonia coenia*). Some native insects are important predators, such as the sand tiger beetle (*Cicindela dorsalis media),* which face threats from lighting and beach renourishment (Witherington, pers. comm.). Nonnative insects include red fire ants (*Solenopsis invicta*), which can negatively impact native wildlife, including sea turtle hatchlings. Africanized honey (killer) bees (*Apis mellifera scutellata*) have also been documented near the refuge. Red bay ambrosia beetles (*Xyleborus glabratus*) have recently affected red bay trees and have the potential to cause wide-spread mortality of these and other related trees.

Fishes

A variety of fish species are found in waters in or near the refuge, and over 350 species utilize the Indian River Lagoon during all or part of their life history (Gilmore 1995). Over 200 fish species are known to occur on or adjacent to the refuge and partner lands, including a federally endangered fish species. A smalltooth sawfish (*Pristis pectinata*) was observed in partner waters. In addition, the waters in and around the refuge may support a federal candidate species, Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*), and four NOAA species of concern, including opossum pipefish (*Microphis brachyurus lineatus*), amphibious mangrove killifish (*Kryptolebias marmoratus*), striped croaker (*Bairdiella sanctaeluciae*), and sand tiger shark (*Carcharias taurus*). The waters in and

around the refuge may also support six other fish species listed by the State of Florida, Florida Committee on Rare and Endangered Plants and Animals, or FNAI, including river goby (*Awaous tajasica*), bigmouth sleeper (*Gobiomorus dormitor*), slashcheek goby (*Ctenogobius pseudofasciatus*), spottail goby (*Ctenogobius stigmaturus*), mountain mullet (*Agonostomus monticola*), and common snook (*Centropomus undecimalis*). Fat snook (*Centropomus parallelus*) and tarpon snook (*C. pectinatus*) are included in Florida's Wildlife Legacy Initiative as part of Florida's species of greatest conservation needs. Other fish using the waters adjacent to the refuge include Atlantic tarpon (*Megalops atlanticus*), spotted seatrout (*Cynoscion nebulosus*), flounder (*Paralichthys* spp.), black mullet (*Mugil cephalus*), red and black drum (*Sciaenops ocellatus* and *Pogonias cromis*), ladyfish (*Elops saurus*), Atlantic Spanish mackerel (*Scomberomorus maculates*), and bluefish (*Pomatomus saltatrix*). American eel (*Anguilla rostrata*) occur in the IRL, and this species has been considered for ESA listing by FWS. These fish species are important not only to commercial and recreational interests, but also to the ecology of the area. Although the refuge boundary includes only a small amount of lagoon, it contains mangrove swamps which are important fish nursery areas that must be protected to help ensure healthy, sustainable fish populations. A common nonnative fish species found in the IRL is the blackchin tilapia (*Sarotherodon melanotheron*), while walking catfish (*Clarias batrachus*) and several other nonnative fishes are found in freshwater habitats.

Amphibians

At least nine amphibians have been identified on the refuge and/or partner lands. Frog species include Eastern narrow-mouthed frogs (*Gastrophryne carolinensis*), green treefrogs (*Hyla cinerea*), pig frogs (*Rana grylio*), Southern leopard frogs (*R. utricularia*), and squirrel treefrogs (*H. squirella*). Southern toads (*Bufo terrestris*) and spadefoot toad (*Scaphiopus holbrooki*) have been documented on the refuge. Two nonnative amphibians, Cuban treefrogs (*Osteopilus septentrionalis*) and greenhouse frogs (*Eleutherodactylus planirostris*), are established on the refuge.

Reptiles

Reptile diversity is high on and near the refuge, with at least 35 species of snakes, lizards, turtles and two crocodilians. American alligators (*Alligator mississippiensis)* are infrequently observed in refuge and partner waters, and there is a documented occurrence of an American crocodile *(Crocodylus acutus)* on a beach just north of the refuge. Snakes include corn snakes (*Drymarchon corais*), Eastern coachwhips (*Lampropeltis triangulum elapsoides*), Florida water snakes (*Nerodia clarkii*), Southern black racers (*Cemophora coccinea*), and yellow rat snakes (*Elaphe guttata*). Three venomous snake species are known to occur on the refuge: Eastern coral snakes (*Masticophis flagellum*), Eastern rattlesnakes (*Crotalus adamanteus*), and pygmy rattlesnakes (*Sistrurus miliarius*). A listed snake species, the Eastern indigo, has also been documented on the refuge. Nonnative snake species found on the refuge include the red-tailed boa (*Boa constrictor constrictor*). Several lizard species have been reported on the refuge and include Eastern glass lizards (*Ophisaurus ventralis*), green anoles (*Anolis carolinensis*), ground skinks (*Scincella lateralis*), and six-lined racerunners (*Cnemidophorus sexlineatus*). One-third of the lizards are nonnative: Cuban anoles (*A. sagrei*), Indo-Pacific geckos (*Hemidactylus garnoti*), and Mediterranean geckos (*H. turcicus*).

Most of the turtles on the refuge are aquatic, including four listed marine species: green sea turtles, hawksbills, leatherbacks, and loggerheads. Freshwater turtles include common snapping turtles (*Chelydra serpentina*), Florida soft shell turtles (*Apalone ferox*), Florida red-bellied slider (*Pseudemys nelsoni*), and striped mud turtles (*Kinosternon baurii*). One estuarine species of turtle, the Florida east coast diamondback terrapin (*Malaclemys terrapin Tequesta*), is becoming increasingly rare. Terrestrial species include the gopher tortoise, a state-listed species; the Eastern box turtle (*Terrepene carolina*); and the Florida box turtle *(T. carolina bauri)*.

Mammals
Mammal on the refuge include over 15 terrestrial and marine species. Predators include bobcats (*Lynx rufus*), gray foxes (*Urocyon cinereoargenteus*), raccoons (*Procyon lotor*), spotted skunks (*Spilogale putorius*), river otters *(Lutra canadensis),* and opossums (*Didelphis virginiana*). Eastern cottontail (*Sylvilagus floridanus*), marsh rabbits (*S. palustris*), and gray squirrels (*Sciurus carolinensis*) are medium-sized herbivores. In addition, several small bat and rodent species occupy a variety of habitats throughout the refuge, including the eastern yellow bat (*Lasiurus intermedius*), eastern mole (*Scalopus aquaticus*), short-tailed shrew (*Blarina brevicauda*), least shrew (*Cryptotis parva*), cotton rats (*Sigmodon hispidus*), cotton mice (*Peromyscus gossypinus*), eastern woodrat (*Neotoma floridana*), and the threatened southeastern beach mouse. Two prominent marine mammals that utilize coastal and estuarine areas along the refuge include bottlenose dolphins (*Tursiops truncatus*) and West Indian manatees. Right whales (*Eubalaena glacialis*) can occasionally be observed during their wintering period along the Florida coast. Other whales that frequent the waters offshore and occasionally strand on the beaches at the refuge include the humpback whale (*Megaptera novaeangliae*), short-finned pilot whale (*Globicephala macrorhyncha*), goose-beaked whale (*Ziphius cavirostris*), false killer whale (*Pseudorca crassidens*), sperm whale (*Physeter macrocephalus*), and pygmy sperm whale (*Kogia breviceps*), while the Atlantic spotted dolphin (*Stenella frontalis*) are also present. Other unusual marine mammal strandings include hooded seals. Nonnative mammal species found on the refuge include nine-banded armadillos (*Dasypus novemcinctus*) and black (*Rattus rattus*) and Norway rats (*R. norvegicus*). Raccoons are the primary nuisance native wildlife species on the refuge. They prey on sea turtle eggs and hatchlings, and the refuge operates a program to control nuisance raccoons on the refuge's nesting beaches to reduce the level of depredation on sea turtle nests.

Birds
More than 140 species of birds have been documented on the refuge, almost half of which are priority bird species of Bird Conservation Region 31 (Peninsular Florida) as derived through the Partners In Flight scoring method and the Strategic Wildlife Conservation Strategy (see Appendix IX). The refuge is a stopover point for migratory birds, including neotropical passerines. The many aquatic habitats support a variety of water birds, wading birds, shorebirds, and waterfowl. In addition, several raptors are found on the refuge or use it during their annual migrations. A few nonnative birds breed on the refuge.

Rare, Threatened, and Endangered Species
Rare, threatened, and endangered wildlife species potentially occurring on the refuge are listed in Table 2.

Table 2. Listed wildlife potentially occurring on the refuge.

Scientific Names	Common Names	Agency Status	
		FWC	FWS/NMFS
Mammals			
Peromyscus polionotus niveiventris	Southeastern Beach Mouse	T	T
Trichechus manatus	West Indian Manatee	E	E
Eubalaena glacialis	Right Whale	E	E
Megaptera novaeangliae	Humpback Whale	E	E
Physeter macrocephalus	Sperm Whale	E	E
Birds			
Aphelocoma coerulescens	Florida Scrub-jay	T	T
Charadrius melodus	Piping Plover	T	T
Mycteria americana	Wood Stork	E	E
Haliaeetus leucocephalus	Bald eagle	T	-
Falco peregrinus	Peregrine Falcon	E	-
Falco sparverius paulus	Southeastern American Kestrel	T	-
Sterna antillarum	Least Tern	T	-
Pelecanus occidentalis carolinensis	Eastern Brown Pelican	SSC	-
Haematopus palliatus	American Oystercatcher	SSC	-
Egretta rufescens	Reddish Egret	SSC	-
Egretta caerulea	Little blue Heron	SSC	-
Egretta thula	Snowy Egret	SSC	-
Egretta tricolor	Tricolored Heron	SSC	-
Ajaia ajaja	Roseate Spoonbill	SSC	-
Eudocimus albus	White Ibis	SSC	-
Rynchops niger	Black Skimmer	SSC	-

Scientific Names	Common Names	Agency Status	
		FWC	FWS/NMFS
Reptiles			
Alligator Mississippiensis	American Alligator	SSC	T(S/A)
Crocodylus acutus	American Crocodile	E	T
Caretta caretta	Loggerhead	E	T
Chelonia mydas	Green Turtle	E	E
Dermochelys coriacea	Leatherback	E	E
Lepidochelys kempi	Kemp's Ridley	E	E
Eretmochelys imbricata	Hawksbill	E	E
Gopherus polyphemus	Gopher Tortoise	T	-
Nerodia clarkii taeniata	Atlantic Salt Marsh Snake	T	T
Drymarchon couperi	Eastern Indigo Snake	T	T

Key: E=endangered, T=threatened, T(S/A)= listed due to similarity in appearance of a threatened species (American crocodile), SSC=species of special concern

Scientific Names	Common Names	Agency Status	
		FWC	FWS/NMFS
Fishes			
Pristis pectinata	Smalltooth Sawfish	-	E
Acipenser oxyrinchus oxyrinchus	Atlantic Sturgeon	SSC	C
Kryptolebias marmoratus	Amphibious Mangrove Killifish	SSC	SC
Microphis brachyurus lineatus	Opossum Pipefish	-	SC
Bairdiella sanctaeluciae	Striped Croaker	-	SC
Carcharias taurus	Sand tiger Shark	-	SC
Centropomus undecimalis	Common Snook	SSC	-

Key: E=endangered, T=threatened, T(S/A)= listed due to similarity in appearance of a threatened species (American crocodile), C=candidate, SC=species of concern (NOAA), SSC=species of special concern (FWC)

American Alligator. Historically, alligators were depleted from many parts of their range as a result of market hunting and habitat loss, and 40 years ago the species was nearing extinction in the wild. Subsequently, the alligator was listed as an endangered species in 1967. A combined effort by the U.S. Fish and Wildlife Service and state wildlife agencies in the southeast allowed the species to recover. In 1987, the Service pronounced the American alligator fully recovered. However, in Florida it remains federally listed due to its similarity to the endangered American crocodile (*Crocodylus acutus*) and is additionally protected by state laws. On the refuge, alligators are rarely in the lagoon, and usually inhabit canals and impoundments where salinities are lower. No records exist of them nesting on the refuge.

Eastern Indigo Snake. Eastern indigo snakes were federally protected as threatened under the Endangered Species Act in 1978. Nonvenomous and the largest snake in the U.S., indigos were once common throughout much of the southeastern United States, but their current geographic range is largely restricted to southern Georgia and peninsular Florida. Major factors contributing to their decline include habitat loss, overcollecting, and road kills (Whitecar 1973; USFWS 1982). Gopher tortoise burrows are particularly important to indigo snakes, since they can provide winter shelter and protection from dessication (Jackson and Milstrey 1989). Eastern indigo snakes have large home ranges [48.2 – 114.2 acres/19.5 - 46.2 ha] and use a variety of habitat types (Legare et al. 1998-2002), making it difficult to determine presence at a site or monitor population status.

Gopher Tortoise. Once abundant, gopher tortoises have dwindled to less that 30 percent of their historical population in Florida. Major causes of their decline include loss of habitat, human consumption, road mortality, and disease (Franz and Puckett 2007). Gopher tortoises prefer xeric habitats with an abundance of herbaceous ground cover, an open canopy, and sparse shrub cover (Franz 1986, Florida Fish and Wildlife Conservation Commission 1987, Fernald 1989). These tortoises dig burrows into well-drained sandy soil to prevent desiccation and to regulate body temperatures. The gopher tortoise functions as a keystone species in the scrub habitat of the refuge, so without their presence, many other species would be rare or nonexistent. Burrows are known to provide habitat for up to 81 species of vertebrates and invertebrates, some of which are found on the refuge. Thirty-two commensal vertebrate species use the burrows, including the listed eastern indigo snake, which is previously described. In addition, tortoise dung provides the major food source for many invertebrates, which are subsequent food sources for birds and reptiles (Jackson and Milstrey 1989; Florida Fish and Wildlife Conservation Commission 1987; Fernald 1989). The species' state protection was upgraded from species of special concern to threatened in June 2006. However, it is not federally listed in Florida. Gopher tortoises are most abundant in the scrub and coastal strand habitat in the northern part of the refuge (segment 1), but are also found in smaller numbers throughout the refuge (segments 2-4). The primary threat to gopher tortoises on refuge and partner lands is road related mortality.

Sea Turtles. Five sea turtle species are found in Florida's marine and estuarine waters: green, hawksbill, Kemp's ridley, leatherback, and loggerhead. Sea turtles have declined world-wide due to factors such as human consumption, entrapment in fishing gear, and loss of nesting habitat. In addition, beach front lights can discourage females from nesting and can disorient hatchlings. These aquatic reptiles rarely come on shore, usually only to lay their eggs on the beach, well above the high tide mark. Three species are known to regularly nest on the refuge: green, leatherback, and loggerhead. Hawksbills have been documented on the refuge, but very rarely. Kemp's ridley turtles, the rarest species, have not been documented nesting on the refuge, but are know to have nested in Florida on rare occasions. The refuge is one of the most important nesting areas for the loggerhead sea turtle in the Western Hemisphere, with nesting densities of up to 1,000 nests per mile (1.6 km) having been recorded in some areas. The refuge is also the most important area for green turtle nesting in North America. Approximately 25 percent of all loggerhead and 35 percent of all green turtle nests in the United States occur within the refuge's 20.5-mi (33 km) boundary. Even the leatherback

sea turtle, the largest and one of the rarest of the sea turtles, nests on the refuge in small, but growing, numbers. The refuge's long stretches of quiet, undisturbed sandy beaches, with little or no artificial lighting, are essential to the reproductive success and survival of the 10,000 to 20,000 sea turtles nesting here annually (USFWS 2007a).

The adjacent Indian River Lagoon and Pelican Island NWR provide developmental habitat for juvenile sea turtles, primarily loggerhead and green sea turtles (Mendonca and Ehrhart 1982, Witherington and Ehrhart 1989). The animals using the lagoon tend to reside there for at least several years prior to departure, based on capture sizes and recapture information from the Mosquito Lagoon, located further north on Merritt Island NWR (Provancha et al. 2005). The lagoon provides vast seagrass beds for green turtles to forage and shellfish resources are available for loggerheads.

Bald Eagle. Pre-colonial era population estimates of bald eagles (*Haliaeetus leucocephalus*) are in the hundreds of thousands. Due to hunting, organopesticide use, and habitat destruction the numbers of these large raptors fell to threatened levels in the continental United States of less than 10,000 nesting pairs by the 1950s, and to endangered levels of less than 500 pairs by the early 1960s. Bald eagles were protected by the Endangered Species Act of 1973 and designated as a threatened species in the lower 48 states. Due to a successful recovery effort, the species was delisted in August 2007 (50 CFR Part 17). The bald eagle will continue to be protected by the Bald and Golden Eagle Protection and Migratory Bird Treaty acts. In addition, Florida populations remain designated by the state as threatened under FWC rules. Bald eagles forage on the refuge, but are currently not known to nest there.

Florida Scrub-jay. The Florida scrub-jay is endemic to the scrub habitat of Florida and is genetically and behaviorally different from other scrub-jay species found in the western United States. This species has extremely specific habitat requirements within the scrub, including an open canopy and open understory (Breininger et al. 1998). In order for scrub-jays to persist and flourish, the characteristics of the habitat must fall within a narrow range that is ideally maintained by fire. Florida scrub-jays live year-round in fairly stable territories and mate for life, while the young stay in their natal territory with the family for several years. Its range has been considerably reduced by development and fire-suppression, which has resulted in fragmented distribution of scrub habitat and unsuitable scrub. This species is federally and state-listed as threatened. Only one known scrub-jay family remains on the refuge.

Piping Plover. The Atlantic Coast piping plover population breeds on coastal beaches from Newfoundland to North Carolina (and occasionally in South Carolina) and winters along the Atlantic Coast from North Carolina south, along the Gulf Coast, and in the Caribbean. Major contributors to the decline of this small shorebird are loss and degradation of habitat due to development and shoreline stabilization. In addition, disturbance by humans and pets often reduces the functional suitability of habitat and causes direct and indirect mortality of eggs and chicks. Predation also limits the reproductive success of piping plover at many Atlantic Coast sites, and human activities are exacerbating natural predation. Garbage dumps and other consequences of human development have allowed the populations of certain sea gull species that prey on piping plovers to increase dramatically. The species was designated as threatened in 1986 (USFWS 1996a). Piping plovers are currently not known to breed on the refuge, but utilize it as a migratory stop-over site. Piping plovers have been observed at Sebastian Inlet State Park (DePue, pers. comm.) and in the Brevard County portion of the refuge (Witherington, pers. comm.).

Wood Stork. Since the 1930s, the U.S. breeding population of wood storks has declined from an estimated 20,000 pairs to approximately 10,000 pairs in 1960. Fewer than 5,000 breeding pairs have been documented since 1978, and the species was federally listed as endangered in 1984 (USFWS 1996b). In Florida wood storks have also been designated as endangered by the FWC. The two dominant factors cited in the decline of wood storks are changes in suitable foraging habitat and loss of

preferred breeding sites (Ogden and Patty 1981). Wood storks are large wading birds that use a unique grope-feeding technique (tacto-location) which requires specific water levels and food densities. In addition, wood storks are colonial breeders that form colonies in large cypress or mangroves which limits nest depredation from terrestrial predators. Each of these specific life-history characteristics has been negatively affected by alterations in water regimes and habitat loss, especially in the Everglades where historic wood stork densities were the highest. Presently, wood stork population are believed to be stable or increasing (USFWS 2007b). Although wood storks are not known to breed on the refuge, they utilize the various shallow aquatic habitats available for feeding.

Southeastern Beach Mouse. The threatened Southeastern beach mouse is a habitat specific sub-species of the more common old field mouse (*Peromyscus polionotus*). A study conducted on Merritt Island NWR indicated that Southeastern beach mice prefer open sand habitat with clumps of palmetto and sea grapes, or dense scrub habitat dominated by palmetto, sea grape, and wax myrtle; over seaward habitat with sea oats (Extine and Stout 1987). Research conducted on the ACNWR determined that this species utilized similar habitat as those found on Merritt Island NWR, but also colonized cleared orange groves in an early successional grass/herb stage (Weidlich 2002). Historically, this sub-species ranged from north Florida's Ponce Inlet in Volusia County to south Florida's Hollywood Beach in Broward County. Due to habitat loss and associated human development impacts (e.g., from feral and semiferal house cats). The Southeastern beach mouse has apparently been eliminated from the southern section of its habitat at Jupiter Island, Palm Beach, Lake Worth, Hillsboro Inlet, and Hollywood Beach. Humphrey (1987) sighted only a few small, fragmented populations between Sebastian Inlet and Hutchinson Island. The healthiest populations appear to occur on public lands: Canaveral National Seashore; Merritt Island National Wildlife Refuge; and Cape Canaveral Air Force Station. The species is thought to be largely extirpated from the refuge north of Sebastian Inlet, but it is documented on the dunes at Sebastian Inlet State Park (south of the Inlet) and in old fields at Pelican Island NWR, albeit in small numbers.

West Indian Manatee. West Indian manatee populations have significantly declined due to loss of habitat, poaching, entanglement with fishing gear, and increased boating activity (collisions with watercraft are the major source of mortality in Florida). They have been listed as endangered under the 1972 Marine Mammal Protection Act and Endangered Species Act of 1973. Federal and state recovery efforts have improved conditions for manatees, and in April 2007 the U.S. Fish and Wildlife Service announced that the West Indian manatee population of Florida had rebounded sufficiently to be reviewed for reclassification from federally endangered to threatened. These recommendations are currently under review. In June 2007, the FWC announced the potential state reclassification for the manatee as threatened. However, the manatee remains classified as endangered by the state until the Florida manatee management plans are approved. Manatees forage in seagrass beds of the lagoon bordering the western boundary of the refuge, and utilize Sebastian Inlet to move between the estuary and ocean.

Listed Plants. Two federally listed plant species are potentially found on the refuge and/or partner lands and waters: Johnson's sea grass (*Halophila johnsonii*) and fragrant prickly-apple (*Harrisia fragrans*). In addition, 11 state-listed species have been documented (see Table 3) on the refuge. Most of these historically occupy relatively small ranges due to their habitat specificity and have been negatively affected by coastal development and competition by exotic plants. Two bromeliads (*Tillandsia* spp.) found on the refuge are epiphytes found in a variety of habitats throughout the state. However, they are seriously threatened by an introduced, bromeliad-eating weevil (*Metamasius callizona*).

Table 3. Listed plants potentially occurring on refuge and partner lands.

Scientific Names	Common Names	Agency Status	
		FWS	FDACS
Glandularia maritima	Coastal mock-vervain	-	E
Lantana depressa var. *floridana*	East coast lantana	-	E
Myrcianthes fragrans	Nakedwood	-	T
Opuntia stricta	Shell mound prickly-pear	-	T
Tillandsia fasciculata	Common pine	-	E
Tillandsia utriculata	Giant wild pine; giant air plant	-	E
Harrisia fragrans (Cereus eriophorus var. fragrans)	Fragrant prickly-apple	E	E
Halophila johnsonii	Johnson's seagrass	T	-
Crossopetalum ilicifolium	Christmas berry		E
Asclepias curtissii	Curtis' (Sandhill) milkweed		E
Ophioglossum palmatum	Hand fern	-	E
Chamaesyce cumulicola	Sand dune spurge (coastal dune sandmat)	-	E
Sideroxylon tenax	Tough bumelia	-	E
Tephrosia angustissima curtissii	Curtiss' hoarypea (devil's shoestring)	-	E
Hexalectris spicata	Crested coralroot	-	E
Ernodea littoralis	Beach creeper	-	T
Acrostichum danaefolium	Giant leather fern	-	CE
Encyclia tampensis	Butterfly orchid	-	CE

Key: E=endangered, T= threatened, CE = commercially exploited, FDACS=Florida Department of Agriculture and Consumer Services

Nonnative Species
Species that have established sustaining populations outside their natural range are called exotic or nonnative. Some nonnative species can cause ecological and/or economic damage. South Florida in particular, hosts a large number of nonnative species compared to many other areas of the United States (Simberloff et al. 1997). Nuisance species are native plants and wildlife that, under certain conditions, can negatively affect natural resources, beyond what is considered sustainable for that area. Table 4 lists the nonnative animals and plants documented on the refuge. Nonnative and nuisance plant and animal species have been identified by Service staff and intergovernmental partners as one of the priority management issues facing the refuge

In Florida, almost one-third of the plants occurring in the wild are exotic, and even though a relatively small percentage becomes "weeds," their impacts can be harmful and expensive, especially in natural areas (Langeland and Burks 1998). The Florida Exotic Pest Plant Council maintains a list of Category I invasive exotic plants that are altering native plant communities and Category II invasive exotic plants, those that have increased, but that have not yet altered native plant communities (Florida Exotic Pest Plant Council 2007). The refuge has several Category I and Category II plants (Table 4) that are of management concern. Nonnative plants can negatively affect native plants and animals through competition, altering habitat, and other biological interactions. Once invasive species become established, eradication becomes difficult and long-term management the norm, which is time-consuming and expensive. Infestations of Australian pine and Brazilian pepper on refuge and partner lands are of particular concern.

Table 4. Nonnative species ocurring on the refuge.

Scientific Name	Common Name	Category
Plants		
Abrus precatorius	Rosary pea	I
Agave sisalana	Sisal hemp	II
Andropogon longiberbis	Hairy bluestem	N/A
Asparagus aethiopicus	Asparagus fern	N/A
Carica papaya	Papaya	N/A
Casuarina litorea	Australian pine	I
Catharanthus roseus	Madagascar periwinkle	N/A
Cupaniopsis anacardioides	Carrotwood	I
Dioscorea bulbifera	Air potato	I
Exotheca paniculata	Butterbough	N/A

Scientific Name	Common Name	Category
Imperata cylindric	Cogon grass	I
Kalanchoe pinnata	Life plant	II
Lantana camaera	Lantana	I
Leucaena leucocephala	Lead tree	II
Momordica charantia	Balsam apple	N/A
Panicum maximum	Guinea grass	II
Panicum repens	Torpedo grass	I
Rhynchelytrum repens	Natal grass	I
Salsola kali	Russian thistle	N/A
Sansevieria hyacinthoides	Bowstring hemp	N/A
Scaevola taccada	Beach naupaka	I
Schefflera actinophylla	Umbrella tree	I
Schinus terebinthifolius	Brazilian pepper	I
Sphagneticola trilobata	Wedelia	II
Thespesia populnea	Seaside maho	I
Urochloa distachya	Tropical signal grass	N/A
Vitex trifolia	Simple-leaf chaste tree	II
Wedelia trilobata	Creeping oxeye	II
Animals		
Anolis sagrei	Brown anole	N/A
Dasypus novemcinctus	Nine-banded armadillo	N/A
Felis silvestris catus	Feral cat	N/A

Scientific Name	Common Name	Category
Hemidactylus garnoti	Indo-Pacific gecko	N/A
Hemidactylus turcicus	Mediterranean gecko	N/A
Mus musculus	House mouse	N/A
Rattus norvegicus	Norway rat	N/A
Rattus rattus	Black rat	N/A
Osteopilus septentrionalis	Cuban tree frog	N/A
Eleutherodactylus planirostris	Greenhouse frogs	N/A
Clarias batrachus	Walking catfish	N/A
Sarotherodon melanotheron	Blackchin tilapia	N/A
Solenopsis invicta	Red imported fire ant	N/A
Metamasius callizona	Bromeliad-eating weevil	N/A
Xyleborus glabratus	Asian ambrosia beetle	N/A
Charybdis hellerii	Indo-Pacific crab	N/A
Phyllorhiza punctata	Australian spotted jellyfish	N/A
Mytella charruana	Charru mussel	N/A
Perna viridis	Asian green mussel	N/A
Balanus amphitrite	Striped barnacle	N/A
Petrolisthes armatus	Green porcelain crab	N/A
Scylla serrata	Serrated swimming crabs	N/A
Key: I=shown to cause ecological damage; II=increasing, not yet shown to cause ecological damage		

Nonnative animals can cause negative natural resource impacts through direct mortality to native wildlife and by competition with native wildlife for food resources. Feral house cats (*Felis catus*) are a serious problem on the refuge due to their predatory nature, especially on migratory songbirds and the listed scrub-jay and southeastern beach mouse. The bromeliad-eating weevil threatens two listed bromeliads, and Asian ambrosia beetles have recently infected red bay trees with a fatal fungus (*Ophiostoma sp.*), causing mass mortality (Perna, personal communication, 2007).

CULTURAL RESOURCES

Numerous archaeological and historical sites are within the vicinity of Archie Carr NWR. In the Brevard County portion of the refuge, 27 Ais Indian shell middens, four burial mounds, and six submerged sites are known to exist. The Old Oak Lodge site (8BR1856) is located on private property, but is within the acquisition boundary of the refuge. The Old Oak Lodge site contains an Ais Indian shell midden and burial mound, as well as the site for the historic Oak Lodge. In the Indian River County portion of the refuge, 12 shell middens, six submerged sites, one historic site, and a historic road exist. Sebastian Inlet State Park is the location for the 1715 Spanish Shipwreck Survivors and Salvors Camp (8IR26). The Historic Jungle Trail (8IR121) was the original beach road in Indian River County. Both are listed on the National Register of Historic Places. Eleven other archaeological sites are associated with the adjacent Pelican Island NWR, with Pelican Island itself a National Historic Landmark.

SOCIOECONOMIC ENVIRONMENT

The refuge is located in the Indian River Lagoon region, which was generally unaffected by human activities until the early 1800s. Early activities included growing citrus, harvesting palmetto berries, and growing pineapple. By the late 1800s, commercial fisheries opened up the lagoon's resources. With repeated freezes devastating agricultural crops, cattle grazing increased in the region. Various military facilities were developed in the region during World War II. By the 1960s, the National Aeronautics and Space Administration's (NASA's) space program instigated considerable growth in the area. The modern economy of the Indian River Lagoon is based on tourism and agriculture, as well as on fishing, manufacturing, real estate, services, and government. In the 1990s, citrus was a $2.1 billion industry in the lagoon region (Indian River Lagoon National Estuary Program 1996).

By 2006, Florida's population had soared to 18 million, with 77 percent living in Florida's 35 coastal counties (U.S. Census Bureau 2007). One of the resident counties of the refuge, Brevard, is in the top 10 most populated Florida counties. In 2006, more than 664,000 people lived in the two resident counties of the refuge, and the average growth rate from 2000-2006 in the two counties of the refuge was 12 percent (see Table 5) (U.S. Census Bureau 2007).

Table 5. Population growth of resident counties between 2000-2006.

County	2006 Population	Growth Rate from 2000-2006
Brevard	534,359	10.9%
Indian River	130,100	13.1%
Total	664,459	12%

Populations of nearby cities changed at varying rates from -0.8% to 25.3% between 2000 and 2006 (see Table 6, University of Florida 2006).

Table 6. Population change between 2000-2006 of adjacent cities.

Adjacent City	2006 Population	Percent Population Change 2000-2006	Location in Relation to Refuge
Indialantic	2,961	0.6	Approximately 2 miles north of the refuge
Melbourne	76,742	6.9	Within 15 miles of the refuge
Melbourne Beach	3,308	-0.8	adjacent to the northern edge of the refuge
Palm Bay	96,683	17.9	Within 15 miles of the refuge
Sebastian	21,666	25.3	Within five miles of the refuge
Total	**201,360**	**9.9**	

Population projections through 2015 indicate that the populations in the refuge's home and neighboring counties are expected to grow substantially due to high growth rates (see Table 7) (Lenze 2002). The projected population of the State of Florida is expected to increase by 44 percent from 2000 to 2030 to over 28 million (U.S. Census Bureau 2007). Highest area population growth rates are expected in nearby Osceola County (at 26 percent), followed by Orange County (at 22 percent). Indian River and Brevard counties are projected to grow by 14-15 percent respectively over the 2005 population to nearly 750,000. Orange County is expected to remain the most populated county in the vicinity of the refuge (Lenze 2002).

Table 7. Projected population growth of area counties.

County	2005 Population	2010 Population	2015 Population	Projected Growth (2005)
Brevard	519,100	562,300	599,400	15.5%
Indian River	126,400	136,300	144,000	13.9%
Orange	1,029,500	1,147,100	1,258,800	22.3%
Osceola	202,600	232,100	255,400	26.1%
St. Lucie	217,200	238,000	256,600	18.1%
State of Florida	17,616,400	19,075,600	20,388,600	15.7%

Economic conditions are generally good for the two resident counties of the refuge. While the median household income for Florida in 2004 was $40,900, Brevard County's was $44,248 and Indian River County's was $41,522 (U.S. Census Bureau 2007). While these values are slightly below the national average, it is estimated that in 2004 approximately 9.2 percent of the population of Brevard and Indian River counties lived below the poverty line, which was less than the national poverty rate of 12.7 percent (U.S. Census Bureau 2007). Further, in 2006, the unemployment rates for Brevard and Indian River counties were below the state and national rates at 3.3 percent and 4.2 percent respectively (the State of Florida's rate was 3.3 percent and the U.S.'s rate was 4.6 percent in 2006) (Florida Agency for Workforce Innovation 2007). According to the 2004 Florida Price Level Index, the cost of living in Brevard County was 3.33 percent below the state average and in Indian River County it was 4.19 percent below the state average (University of Florida 2004). In both counties, food costs were above the state average, while healthcare, housing, other goods and services, and transportation costs were below the state average (University of Florida 2004).

The State of Florida is anticipated to reach 20.4 million by 2015 (Lenze 2002) and over 28 million by 2030 (U.S. Census Bureau 2007). The populations of Brevard and Indian River counties continue to be predominantly white (each at 87 percent) and older, with considerable increases in the Hispanic category (U.S. Census Bureau 2007). Brevard County's median age rose to 41.4 years of age with 20 percent aged 65 and older, while Indian River County's median age is 47 with over 29 percent aged 65 and older (U.S. Census Bureau 2007).

The challenges and opportunities represented by projected growth and changes in the population around the refuge include the a rapidly aging population and the subsequent impacts on the economy in terms of available workforce, a weakening per capita income and the impacts of a low labor force participation rate and a weak job mixture (e.g., Brevard County is overly reliant on low-paying retail sector jobs with few higher-paying jobs in other job sectors), the challenge of diversifying the local economy, and the opportunity to capitalize upon strong social and economical conditions (e.g., both counties have low crime rates, low poverty rates, strong job growth, well-educated populations, an attractive climate, and access to the Intracoastal Waterway and the Atlantic Ocean) (Market Street Services, Inc. 2001).

The Indian River Lagoon is renowned for its recreational and ecotourism opportunities and for its world class fishing. The seagrass beds of the Indian River Lagoon act as nursery grounds that support an $800 million dollar industry to the local economy (Apogee 1996). Commercial and sport fishing, tourism, and real estate development are the mainstay in this area. In 1995 residents and tourists valued the Indian River Lagoon at over $733 million, including spending on recreational activities (e.g., rental of fishing boats), commercial fish landings (e.g., seafood sales), and lagoon-front property (e.g., home purchases) (Apogee 1996). [Of this $733 million, access to the resources, valued at $200 million, is not reflected in market transactions (Apogee 1996).] An estimated $54 million was spent on recreational fishing in the lagoon in 1990 with an anticipated escalation to $87 million by 2010 (Milon and Thunberg 1993). Fishing activity in the Indian River Lagoon comprises 50 percent of Florida's east coast catch (Brevard Nature Alliance 2001). Brevard County's Office of Tourism estimated that more than 650,000 anglers fished in these waters in 2001 (Brevard Nature Alliance 2001).

Wildlife viewing has emerged as an important economic value to the State of Florida, generating an estimated $477 million in retail sales in Florida alone from birdwatching (Florida Fish and Wildlife Conservation Commission 2001). The Florida Fish and Wildlife Conservation Commission estimates that the economic impact of wildlife viewing in the State of Florida is nearly $1.8 billion (Harding 2004b) and that out-of-state visitors spend $192 per day on wildlife viewing activities (Harding 2004a). Brevard County pulls in an economic value of over $56 million from wildlife viewing activities (Florida Fish and

Wildlife Conservation Commission 2003). Statewide, birding and associated activities are attracting a substantial dollar amount for Florida. In an effort to further promote this growing trend, the FWC has developed birding calling cards that visitors can leave at area businesses that state they have come to that community specifically to birdwatch. The FWC also developed the Great Florida Birding Trail, a 2000-mile trail that links bird watching sites in Florida. The Indian River Lagoon region has over 40 Great Florida Birding Trail sites. Two trails on the refuge are within the Great Florida Bird Trail system.

REFUGE ADMINISTRATION AND MANAGEMENT

The establishment of Archie Carr National Wildlife Refuge was made possible by a multiagency land acquisition and conservation partnership. State and local governments participated by adding on to the protected areas of the refuge to include the last remaining high-quality natural areas of the barrier island ecosystem. Partners in the land acquisition effort include the U.S. Fish and Wildlife Service, the Florida Department of Environmental Protection, Brevard County, Indian River County, the Richard King Mellon Foundation, The Conservation Fund, and The Nature Conservancy. Coordination efforts have been enhanced by the formation of the Archie Carr Working Group, which is composed of representatives from numerous agencies and organizations and the local community. The members of this Working Group have a diversity of interests and objectives, but share a common vision of protecting this globally important area (DeFreese 1998).

The headquarters office for both the Archie Carr and Pelican Island national wildlife refuges is currently co-located with the South Florida Ecological Services Field Office in Vero Beach, Florida.

LAND PROTECTION AND CONSERVATION

Public ownership in and around Archie Carr NWR reaches beyond the U.S. Fish and Wildlife Service and includes the State of Florida, Brevard County, and Indian River County. In response to the substantial development pressures experienced by this area, these governmental entities participated in a coordinated land acquisition effort, which has resulted in the purchase of approximately 1,324.77 acres (536.12 ha) within the refuge's acquisition boundary and 2,668.56 acres (1,079.93 ha) within the larger Archie Carr Refuge partnership (as of 2007). Figures 7-1 through 7-5 outline the land status of the refuge. Of these lands, the Service owns 183.05 acres (77.08 ha) and leases 75.00 acres (30.35 ha) from the state (for a total of 258.05 acres/104.43 ha). To further the goals of this land acquisition effort, the Richard King Mellon Foundation also purchased lands within the area of Archie Carr NWR and then donated them to the Service, Brevard County, and Hubbs-SeaWorld Research Institute. To date, the Richard King Mellon Foundation has donated 231 acres (93 ha) to the various entities, including 127 acres (51 ha) to the Service.

Figure 7-1. Land status for Archie Carr NWR, Segment 1.

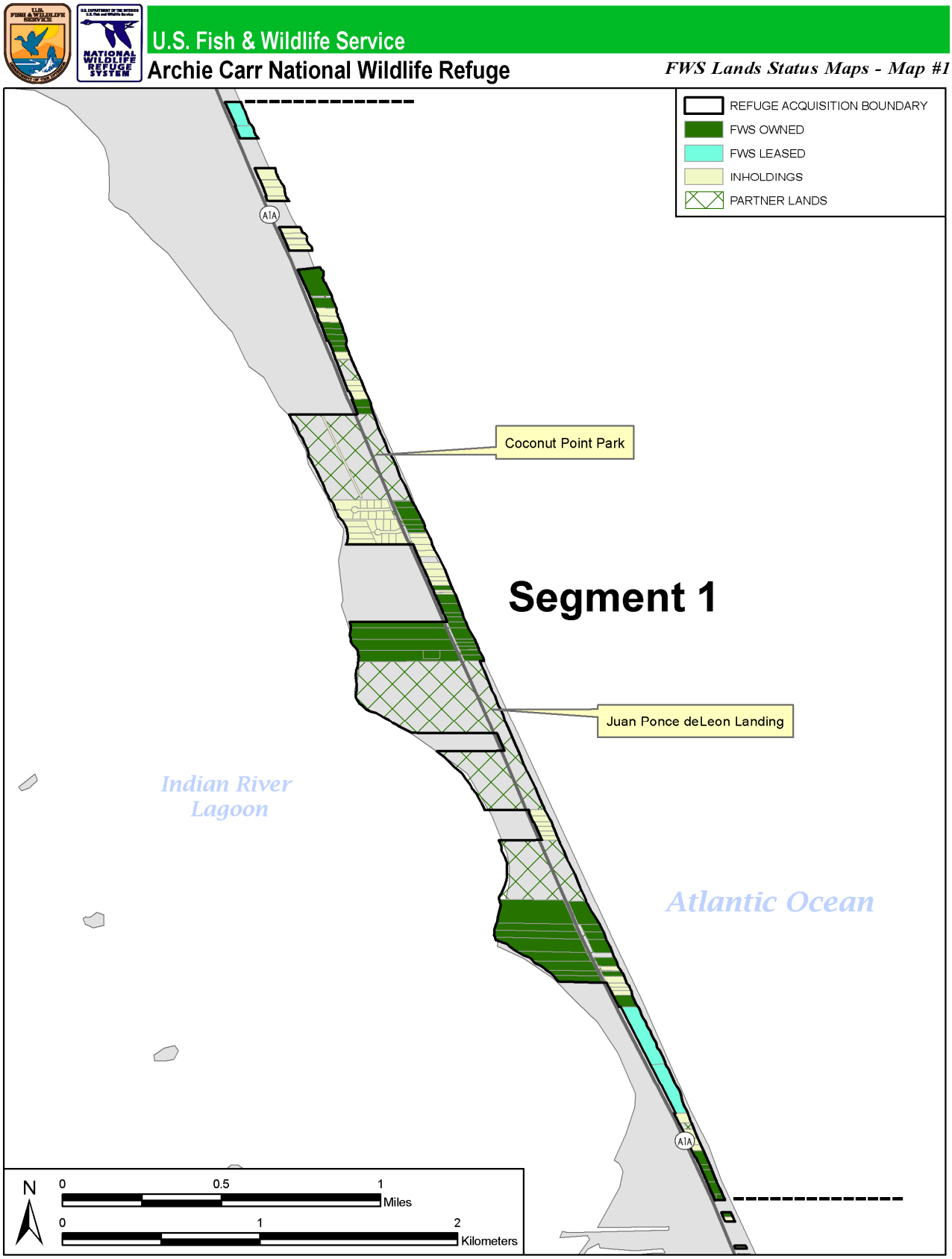


Figure 7-2. Land status for Archie Carr NWR, Segment 2.

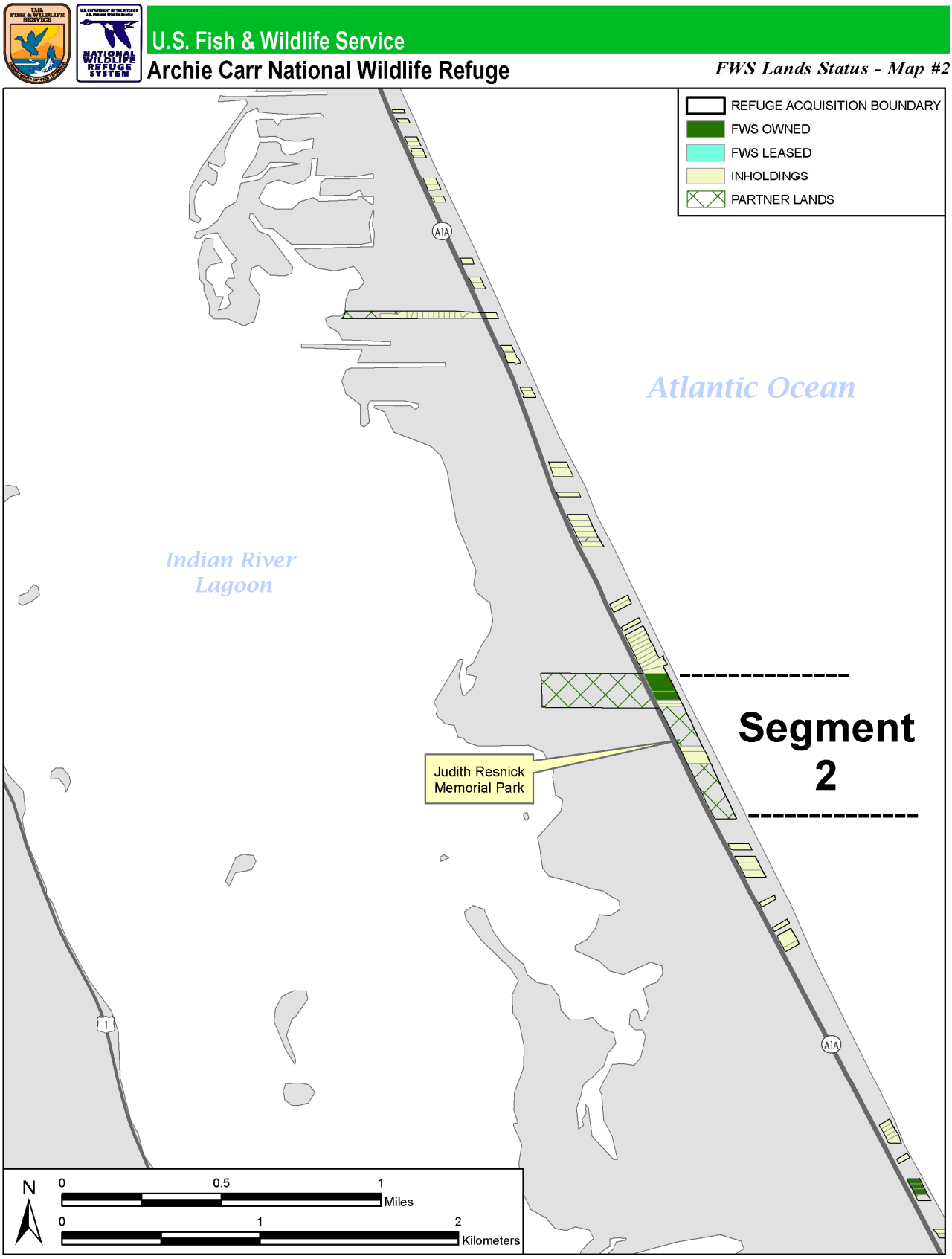


Figure 7-3. Land status for Archie Carr NWR, Segment 3 North.

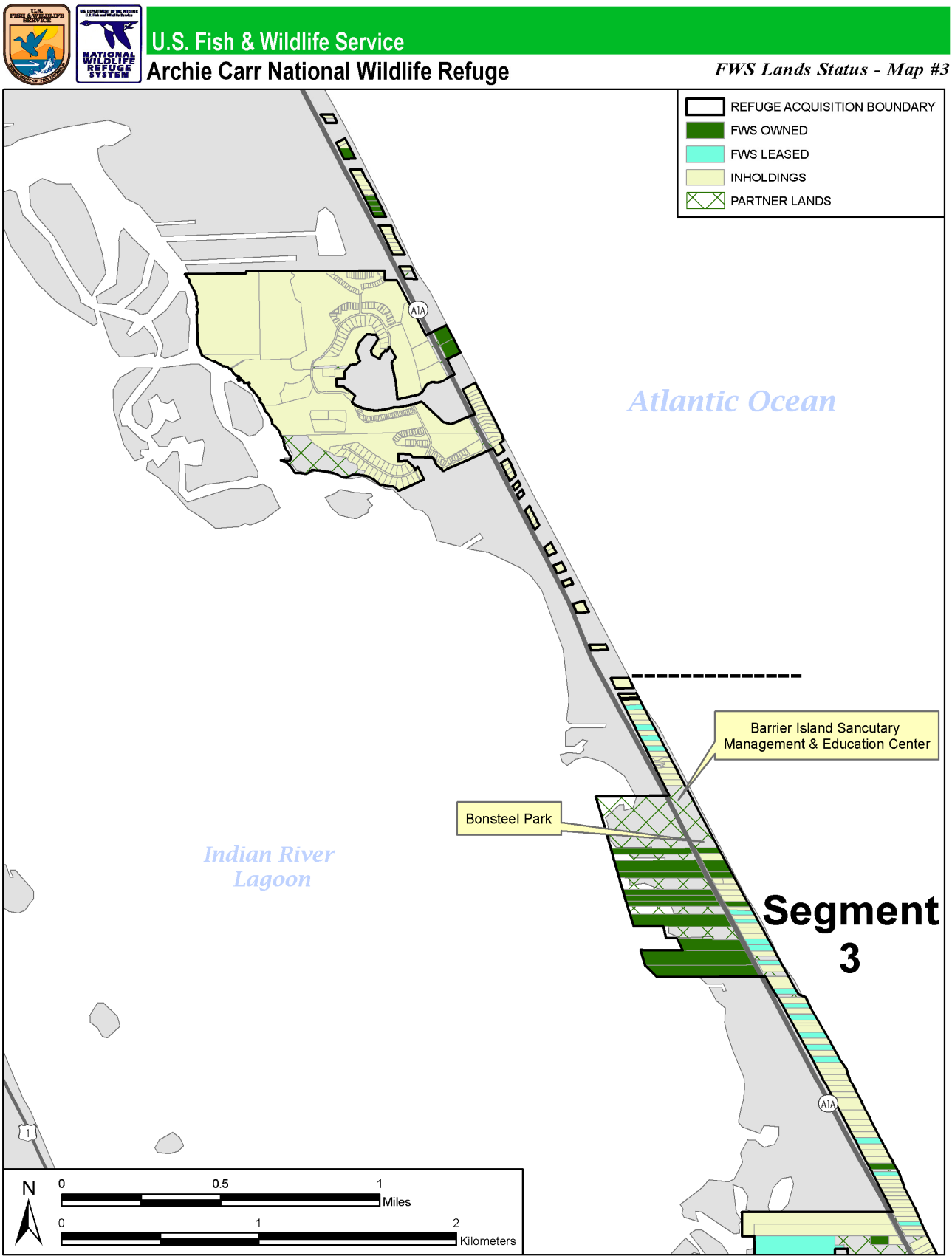


Figure 7-4. Land status for Archie Carr NWR, Segment 3 South.

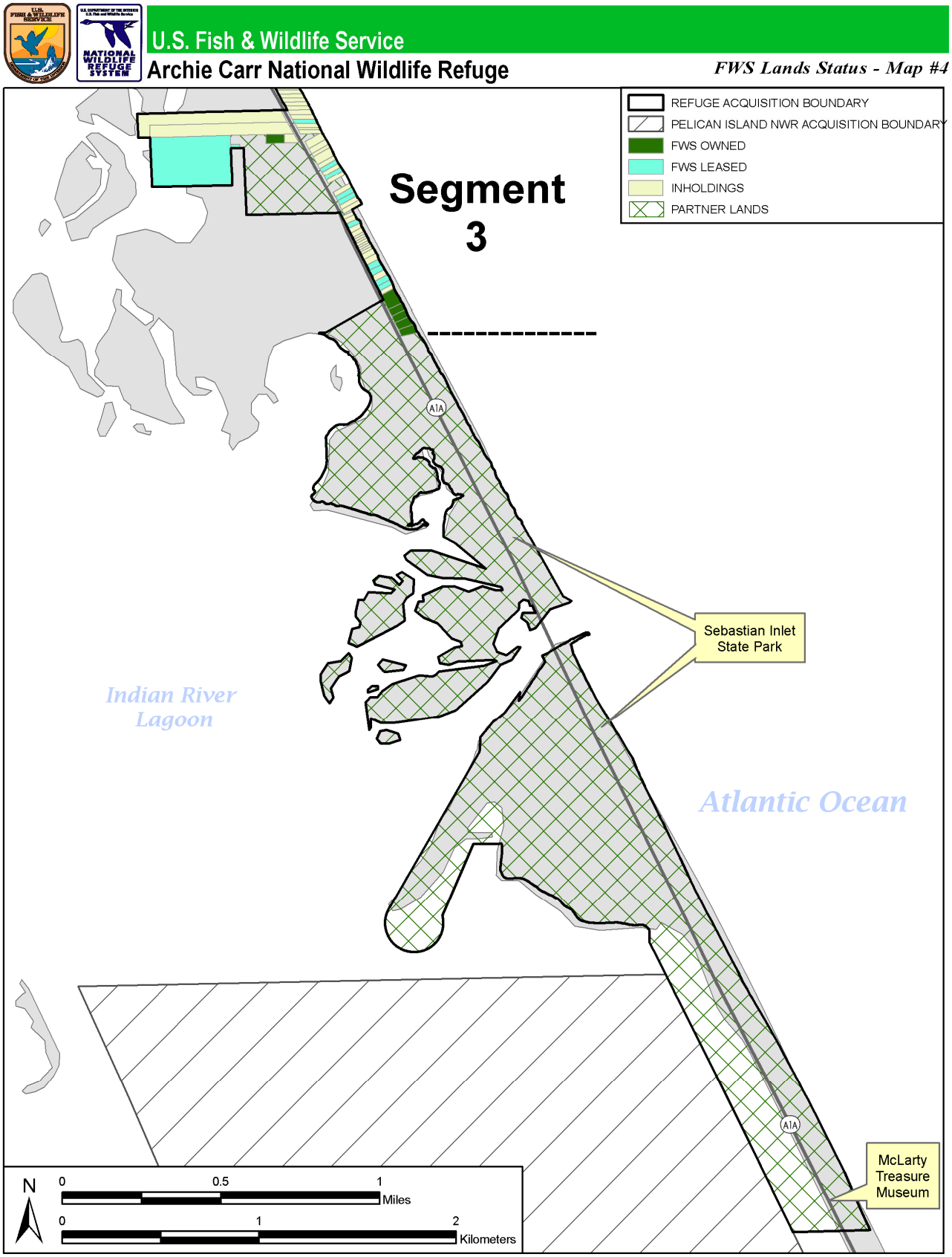
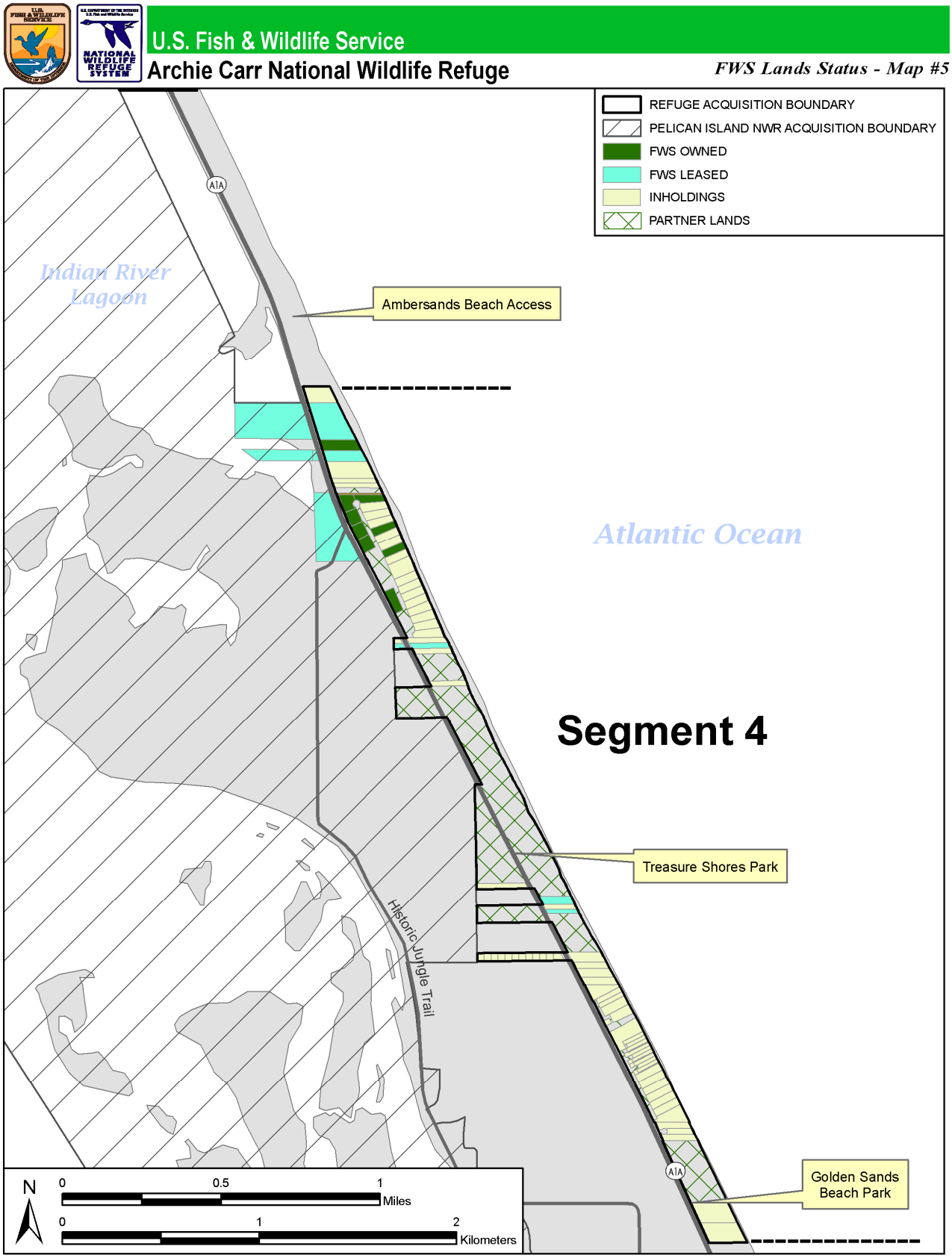


Figure 7-5. Land status for Archie Carr NWR, Segment 4.



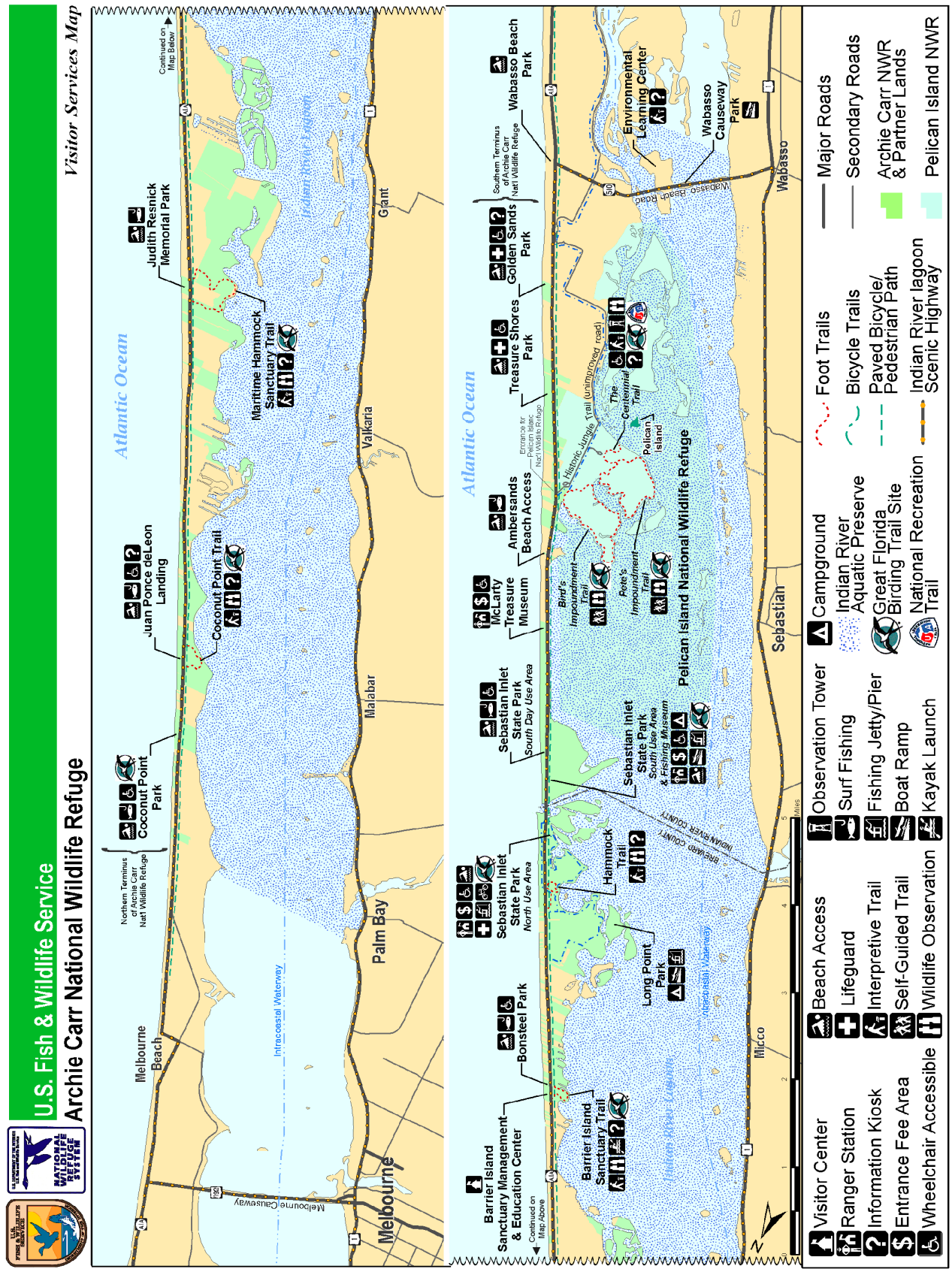
The existing land and water management partners in the Archie Carr NWR area include: the State of Florida (e.g., Department of Environmental Protection [FDEP] – Florida Park Service, Division of State Lands, Bureau of Beaches and Coastal Systems, and Office of Coastal and Aquatic Managed Areas; Florida Fish and Wildlife Conservation Commission (FWC) – Imperiled Species Management Section; and St. Johns River Water Management District); Brevard County (e.g., Environmentally Endangered Lands Program, Parks and Recreation Department, Natural Resources Management Office, and Brevard County Mosquito Control); and Indian River County (e.g., Parks Division, Coastal Engineering Section, Environmental Planning Section, and Indian River Mosquito Control). Research partners include FWC – Fish and Wildlife Research Institute, the University of Central Florida (UCF), the University of Florida (UF), Florida Institute of Technology (FIT), University of North Carolina (UNC) – Chapel Hill, and Hubbs-SeaWorld Research Institute. Education and outreach partners include the Friends of the Carr Refuge (FOCR), Sea Turtle Survival League (STSL), The Ocean Conservancy, and the Sea Turtle Preservation Society. Other partners include local residents and neighbors, businesses, and political representatives. The local partnerships have proven successful for land acquisition and public outreach.

The Service owns eight lots in a beachside community called SeaView. Three of these lots are ocean-front and five are along A1A, adjacent to other Archie Carr and Pelican Island properties. The three lots are not contiguous. The properties protect an old maritime hammock and beach dune that has supported listed Southeastern beach mice and rare eastern woodrats.

VISITOR SERVICES

Consistent with the provisions outlined in the National Wildlife Refuge System Improvement Act, the Service will continue working with partners to provide quality compatible wildlife-dependent recreation programs. At Archie Carr NWR, these include fishing, observing and photographing wildlife, and participating in environmental education and interpretation (see Figure 8). These priority public uses provide the public with an opportunity to learn about, enjoy, and appreciate natural resources, but not at the expense of the natural environment. Any allowed use of the refuge, including these priority public uses, must be determined to be compatible with the refuge's purposes and with the mission of the National Wildlife Refuge System (see Appendix VI for the compatibility determinations). Fundamental and supreme to the provisions of these uses is the provision of viable and diverse fish and wildlife populations and the habitats upon which they depend. Those uses that do not support the purposes of the refuge, that threaten or disturb fish and wildlife populations, or that are not compatible public uses will be phased out on the refuge. Currently, compatibility determinations have not been completed for all recreational uses occurring on Service lands of the refuge and the refuge is generally closed to the public. With the exception of a few minor foot paths, the only portion of Service properties along the Atlantic Ocean that are open to public use are those areas eastward of the seaward extent of the dune vegetation to mean high water. Visitors access the refuge through partner properties by walking along the beach and accessing Service properties above mean high water. One beach access trail is located on Service lands: the long-used Spanish House trail near Sebastian Inlet State Park. Fishing activities also occur on refuge properties above mean high water along the shorelines of the Indian River Lagoon. As with the Atlantic Ocean side, access to these lagoon shorelines is from partner properties.

Figure 8. Public use map.



The Archie Carr Refuge Partnership

As a fragmented, linear refuge, Archie Carr NWR exists within a larger context of lands and waters managed by a variety of entities for conservation and visitor services, locally referred to as The Carr Refuge or the Archie Carr Refuge partnership. In 2006, an estimated 195,000 visitors accessed the lands and waters of the Archie Carr Refuge partnership to observe wildlife, hike, fish, sunbathe and swim, surf, and learn about sea turtles and the barrier island ecosystem. Within the acquisition boundary of the Archie Carr Refuge partnership, three beach accesses are within Sebastian Inlet State Park (the fifth most visited state park in Florida, which provides services to 750,000 visitors annually) with one of those accesses crossing Service-owned property; additional sites include eight Brevard County beach parks and beach accesses; three Indian River County beach parks; and three foot trails through pristine barrier island ecosystems on Brevard County's Environmentally Endangered Lands on the west side of State Road (SR) A1A., and the Barrier Island Sanctuary Management and Education Center (Barrier Island Center).

No visitor center or visitor contact facilities exist on Service-owned lands within the Archie Carr NWR. Existing land management partners are currently providing and planning for adequate levels of visitor facilities on lands acquired primarily for public access and recreation. Brevard County's Barrier Island Center, which opened in May 2008, will serve as the focal visitor contact point for the refuge. This new Center and the existing public facilities and accesses are currently providing and planning for adequate levels of visitor services on lands acquired primarily for public access and recreation within the larger Archie Carr Refuge partnership. The refuge administrative office is co-located with the Service's South Florida Ecological Services Field Office in Vero Beach, 25 miles south of the refuge. The refuge employs one Park Ranger dedicated to visitor services and this employee divides time between both the Archie Carr National Wildlife Refuge and Pelican Island National Wildlife Refuge.

The majority of public access to the Archie Carr NWR is through partner lands via SR A1A, which is part of the Indian River Lagoon Scenic Highway under America's Byways program. The main visitation to the Archie Carr NWR is through Sebastian Inlet State Park, county beach parks, and the Barrier Island Center. The Spanish House beach access point is located on Service lands, adjacent to Sebastian Inlet State Park. Some visitors are attracted to the Archie Carr Refuge for its world renowned designation as the most important nesting beach for loggerhead sea turtles in the Western Hemisphere. Table 8 provides a breakdown of visitor use areas within the refuge.

Welcoming and Orienting Visitors

Welcome signs to the Archie Carr NWR are posted at both the northernmost and southernmost boundaries on SR A1A to let the general public know they are driving within the boundary of the refuge. The main visitor contact point within the Archie Carr NWR is the newly opened (May 2008) Barrier Island Sanctuary Management and Education Center on SR A1A, owned and operated by the Brevard County Environmentally Endangered Lands Program. Since no Service operated visitor center exists, this new sea turtle and barrier island habitat education facility will serve as the focal point for welcoming and orienting visitors entering the Archie Carr NWR. This facility is a state-of-the-art visitor center and provides visitors with important information on recreational opportunities within the entire Archie Carr partnership, features exhibits on sea turtles and other wildlife within the barrier island ecosystem, and offers ongoing orientation and educational movies.

Other major visitor contact points within the Archie Carr NWR include:

- Sebastian Inlet State Park - north and south Ranger Station entrances, an administration office, one foot trail, and one public beach access;
- Brevard County Parks and Recreation - eight public beach accesses;
- Indian River County Parks and Recreation - three public beach accesses;
- Brevard County Environmentally Endangered Lands Program - three foot trails.

With exception to lifeguards at the Treasure Shores and Golden Sands beach accesses in Indian River County, all county beach accesses are unstaffed, but have entrance signs visible from SR A1A posted by their respective county or state managing entity. Once inside all beach accesses, visitors will find a sea turtle etiquette informational sign at the dune crossovers which identifies the beach as within the Archie Carr NWR. Two major beach accesses, one in Brevard County and one in Indian River County, and the foot trail at Sebastian Inlet State Park have a three-panel Service informational kiosk that provides a refuge map, as well as information on the refuge's history, sea turtles, and Dr. Archie Carr. Each of the three foot trails managed by Brevard County host a trailhead kiosk to welcome and orient visitors, but do not specifically mention the Archie Carr NWR.

Table 8. Visitor use areas (predominantly on partner properties).

Public Access	Ownership & Management	Access Type
Coconut Point Park	Brevard County Parks & Recreation	Improved beach access, 64 parking spaces
Juan Ponce de Leon Landing	Brevard County Parks & Recreation	Improved beach access, 47 parking spaces
Coconut Point Sanctuary	Brevard County Environmentally Endangered Lands Program	Unimproved foot trail access
Atlantic Drive Beach Access	Brevard County Parks & Recreation	Unimproved beach access, 5 parking spaces
River Drive Beach Access	Brevard County Parks & Recreation	Unimproved beach access 3 parking spaces
Judith Resnick Memorial Park	Brevard County Parks & Recreation	Unimproved beach access, 7 parking spaces
Maritime Hammock Sanctuary	Brevard County Environmentally Endangered Lands Program	Unimproved foot trail access
Ballard Cove Beach Access	Brevard County Parks & Recreation	Unimproved beach access no parking spots
Barrier Island Center Trail	Brevard County Environmentally Endangered Lands Program	Unimproved foot trail access
Barrier Island Sanctuary	Brevard County Environmentally	Refuge partnership visitor center

Management & Education Center	Endangered Lands Program	
Bonsteel Beach Park	Brevard County Parks & Recreation	Primitive beach access, 52 parking spaces
River Oaks Road Beach Access	Brevard County Parks & Recreation	Unimproved beach access, 5 parking spaces
Long Point Park	Brevard County Parks & Recreation	Ranger station, boat ramp, >50 parking spaces, bridge access to trail
Sebastian Inlet State Park / ACNWR, Spanish House (Brevard County)	Florida Department of Environmental Protection, U.S. Fish and Wildlife Service	Unimproved beach access and foot trail access, 40 parking spaces
Sebastian Inlet State Park, North (Brevard County)	Florida Department of Environmental Protection	Ranger station, improved beach access, 243 parking spaces
Sebastian Inlet State Park, South (Indian River County)	Florida Department of Environmental Protection	Ranger station, improved beach access, 225 parking spaces, Sebastian Fishing Museum, McLarty Treasure Museum (1715 Spanish Plate Fleet Survivor's Camp) (27 spaces), boat ramp, boat-trailer parking
Sebastian Inlet State Park, Day Use Area (Indian River County)	Florida Department of Environmental Protection	Improved beach access, 79 parking spaces
Sebastian Inlet Marina	Privately Owned	24 parking spaces
Ambersands Beach Park	Indian River County Parks & Recreation	Unimproved beach access, 20 parking spaces
Treasure Shores Park	Indian River County Parks & Recreation	Improved beach access, 78 parking spaces
Golden Sands Park	Indian River County Parks & Recreation	Improved beach access, 139 parking spaces
Source: T. Stoms, Brevard County Parks and Recreation, Pers. comm., August 2008		

Environmental Education and Interpretation

Due to the lack of environmental education facilities and education staff, neither the Service nor the Barrier Island Sanctuary Management and Education Center will focus directly on environmental education and interpretive programming. Instead, the Barrier Island Center's focus is on conducting teacher workshops for teacher-guided school visits with Brevard County students. The Center also conducts summer camps and environmental education and interpretive programs by special request for home school, scout, and other groups. The Barrier Island Center itself provides an excellent opportunity for passive environmental education through its youth-friendly exhibits and audiovisual facility. The major interpretive themes of the Center's programs revolve around barrier island wildlife and habitats, while emphasizing sea turtle conservation. Several partners, including the Caribbean Conservation Corporation, Friends of the Carr Refuge, the Sea Turtle Preservation Society,

Sebastian Inlet State Park, Disney's Vero Beach Resort, and the Environmental Learning Center are providing opportunistic offsite environmental education to schools and/or children in the area. The mainstay interpretive program within the Archie Carr NWR is the sea turtle watch programs conducted by the Service, the Caribbean Conservation Corporation, and Sebastian Inlet State Park in the months of June and July.

Wildlife Observation, Photography, and Interpretation

The Brevard County Environmentally Endangered Lands Program manages three foot trails on the west side of SR A1A within the Archie Carr NWR at Coconut Point Sanctuary, Maritime Hammock Sanctuary, and the Barrier Island Center. Combined, these trails provide visitors with four and a half miles of foot access through a variety of habitats, including coastal strand, oak scrub, coastal oak forest, maritime and hydric hammock, and mangrove swamp. Informational kiosks are located at each of the three trailheads and the trails provide the public with unique access and interpretation of the barrier island ecosystem. Within the Coconut Point Sanctuary, and adjoining Service-owned refuge property, is the only known family of the threatened Florida scrub-jay within the refuge, which is an excellent place to observe other rare wildlife and plants. All three trails were designated as Great Florida Birding Trail (GFBT) sites in January 2008, bringing the total number of GFBT sites in the refuge to five. Coconut Point Beach Park and Sebastian Inlet State Park were incorporated into the GFBT system in 2000. Currently, bird watching in the refuge is promoted mainly through the GFBT program, with the most common bird watching activities occurring on the beach. Interpretive guided walks and programs on EEL properties of the refuge are conducted by staff at the Barrier Island Sanctuary Management and Education Center by request.

The most popular wildlife observation activities on the refuge are the guided sea turtle watch programs, where visitors have the opportunity to watch a sea turtle nesting up close on the beach. These formal interpretive programs are permitted statewide by the Florida Fish and Wildlife Conservation Commission and are conducted in the Archie Carr NWR each June and July by refuge staff and volunteers and conservation partners, Sebastian Inlet State Park and the Caribbean Conservation Corporation (CCC). In addition to providing quality wildlife observation opportunities, this program provides valuable information on sea turtle conservation and is the keystone program for sea turtle education in the refuge and in the state. Since no Service-owned facilities are located in the Archie Carr NWR, CCC and refuge staff rely on both state and county facilities to conduct the sea turtle watch programs. For years, the indoor portion of the program was conducted at the Sebastian Inlet State Park Administrative Building. Starting in summer of 2008, both CCC and refuge staff began conducting the indoor portion of the program from the new Barrier Island Center. Approximately 800 people per year participate in a sea turtle watch program within the Archie Carr NWR, although this is still not meeting the public demand for these programs. With the new Barrier Island Center in place and a partnership with CCC to conduct up to four sea turtle watch programs per week, that figure has the potential to increase by 600 participants, which will help meet the increasing demand. In addition, various interpretive guided walks are planned as part of the activities to be conducted out of the new Barrier Island Center.

Communicating Key Issues with Offsite Audiences

With only one Park Ranger designated to support visitor services and with no Service-owned or managed visitor facilities, the refuge relies heavily on a variety of partners to accomplish interpretive and outreach activities associated with the Archie Carr NWR. The Friends of the Carr Refuge (FOCR), the refuge's nonprofit support group, funds and assists in the distribution of a sea turtle brochure, which serves as the only refuge related brochure. Among other things, management and collaboration of interpretation and outreach efforts within the refuge are accomplished through the Archie Carr Working Group, a group of individuals representing the land management agencies within the refuge along with the nonprofit organizations, private companies, and local citizens with a

vested interest in supporting the Archie Carr NWR. These partners are fully engaged and supportive of the refuge and their interpretive and outreach efforts of refuge resources include offsite interpretive programs for schools, universities, civic organizations, clubs, and many other interested groups; TV, radio, and newspaper interviews; news releases on a variety of special events and/or key resource issues; exhibits, publications, brochures, and educational materials; Service and partner websites; refuge special events (i.e., Pelican Island Wildlife Festival); participation in conservation partner special events; and relationships with other partners, such as the Friends of the Carr Refuge, Sea Turtle Preservation Society, Ocean Conservancy, Caribbean Conservation Corporation, Pelican Island Preservation Society, Pelican Island Audubon Society, Space Coast Audubon Society, Florida Audubon Society, Indian River Land Trust, Marine Resources Council, Turtle Coast Sierra Club, and Disney Wildlife Conservation Fund. In addition, the NESTS (Neighbors Ensuring Sea Turtle Survival) Program was created by members of the Archie Carr Working Group, which sought to develop a sea turtle friendly certification program that would recognize neighbors' efforts to ensure sea turtle survival. The NESTS Program is designed to increase community involvement in protecting sea turtle nesting beaches and habitat.

Hunting and Fishing

The Archie Carr NWR is not open to hunting. Surf fishing occurs through partner access points, but the Service is not actively engaged in administering a fishing program on Service lands. Surf fishing occurs on the beach through public accesses managed by the state or county partners; however, no visitor counting systems are in place to estimate the number of users participating in fishing activities. Sebastian Inlet State Park, also within the boundary of the Archie Carr NWR, manages a large fishing program through jetty access and fishing piers at the Inlet. Concern exists regarding with how to regulate unofficial dune access, or social trails, for fishing and surfing events that occur on both Service and partner lands within the refuge.

Volunteer Program

Volunteers continue to be a major contributor to the success of the Refuge System. In 2005, nearly 38,000 volunteers contributed more than 1.4 million hours on refuges nationwide, a service valued at more than $25 million in work on behalf of wildlife and wildlife conservation. At Archie Carr National Wildlife Refuge in fiscal year 2006, 21 volunteers contributed 430 hours to help with the turtle watch programs, remove exotic and invasive plants, and conduct sea turtle surveys. The volunteer program is run by the refuge's Park Ranger as a collateral duty with Pelican Island National Wildlife Refuge. Volunteers are shared between the refuge, Brevard County Parks and Recreation and Sebastian Inlet State Park (SISP). An active recruitment and training effort provides materials and equipment for volunteers to safely do their jobs. The refuge has a partnership with SISP to provide an RV site, when available, for work camper volunteers. Archie Carr NWR volunteers are recognized at an annual dinner and field trip with Pelican Island National Wildlife Refuge volunteers and are supported by the Friends of the Carr Refuge and the Pelican Island Preservation Society (the official support group of Pelican Island National Wildlife Refuge).

Friends Group

The Friends of the Carr Refuge is the official support group for Archie Carr National Wildlife Refuge. As a subsidiary organization formed under the 501(c)(3) of the Sea Turtle Preservation Society, FOCR's main goals are to support the Archie Carr NWR through special programs, outreach programs, educational activities, volunteer coordination, and fund raising for refuge projects. No Memorandum of Agreement currently exists between FOCR and the Service.

PERSONNEL, OPERATIONS, AND MAINTENANCE

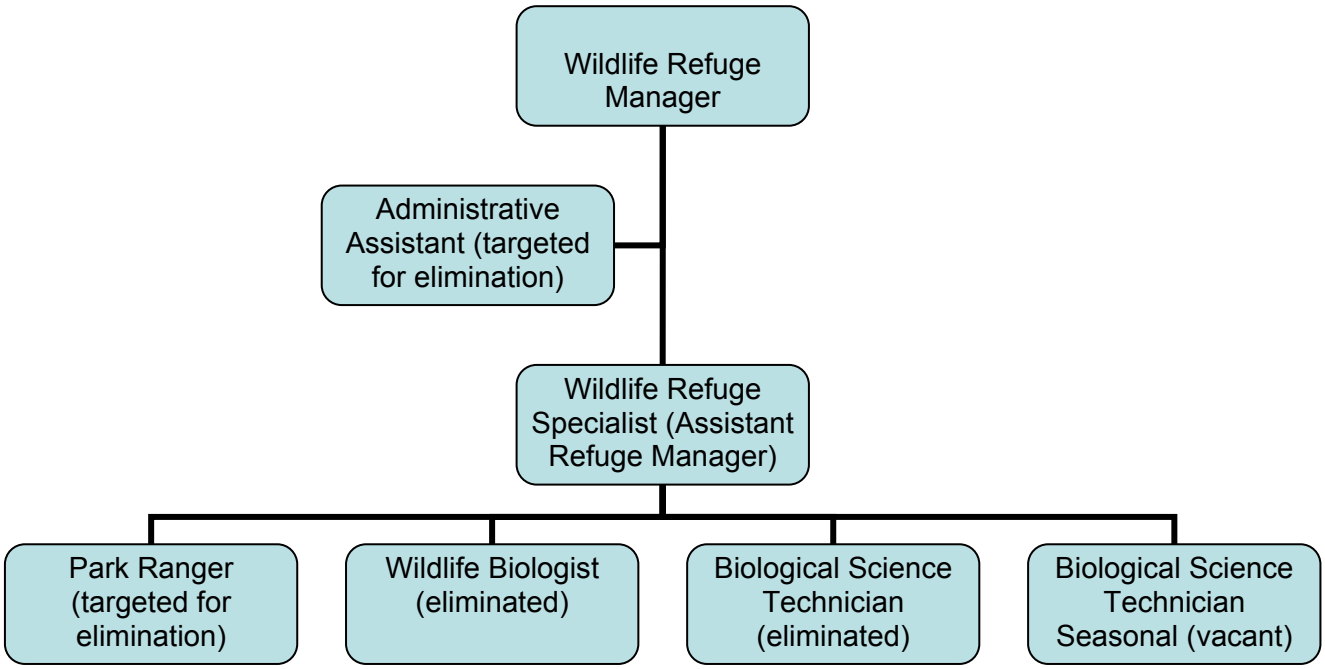
Archie Carr NWR has no staff; however, the staff assigned to Pelican Island NWR manages Archie Carr NWR as a collateral duty. The current staff (as of 2007) includes the Wildlife Refuge Manager, Wildlife Refuge Specialist (Assistant Refuge Manager), Park Ranger, and Administrative Assistant (see Figure 9). Both the Park Ranger position and the Administrative Assistant positions are being eliminated as part of the Service's Southeast Region Workforce Management Plan in addition to the previously eliminated Wildlife Biologist and Biological Science Technician positions. Seasonally, as funds are available, a temporary Biological Science Technician is hired during the summer months to conduct sea turtle surveys. Biological work is performed under special use permits or cooperating agreements with the University of Central Florida and the University of Florida.

Since the refuge lacks maintenance positions, most maintenance work is contracted out to other entities. In 2004 two refuge buildings were destroyed by hurricanes and another was damaged. As of 2007 the Archie Carr NWR has just one support building located on the refuge: the Jordan Beach House, which is currently utilized by the University of Central Florida for sea turtle research and survey efforts on the refuge. A contract is in place to build a bunk house at Archie Carr NWR to replace the two buildings destroyed in 2004. Construction is anticipated to be complete in 2008.

The refuge currently uses three storage bays located at Sebastian Inlet State Park under a Grant Agreement. In addition several temporary storage buildings are located at Pelican Island NWR. Two small buildings are under contract to be built at Pelican Island NWR: a small pole shed for storing small equipment and lumber and a small concrete building to be used for chemical storage. All refuge roads are small, unimproved sand roads, except for the paved shell driveway at the Jordan House.

Figure 9. Archie Carr NWR organizational chart.

(All staff are assigned to and shared with Pelican Island NWR.)



III. Plan Development

SUMMARY OF ISSUES, CONCERNS, AND OPPORTUNITIES

The comprehensive planning process officially began in December 1999 with preplanning activities such as gathering data and information, meeting with Archie Carr NWR staff and Merritt Island NWR Complex staff, meeting with the Archie Carr Working Group, meeting with intergovernmental partners, visioning, and preparing for the public scoping phase of the planning process. To include the governmental partners in the planning process, an Intergovernmental Coordination Planning Team was formed. Team meetings were conducted between January and May 2000. The Intergovernmental Coordination Planning Team identified items such as existing and needed data, refuge resources, issues, concerns, affected members of the public, vision ideas, and public participation issues. As a group, this Intergovernmental Team prioritized its top issues to be addressed by the refuge over the 15-year life of the plan (see Appendix IV for a summarized list of these issues).

A Service Core Planning Team was assembled and held a series of meetings in preparation for conducting the planning effort and in advance of public scoping. Public scoping commenced on April 24, 2000, including notices in the *Federal Register* (on April 24 and May 12, 2000) and in local newspapers (on April 28-30 and May 19-20, 2000). Additional information about the planning process and public scoping was provided through informational flyers, planning updates, several articles in the local newspapers, and postings on the Service's Internet web sites (http://www.fws.gov/MerrittIsland, http://www.fws.gov/PelicanIsland, and http://www.fws.gov/ArchieCarr). Given the proximity of the two refuges, several shared issues, and many overlapping interested parties, joint public meetings were held for Pelican Island and Archie Carr NWRs.

Using the refuge's existing public mailing lists, as well as public mailing lists from various governmental partners, more than 1,200 informational flyers were initially mailed. This first flyer invited participation in the planning process through a variety of means, including public meetings, letters, faxes, telephone calls, e-mail messages, and personal visits. The flyer also announced the times and locations of the public meetings, provided other information, and described the purposes of the two refuges. Afterwards, three neighborhood meetings were conducted on May 3, May 25, and June 1, 2000. Outlining the planning process and highlighting the issues and concerns raised to date, a June 2, 2000, Planning Update was mailed out to over 2,800 interested parties. Following this Planning Update, two summary, countywide meetings were held on June 14 and June 15, 2000, in Sebastian (Indian River County) and Melbourne (Brevard County).

The public meetings were attended by a total of 90 individuals representing a variety of interests and organizations. Approximately 117 individuals, organizations, and governmental entities submitted comments regarding the plans for Pelican Island and Archie Carr NWRs. Letters, faxes, email messages, and phone calls were received from across the country. Comments from the public were submitted by a variety of entities, ranging from a local middle school student to a coalition of six organizations representing more than 700,000 members.

Members of the Service's Core Planning Team met periodically to review public comments, data, and information collected to write the plan. In 2003, the Archie Carr NWR CCP was put on hold for a variety of reasons (e.g., to develop draft and final CCPs for Pelican Island NWR). The Service re-started the planning process in 2006 with professional reviews of the refuge to determine the

status, trends, and conditions of refuge resources and facilities. A wilderness review was conducted in 2006. Experts from the Service, State of Florida (including Fish and Wildlife Conservation Commission, Department of Environmental Protection, and St. Johns River Water Management District), Indian River County (Parks Division, Coastal Engineering Division, and Environmental Planning Section), Brevard County (Natural Resources Management Office, Parks and Recreation Department, and Environmentally Endangered Lands Program), University of Central Florida, University of Florida, and Hubbs-SeaWorld Research Institute participated in a wildlife and habitat management review of the refuge in 2006. A visitor services review was also conducted in 2006 and included representatives and experts from Brevard County, Indian River County, Florida Department of Environmental Protection (Florida Park Service), Friends of the Carr Refuge, Caribbean Conservation Corporation, Ocean Conservancy, and Florida Institute of Technology. The information garnered from these reviews helped the planning team analyze and develop recommendations for the Draft CCP/EA.

During the preplanning and public scoping phases of plan development, a myriad of issues, concerns, and opportunities were raised by the public, the Service, and other public agencies. The identification of issues is a major factor in determining future management goals and objectives, as well as future projects. In addition to the general public scoping meetings, a series of other meetings were conducted with federal, state, and local government agencies. Coordination with government partners and the public is essential to ensure support for the plan and its identified projects. While some of the issues and concerns raised during scoping are important to the future of the refuge, many are not within the Service's management jurisdiction or authority, and some are outside of its control. Several opportunities raised during scoping are addressed by the Service in this plan. A Service planning team evaluated the long list of issues raised, identified the priority issues to be addressed over the next 15 years, evaluated steps to rectify these issues and resource needs, and measured the impact of plan implementation. The Core Team developed a list of goals, objectives, and strategies to shape the management of the refuge for the 15-year life of the plan. The priority issues for the refuge to address during the 15-year life of the plan are:

- Threats and impacts to threatened and endangered species.
- Lack of law enforcement presence.
- Fragmented, linear conservation lands under multiple jurisdictions.
- Lack of needed staff and projects.
- Ongoing development of the landscape.
- Lack of public understanding, awareness, and appreciation of the human impacts to wildlife and habitats.
- Spread and impacts of exotic, invasive, and nuisance species.
- Lack of information on refuge resources.
- Impacts of climate change.

Several management priorities were identified in response to the challenges resulting from the fragmented, linear nature of the refuge, its location along a southeast Florida barrier island system, the ongoing human population growth of this area, and historic management. Climate change and its associated impacts, which are not well understood for the refuge, relate to and can exacerbate all of these impacts. Although some of the challenges span more than one category, these priority issues were divided into four management categories: wildlife and habitat management, resource protection, visitor services, and refuge administration.

WILDLIFE AND HABITAT MANAGEMENT

As the landscape continues to develop, several impacts are experienced by the refuge and its resources, including loss and fragmentation of habitats; spread and impacts of exotic, invasive, and nuisance species; water quality and quantity concerns; threats and impacts to threatened and endangered species; threats and impacts to native wildlife; and decreased habitat quality. The refuge lacks baseline survey and monitoring data for most species (except sea turtles) using the barrier island system and for refuge habitats, which further impact the refuge's abilities to evaluate the status and trends of refuge resources.

RESOURCE PROTECTION

The ongoing development of the landscape has direct impacts on the resource protection efforts of the Service and the partners of the Archie Carr NWR. While real estate prices have stabilized or declined in some cases recently (in 2007), overall the development pressures experienced in this area have dramatically driven land prices upwards, making it more difficult for the Service and the partners to acquire interests in these properties (e.g., through fee title acquisition, easements, and agreements). Further, development has spread throughout the barrier island system. Many properties which were undeveloped at the establishment of the refuge, just over 15 years ago, have since been developed. This ongoing development of the landscape threatens not only wildlife and habitat resources of the barrier island system, but also the archaeological and historical resources that help define the cultural link to the past, present, and future.

With no regular Service law enforcement presence at Archie Carr NWR or Pelican Island, resource protection is minimal. Law enforcement response comes from Merritt Island NWR, when necessary, about 1.5 hours away or from the Service's Zone Officer who could be located anywhere in the zone at any particular time, making for variable and long response times. Local and state law enforcement officers respond to resource threats on partner lands.

VISITOR SERVICES

The priority visitor services management issues at the Archie Carr NWR are closely related to the growth of the human population in Brevard and Indian River counties and the increase in tourism to the area, the impacts associated with the growing population and tourism, and the associated increase in demand for recreational and educational activities. The refuge is spatially located in Brevard and Indian River counties with estimated 2006 county populations of 534,359 and 130,100 respectively (U.S. Census 2007). The human population growth rate from 2005 to 2015 for the communities around the refuge is expected to average over 30%, with the State of Florida's anticipated growth rate for the same time period being 27% (Lenze 2002).

Due to the lack of refuge public use and law enforcement staff and lack of public facilities on Service lands, the Service is committed to working with state and county land management partners to provide appropriate, compatible, and quality public use opportunities on partner lands. This planning process identifies the importance of increasing public awareness and understanding of wildlife and habitats to address the increasing impacts to and disturbance of wildlife and habitat from human activities and use (e.g., vehicle collisions; wildlife disturbances and take; decreased water quality; erosion; development; increased pollution, runoff, and trash and debris; and illegal access).

As the human population grows, the refuge is likely to be facing a variety of negative impacts, including greater disturbances to nesting sea turtles on the beach at night and increased dune habitat destruction created from user group conflicts. Greater disturbances to nesting sea turtles are likely to

result from increased coastal development, increased lighting, and increased human activity on the beach at night. There is a natural human curiosity to watch sea turtles nesting at night. Unfortunately, the current level of the state-permitted sea turtle watch programs is not meeting the public demand and many people prefer and will continue to seek out turtles on their own, thereby causing greater disturbances to nesting females. In some areas current surf fishing access conflicts with management or with other beach users, while beach access in some areas causes habitat destruction by the unauthorized creation of dune foot paths by fishermen, surfers, and other beach goers looking to find less crowded beach areas.

REFUGE ADMINISTRATION

In looking at current and future management needs to serve the purposes, vision, and goals of the refuge, several administration concerns arise. The first involves the fragmented, linear conservation lands that exist on this developing barrier island system. Although colloquially referred to as the Archie Carr NWR, the conservation lands of this barrier island system are under multiple jurisdictions with different management perspectives, philosophies, and directives. The Service, Brevard County (Parks and Recreation Department and the Environmentally Endangered Lands Program), Indian River County (Parks Division and the Conservation Lands Program), the State of Florida (Florida Park Service), and Hubbs-SeaWorld Research Institute all own and manage conservation lands within the Archie Carr NWR. Further, many of the management units of any one particular entity are too small to be effectively managed without integration and coordination between the land managers of the neighboring conservation properties (e.g., for fire management). Beyond the mix of jurisdictions and land managers, the refuge lacks the staff, volunteers, and projects needed to pursue the purposes, vision, and goals of the refuge. A distinct lack of law enforcement presence for these conservation lands is notable.

WILDERNESS REVIEW

Refuge planning policy requires a wilderness review as part of the comprehensive conservation planning process. A wilderness review for the refuge was conducted in 2006. In summary, no areas of the refuge were found to be suitable for designation as wilderness at this time. The results of the wilderness review are provided in Appendix VIII.

PUBLIC REVIEW AND COMMENT

More than 1,900 postcards were mailed to those parties on the CCP mailing list to enable interested parties to request a compact disk (CD) or paper copy of the Draft CCP/EA for their review. The Draft CCP/EA was also made available to the public on the Internet.

IV. Management Direction

INTRODUCTION

The Service manages fish and wildlife habitats considering the needs of all resources in decision-making. But first and foremost, fish and wildlife conservation assumes priority in refuge management. A requirement of the National Wildlife Refuge System Improvement Act of 1997 is for the Service to maintain the ecological health, diversity, and integrity of refuges. Public uses are allowed if they are appropriate and compatible with wildlife and habitat conservation. The Service has identified six priority wildlife-dependent public uses (i.e., hunting, fishing, wildlife observation, wildlife photography, environmental education, and interpretation) and they are addressed in this CCP.

Described below is the proposed Comprehensive Conservation Plan (CCP) for managing Archie Carr National Wildlife Refuge over the next 15 years. This proposed management direction contains the goals, objectives, and strategies that will be used to achieve the refuge vision.

Four alternatives for managing the refuge were considered: Alternative A (Current Management [No Action]); Alternative B (Rare, Threatened, and Endangered Species); Alternative C (Migratory Birds); and Alternative D (Wildlife and Habitat Diversity). The Service selected Alternative B (Rare, Threatened, and Endangered Species) as the proposed management direction.

Implementing Alternative B, the proposed action, will provide increased protection to listed species (especially sea turtles) and is anticipated to result in increased populations. In addition, other wildlife species and habitats as well as biodiversity are expected to benefit under this alternative. Resource protection activities would be enhanced through a greater law enforcement presence and the management of inappropriate uses. Visitor services would improve and adapt to the expected rise in visitation. Finally, refuge administration activities would focus on contributing to the recovery of listed species, as well as improving wildlife and habitat diversity through streamlined efforts and strengthening local and regional partnerships.

VISION

Archie Carr National Wildlife Refuge protects a globally important sea turtle nesting beach, honoring the efforts and achievements of the late Dr. Archie F. Carr. The Service has a responsibility to ensure the continued protection of the refuge's barrier island beaches to provide for the protection and recovery of sea turtles and other federally and state-listed species, while also protecting wildlife and habitat diversity native to this system. Through a minimally developed landscape with limited artificial lighting on the barrier island, the area and the refuge will serve as a model for resource protection through partnerships amongst a variety of public and private interests. The refuge will serve as a world-class living laboratory to foster excellence in biological and ecological research and to enable integrated and adaptive land management. Based on best available science, the refuge and its partners will conserve wildlife and habitat on the larger landscape level and contribute to the recovery of threatened and endangered species. People will gain a better biological understanding and appreciation of the wildlife and habitats of the refuge and the surrounding barrier island ecosystem. An informed public should minimize human impacts to these resources.

GOALS, OBJECTIVES, AND STRATEGIES

The goals, objectives, and strategies presented below are the Service's responses to the issues, concerns, and needs expressed by the planning team, the refuge staff and partners, and the public and are presented in a hierarchical format. Chapter V, Plan Implementation, identifies the projects associated with the various goals, objectives, and strategies. To accomplish any of the outlined goals, the Service, together with the larger Archie Carr Partnership, the public, and other partners will need to work together.

These goals, objectives, and strategies reflect the Service's commitment to achieve the mandates of the National Wildlife Refuge System Improvement Act of 1997; the mission of the National Wildlife Refuge System; and the purposes and vision of Archie Carr National Wildlife Refuge. With staffing and funding as outlined in Chapter V, Plan Implementation, the Service intends to accomplish these goals, objectives, and strategies within the next 15 years.

WILDLIFE AND HABITAT MANAGEMENT
The proposed wildlife and habitat management activities are divided into: rare, threatened and endangered species; migratory birds; native wildlife and habitat; exotic, invasive, and nuisance species; and climate change. A Habitat Management Plan would need to be developed for the refuge in order to fulfill the goals, objectives and strategies outlined in this section.

Rare, Threatened and Endangered Species

WILDLIFE AND HABITAT MANAGEMENT GOAL 1: Remove the threats to and promote the recovery of listed species occurring at Archie Carr National Wildlife.

1.a. Sea Turtles

WILDLIFE AND HABITAT MANAGEMENT OBJECTIVE 1.a(1): Continue to work with the partners to monitor and maintain the 21 miles (34 km) of beaches and nearshore habitats of the larger Archie Carr NWR partnership to support annual nesting targets of at least 10,000 loggerhead nests and a biennial target of at least 3,000 green sea turtle nests and 50 leatherback nests to support sea turtle recovery efforts.

Discussion: Beaches along Archie Carr NWR are important nesting areas for three species of sea turtles, all of them federally protected under the Endangered Species Act. In order to evaluate whether these targets are met, daily surveys of the nesting beach is necessary. The Refuge will continue to survey 5 miles (8 km) of beaches in northern Indian River County (Wabasso Beach), facilitate the University of Central Florida and/or Hubbs-SeaWorld Research Institute to survey the 13 miles (21 km) of beaches in southern Brevard County (Carr Refuge Study Area) and coordinate with Sebastian Inlet State Park to survey the 3 miles (5 km) within state park boundaries. The refuge and its partners would continue to conduct daily early morning surveys of refuge beaches during the nesting season, to identify, enumerate, and evaluate nesting activities using standardized criteria. The refuge and its partners would continue to assess hatching success, emerging success, clutch frequency, and remigration interval to determine reproductive output and help assess the status of sea turtle populations. The refuge and its partners would continue to conduct daily sea turtle stranding surveys to record dead strandings and rescue live ones. Data from stranding surveys help identify and enumerate in-water threats to sea turtles. Threats on the nesting beach can also be identified during daily surveys. Short-term threats to nesting sea turtles (and their eggs and hatchlings) include poaching, predation, tidal inundation, beach erosion (wash-outs), beach accretion (entombments), artificial lighting, beach driving, and human disturbance.

Long-term threats may increase with impacts resulting from climate change, including sea level rise, higher frequency storm events, and salt water intrusion (Fish et al. 2005). Shorelines are expected to retreat dramatically with the predicted sea level rise (Gilman et al. 2007, Nicholls et al. 2007) caused by global warming (Hume 2005). Human induced changes to the nesting beach may exacerbate those impacts through beachfront development, beach armoring, and potentially unsound beach renourishment practices. Through collaborative efforts with partners, the refuge can work to reduce some of these harmful impacts and restore nesting habitat. Predator control is addressed in Wildlife and Habitat Management Objective 1.a(2). Disorientations associated with lighting and human disturbance is addressed in Wildlife and Habitat Management Objective 1.a(3). Nighttime beach access is addressed under Wildlife and Habitat Management Objective 1.a(3) and Visitor Services Objective 6.b. Increased law enforcement can continue to minimize poaching and reduce nest and hatchling destruction associated with unauthorized beach driving. Impacts associated with tidal inundation and beach erosion can be lessened if dunes are left intact and if sea walls, rock revetments, and geotextile tubes are avoided or removed. Unnatural beach accretion usually occurs through beach renourishment or dune rebuilding and can be beneficial if conducted with sound biological principles, but can also have impacts if designed improperly. Short-term impacts can include nest entombment from sand placement or nest destruction from heavy equipment of any nests missed by a nest survey and egg relocation program established to minimize project impacts to nests. Long-term impacts can result if the beach renourishment or dune rebuilding is designed improperly. Those impacts can include lower nesting success due to increased beach width, scarping, and/or compaction and lower reproductive success if the sand quality is poor. In addition, more information is needed to understand the importance of nearshore habitats to sea turtle biology so that these areas can be protected. Further, the refuge will work with research partners to implement appropriate monitoring to better understand the impacts of climate change on the sex ratios of sea turtle hatchings within the larger Archie Carr Refuge partnership. The sex of sea turtles is determined by the nest temperature surrounding the egg during development, with higher temperatures causing more females to be produced (Yntema and Mrosovsky 1980, Graeme et al. 2003, Hawkes 2007). Multiyear studies of the sex ratios of loggerheads at Cape Canaveral, near Archie Carr, (Mrosovsky and Provancha 1989 and1992) indicated that a strong female bias already exists (87%- 99% female). Slight changes in atmospheric temperatures due to climate change could further alter ratios eliminating production of males altogether in this region. The U.S. Fish and Wildlife Service is mandated by the Endangered Species Act to protect threatened and endangered sea turtles populations and accomplish target population goals for each species. Thus, the refuge will coordinate with research groups at various east coast locations to monitor rates of change in relation to sex ratios in sea turtle hatchlings, increases in temperature, and other related factors. This will require coordination with nesting beaches in northerly locations along the U.S. eastern seaboard. The refuge would also benefit from partnerships to continue sea turtle research efforts. In addition, the refuge would work with the Service's Endangered Species Program to develop sea turtle recovery targets.

WILDLIFE AND HABITAT MANAGEMENT OBJECTIVE 1.a(2): Within one year of plan adoption, work with the partners to lower sea turtle nest predation rates from the current level of about 10 percent to less than five percent within the larger Archie Carr NWR partnership to support sea turtle recovery efforts.

Discussion: Sea turtle egg and hatchling predation is another serious threat to sea turtles. Raccoons and other small predators can consume large numbers of eggs and hatchlings. While the raccoon population is controlled to some extent by bobcats, disease, and vehicle collisions, some areas in the Archie Carr NWR have historically experienced higher densities of raccoons than would normally exist. These areas have had either an availability of surplus human food waste in dumpsters and garbage cans or have had people actually feeding raccoons. Since 2003, the refuge has conducted a trapping program as outlined in the refuge's Predator Control Plan. The

objective of the program is to reduce the number of raccoons that target turtle nests by setting traps at locations where nests have been raided by raccoons. This approach is responsive to abnormally high incidences of raccoon depredation and targets only raccoons that are preying on turtle nests. This method may remove fewer raccoons than other trapping programs, but effectively reduces depredation rates on sea turtle nests to less than 10 percent. The refuge would work with volunteers, other agencies, private landowners, researchers, and other partners to broaden efforts at removing targeted raccoons from public and private lands and achieve at a maximum depredation rate on sea turtle nests of five percent or less.

WILDLIFE AND HABITAT MANAGEMENT OBJECTIVE 1.a(3): Within two years of plan approval, work with the partners to minimize human disturbance and impacts to nesting sea turtles and hatchlings on the 20.5 miles (33 km) of beaches of the larger Archie Carr NWR partnership to support sea turtle recovery efforts.

Discussion: Human disturbance can adversely affect nesting sea turtles, causing disorientation or even nest abandonment. The Archie Carr NWR is experiencing an increase in human activity on the beach at night during the nesting season. People are reportedly looking for nesting sea turtles to watch and inadvertently disturb sea turtles when they approach them, many times with bright flashlights. The refuge would focus law enforcement efforts in problem areas where repeated incidents of turtle harassment have been reported. Law enforcement officers would warn and educate those individuals that are simply ignorant in their pursuit of having a close encounter with a sea turtle and cite or arrest only those who blatantly disregard warnings or engage in intentional harassment or harm of sea turtles. The refuge would also work with the partners to conduct public education campaigns to minimize harassment of nesting females and hatchlings. The refuge would also work with the partners to increase the number of interpretive nighttime turtle walks to meet demand and minimize overall disturbance to nesting females and hatchlings. Working with partners to physically close and lock all public beach parks and accesses during the nesting season would also contribute to reducing the incidence of people conducting unauthorized turtle walks and disturbing nesting sea turtles. Beachfront lighting interferes with nesting behavior and can disorient hatchlings. With additional law enforcement, the refuge would work with the local jurisdictions to assist them in their lighting ordinance education and enforcement. Nighttime beach access is also addressed under Wildlife and Habitat Management Objective 1.a(1) and Visitor Services Objective 6.b.

1.b. Southeastern Beach Mouse

WILDLIFE AND HABITAT MANAGEMENT OBJECTIVE 1.b(1): Over the life of the plan, work with the partners to evaluate and manage those habitats that could serve Southeastern beach mice within the larger Archie Carr NWR partnership and continue to work with the partners to support translocation efforts from donor sites to the refuge to support recovery efforts for the Southeastern beach mouse.

Discussion: The Southeastern beach mouse was first described in 1889 by Frank Chapman in Brevard County at what is now considered the Archie Carr NWR. The Southeastern beach mouse historically occurred along about 174 miles of Florida's southeast coast, from Ponce Inlet in Volusia County southward to Hollywood in Broward County, and possibly as far south as Miami Beach in Dade County. Based on the most recent published literature, this subspecies is currently restricted to about 50 miles of beach occurring in Volusia County, Brevard County, and scattered locations in Indian River and St. Lucie counties. The Southeastern beach mouse is thought to be extirpated from most of the refuge, especially north of Sebastian Inlet. Remnant populations exist on the refuge in Indian River County at Sebastian Inlet State Park (south of the Inlet), Segment 4 of the refuge, and Pelican Island NWR, adjacent to Segment 4. Predation is the primary cause of mortality of adult

beach mice. Increased urbanization of the coastal environment has also resulted in a greater abundance of feral, semiferal, and free-roaming domestic cats. The refuge would work with partners to discourage the introduction and establishment of feral and semiferal domestic cats in beach mouse habitat and remove any feral cats found in beach mouse habitat. The refuge would work with partners to prevent the establishment of feral cat colonies, including Trap/Neuter/Release (TNR) colonies anywhere near the Archie Carr NWR or other conservation lands. Loss of habitat is another key factor. Habitat essential for the recovery of the Southeastern beach mouse includes the sea oats zone of primary coastal dunes and swales. This habitat has been lost in some areas due to accelerated beach erosion. The refuge would work with state and other partners to manage and restore the habitat at the refuge through the use of mechanical clearing, prescribed burning, and exotic plant removal. The refuge would continue to restore the dunes by planting sea oats and other suitable dune vegetation. Beach renourishment projects should avoid impacting the dunes by placing sand outside the primary dune system. The refuge would work with partners to reestablish beach mouse populations at the refuge and monitor new populations to determine the success of the reintroduction of beach mice. Additional surveys are needed to ascertain the status of the Southeastern beach mice throughout the Archie Carr NWR, including refugia habitat (e.g., old fields and abandoned citrus groves).

Strategies:

- Coordinate management between ACNWR, Pelican Island NWR, and Sebastian Inlet State Park
- Restore habitat – plant and manage for sea oats and other forage plants, conduct regular prescribed burning, and use mechanical cutting of vegetation
- Reestablish three populations/locales
- Work with partners to discourage feral cat Trap-Neuter-Return programs near refuge lands (FWC 2003).

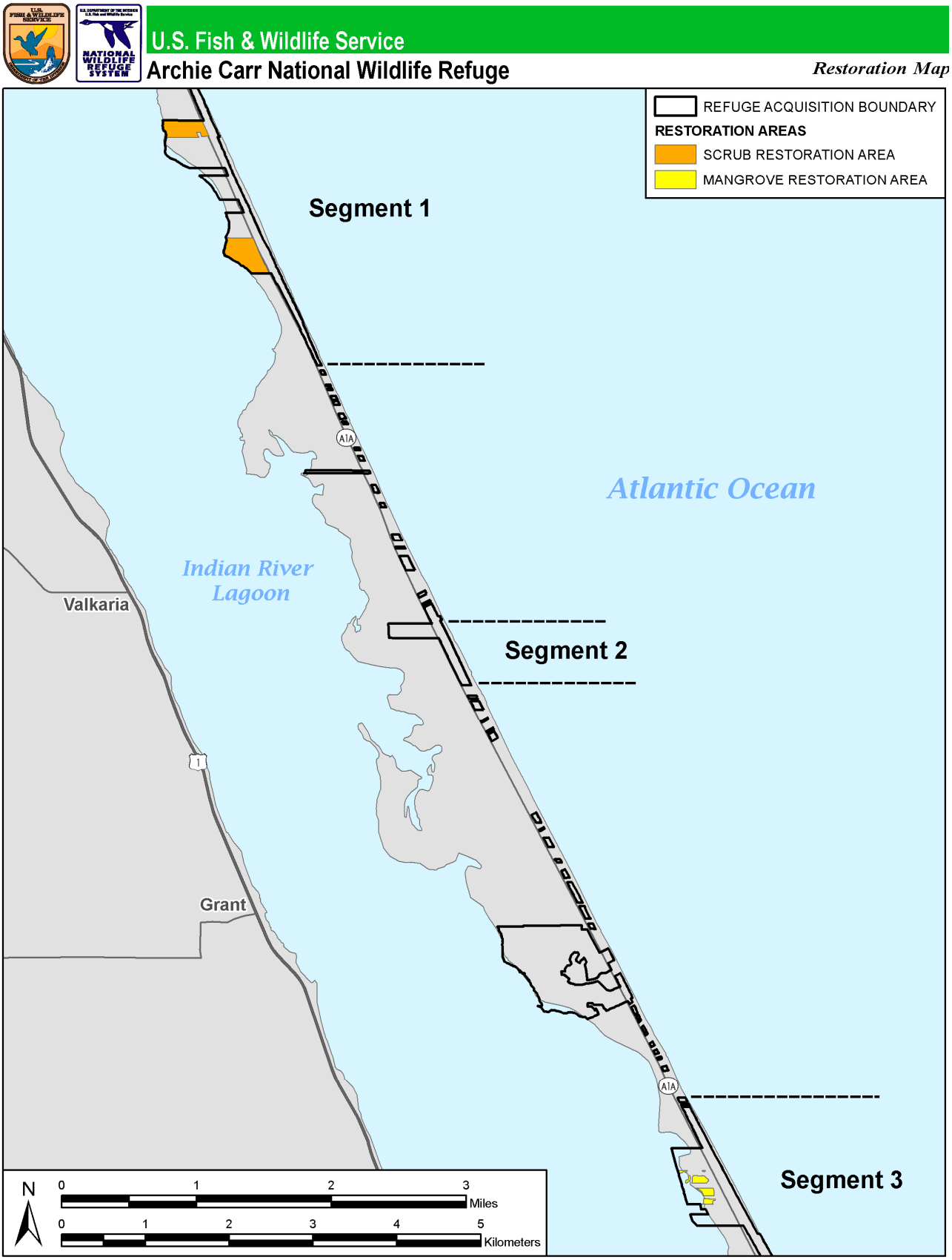
WILDLIFE AND HABITAT MANAGEMENT OBJECTIVE 1.b(2): Within seven years of plan adoption, work with the Service's North Florida and South Florida field offices to develop Southeastern beach mouse recovery targets for the refuge.

1.c. Gopher Tortoise

WILDLIFE AND HABITAT MANAGEMENT OBJECTIVE 1.c(1): During the life of the plan, work with the partners to enhance refuge habitat management activities to protect and maintain approximately 300 acres (121.5 ha) to support gopher tortoises using the refuge (Figure 10).

Discussion: Gopher tortoises require an abundance of herbaceous cover for grazing, conditions typically found in areas with an open canopy and sparse shrub cover which allows sunlight to reach the ground floor (Florida Fish and Wildlife Conservation Commission 1987). Without periodic fires that create suitable foraging areas for gopher tortoises, the ground cover is replaced by larger, unsuitable plant species. Through prescribed burning, mowing, planting forage, and other mechanical treatments and management techniques, favorable tortoise grazing areas can be maintained. The refuge would work with the partners to develop a management plan for gopher tortoise habitat within the entire partnership boundary. Another 200 acres (81 ha) could be restored for scrub-jays and also provide enhanced habitat for gopher tortoises.

Figure 10. Proposed mangrove and scrub restoration areas.



WILDLIFE AND HABITAT MANAGEMENT OBJECTIVE 1.c(2): Within two years of the plan's adoption, begin working with the partners to minimize impacts to gopher tortoises from vehicle collisions.

Discussion: Vehicle collisions are a main cause of gopher tortoise injuries and mortality. This is especially important in areas where road rights-of-way are frequently mowed, creating favorable grazing areas. Gopher tortoises occupy contiguous habitat managed by both the refuge and Brevard County. A number of strategies to reduce this impact could be evaluated by the refuge and partners for implementation. A few of these strategies are listed.

Strategies:

- Coordinate with FDOT to build roadway underpasses (especially during roadway maintenance work for logistical reasons)
- Coordinate with FDOT and Brevard County to install gopher tortoise crossing signs (e.g., give 'em a brake)
- Coordinate with FDOT to reduce speed limits in high-risk areas and enforce existing speed limits, especially at Coconut Point Sanctuary/Juan Ponce de Leon Landing Park and Maritime Hammock Sanctuary/Judith Resnick Memorial Park.
- Create barriers to movement (e.g., use fencing and provide for foraging needs within fenced areas)

WILDLIFE AND HABITAT MANAGEMENT OBJECTIVE 1.c(3): Within 10 years of the plan's approval, assess population status and trends of gopher tortoises using the refuge.

WILDLIFE AND HABITAT MANAGEMENT OBJECTIVE 1.c(4): Within 10 years of the plan's approval, determine carrying capacity for refuge lands.

WILDLIFE AND HABITAT MANAGEMENT OBJECTIVE 1.c(5): Within 10 years of the plan's approval, evaluate the need for relocation within the larger Archie Carr NWR partnership and the potential for receipt of translocated tortoises from offsite areas.

Discussion: With the exception of occasional surveys performed by visiting researchers, little is known about the gopher tortoise population using the refuge and adjacent lands. An assessment of the population status and trends, including diseases, would help establish important baseline information on which management decisions would be based. The refuge would evaluate the location, abundance, and habitat use of gopher tortoises on all Archie Carr NWR lands. The area currently managed for scrub habitat (100 acres/40.5 ha) could conceivably support up to 40 male tortoises and 200 female tortoises. Working with the partners, the refuge would survey and map the locations of all gopher tortoise burrows on Archie Carr NWR and partner lands. These survey and monitoring efforts would expand on Dr. Ehrhart's work, including the development of additional burrow assessment techniques (e.g., use burrow cams). As part of the recovery effort, the refuge would work with partners to develop carrying capacity data, assess the need for relocation, and identify sites for translocation from non-Service sites. The refuge would work with the partners to conduct genetic analysis of barrier island versus mainland populations to assess the feasibility of receiving translocated tortoises.

1.d. Florida Scrub-jay

WILDLIFE AND HABITAT MANAGEMENT OBJECTIVE 1.d: Within five years of the plan's adoption, work with the North Florida Ecological Services Field Office to evaluate the Service's ability to serve

the needs of the Florida scrub-jay on Archie Carr National Wildlife Refuge and partner lands. In accord with the findings of this evaluation, if the refuge is determined to have potential to serve scrub-jays, restore and manage approximately 300 acres (121.5 ha) of potentially suitable habitat on refuge and partner lands.

Discussion: Scrub-jays are habitat specialists and through habitat loss, fragmentation, and alteration, the populations of this species have steadily declined at the Archie Carr NWR until only one known family remains. The refuge would work with the North Florida Ecological Services Field Office and other partners to determine if the refuge can provide long-term suitable conditions for scrub-jays. Currently, the Archie Carr NWR (including a large proportion of partner lands) has about 300 acres (121.5 ha) of former scrub-jay habitat (scrub/coastal strand) that could be restored to support about 10-12 families. The refuge area once supported 11 families (EEL 1995). If the Archie Carr NWR is determined to be a potentially viable location for scrub-jays, the refuge would work with the partners to aggressively restore and maintain habitat and conduct monitoring efforts to determine emigration/immigration patterns. Currently, Brevard County, the Service, and the Florida Division of Forestry (FDOF) manage about 100 acres (40.5 ha) (at the Coconut Point Sanctuary) with prescribed fire, supporting one family of scrub-jays. Scrub restoration and management on about 200 acres (81 ha) would also involve the use of some mechanical removal of woody vegetation and, as for prescribed fire operations, would require outreach to the local community. In addition to increasing the potential for scrub-jay utilization, scrub restoration and maintenance efforts would benefit a host of other wildlife and plants, including gopher tortoises and indigo snakes.

1.e. Wood Stork

WILDLIFE AND HABITAT MANAGEMENT OBJECTIVE 1.e: Within eight years of plan approval, work with the partners to minimize human disturbance and impacts to the wood storks using the lands and waters of the larger Archie Carr NWR partnership to support wood stork recovery efforts.

Discussion: Although wood storks are not known to breed on the refuge, they do breed on adjacent conservation lands at Pelican Island NWR and the Indian River Lagoon Aquatic Preserve and they do utilize various habitats in the Archie Carr NWR for foraging. Increasingly, wood storks have learned to associate fish cleaning stations with a readily available food supply. Wood storks often try to ingest fish carcasses that are too large, leading to injury and potentially, death. Increasing awareness and changing behaviors of humans (e.g., discourage feeding of wildlife and properly dispose of fish carcasses) would help reduce potential impacts to wood storks. Also, wood storks come in contact with fish hooks and monofilament, which can also be deadly. The refuge would work with Brevard and Indian River Counties to reduce monofilament in the environment by providing monofilament recycling containers at all public fishing accesses as part of FWC's Monofilament Recovery and Recycling Program and continue to educate anglers to avoid discarding monofilament. The refuge would also work with Keep Brevard Beautiful and Keep Indian River Beautiful to pick up monofilament and other marine debris during cleanups. These efforts would also benefit other wildlife (e.g., herons and pelicans). In addition, the refuge would work with volunteers, veterinarians and licensed wildlife rehabilitators to increase the ability to rescue and rehabilitate injured wood storks. Currently inadequate facilities exist nearby to handle the number of sick and injured birds that are found in or near the Archie Carr NWR.

1.f. Bald Eagle

WILDLIFE AND HABITAT MANAGEMENT OBJECTIVE 1.f: When and where bald eagle nest sites are located on the refuge, work with the partners to protect these sites.

Discussion: Bald eagles currently are not known to nest on the refuge, but they utilize lagoon areas for foraging. Though bald eagles were delisted (U.S. Department of the Interior 2007), the refuge would continue to collaborate with FWS Ecological Services, FWC, DEP, Brevard and Indian River Counties to implement recovery plan recommendations and appropriate protection measures. These would include the minimization of disturbance around future nest sites.

1.g. Piping Plover

WILDLIFE AND HABITAT MANAGEMENT OBJECTIVE 1.g: Within 10 years of the plan's approval, conduct annual wintering surveys for piping plovers and when they are located on the refuge, adapt management as necessary and work with the partners to protect these sites.

Discussion: Piping plovers are currently surveyed only once every five years. Annual surveys would provide more reliable information on the presence, location, and abundance of piping plovers in the Archie Carr NWR area, enabling more focused protection measures.

1.h. Eastern Indigo Snake

WILDLIFE AND HABITAT MANAGEMENT OBJECTIVE 1.h: Within 10 years of the plan's approval, conduct additional surveys to determine the status of the Eastern indigo snake on the refuge and partner lands.

Discussion: Eastern indigo snakes have been observed (Tritaik, pers. observ., Ehrhart, pers. comm.) and tracked (Bolt, pers. comm.) on or near the Archie Carr NWR. They have been observed in a diversity of habitats, such as scrub, maritime hammocks, and mangrove wetlands. However, indigo snakes have not been observed in the last five years (Ehrhart, pers. comm.). Gopher tortoise burrow cameras and other techniques (e.g., specially trained dogs) could be used to confirm the presence of indigos on the refuge. Indigo snakes require larger areas of habitat than gopher tortoises. Indigos have large home ranges that can expand or contract depending on the time of year, habitat quality, and other factors, and it is currently unknown how many individual snakes the refuge could optimally support. Because indigos are also more generalists in their habitat requirements, surveys should also be conducted in maritime hammock and mangrove habitat, to determine presence and relative abundance. The refuge would coordinate with Brevard County, Indian River County, Florida Park Service, and St. Johns River Water Management District to survey across management boundaries.

1.i. West Indian Manatee

WILDLIFE AND HABITAT MANAGEMENT OBJECTIVE 1.i: During the life of the plan, work with the partners to improve coordination with partners during strandings of West Indian manatee.

Discussion: The refuge would work with FWC to respond to reports of injured or stranded manatees. Manatees sometimes strand themselves on the ocean beach when engaged in mating behavior. This sometimes occurs in the fall when female manatees are attempting to avoid male suitors.

Migratory Birds

WILDLIFE AND HABITAT MANAGEMENT GOAL 2: Protect refuge coastal barrier island habitats to contribute to national and regional population objectives for migratory birds in the Peninsular Florida Physiographic Area.

Discussion: Limited information is available on migratory birds using the refuge and baseline data is needed for all groups. The refuge would work with the Service's Migratory Birds Office to determine the refuge's contribution to national and regional population objectives. By conducting regular surveys and adapting management as necessary, the refuge and partners would assist in meeting these objectives.

2.a. Neotropical Migratory Birds

WILDLIFE AND HABITAT MANAGEMENT OBJECTIVE 2.a: During the life of the plan, organize regular, annual Christmas Bird Counts (CBCs) for the refuge.

2.b. Shorebirds

WILDLIFE AND HABITAT MANAGEMENT OBJECTIVE 2.b(1): During the life of the plan, organize regular, annual Christmas Bird Counts for the refuge.

WILDLIFE AND HABITAT MANAGEMENT OBJECTIVE 2.b(2): During the life of the plan, work with the partners to create closed areas as necessary to minimize impacts to nesting shorebirds.

Discussion: Human disturbance, the presence of dogs and cats, and beach erosion are all factors that impact the use of beaches by birds. Shorebird nesting, foraging, and loafing sites would be closely monitored and evaluated for closure, if necessary. Greater law enforcement would reduce the incidence of disturbance from dogs on the beach. If shorebird nesting occurs on the ocean beach, then the turtle survey protocol may need to be adjusted to avoid disturbance to the shorebird colony and/or nesting sites (especially if it involves a listed species). The refuge would work with the Florida Park Service, Brevard and Indian River Counties, and FWC to protect colonies that span management boundaries.

2.c. Wading, Water Birds, and Waterfowl

WILDLIFE AND HABITAT MANAGEMENT OBJECTIVE 2.c: During the life of the plan, work with partners to conduct CBCs and minimize disturbance.

Native Wildlife and Habitat Diversity

WILDLIFE AND HABITAT MANAGEMENT GOAL 3: Restore and enhance refuge coastal barrier island habitats to achieve high levels of natural wildlife and habitat diversity.

3.a. Land Crabs

WILDLIFE AND HABITAT MANAGEMENT OBJECTIVE 3.a: Within eight years of plan's approval, work with FWC, Indian River and Brevard County Sheriff's Office to increase law enforcement to protect land crabs from illegal take.

Discussion: Land crabs are utilized for human consumption, though high levels of harvesting are unsustainable. To help protect the species, the refuge would work with the partners to increase law enforcement patrols (especially during harvest times), increase bilingual regulatory and educational signage, incorporate land crab protection into other outreach efforts, and install interpretive signage to promote land crab protection. Because land crabs are migratory, utilizing the lagoon and ocean, they occupy both refuge and partner lands during various stages of their migration.

3.b. Wildlife Impacts from Vehicle Collisions

WILDLIFE AND HABITAT MANAGEMENT OBJECTIVE 3.b: Within six years of the plan's approval, work with the partners to minimize impacts to wildlife from vehicle collisions within the larger Archie Carr NWR partnership.

Discussion: State Road A1A, a coastal highway, runs through the Archie Carr NWR and nearby lands, and results in high vehicle-induced wildlife mortality. The refuge would work with the Florida Department of Transportation (FDOT) and local partners to evaluate, develop, and install wildlife underpasses (e.g., for gopher tortoises and land crabs). Two private road underpasses have already been installed for pedestrians in the Archie Carr NWR area (at the Windsor and Disney properties). Underpasses could be located at existing public use areas that would enable safe passage for pedestrians accessing public use areas on both sides of SR A1A, as well as provide safe passage for wildlife (e.g., Coconut Point Sanctuary/Ponce Landing Park, Maritime Hammock Sanctuary/Judith Resnick Park, and Sebastian Inlet Hammock Trail/Spanish House Beach Access). Wildlife crossing signs (e.g., Give 'em a brake), fencing, and measures to reduce speeds on SR A1A within the Archie Carr NWR would also be implemented in the short-term, while pursuing underpasses in the long-term. The refuge would also work to increase the awareness of wildlife impacts in the area from increased traffic.

3.c. Wildlife Diversity

WILDLIFE AND HABITAT MANAGEMENT OBJECTIVE 3.c: During the life of the plan, develop baseline data to determine the types of species using the refuge.

Discussion: Limited information is available on the diversity of wildlife using the refuge and baseline data is needed for all groups. The refuge would conduct additional surveys to identify all mammal and herptetological species using the Archie Carr NWR, particularly those that have either been historically recorded on the refuge or whose range indicates that they would be expected to be in the refuge, including Florida mouse (*Podomys floridanus*), roundtail muskrat (*Neofiber alleni*), marsh rice rats (*Oryzomys palustris*), Atlantic salt marsh mink (*Mustela vison lutensis*), southern flying squirrel (*Glaucomys volans*), and several species of bats. Also, reports of rare sightings would be investigated, such as those of the jaguarondi (*Felis yagouaroundi*). Fish surveys would also be conducted, especially in nursery habitat within the impounded wetlands and along some mangrove-fringed shorelines. The impoundments between Long Point and Pelican Island have been shown to be the best nursery habitat for juvenile tarpon in the U.S. (Shenker 2006). Refuge surveys would also be expanded to include invertebrates, especially horseshoe crabs, butterflies, and tiger beetles. Determining the abundance and distribution of these and other invertebrates can provide an index of wildlife diversity and ecological health.

3.d. Scrub and Coastal Strand

WILDLIFE AND HABITAT MANAGEMENT OBJECTIVE 3.d: Within five years of the plan's approval, begin the process to triple the amount of scrub/coastal strand acreage managed within the Archie Carr NWR partnership.

Discussion: Scrub habitat is important for a variety of wildlife and plants, especially several listed species. The refuge would consider existing and historic acreages of scrub to identify high priority areas that could be restored to scrub. It is estimated that about 200 acres (81 ha) have the potential for restoration in addition to the 100 acres (40.5 ha) currently managed for scrub habitat (Figure 10). Another area that could potentially be restored through a carefully managed prescribed burn (through

proper coordination with adjacent landowners) is the Miller House Tract (see Figure 11). Restoration would begin in designated areas and current scrub would continue to be managed. Management actions include mechanical clearing and prescribed burning. Prescribed fire is used to mimic natural fire regimes (every five years) in order to reduce fuel loads, vegetation density, and canopy heights. Prescribed fire would be designed to burn roughly 25% of a scrub unit, thereby allowing adequate escape cover for wildlife. Mechanical clearing is necessary to establish open areas through roller chopping and other means in areas where prescribed fire is not practical (e.g., on small tracts and in places that have a high urban interface). The Archie Carr NWR would seek fire support from Merritt Island NWR. Prescribed fire, wildfire suppression, mechanical clearing, fire break construction, and exotic removal would all be coordinated between the refuge, Brevard EEL, Brevard Recreation and Parks, and Florida Division of Forestry under management agreements. Surveys and monitoring of important scrub-dependent species would be needed to determine the effectiveness of these efforts.

3.e. Hammocks

WILDLIFE AND HABITAT MANAGEMENT OBJECTIVE 3.e: During the life of the plan, continue to maintain approximately 500 acres (202.5 ha) of hammocks within the Archie Carr NWR partnership and restore, where feasible, maritime hammocks to support a variety of species, especially neotropical migratory birds, indigo snakes, and woodrats.

Discussion: Coastal hammocks generally do not require active management, except for nonnative plant control, as necessary. Controlling Laurel Wilt Disease (caused by fungus which is vectored by a nonnative beetle) is needed to prevent the loss of red bay trees (*Persea borbonia*). Hammock restoration would be coordinated with Brevard EEL, Brevard Recreation and Parks, Indian River Lagoon Preserve State Park, Sebastian Inlet State Park, The Nature Conservancy, and other partners. Varying restoration techniques would be considered, including natural recruitment and succession and active planting of hammock species.

3.f. Beach and Dune System

WILDLIFE AND HABITAT MANAGEMENT OBJECTIVE 3.f: During the life of the plan, continue to maintain and manage approximately 300 acres (121.5 ha) of beach and dune within the Archie Carr NWR partnership to support a variety of species, especially sea turtles and Southeastern beach mice.

Discussion: Beaches and dunes along the refuge are being seriously eroded, reducing available habitat for a variety of species. Undeveloped dunes will stabilize over time after an erosion event, but coastal residents are increasingly armoring their properties in response to erosion. The seawalls and other semi-permanent structures that are built to protect beach-front land become serious obstacles for nesting turtles and create additional erosion issues for nearby properties. By working with partners to renourish beaches and rebuild dunes where needed, the refuge can help maintain these valuable habitats. However, such renourishment projects need to be carefully designed to avoid impacts to the beach profile (e.g., avoid escarpments) and beach composition (e.g., sand quality) which are factors in sea turtle nesting success. Also, renourishment projects need to avoid impacts to the nearshore and surfzone Sabellariid worm rock reef habitat, which provides vital nursery habitat for many marine organisms, as well as important foraging habitat for juvenile green turtles. Additionally, dune-building projects need to be designed to avoid impacts to the beach profile (e.g., avoid escarpments) and beach composition (e.g., sand quality). The size and scope of such projects should also be restricted to minimize impacts to the beach/dune plant community, mole crabs, and tiger beetles. Pre and post surveys should be conducted to evaluate not only sea turtle nesting and reproductive success, but also wildlife and habitat diversity. Furthermore, through partnerships such as the NESTS (Neighbors Ensuring Sea Turtle Survival)

Figure 11. Miller House Tract burn unit.

Program, the refuge can help educate coastal residents about the impacts of beach-armoring and promote alternative strategies that are compatible with conservation objectives. Dunes can also be protected and restored through planting dune vegetation. Friends of the Carr Refuge members and volunteers could provide much-needed support for such projects.

3.g. Mangroves

WILDLIFE AND HABITAT MANAGEMENT OBJECTIVE 3.g: Within five years of plan approval, work with the partners to restore 25 acres (10.1 ha) of mangroves and wetlands on the refuge (Figure 10).

Discussion: Mangrove swamps are the dominant wetland habitat along the western shores of the Archie Carr NWR. Mangrove swamps are important nursery areas for many marine fish and invertebrates. In addition, they provide habitat for birds, reptiles, and mammals. These forests also buffer the shoreline from large waves. The refuge would work with Hubbs-SeaWorld Research Institute (HSWRI), Brevard EEL, Marine Resources Council (MRC), and other partners to restore mangrove habitat, especially in the Pepper Cove area. Hubbs-SeaWorld would assist exotic control efforts on Service tracts adjoining HSWRI tracts. Hubbs-SeaWorld would also conduct restoration activities as part of an experimental forest-type research project under a management agreement with the refuge. Brevard EEL would assist management on a Service tract sandwiched between two Brevard EEL tracts under a management agreement with the refuge. Replanting projects would be initiated in areas where mangroves have been lost and MRC volunteers and FOCR members could provide valuable assistance with these efforts.

Exotic, Invasive, and Nuisance Species

WILDLIFE AND HABITAT MANAGEMENT GOAL 4: Eliminate current and future exotic, invasive, and nuisance species on the refuge to maintain and enhance the biological integrity of the refuge's native barrier island habitats.

4.a. Control of Exotic Plants

WILDLIFE AND HABITAT MANAGEMENT OBJECTIVE 4.a: Within three years of the plan's approval, work with the partners to identify and locate new infestations of Florida Exotic Pest Plant Council Category I and Category II invasive upland plants and control (eliminate where feasible) the spread of existing exotic, invasive, and nuisance plants with a focus on those habitats serving rare, threatened, and endangered species.

Discussion: Nonnative invasive plants can negatively affect refuge habitats and wildlife, primarily by displacing native vegetation. Problematic species found on the refuge include Australian pine, Brazilian pepper, and Guinea grass (*Panicum maximum*). Effective long-term control is likely to be most successful if neighboring land owners are involved in the effort, thereby reducing the likelihood of repeat invasions. The Brevard EEL Program has assisted with invasive exotic control and removal efforts on refuge lands. The Brevard EEL Program has also successfully competed for state grants to remove invasive exotics on county and state lands, and federal grants to remove invasive exotics from private lands within the Archie Carr NWR area. The Marine Resources Council has provided volunteers for invasive exotic removal. The refuge would continue invasive exotic control partnerships through management agreements and compete for grants to continue work. Volunteers and FOCR members could provide valuable assistance with exotic plant removal projects. An exotic species management plan would need to be developed.

4.b. Control of Feral and Free-roaming Animals

WILDLIFE AND HABITAT MANAGEMENT OBJECTIVE 4.b: Within three years of the plan's approval, coordinate with the partners to control feral and free-roaming animals to minimize adverse impacts to rare, threatened, and endangered species.

Discussion: Feral and free-roaming animals (e.g., cats, dogs) can negatively impact refuge wildlife and habitats through predation. Feral cats, in particular, can cause serious negative impacts on native wildlife and are believed to kill millions of birds and small mammals in Florida every year (Hatley 2003). The refuge would work with adjacent landowners to increase awareness and understanding and evaluate methods for removal of these animals from the refuge (e.g., trapping and animal control). The refuge would work with Brevard and Indian River Counties to prevent the establishment of any Trap/Neuter/Release feral cat colonies on or near the Archie Carr NWR.

Climate Change

WILDLIFE AND HABITAT MANAGEMENT GOAL 5: Understand the impacts of climate change on refuge resources to plan for and adapt management as necessary to protect the native wildlife, barrier island habitats, and cultural resources of the refuge.

5.a. Sea Level Rise and Shoreline Changes

WILDLIFE AND HABITAT MANAGEMENT OBJECTIVE 5.a: Within two years of plan approval, work with the partners to establish benchmarks in relation to sea level rise and shoreline changes and evaluate refuge management activities that could adapt to these changes and/or minimize their impacts.

Discussion: The effects of climate change on South Florida barrier islands include sea level rise and an increase in tropical cyclones (Church and Gregory 2001; Emanuel 1987; Emanuel 2005; Webster et al. 2005; Mann and Emanuel 2006; Holland and Webster 2007; IPCC 2007), both of which are likely to further erode refuge beaches and dunes. Increased coordination with researchers would help the refuge to adapt management to coincide with these changes. Sea level rise and the associated salt water intrusion and beach/dune erosion are likely to reduce the amount of habitat available for Southeastern beach mice as well as sea turtle and shorebird nesting, especially in areas where shorelines are developed. Mangrove swamps are predicted to migrate inland with increasing sea levels (Doyle 1998), replacing habitats further inland. By obtaining sea-level rise and associated shoreline retreat estimates, the refuge and land management partners would be able to better plan future management efforts.

5.b. Other Climate Change Impacts

WILDLIFE AND HABITAT MANAGEMENT OBJECTIVE 5.b: Within 10 years of plan approval, work with the research partners (FWC's Fish and Wildlife Research Institute, Hubbs-SeaWorld Research Institute, University of Central Florida, and University of Florida) and to assess the changes to refuge resources associated with climate change and evaluate refuge management activities that could adapt to these changes and/or minimize their impacts.

Discussion: Other effects of climate change include increased droughts and wildfires (Natural Resources Defense Council 2001; Westerling et al. 2004), which would alter habitats on the refuge. Also, higher temperature can change the sex ratio of sea turtles (Graeme et al. 2003) and is likely to alter the sea turtle nesting season (Weishampel et al. 2004). Warmer temperatures can also change

migratory and nesting seasons for various species. Global warming will likely cause distributional shifts of species, with more tropical species moving into the area and with the local extirpation of species with temperate origins (McCarty 2001, Paremesan and Yohe 2003, Root et al. 2003, Hannah et al. 2005, Parmesan 2006).

RESOURCE PROTECTION

The proposed resource protection activities are divided into: existing acquisition boundary, future conservation focus areas, and cultural resources.

Existing Acquisition Boundary

RESOURCE PROTECTION GOAL 1: Work with the partners to acquire or otherwise manage all remaining properties within the refuge's acquisition boundary to protect these important barrier island resources.

1.a. Refuge Acreage, Acquisition Boundary, and Land Status

RESOURCE PROTECTION OBJECTIVE 1.a: Within one year of plan approval, work with the Service's Southeast Region, Division of Realty, to determine the correct total acreage, acquisition boundary, and land status of the refuge.

During the development of the CCP, the Service discovered discrepancies between the Division of Realty's boundary shapefile that represents the Archie Carr NWR parcel information and the one generated for the Archie Carr NWR CCP, working with the partners and utilizing parcel data from the property appraisers of Brevard and Indian River Counties. Further, the original acquisition boundary developed for the refuge included errors, which were then repeated in subsequent boundaries and acreage estimates developed for the refuge. Based on the Wildlife Refuge Manager's (Paul Tritaik) knowledge and best information available, the refuge's and the partners' parcels were mapped using the parcel data from the counties. The Brevard County parcel information is dated December, 2006, and the Indian River County data is from June, 2006.

By overlaying the refuge's parcels that were generated using the counties' data with Realty's GIS layer for the refuge, numerous discrepancies became apparent. One of the differences appeared to be the result of Realty's clipping the parcel data to a shoreline layer. One result of clipping the parcel data with the shoreline layer is that the parcels on the Atlantic Ocean are extended to the shoreline. However, the shoreline below the Mean High Water (MHW) mark in Florida is owned by the state, making all parcels short of the actual shoreline and consequently that of Realty's layer. Another consequence of clipping the parcel data with the shoreline data is that the parcels that extend into the Indian River Lagoon are truncated. However, some of these parcels actually extend into the lagoon with title to the submerged lands. The other discrepancies discovered included an ownership parcel that was in the wrong location, leased parcels that were not represented, and errors in the acquisition boundary. A point layer was created to detail all of these discrepancies. In the point layer is an attribute field name "ISSUE" which details the suspected problem with the layer and how it might be corrected.

For the interim, the refuge will work with the Division of Realty to recognize the GIS layer created for the Archie Carr NWR CCP as the most accurate representation of parcel information available for the refuge. Then, the refuge will work with the partners and with the Division of Realty to address the discrepancies in order to develop a more accurate representation of the refuge's acquisition boundary, total acreage contained within the acquisition boundary, the refuge's management

boundary, the total acreage represented by the management boundary, and the status of all lands and waters of the refuge's acquisition boundary.

1.b. Inholdings

RESOURCE PROTECTION OBJECTIVE 1.b: Within one year of plan approval, prioritize Service acquisition efforts to those properties east of SR A1A and contiguous to existing conservation areas and resolve acreage and boundary discrepancies with the official Realty record.

Discussion: The Final Environmental Assessment and Land Protection Plan for the Proposed Archie Carr National Wildlife Refuge (August, 1990) prioritized properties for acquisition into four groups. Undeveloped tracts east of SR A1A within the four core segments (Group 1) were the highest priority for acquisition (with an emphasis on fee title acquisition of these properties). Developed tracts east of SR A1A within the four core segments (Group 2) were the second highest priority for acquisition (with a focus on easements for these properties). Lands owned by the either the State of Florida or the counties (Group 3) were the third highest priority for acquisition (with a focus on cooperative agreements for these properties). Undeveloped lands west of SR A1A and within a core segment of the refuge or undeveloped lands east of SR A1A between core segments (Group 4) were the lowest priority for acquisition (an emphasis on fee title acquisition of these properties). However, the Land Protection Plan acknowledged that lands within lower priority groups may be acquired before lands in higher priority groups, depending on land values, appropriations, and willing sellers.

Since the Land Protection Plan was approved in 1990, the refuge has acquired 137 parcels (258.05 acres/104.43) either through fee title acquisition, donation from partners, leased by partners, or granted easements by property owners. These lands are currently managed as part of the refuge.

Also during that same time, the partners have acquired 59 parcels from Groups 1, 2, and & 4 (totaling 216 acres/87 ha). By adding these 59 parcels to the previously acquired Group 3 parcels, the partners have acquired results in a total of 137 parcels (totaling 981 acres/397 ha). These lands are being managed by the partners. The partner properties would still eligible for inclusion under refuge management through some type of agreement (e.g., through a cooperative agreement where sharing management responsibilities would benefit the resource objectives of the respective agencies).

Due to the variation in availability by willing sellers, many parcels were purchased by private interests and developed. Since 1990, 423 parcels from Groups 1 and 4 (totaling 281 acres/114 ha) have been developed. The total of those to the previously developed properties in Group 2 is parcels results in a total of 479 parcels (totaling 317 acres/128 ha). The developed properties would still be eligible for inclusion under refuge management (e.g., through conservation easements) acquisition by easement. They could also be acquired by fee title if they are in a priority location and the value of the buildings becomes valued at or less than 5% of the total value of the property.

The remaining properties acreage within the refuge's approved acquisition boundary (totaling 190 acres/77 ha) is eligible for fee title acquisition on a willing seller basis, but with varying degrees of priority based on location and proximity to already protected lands. The parcels identified for priority acquisition are represented in Figures 12-1 through 12-5 and are grouped into the listed priorities.

Acquisition Priority	Description
Very High (undeveloped)	Group 1 lands bordered on two sides by refuge or partner lands east of SR A1A (7 parcels = 6 acres/2.4 ha)
Very High (minor developed)	Group 1 or 2 lands that have houses valued at or less than 5% of the total value of the property and is bordered on two sides by refuge or partner lands east of SR A1A (2 parcels = 3 acres/1.2 ha)
High (undeveloped)	Group 1 lands bordered on one side by refuge or partner lands east of SR A1A (29 parcels = 50 acres/20 ha)
High (minor developed)	Group 1 or 2 lands that have houses valued at or less than 5% of the total value of the property and bordered on one side by refuge or partner lands east of SR A1A (1 parcel = 3 acres/1.2 ha)
Medium	Group 4 lands bordered on one or more sides by refuge or partner lands and Group 1 lands bordered by refuge or partner lands west of SR A1A (11 parcels = 68 acres/27.5 ha)
Low	Group 1 lands bordered on two sides by developed lands east of SR A1A (23 parcels = 44 acres/17.8)
Very Low	Group 4 lands bordered on two sides by developed lands east of SR A1A (30 parcels = 16 acres/6.5 ha)

Exceptions to the above criteria will be made to consider outstanding natural resource or cultural value (e.g., Old Oak Lodge Hammock Site).

The refuge will work with the partners to identify willing sellers and continue to submit Archie Carr NWR for ranking in the Service's Land Acquisition Priority System (LAPS). The refuge would also work with the state's Florida Forever Program (and its possible successor) to elevate the Archie Carr NWR project to the A list of the State of Florida's land acquisition priorities, to trigger active negotiation and acquisition. The refuge would consider land swaps when outright acquisition is not possible. Such land swaps would need to produce a net benefit to conservation at Archie Carr NWR by consolidating adjacent parcels and increasing management capabilities. For example, the Service owns eight lots in a beachside community called SeaView. Three of those lots are ocean-front lots and five are along A1A adjacent to other Archie Carr and Pelican Island properties. The three lots are not contiguous. Those properties protect an old maritime hammock and beach dune that has supported listed southeastern beach mice and rare eastern woodrats. Every effort should be made to either acquire the lots between the Service-owned lots or swap lots to make the three ocean-front lots contiguous with the northern boundary of the community. Current SeaView by-laws prohibit the Service from acquiring more lots. The refuge should also attempt to eliminate or reduce the association fees charged to the refuge (and other lot owners) for maintenance services.

Figure 12-1. Refuge priority acquisitions, Segment 1.

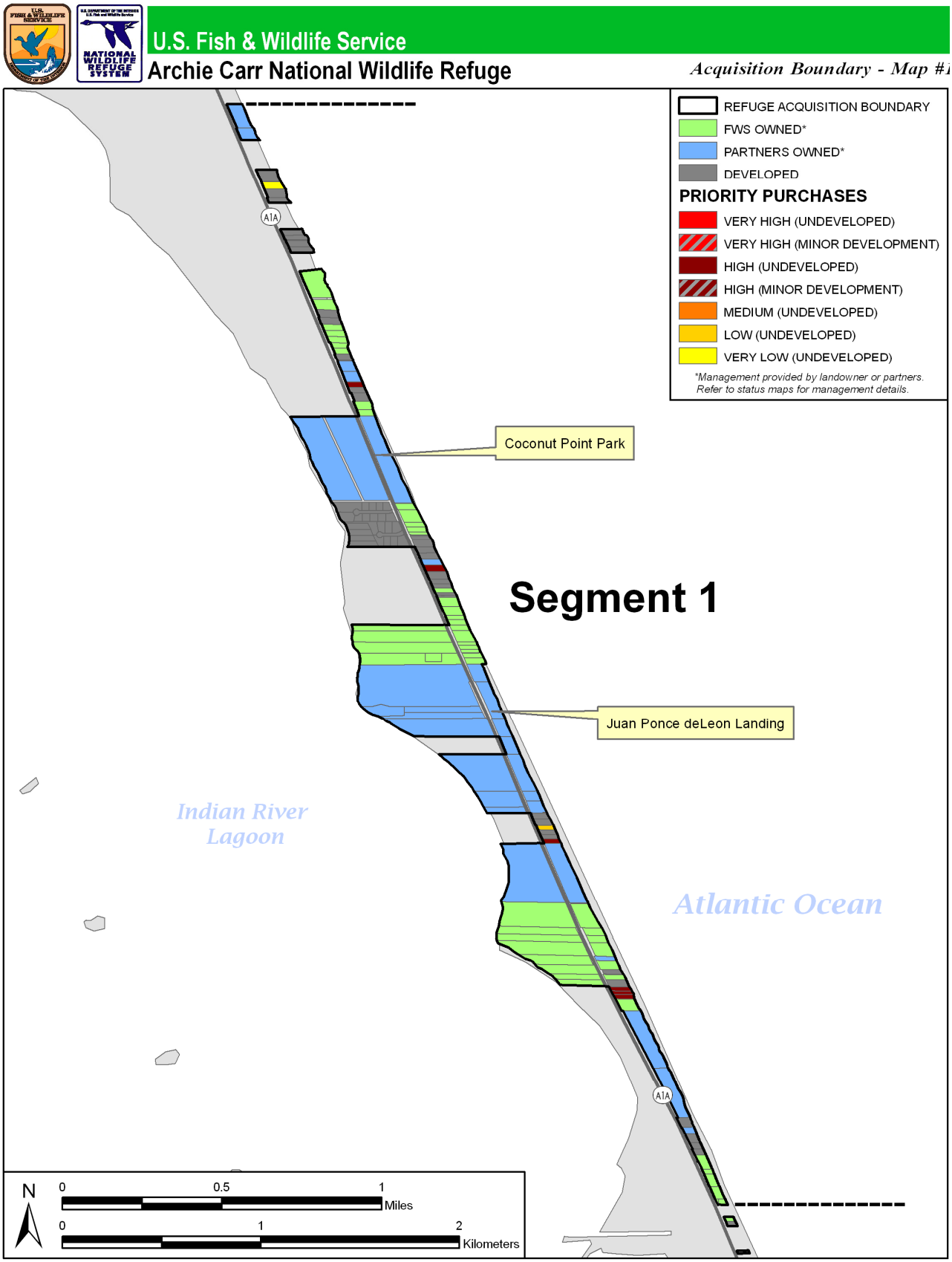


Figure 12-2. Refuge priority acquisitions, Segment 2.

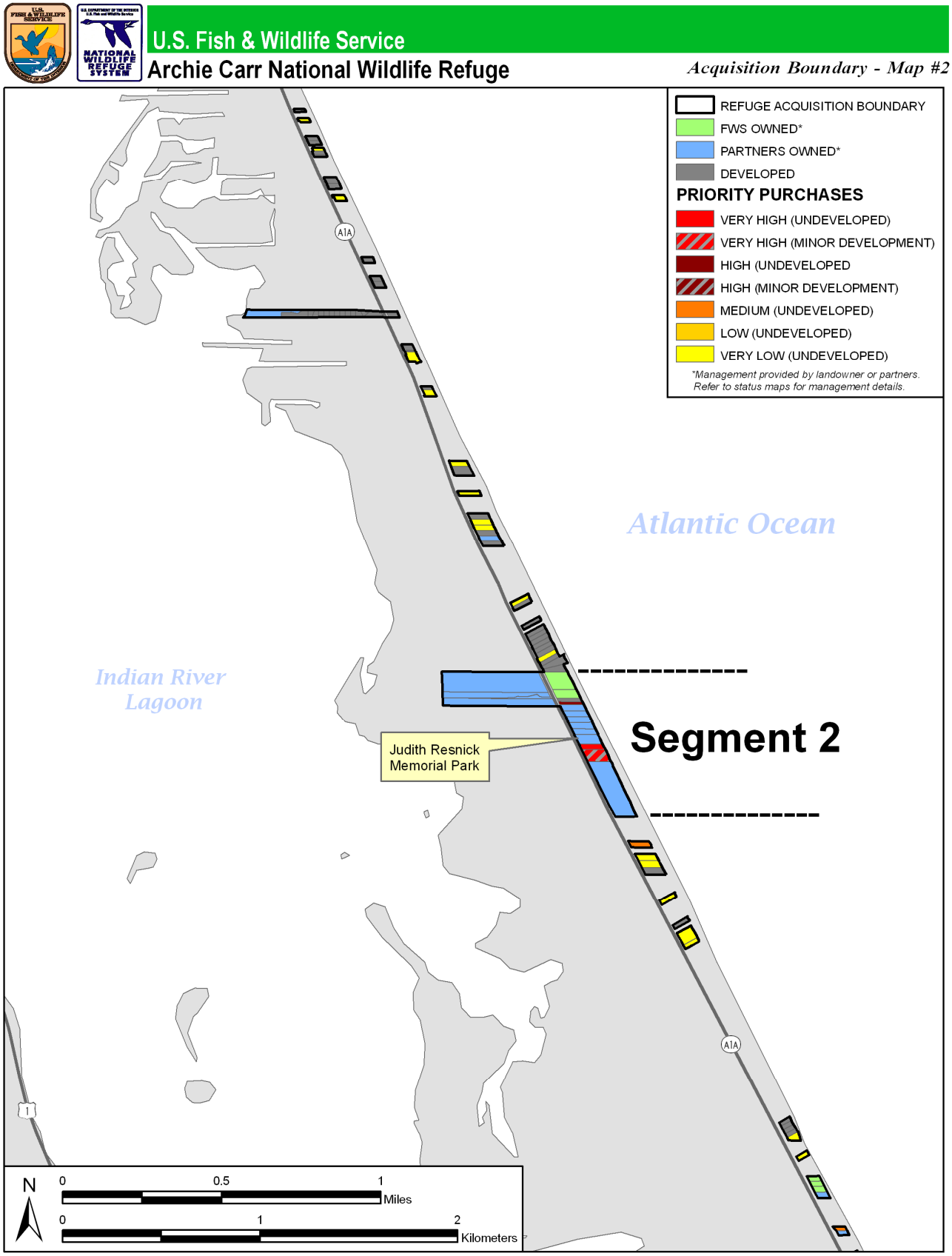


Figure 12-3. Refuge priority acquisitions, Segment 3 North.

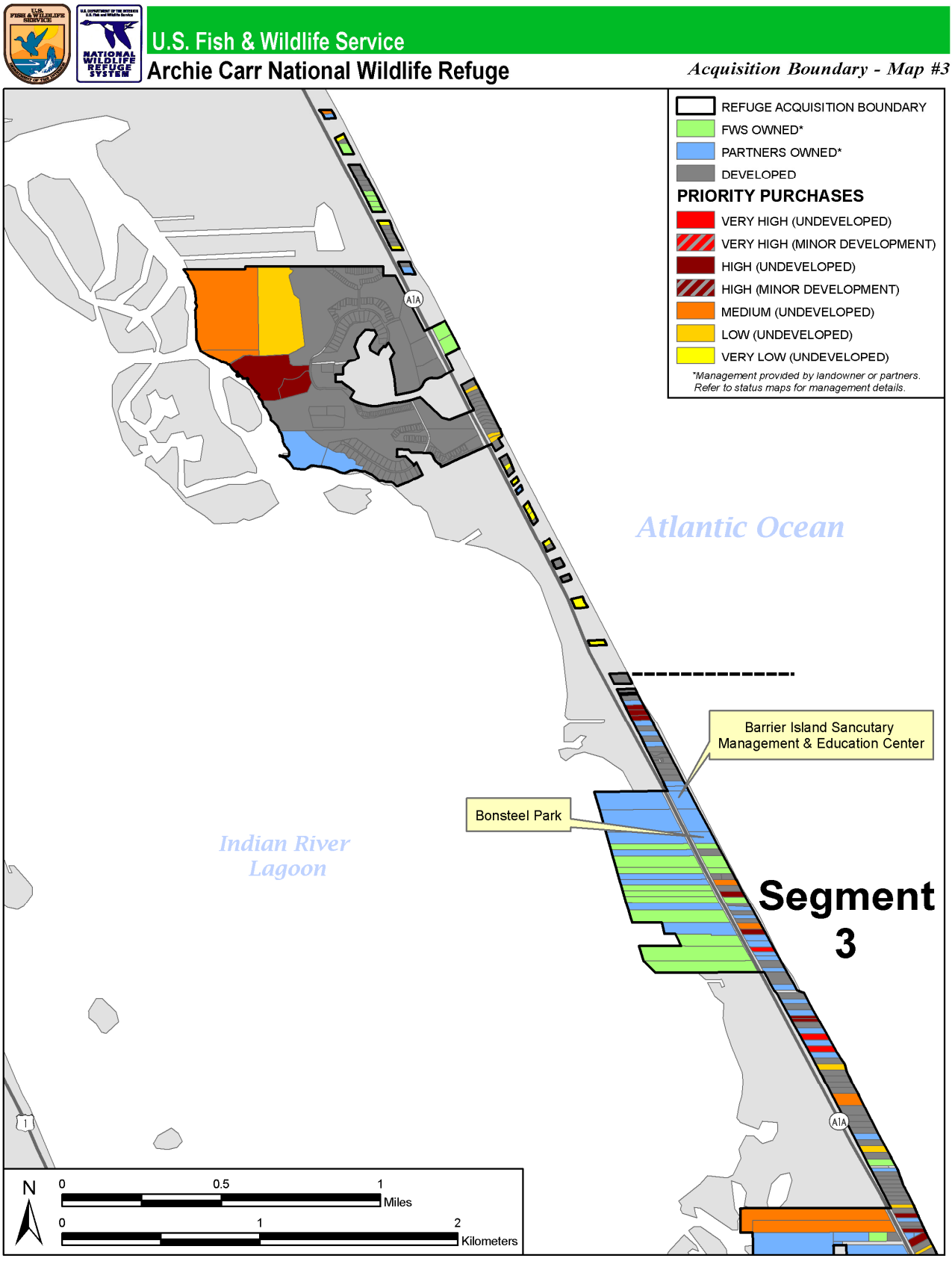


Figure 12-4. Refuge priority acquisitions, Segment 3 South.

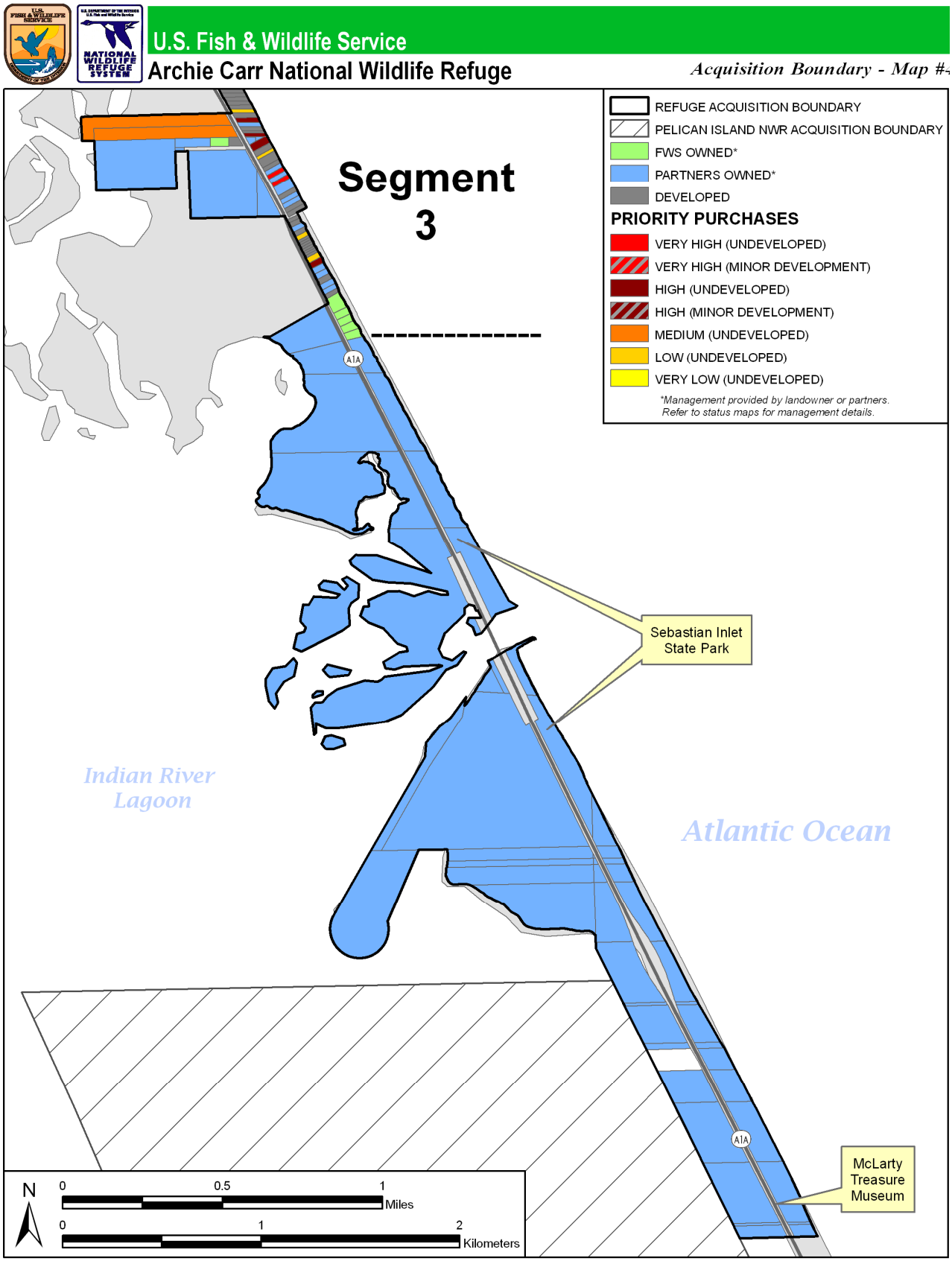
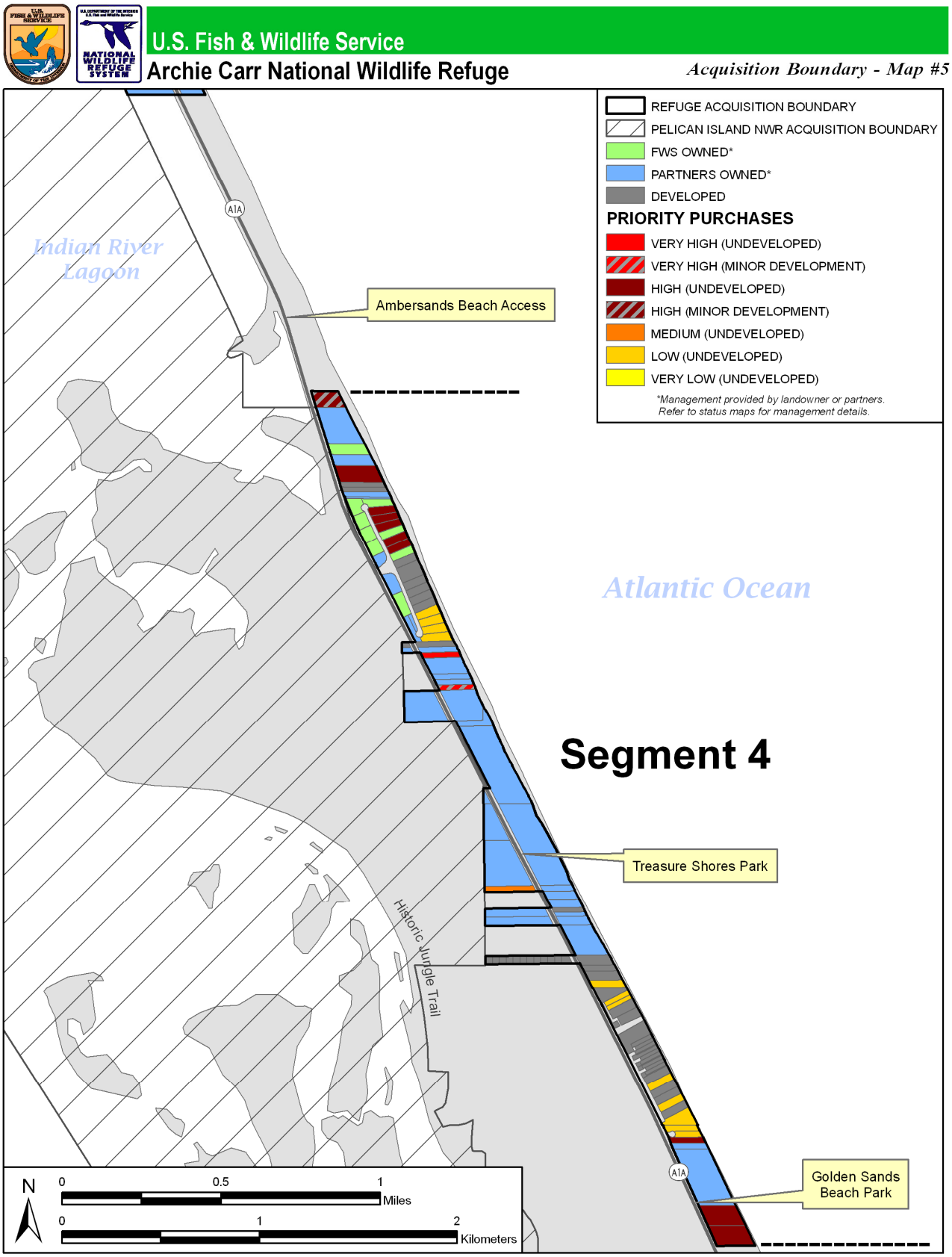


Figure 12-5. Refuge priority acquisitions, Segment 4.



Future Conservation Focus Areas

RESOURCE PROTECTION GOAL 2: Work with the partners to identify, protect, restore, and manage ecologically valuable barrier island habitats utilized by listed species.

2. Important Habitats and Connections

RESOURCE PROTECTION OBJECTIVE 2: During the 15-year life of the plan, document important habitats and wildlife corridors connecting the refuge to nearby conservation areas and work with the partners to protect these areas.

Discussion: Providing connectivity (wildlife corridors) and enlarging conservation lands are two important tools that can be used to better protect and manage refuge resources. The refuge is highly fragmented, consisting of four distinct segments that are each surrounded by private and public lands. These developed areas, in turn, vary in the intensity and type of human development. The consolidation of refuge and partner lands into larger, contiguous tracts would greatly benefit the habitats and associated species found there. Any important properties needed for connectivity and protection that are outside of the current acquisition boundary would either be targeted by partners or proposed for addition under a Minor Expansion Proposal of less than 10 percent of the approved acquisition boundary minus the 65 acres (26 ha) added under the last MEP (2004). Developing a land acquisition plan would help the refuge and partners plan and prioritize the process. The refuge would work with partners to consider sharing resources with public lands outside the Archie Carr NWR boundary, but within other management districts, such as Spessard Holland Park in Brevard County and Captain Forster's Hammock Preserve in Indian River County.

Cultural Resources

RESOURCE PROTECTION GOAL 3: Maintain and preserve in perpetuity the archaeological and historical resources of the refuge exemplifying the natural and cultural history of the barrier island system of the central Indian River Lagoon area.

3.a. Oak Lodge Site

RESOURCE PROTECTION OBJECTIVE 3.a: Within five years of plan approval, actively work with the partners to acquire or otherwise protect the historically important Oak Lodge site.

Discussion: The Old Oak Lodge site (8BR1856) is on private property (Aquarina Country Club), but is within the acquisition boundary of the refuge. The Old Oak Lodge site contains an Ais Indian shell midden and burial mound, as well as the site for the historic Oak Lodge. Oak Lodge was a 10-bedroom boardinghouse run by Charles and Frances "Ma" Latham, who catered to such renowned scientists, naturalists, artists, photographers, and writers as John Jenks, William Hornaday, William Beebe, Arthur Cleveland Bent, Herbert Job, Louis Agassiz Fuertes, and Frank Chapman. The Lathams introduced Frank Chapman to Paul Kroegel, and from that moment a campaign was born to save the pelicans of Pelican Island. This campaign, of course, led to the establishment of our first national wildlife refuge, and ultimately, the National Wildlife Refuge System. Oak Lodge was built in 1880 and rebuilt in 1889 after it burned in a fire. The lodge continued to house famous visitors until one night in May of 1910. As Halley's Comet streaked across the sky, the Oak Lodge burned down for the second and last time. The site would make an outstanding addition to historic interpretation, but is under development pressure from the property owners who have expressed plans to build condos on the site. Local Aquarina residents have worked with the refuge, Florida Institute of Technology, Florida Historical Society, Indian River Lagoon Anthropological Society, Brevard EEL

Program, and Friends of the Carr Refuge to gather support to protect the Old Oak Lodge site. In August, 2003, the Acquisition and Restoration Council (ARC) approved the addition of the 15-acre (6.1-ha) Old Oak Lodge Preserve site to the Indian River Lagoon Blueway Project. If acquired, the Old Oak Lodge Preserve site would be protected, and additional cultural, archaeological, and biological surveys would be conducted. Once protected, surveyed, and secured, the Oak Lodge site would be opened to limited public use. Construction of a kiosk and a pavilion would enable the interpretation and education of the Oak Lodge's historical and biological significance to a limited group of visitors. Public access is already permitted for canoes and kayaks.

3.b. Archaeological and Historical Resources

RESOURCE PROTECTION OBJECTIVE 3.b: Within 15 years of plan approval, coordinate with the Service's Regional Archaeologist and the State Historic Preservation Office (SHPO) to develop a comprehensive survey of all cultural resources of the refuge.

Discussion: Although numerous cultural resources are located in the area, no comprehensive cultural resources survey exists for the refuge. This information would help adapt management to protect these resources and protect them from vandalism and theft. The refuge would work with the Regional Archaeologist and SHPO to compile a complete set of Archaeological Site Forms from the Florida Master Site File. The refuge would work with the partners to include surveys on partner lands where feasible. All archaeological sites would be mapped only for management purposes. A cultural resources management plan would be developed.

VISITOR SERVICES

The Service is committed to working with state and county land management partners to provide appropriate, compatible, and quality public use opportunities on partner lands. Special emphasis is placed on working with the Barrier Island Center and other partners to communicate Service messages focused on rare, threatened, and endangered species and on the minimization of human impacts. Resource protection and enforcement would be central to support improvements to recreational programs. Increasing volunteer participation through FOCR would be needed to support many of the visitor services' goals and objectives.

The Archie Carr NWR partnership provides recreational opportunities on lands owned and managed by the refuge, Brevard EEL Program, Brevard Recreation and Parks, Indian River County Parks, and Sebastian Inlet State Park. The proposed visitor services activities are divided into the several goals: welcome and orient visitors; provide quality fishing opportunities; provide quality wildlife observation and photography opportunities; provide quality environmental education programs; interpret key resources; manage for appropriate recreational opportunities; communicate key issues with offsite audiences; build volunteer programs; build support of friends group; and remove litter and ocean debris.

Welcome and Orient Visitors

VISITOR SERVICES GOAL 1: Visitor will feel welcome and find accurate, timely, and appropriate orientation material and information on visitor facilities, programs, and management activities available in the area of the refuge.

1.a. Visitor Contact Sites, Kiosks, and Trailheads

VISITOR SERVICES OBJECTIVE 1.a(1): During the life of the plan, work with the partners to develop, install, and maintain Archie Carr NWR kiosks at all improved beach access points and Archie Carr NWR informational signage at the remaining designated beach access points.

Discussion: Currently three beach accesses (Ponce Landing Park in Brevard County, Sebastian Inlet State Park at Spanish House, and Golden Sands Park in Indian River County) have interpretive kiosks on the refuge. At this time, no Archie Carr NWR interpretive kiosks are located at Coconut Point Park and Bonsteel Park in Brevard County, three accesses at Sebastian Inlet State Park, and Treasure Shores Park in Indian River County. All existing and proposed kiosks would provide users with information regarding the larger Archie Carr partnership and sea turtles.

VISITOR SERVICES OBJECTIVE 1.a(2): Within one year of plan approval, work with the partners to develop a visitor counting process to estimate the numbers of visitors to the larger Archie Carr NWR partnership.

Discussion: Currently, no reliable way is utilized to estimate numbers of visitors to beach parks and accesses and to trailheads, which are managed by our partners. Some solutions include car counters at the entrance to the parking lots and trail counters at the heads of trails. While these methods are not 100% reliable, they do provide a reasonable estimate of visitation, which is not currently available for any of the areas other than Sebastian Inlet State Park.

VISITOR SERVICES OBJECTIVE 1.a(3): During the life of the plan, develop a Service movie for Archie Carr National Wildlife Refuge.

VISITOR SERVICES OBJECTIVE 1.a(4): Within one year of plan approval, provide the Archie Carr NWR brochure at the Barrier Island Sanctuary Management and Education Center, Sebastian Inlet State Park, and kiosks within Pelican Island National Wildlife Refuge.

VISITOR SERVICES OBJECTIVE 1.a(5): During the life of the plan, work with Sebastian Inlet State Park, Brevard and Indian River Counties to update and replace existing Service-owned interpretive panels to comply with Service standards.

Discussion: The current interpretive panels need to be updated, to reflect changes in sea turtle production numbers and refuge boundaries. The current format of the three panels (dedicated to sea turtles, the refuge, and Dr. Archie Carr) should be supplemented with a panel dedicated to the park where the kiosk is located. Additional emphasis should be given to the partnership of agencies and organizations that have made the Archie Carr NWR a success. The map associated with the refuge panel needs to be updated.

VISITOR SERVICES OBJECTIVE 1.a(6): Over the life of the plan, work with the Brevard EEL Program to include Archie Carr NWR information on all trailhead kiosks and at the welcome and orientation kiosk at the Barrier Island Sanctuary Management and Education Center.

1.b. Brochures

VISITOR SERVICES OBJECTIVE 1.b(1): During the life of the plan, develop a general wildlife observation brochure and provide this brochure at all kiosks and trailheads within the Archie Carr NWR partnership.

VISITOR SERVICES OBJECTIVE 1.b(2): During the life of the plan, work with the partners to develop a joint Pelican Island/Archie Carr bird checklist and provide at all kiosks and trailheads within the Archie Carr NWR partnership.

1.c. Signs

VISITOR SERVICES OBJECTIVE 1.c(1): During the life of the plan, work with the partners to simplify regulatory signage to minimize confusion to the users.

VISITOR SERVICES OBJECTIVE 1.c(2): During the life of the plan, work with the partners to incorporate the refuge's name into existing roadway signs to increase awareness of the refuge to users.

VISITOR SERVICES OBJECTIVE 1.c(3): Within one year of plan approval, work with the partners to develop common nomenclature to reflect the larger Archie Carr NWR partnership.

Discussion: The conservation lands of the Service and the partners in this area are colloquially referred to as The Carr Refuge or the Archie Carr Refuge partnership. The larger partnership includes Brevard and Indian River county beach parks, EEL trailheads, state parks and properties, the Service's properties, and the new Barrier Island Center. Working through the Archie Carr Working Group, these partners coordinate acquisition and management activities. This partnership has been in existence for nearly 20 years and began by focusing on land acquisition in and around the federal acquisition boundary for Archie Carr NWR. Over time, the partners have expanded their management activities (e.g., fire management, kiosks and educational signs and the new Barrier Island Center). The Working Group could discuss the development of common nomenclature to consistently refer to this partnership by a common overall name, stepping down to specific names for specific sites (e.g., Sebastian Inlet State Park).

VISITOR SERVICES OBJECTIVE 1. c(4): Within one year of plan approval, install double-sided entrance/exit signs on SR A1A at the northern and southern boundaries of the Archie Carr NWR partnership.

Discussion: The existing entrance/exit signs generally mark the boundaries of the Service's and the partners' properties of the larger Archie Carr NWR partnership, providing a special sense of place to this area, despite whether the user is visiting an EEL trailhead, a county beach park, Sebastian Inlet State Park, or a neighborhood.

1.d. Maps

VISITOR SERVICES OBJECTIVE 1.d: Within one year of plan approval, work with the partners to develop a tear sheet map of the visitor facilities available within the larger Archie Carr NWR.

1.e. Internet

VISITOR SERVICES OBJECTIVE 1.e: Within one year of plan approval, work with the partners to actively maintain and update the refuge website to include information on visitor opportunities within the Archie Carr NWR partnership, including cross links between the partners' sites.

Provide Quality Fishing Opportunities

VISITOR SERVICES GOAL 2: Members of the fishing public will enjoy their fishing experiences, display ethical behavior, and support refuge management.

2.a. Fishing Opportunities

VISITOR SERVICES OBJECTIVE 2.a(1): During the life of the plan, work with Sebastian Inlet State Park, Brevard and Indian River Counties to provide fishing information to the public to increase awareness and minimize disturbance and impacts.

Discussion: Fishing information would be provided by developing a fishing brochure and/or interpretive panels at beach access points. Educational programs could also help minimize the impacts of fishing activities to wildlife (e.g., waterbirds, including wood storks and pelicans). Through educational programs, a fishing brochure and improved signage, the fishing public can reduce the amount of improperly discarded monofilament line that can injure or kill wildlife. The number of monofilament line recycling bins would be increased through coordination with the partners. In addition, the surf-fishing at night with lights would be discouraged during sea turtle nesting season to avoid disturbance to sea turtles.

VISITOR SERVICES OBJECTIVE 2.a(2): During the life of the plan, work with partners to direct fishing activities to designated access points and close all undesignated access points through refuge properties managed for conservation.

Discussion: Surfcasting is a popular activity along the 20.5 miles of beach within the Archie Carr NWR. Some fishermen, like some other beachgoers, do not utilize designated beach access points, preferring instead to use existing secluded foot paths through the dunes or create new ones. This often results in dune blow-outs that increase the likelihood of storm surge flooding and dune erosion. Dunes provide the critical function of storm protection for the barrier island and all its inhabitants, but where there are gaps in the dunes, waves wash through and flood areas behind the dunes. Another impact of the public using undesignated paths to the beach is the increased likelihood of litter left behind. Surfcasters and surfers are especially motivated to seek secluded paths to the beach, because their access to improved, lifeguarded beach parks is typically restricted to areas outside the lifeguarded areas, so as not to conflict with the swimming public. Currently only a few beach parks and accesses are suitable for surfcasters. Those sites that are attractive to surfcasters are Judith Resnick Park, River Oaks Drive Beach Access, and Bonsteel Park in Brevard County and Ambersands Beach Access in Indian River County. Some of the improved beach parks have secluded footpaths on the same property as the paved accesses, including Ponce Landing Park in Brevard County and Treasure Shores Park in Indian River County. The refuge would work with the partners to provide attractive beach access points for fishermen that would not conflict with other beachgoers and that would help protect the dunes. Further, the refuge would work with the partners to close secluded paths that pose a threat to dune integrity. Public scoping and outreach would be conducted to get input from fishermen and other members of the public. Close coordination with the users and the partners is necessary to adequately address this issue. For example, some secluded paths may have a benefit for the land manager by providing access for research and management. Other paths may have a primary public value on properties that were acquired for beach access (e.g., those properties acquired under the Save Our Coasts program). Paths which have a public benefit that outweigh the negative impacts would be left open, but would require dune restoration and the construction of ecologically sound dune crossovers. Paths that have a research or management benefit would be left open, but would be gated and would also require dune restoration and the construction of ecologically sound dune crossovers. Paths that do not have primary public or management benefit would be closed and restored, preferably using native vegetation, such as saw palmetto and sea grape. The closure of unapproved access points is also addressed under Visitor Services Objective 6.a.

Provide Quality Wildlife Observation and Photography Opportunities

VISITOR SERVICES GOAL 3: Wildlife observers and photographers of all abilities will enjoy and value the diversity of refuge wildlife, will display ethical behavior, and will support efforts to maintain quality wildlife habitat on the barrier island.

3. Wildlife Viewing and Photography Opportunities

VISITOR SERVICES OBJECTIVE 3: During the life of the plan, continue to work with the partners to provide quality opportunities for wildlife observation and photography on partner properties within the larger Archie Carr NWR partnership.

Discussion: Sea turtle watch programs and birding are the major wildlife observation activities on the refuge. The most popular wildlife observation program conducted on the Archie Carr NWR, by far, is the sea turtle watch program. This program is so popular that hundreds of people are turned away each year due to the limitations on availability. The sea turtle watch program combines educational and interpretive components with a guided walk on an active sea turtle nesting beach. Sea turtle watch programs are operated under a State of Florida permit and require adherence to strict program guidelines. Continue to work with the partners to conduct sea turtle watch programs on the refuge and expand opportunities where feasible. For example, the Caribbean Conservation Corporation assists the refuge in conducting sea turtle watch programs out of Bonsteel Park in Brevard County three nights a week (Monday-Wednesday). Sebastian Inlet State Park conducts sea turtle watch programs out of McLarty Museum in Indian River County five nights a week (Tuesday-Saturday). The refuge would work with CCC to provide additional sea turtle watch programs on Friday and Saturday nights to maximize the allowable number programs authorized under the state permit. The refuge would work with the partners to explore an additional access point that would not interfere with conservation and research, but would help alleviate demand for turtle walks.

Birding is another popular wildlife observation and photography activity at the Archie Carr NWR. Sebastian Inlet State Park is part of the Great Florida Birding Trail, with shorebirds and waterbirds the focus of attraction. Three foot trails totaling 4.5 miles (7.2 km) on Environmentally Endangered Lands' properties have been nominated for addition to the Great Florida Birding Trail because they provide opportunities to observe birds in three different habitats: mangrove swamp, maritime hammock, and coastal strand/scrub. The refuge would provide a volunteer, intern, or Park Ranger to conduct additional interpretive programs, leading from the Barrier Island Center.

Strategies:

- Develop a joint Archie Carr/Pelican Island bird checklist and post this on the Service's website for the refuge [see Visitor Services objectives 1.b(2) and 1.e].
- Develop a general wildlife viewing brochure/tear sheet, which would be a list of species that visitors are likely to see during different parts of the year. Make this information a part of the Service's website and consider adding pictures and sound to the web version. Also provide this brochure for the kiosks and trailheads on the public lands (see Visitor Services Objective 1.d.).
- Coordinate with FWC to add additional beach access sites to the Great Florida Birding Trail, if eligible.
- Conduct outreach to birders by getting articles in publications and on websites.

Provide Quality Environmental Education Programs

VISITOR SERVICES GOAL 4: Provide quality, appropriate, and compatible wildlife-dependent environmental education and interpretation opportunities to promote understanding and awareness of the value of the refuge, its natural resources, and the human influences on the barrier island.

4.a. Environmental Education Opportunities

VISITOR SERVICES OBJECTIVE 4.a: Within 15 years of plan approval, work with the partners to develop on- and offsite curriculum-based environmental education programs with messages focused on sea turtles and other rare, threatened, and endangered species.

Discussion: No facilities are available on refuge land to support the environment education program. The EEL Program and CCC will conduct environmental education out of the Barrier Island Sanctuary Management and Education Center. The CCC has hired an education specialist to conduct educational programs at the Archie Carr NWR. The refuge would assist the partners in seeking grants and training staff and volunteers to conduct environmental education programs in classrooms and during field visits. The refuge would also assist the partners in training teachers to conduct these programs in the classroom or during self guided field trips.

Strategies:

- Coordinate with the Brevard EEL Program and CCC to develop an environmental education turtle walk web cast.
- Continue working with the partners to incorporate Service and Archie Carr NWR messages and information into their presentations and programs.
- Train staff, volunteers, and teachers to conduct education and interpretive programs, and conduct indoor and outdoor classroom activities on partner properties.
- Work with the Brevard EEL Program, CCC, and other education partners to develop education materials to be included in a self-guided teacher activity packet. These materials should meet state standards.
- Work with the Brevard EEL Program, CCC, and other education partners to develop a sea turtle activity kit for teachers to use in their classrooms. Develop a volunteer environmental education group to provide presentations in classrooms.
- Work with partners (e.g., CCC and EEL) to develop an outreach program to promote awareness of the refuge and its conservation issues among local residents.

Interpret Key Resources

VISITOR SERVICES GOAL 5: Visitors of all abilities will enjoy their visits and increase their knowledge, understanding, and appreciation of sea turtle conservation, the barrier island ecosystem, and the National Wildlife Refuge System, resulting in minimizing the impacts to wildlife and habitats.

5.a. Interpretive Programs

VISITOR SERVICES OBJECTIVE 5.a(1): Within 15 years of plan approval, work with the Sebastian Inlet State Park, Brevard and Indian River Counties, Friends of the Carr Refuge, and Caribbean Conservation Corporation to develop on- and offsite interpretive programs with messages focused on rare, threatened, and endangered species and on the minimization of human impacts.

Discussion: The refuge would work with the partners to train volunteers to provide opportunistic presentations at improved beach access points.

VISITOR SERVICES OBJECTIVE 5.a(2): Within three years of plan approval, complete coordination with the State of Florida, the Service's Sea Turtle Recovery Coordinator, and other partners to evaluate and refine key messages to be conveyed to all sea turtle walk participants.

Discussion: The Florida Fish and Wildlife Conservation Commission provides a list of 17 current issues that is required to be presented at all public turtle watch programs. This list is currently the only educational framework that is provided to organizations developing and conducting sea turtle watch programs throughout the state. As a result, there exists a lack of consistency in messages being delivered and there has been no evaluation, until recently, to determine whether or which of the 17 guidelines are having a positive effect on participant outcomes. Given the value of the sea turtle watch programs on sea turtle conservation, a thorough program evaluation needs to be conducted on sea turtle watch programs taking place within the refuge. Participant outcomes need to be measured, goals and objectives need to be developed and key messages need to be refined. Evaluation work conducted on refuge turtle watch programs will serve as a model to improve program delivery and participant outcomes throughout the state. Initial Sea Turtle Watch Program evaluations were conducted on refuge programs in the summer of 2006. A new partnership needs to be established to complete the evaluation work, which may take one to two years.

VISITOR SERVICE OBJECTIVE 5.a(3): Within 15 years of plan approval, hire a Park Ranger to develop and provide training to commercial tour operators and to rangers and volunteers at Sebastian Inlet State Park to increase awareness and understanding of the Service and the refuge.

VISITOR SERVICES OBJECTIVE 5.a(4): Within 15 years of plan approval, work with the partners to incorporate Service messages focused on rare, threatened, and endangered species delivered through brochures, kiosks, interpretive panels, and programs at the Barrier Island Center.

Manage for Appropriate Recreational Opportunities

VISITOR SERVICES GOAL 6: All public use activities will be appropriate and compatible and visitors will support priority public use activities that minimize wildlife and habitat disturbance.

6.a. Control of Undesignated Trails to the Beach

VISITOR SERVICES OBJECTIVE 6.a: During the life of the plan, work with the partners to close all unapproved foot trails providing public access through refuge properties to minimize impacts to wildlife and habitat.

Discussion: Some beachgoers do not utilize designated beach access points, preferring instead to use existing secluded paths through the dunes or create new ones. This often results in dune blow-outs that increase the likelihood of storm surge flooding and dune erosion. Dunes provide the critical function of storm protection for the barrier island and all its inhabitants, but where there are gaps in the dunes, waves wash through and flood areas behind the dunes. Another impact of the public using undesignated paths to the beach is the increased likelihood of litter left behind. Surfcasters and surfers are especially motivated to seek secluded paths to the beach, because their access to improved, lifeguarded beach parks is typically restricted to areas outside the lifeguarded areas, so as not to conflict with the swimming public. Currently only a few beach parks and accesses are suitable for surfcasters and surfers because they have features that are unattractive to the swimming public (e.g., unpaved parking and unguarded beaches). Those sites that are attractive to surfcasters are

Judith Resnick Park, River Oaks Drive Beach Access, and Bonsteel Park in Brevard County and Ambersands Beach Access in Indian River County. Some of the improved beach parks have secluded footpaths on the same property as the paved accesses, but 100 yards/100 m or more away from the improved sites. Those sites include Ponce Landing Park in Brevard County and Treasure Shores Park in Indian River County. The refuge would work with the partners to provide attractive beach access points for fishermen that would not conflict with other beachgoers and would help protect the dunes. Further, the refuge would work with the partners to close secluded paths that pose a threat to dune integrity. Public scoping and outreach would be conducted to get input from beachgoers. Close coordination with the users and partners is necessary to adequately address this issue. For example, some undesignated paths may have a benefit for the land manager by providing access for research and management. Other paths may have a primary public value on properties that were acquired for beach access (e.g., Save Our Coast sites and Beach and Riverfront sites). Paths which have a public benefit that outweigh the negative impacts would be left open, but would require dune restoration and the construction of ecologically-sound dune crossovers. Paths that have a research or management benefit would be left open, but would be gated and would also require dune restoration and the construction of ecologically-sound dune crossovers. Paths that don't have primary public or management benefit would be closed and restored, preferably using native vegetation, such as saw palmetto and sea grape. The closure of unapproved access points is also addressed under Visitor Services Objective 2.a(2).

6.b. Nighttime Beach Access during Sea Turtle Nesting Season

VISITOR SERVICES OBJECTIVE 6.b: Within three years of plan approval, work with the Sebastian Inlet State Park, Brevard and Indian River Counties to reduce nighttime access to the beach during the sea turtle nesting season to minimize impacts to nesting and hatching sea turtles.

Discussion: Due to the increased risks to nesting turtles, nighttime access would be limited during sea turtle nesting season to approved sea turtle walks through nighttime closure of public accesses and increased law enforcement Most beach parks are closed at night, but some do not have gates or the gates are not locked. Beach accesses typically do not have gates. Gates would need to be installed and locked in key areas to further increase the effectiveness of these efforts. The refuge would work with local governments to secure and enforce nighttime closures. Nighttime beach access is also addressed under Wildlife and Habitat Management objectives 1.a(1) and 1.a(3).

6.c. Compatibility Determinations

VISITOR SERVICES OBJECTIVE 6.a: Within one year of plan approval, complete compatibility determinations for all public uses on Service lands.

Discussion: The refuge currently does not have compatibility determinations completed for uses occurring on Service lands at Archie Carr NWR.

Communicate Key Issues with Offsite Audiences

VISITOR SERVICES GOAL 7: Local residents will recognize the refuge and support its purposes.

7. Local Residents and Area Visitors

VISITOR SERVICES OBJECTIVE 7.a: During the life of the plan, develop key refuge messages and incorporate these into all communications to increase awareness and support of the refuge and its purposes so that at least 50 percent of regularly sampled local residents will be able to recognize the

location of the refuge and will understand the importance of the refuge to rare, threatened, and endangered species.

Discussion: Melbourne Beach, Sebastian, Vero Beach, and residents within a 20-mile (32 km) radius of the refuge are likely to have the greatest potential impact on the refuge through their activities and land uses. Currently few of these residents are aware of the refuge or know what activities are permitted on the refuge. The refuge and the resources would benefit if more local area residents become aware of the refuge and its purposes and understand its conservation goals and objectives. Outreach efforts would focus on rare, threatened, and endangered species, especially sea turtles. Increase refuge, volunteer, and FOCR outreach efforts. Key messages would be provided to the Archie Carr Working Group, rangers and volunteers at Sebastian Inlet State Park, staff and volunteers at the Barrier Island Center, commercial tour operators, and lifeguards to increase awareness and understanding of the Service and the refuge.

Strategies:

- Expand outreach programs via the media, website, and conservation groups.
- Create sampling protocols and data sheets for surveys.
- Work with FOCR and volunteers to assist in sampling efforts.
- Work with local homeowners' associations to increase awareness and support of the refuge.

7.b. Dr. Archie Carr Wildlife Refuge, Costa Rica

VISITOR SERVICES OBJECTIVE 7.b: During the life of the plan, work with the Caribbean Conservation Corporation to develop a sister refuge coalition with the Dr. Archie Carr Wildlife Refuge in Costa Rica to expand the global connection and awareness of these refuges and their purposes.

Build Volunteer Programs

VISITOR SERVICES GOAL 8: A sufficient number of skilled and trained volunteers will support the refuge in meeting its purposes, vision, and goals.

8. Volunteers

VISITOR SERVICES OBJECTIVE 8: During the life of the plan, work with the partners to increase the number of active volunteers from 25 to 50 and focus projects on those that benefit listed species.

Discussion: Focus projects on those that benefit rare, threatened, and endangered species and habitat improvement. Hire a full-time Park Ranger to serve as the Volunteer Coordinator to coordinate and supervise volunteers that are shared amongst the partners.

Build Support of Friends Group

VISITOR SERVICES GOAL 9: The Friends of the Carr Refuge will be an advocate for the refuge, supporting all refuge goals and objectives and providing financial and in-kind support of refuge management activities.

9. Friends of the Carr Refuge

VISITOR SERVICES OBJECTIVE 9: Within one year of plan approval, invigorate the Friends of the Carr Refuge, with an active board of directors, to increase membership, levels of activities, and support for refuge management activities.

Discussion: The refuge would assist the friends group with becoming an independent 501(c)(3) nonprofit organization and the friends group would enter into a Cooperating Agreement with the refuge. The friends group currently operates under the 501(c)(3) of the Sea Turtle Preservation Society. The refuge would help recruit new board members with the current board serving as an advisory group and would develop a cooperative agreement to establish the organization as the official friends group for the refuge. The refuge would provide assistance to the friends group in developing a charter and by-laws to govern its operations. The refuge would help the friends group to obtain 501(c)(3) nonprofit status. The friends group would be encouraged to establish agreements with refuge partners to be able to fund projects throughout the Archie Carr NWR, including on partner lands. The friends group is an integral part of the refuge's efforts to accomplish many of the goals and objectives of the CCP.

Litter and Ocean Debris

VISITOR SERVICES GOAL 10: The refuge's barrier island beaches and other habitats will be maintained litter and ocean debris free.

10. Litter and Ocean Debris

VISITOR SERVICES OBJECTIVE 10: During the life of the plan, work with the Friends of the Carr Refuge, Keep Brevard Beautiful, and Keep Indian River Beautiful to control and eliminate litter and ocean debris from the refuge.

Discussion: Litter can negatively impact refuge wildlife and ocean debris (trash from ships and boats) in particular has been shown to be very detrimental to sea turtles and many sea birds. The refuge would work with the partners and volunteers to develop a regular cleanup program for the expanse of refuge and partner beaches. Scheduling major cleanup efforts prior to, during, and after the sea turtle nesting season would further benefit these species. Periodic assessments would determine the need to conduct additional cleanups (e.g., after hurricanes and winter storms). The refuge would coordinate with the partners to establish outreach efforts aimed at area boaters and users of the Port of Canaveral (e.g., cruise ships) to minimize litter and ocean debris from these vessels. In addition, the refuge would coordinate with the partners to increase awareness and understanding of area dump stations for boats [e.g., provide global positioning system (GPS) locations of existing stations and work to develop additional dump stations]. The refuge, with the assistance of FOCR members and volunteers, could also organize clean-up events (e.g., with area schools and community groups). The refuge can contribute to the goals and objectives of NOAA's Marine Debris Removal Program, helping to positively impact not only the refuge, but also regional coastal and marine environments.

REFUGE ADMINISTRATION

REFUGE ADMINISTRATION GOAL 1: Work with the Archie Carr Working Group partners to increase staff, volunteers, facilities, and equipment to implement a comprehensive refuge management program to protect and manage the natural and cultural values of the refuge's barrier island system and the nation's most important sea turtle nesting beach.

1.a. Staff

Discussion: Currently, all refuge staff members are shared with Pelican Island NWR. Additional maintenance, fire management, law enforcement, and education/outreach full-time staff would be necessary to implement the goals, objectives, and strategies outlined in the CCP. Future increases in visitors and additional impacts from an increasingly developed landscape surrounding the refuge necessitate an adequately staffed refuge (see the proposed organizational chart, Figure 13.

REFUGE ADMINISTRATION OBJECTIVE 1.a(1): Within one year of the plan's approval, hire a seasonal Biological Science Technician (trapper).

REFUGE ADMINISTRATION OBJECTIVE 1.a(2): Within two years of the plan's approval, hire a full-time biological science technician.

REFUGE ADMINISTRATION OBJECTIVE 1.a(3): Within three years of the plan's approval, hire a full-time Maintenance Worker.

REFUGE ADMINISTRATION OBJECTIVE 1.a(4): Within four years of the plan's approval, hire a full-time Park Ranger to serve as the volunteer coordinator and to serve the outreach, environmental education, and interpretive programs.

1.b. Administrative Facilities, Utilities, Equipment, and Signs

REFUGE ADMINISTRATION OBJECTIVE 1.b: Within the 15-year life of the plan, ensure office, support facilities, and other infrastructure sufficient to support outlined staff and volunteers.

Strategies:

- Once quarters are built to house researchers, use the existing beach house for additional interns and as an office facility. The beach house may continue to function as a base of operations and beach access for marine turtle research until garage facilities are available at the new research quarters.
- Share office and maintenance facilities with Pelican Island NWR, off Jungle Trail.
- Develop additional office space specific to the refuge.
- Consider adding RV pads (onsite or offsite).
- Demolish the derelict beach structure.
- Consider sharing facilities with other entities (e.g., Sebastian Inlet State Park, EEL, and HSWRI) and/or develop new or convert existing facilities to meet the needs of the refuge.

V. Plan Implementation

INTRODUCTION

As required by the National Wildlife Refuge System Improvement Act of 1997, the Service will manage all refuges in accordance with an approved comprehensive conservation plan, which, when implemented, will achieve refuge purposes; help fulfill the Refuge System mission; maintain and, where appropriate, restore the biological integrity, diversity, and environmental health of the refuge; help achieve the goals of the National Wilderness Preservation System; and meet other mandates.

This chapter summarizes the implementation strategy for the purposes, vision, goals, and objectives outlined in the CCP, addressing refuge projects, funding and personnel needs, volunteers, partnership opportunities, step-down management plans, a monitoring and adaptive management plan, and plan review and revision.

PROPOSED PROJECTS

The proposed projects reflect the basic needs identified by Service staff, the public, and the planning team members for the management of fish and wildlife populations, habitats, cultural resources, land protection, public use, outreach, and environmental education to address the identified priority issues and to serve the vision and goals developed for the refuge. Among these projects is a list of step-down management plans to be developed. Step-down plans are individual and specific and are the blueprint under which refuges operate. The step-down plans would provide more detail and specific tasks, stepping down from the CCP. Some existing plans would need revision, while others would need to be developed. The Service prepares step-down plans in conjunction with the provisions set forth in the National Environmental Policy Act of 1969.

Annual funding for staff, facilities, operations, and maintenance is an integral part of project implementation. The general cost estimates provided will be updated and adjusted annually. Essential needs are addressed, such as eliminating biological threats and problems, meeting National Wildlife Refuge System mission requirements, and fulfilling the purposes for which the refuge was established. There are no assurances that these projects will be either partially or fully funded. However, with the help and cooperation of conservation partners, the Service will use this Plan to focus attention on funding the operations and maintenance needs of the refuge.

For the purpose of achieving the goals and objectives developed for the refuge, the plan has grouped management strategies into specific projects. The plan describes 18 projects for development and management. Additional staff would be needed to implement these projects. All projects would require the close coordination with partner agencies and organizations. Partnership agreements that would facilitate project implementation are also discussed.

WILDLIFE AND HABITAT MANAGEMENT

Project 1. Work with the partners to standardize survey and monitoring.

In partnership with FWC, UCF, UF, HSWRI, EEL, FDEP, and others, the refuge would standardize surveys and monitoring of sea turtles, Eastern indigo snakes, gopher tortoises, Florida scrub-jays,

and beach mice. Systematic surveys based on standardized protocols would be conducted to determine presence and distribution of priority wildlife species and to provide baseline data to assist managers in habitat management practices. A full-time Biological Science Technician would be employed to assist in implementing the monitoring program. Information to be collected is the foundation for implementing the comprehensive conservation plan, formulating habitat management, and developing adaptive management strategies for species of conservation concern.
Wildlife and Habitat Management Objectives: 1.a(1), 1.b(1), 1.c(3), 1.c(4), 1.c(5), 1.d, 1.f, 1.h, 2.a, 2.b(1), 2.c, 3.c, 4.a, 5.a, 5.b
Resource Protection Objectives: 1.a, 1.b, 2, 3.a, 3b
Refuge Administration Objectives: 1.a(2), 1.a(4)

Project 2. Build and maintain databases containing biological resource data and spatial relationships for the refuge and surrounding environments.

A fully implemented geographic information system is not in use at ACNWR. In partnership with all land management partners, this project would develop an up-to-date data management, storage, and retrieval system; obtain spatial information from appropriate sources; develop geographic layers for refuge management programs; and facilitate spatial analysis and creation of maps by the refuge's biological staff. The full-time Biological Science Technician described in Project 1 would assist in this effort.
Wildlife and Habitat Management Objectives: 1.a(1), 1.b(1), 1.b(2), 1.c(1), 1.c(2), 1.c(5), 1.d, 1.f, 2.b(2), 3.b, 3.d, 3.e, 3.f, 3.g, 4.a, 5.a, 5.a
Resource Protection Objectives: 1.a, 1.b, 2, 3.a, 3.b
Visitor Service Objectives: 1.d, 6.a
Refuge Administration Objective: 1.a(2)

Project 3. Continue to identify, locate, control and eliminate where possible nonnative plants.

The refuge contains a diversity of habitats, and with encroaching development, invasive plant species such as Australian pine and Brazilian pepper are expanding onto refuge lands. Current known locations are primarily along refuge roads and other disturbed sites. Spot-treatment is ongoing, but without a comprehensive control plan these exotic plant species would spread into the interiors of the refuge, degrading habitat for several listed species, migratory birds, and a variety of herpetofauna. This project would identify invasive upland plant species within the larger Archie Carr Refuge partnership, determine their distribution, and treat affected areas using appropriate control measures.
Wildlife and Habitat Management Objectives: 1.c, 1.d, 3.c, 3.d, 3.e, 3.f, 3.g, 4.a, 5.b
Visitor Services Objectives: 4.a, 5.a(1), 7.a, 8, 9
Refuge Administration Objectives: 1.a(2), 1.a(4)

Project 4. Use prescribed fire and other forestry techniques to maintain and restore scrub plant communities.

In partnership with Merritt Island NWR, EEL, Brevard Recreation and Parks, and Florida Division of Forestry (FDOF), an expanded prescribed burning program is essential to restore and maintain scrub and to reduce fuel loads that could lead to devastating wildfires. Given the fragmented, linear nature of the refuge, the Service's properties are bordered by urban interface, making fire management highly necessary to also protect adjacent developed properties. In order to properly manage a wide array of species, including protected species such as the scrub-jay and gopher tortoise, it is critical that refuge lands be burned on a regular schedule and under controlled conditions. The refuge hosts dozens of scrub-dependent species throughout the year. Restoring these habitats, through the use of controlled burns and other techniques, reduces the potential of wildfire, while enhancing habitat for

these priority species. Prescribed burning is also an effective tool to minimize the spread of invasive exotic plant species.

Wildlife and Habitat Management Objectives: 1.c, 1.c(4), 1.c(5), 1.d, 3.d, 4.a, 5.b
Resource Protection Objectives: 1.a, 1.b, 2
Visitor Services Objectives: 1.a(5), 1.d, 4.a, 5.a
Refuge Administration Objectives: 1.a(2), 1.a(4)

Project 5. Use replanting to restore the mangrove swamps.

Most of Archie Carr NWR's shoreline along the IRL consists of mangrove tidal forests, a declining habitat in Florida. In partnership with Hubbs-SeaWorld Research Institute, EEL, SJRWMD, and others, mangrove restoration would include removing exotic plants, replanting mangroves, and restoring tidal connections where feasible.
Wildlife and Habitat Management Objectives: 3.g, 5.a
Visitor Services Objectives: 8, 9
Refuge Administration Objectives: 1.a(2)

Project 6**.** Restore and monitor the coastal dune system and control foredune erosion.

In partnership with FDEP's Bureau of Invasive Plant Management and others, the refuge would restore and monitor the coastal strand community. The project would require the complete removal of all invasive exotic plants, including Australian pine and Brazilian pepper, followed by successive re-treatments. While some natural recruitment of native plant species is expected, this effort would be facilitated by replanting native species. The schedule for replanting would be coordinated with beach nourishment projects to provide the greatest benefit for dune accretion.

Beach and dune erosion threaten sea turtle nesting areas and habitat important to a host of other species. Barrier islands naturally experience some form of erosion, as well as some accretion, but with the level of development on the barrier island, the human factor influences shoreline dynamics as much as natural processes. Ocean inlets kept open with jetties and maintenance dredging interrupt longshore sand transport and can contribute to shoreline erosion downdrift of the inlets (Kraus 2005). The construction of multi-million dollar homes and condos along the shoreline also influences shoreline dynamics by providing economic incentive to protect valuable structures from shoreline erosion. This is manifested in beach nourishments and beach armoring (e.g., seawalls). With so much value placed on stabilizing the shoreline, the refuge's interest in allowing natural processes to occur is at odds with the interests of many of the adjacent private landowners, especially since the refuge is intertwined with private development. With such a high degree of urban interface, erosion can best be slowed by sound dune stabilization management in concert with beach nourishment and sand transfer projects. In recent history, efforts have been made to protect beachfront properties by constructing rock revetments and sea walls and by using geotextile tubes. These shoreline hardening projects have long-term detrimental impacts, especially for nesting sea turtles. If nourishment or other sand placement projects are to be implemented in the Archie Carr NWR area, then extra steps should be taken to ensure that the sand placement is designed to mimic the natural beach profile as close as possible and that the area of alteration be minimized as much as possible to allow beach organisms (e.g., mole crabs, ghost crabs, and sand tiger beetles) enough nearby natural beach to withstand major impacts to the micro-environment in the project area. Smaller nourishment and sand placement projects would also result in greater sea turtle nesting success than large projects that would impact more of their nesting environment. Associated with beach nourishment is the need to replant native species on the foredune and backdune areas. Plant species such as sea oats, dune panic grass, beach star, and railroad vine help stabilize and build

dunes. Aside from the benefits of dune stabilization, replanting is labor intensive and requires a large amount of nursery-raised plants. To address this situation, partnerships could be developed with local nurseries and volunteers.

This project would protect sea turtle nesting habitat, as well as habitat for Southeastern beach mice, shorebirds, and many other organisms dependent on healthy beach and dune habitat. A dune and coastal strand restoration plan would be developed for this project.
Wildlife and Habitat Management Objectives: 1.a(1), 1.b(1), 1.g, 2.b(2), 3.f, 5.a
Resource Protection Objectives: 1.a, 1.b, 2
Visitor Services Objectives: 2.a(2), 6a, 10
Refuge Administration Objective: 1.a(2)

Project 7. Control sea turtle predators.

The refuge and nearby beaches provide important nesting habitat for sea turtles. For the short time span when the female comes ashore to dig the nest and lay her eggs, the refuge would provide protection from human disturbance activities. For the subsequent two to three months that the eggs need to incubate and hatch, the refuge would provide protection not only from inappropriate/illegal use of the refuge's beaches, but also from wildlife, such as raccoons which eat sea turtle eggs. While refuge officers would provide the necessary protection from incompatible night-time beach use (e.g., disturbing nesting sea turtles), a seasonal biological technician would implement current mammalian predator control techniques to achieve a sea turtle nest depredation rate not exceeding five percent. The refuge would focus on reducing and maintaining the natural predation rate (as incurred from native predators) to five percent or less and would focus on preventing nest depredation by any exotic species (e.g., armadillos and red fire ants).
Wildlife and Habitat Management Objectives: 1.a(2), 4.b
Visitor Services Objectives: 4.a, 5.a(1)
Refuge Administration Objective: 1.a(2)

Project 8. Minimize vehicle-wildlife collisions on refuge and partner lands.

Wildlife mortality caused by vehicle collisions has been identified as one of several major issues facing the refuge. Although it affects many species on the refuge, it is disproportionately adverse to listed species, given their low numbers. Among these, gopher tortoises, scrub-jays, and indigo snakes are especially at risk. Through collaborative efforts with the partners, the refuge would install additional wildlife crossing signs and barrier fences and would work with FDOT to slow traffic in high risk areas through posting lower speed limits, marking "No Passing" lanes, installing rumble strips, and/or installing flashing lights. Wildlife underpasses would be pursued when feasible (e.g., during major road work) or included with the justification for pedestrian underpasses. In addition, the refuge would work with local and state law enforcement agencies to enforce existing speed limits.
Wildlife and Habitat Management Objective: 3.b
Visitor Services Objectives: 4.a, 5.a(1)
Refuge Administration Objectives: 1.a(2), 1.a(3), 1.a(4)

RESOURCE PROTECTION

Project 9. Protect refuge resources and visitors.

The larger Archie Carr Refuge partnership hosts more than 100,000 visitors annually, not counting the visitation to Sebastian Inlet State Park. In recent years, disturbance to sea turtles, illegal harvest of plants and animals, vandalism, encroachment activities, littering, and other inappropriate or illegal

activities have increased due to the ease of accessibility to refuge properties, the remoteness of certain areas of the refuge, and the lack of regular law enforcement patrols. The presence of a full-time Law Enforcement Officer would result in improved visitor safety and services. The Refuge Officer would share duties with neighboring Pelican Island NWR. Regular law enforcement patrols would deter wildlife take, vandalism, trespass, loitering, and other illegal activities and respond to violations, complaints, and incidences when they occur.
Wildlife and Habitat Management Objectives: 1.a(3), 1.e, 1.f, 1.g, 2.b(2), 2.c, 3.a, 3.b
Resource Protection Objective: 3.b
Visitor Services Objectives: 2.a, 2.a(2), 6.a, 6.b, 10

Project 10. Protect archaeological resources through surveys and planning.

The Archie Carr NWR has 58 archaeological sites that are known to exist on refuge and partner lands combined, but law enforcement protection is not adequate. This project would provide for the completion of an archaeological survey list and locate and describe all sites within the Archie Carr NWR and to determine which sites are on refuge property and covered under the Archaeological Resources Protection Act. This project would also initiate the development of a protection plan for cultural and historical resources identified by the survey.
Resource Protection Objectives: 3.a, 3.b
Refuge Administration Objective: 1.a(4)

Project 11. Develop management agreements for adjacent public conservation lands and private lands that support listed species and document conservation focus areas and wildlife corridors.

The refuge is highly fragmented, with Service-acquired land parcels located in a mosaic of other public conservation lands and county-owned management areas, as well as private lands that have been developed at various levels of intensity (e.g., from low-density residences to commercial businesses to high-rise condominiums). In order for conservation efforts to be successful, the refuge needs to work with multiple partners to seek common objectives and develop management strategies that can be employed across the barrier island landscape. Close cooperation and coordination between the refuge and partners at state and local levels are paramount in achieving many of the objectives outlined in this Plan.
Wildlife and Habitat Management Objectives: 3.d, 3.e, 3.g, 4.a, 5.a, 5.b
Resource Protection Objectives: 1.a, 1.b, 2

Project 12. Evaluate inholdings for potential acquisition from willing sellers.

The refuge exists in a mosaic of public and private lands. In order to minimize fragmentation, the purpose of this project would be to determine which inholdings would contribute the most to the overall management objectives of the refuge. The refuge would work with the State of Florida ARC to elevate the Archie Carr Sea Turtle Refuge project to the A list for active acquisition by the state. Several properties are currently for sale on the open market that are high priorities due to their locations next to public lands or due to them being surrounded by public lands. Properties that are within the current acquisition boundary and have willing sellers would be considered for acquisition by the Service. Any important properties needed for connectivity and protection that are outside of the current acquisition boundary would either be targeted by partners or proposed for addition under a Minor Expansion Proposal of less than 10% of the approved acquisition boundary minus the 65 acres (26 ha) added under the last MEP (2004).
Resource Protection Objective: 1.b

VISITOR SERVICES

Project 13. Work with the partners to close unauthorized beach access points, improve existing access facilities, and limit night time beach access during the sea turtle nesting season.

Unauthorized beach access is an issue for the refuge because it destroys vegetation, increases dune erosion, increases exposure to coastal flooding, and leads to littering. Nighttime beachgoers can disturb sea turtles, causing them to return to sea before laying eggs. This project would work close unauthorized access points that have no compelling public interest and improve existing dune-crossovers to minimize impacts to dunes. Access points that have a compelling public interest (e.g., Save Our Coast sites) would be improved with dune cross-overs to minimize impacts to dunes. Access points that have a research or management value would also be improved to minimize impacts to dunes, but would be closed to the public. The refuge would work with partners to evaluate the need for additional beach access points and facilities at strategic locations, where feasible. In addition, through awareness programs and increased law enforcement, nighttime beach access during the sea turtle nesting season would be minimized. Obtaining (in coordination with refuge partners) baseline visitor data would useful in determining high-use areas.
Wildlife and Habitat Management Objectives: 1.a(3), 3.f
Visitor Services Objectives: 6.a, 6.b
Refuge Administration Objectives: 1.a(3), 1.a(4)

Project 14. Minimize the impacts of fishing.

The larger Archie Carr Refuge partnership hosts more than 10,000 fishermen annually. Surfcasting (saltwater fishing) is an important recreational activity on refuge beaches, as is estuarine fishing in the waters surrounding the refuge. This project would work with partners to use signs, fliers, and other methods to inform anglers of the potential impacts that this activity could have on wildlife and habitat. Anglers would be made aware of the need to recycle monofilament line, dispose of other trash (including fish waste) appropriately, prevent seagrass scarring, minimize risks of collisions with manatees, use authorized beach access points, and engage in ethical fishing behavior.
Wildlife and Habitat Management Objective: 1.e
Visitor Services Objectives: 2.a(1), 2.a(2), 6.a, 6.b, 10
Refuge Administration Objectives: 1.a(3), 1.a(4)

Project 15. Increase outreach and opportunities for environmental education and interpretation.

The larger Archie Carr Refuge partnership hosts more than 10,000 visitors annually seeking educational or interpretive experiences. This project would enable the refuge to employ an outreach and visitor services specialist to work with partners to educate residents, tourists, and school children about the refuge's role in the barrier island ecosystem, as well as threats to the refuge's wildlife and habitat. This position would improve partnership opportunities and expand educational and interpretive programs by working with partners (e.g., EEL, CCC, and FOCR), volunteers, and other organizations. Refuge resources would be appropriately interpreted and communication with outside audiences via news releases, web media, and special events would be coordinated with partners.
Visitor Services Objectives: 4.a, 5.a(1), 5.a(2), 5.a(3), 5.a(4), 7.a, 7.b, 10
Refuge Administration Objectives: 1.a(2), 1.a(4)

Project 16. Increase wildlife observation and photography visitor services.

The larger Archie Carr Refuge partnership hosts more than 3,000 wildlife watchers and photographers annually. This project would enable the refuge to work with partners to expand wildlife observation and photography opportunities, as well as investigate the potential to use certain areas of ACNWR to provide connectivity with partner conservation lands.
Visitor Services Objective: 3
Refuge Administration Objectives: 1.a(3), 1.a(4)

Project 17. Minimize litter and ocean debris.

Litter and ocean debris (trash blown/thrown) off boats and ships can harm wildlife and injure visitors. This project would work with the partners to use signs, brochures, and other tools to educate the public about the harmful effects of litter. It would evaluate the need for more trash and recycling bins and organize beach and lagoon clean-up efforts. As part of this program, boaters would also be educated to make them aware of the harmful effects of litter. Furthermore, similar outreach efforts would also be directed at the cruise ships and other shipping entities that utilize Port Canaveral in an effort to reduce ocean debris.
Wildlife and Habitat Management Objectives: 1.a(3), 3.f
Visitor Services Objectives: 2.a(1), 4.a, 5.a(1), 5.a(2), 7, 10
Refuge Administration Objectives: 1.a(2), 1.a(4)

Project 18. Improve maintenance operations and facilities management.

This project would provide one Maintenance Worker to improve refuge operations and facilities maintenance, including trails, kiosks, signs, and boardwalks. The worker would also conduct maintenance of refuge buildings and quarters.
Visitor Services Objectives: 1.a(1), 1.a(5), 1.c(4)
Refuge Administration Objectives: 1.a(3), 1.b

FUNDING AND PERSONNEL

Implementation of this plan would require increased funding and personnel support from a variety of internal and external sources. New projects are identified in the Refuge Operating and Needs System (RONS), while maintenance needs for existing facilities and projects are identified through Service Asset and Maintenance Management System (SAMMS). This plan outlines proposed projects that are substantially above current budget allocations. The plan does not constitute a commitment (from Congress) for staffing increases, operational and maintenance increases, or funding for future land acquisition, but provides direction for future management and represents wildlife resource needs based on sound biological science and input from the public.

To achieve the goals, objectives, and strategies outlined in Chapter IV of the proposed plan, additional personnel, operations, maintenance, facilities, and funds are needed. Three and a half additional, non-shared positions would be needed (see Figure 13) in addition to the currently shared (between ACNWR and Pelican Island NWR) positions (Figure 9). The refuge staff would need to increase from a total of 4.5 shared with Pelican Island NWR in Fiscal Year 2008, to a total of 14 (3.5 for Archie Carr, 3.5 for Pelican Island and 7 shared) by year 2023 (Table 9 and Figure 13). This increase in staff would also necessitate an increase in base funding above standard yearly increases that allow only for inflation.

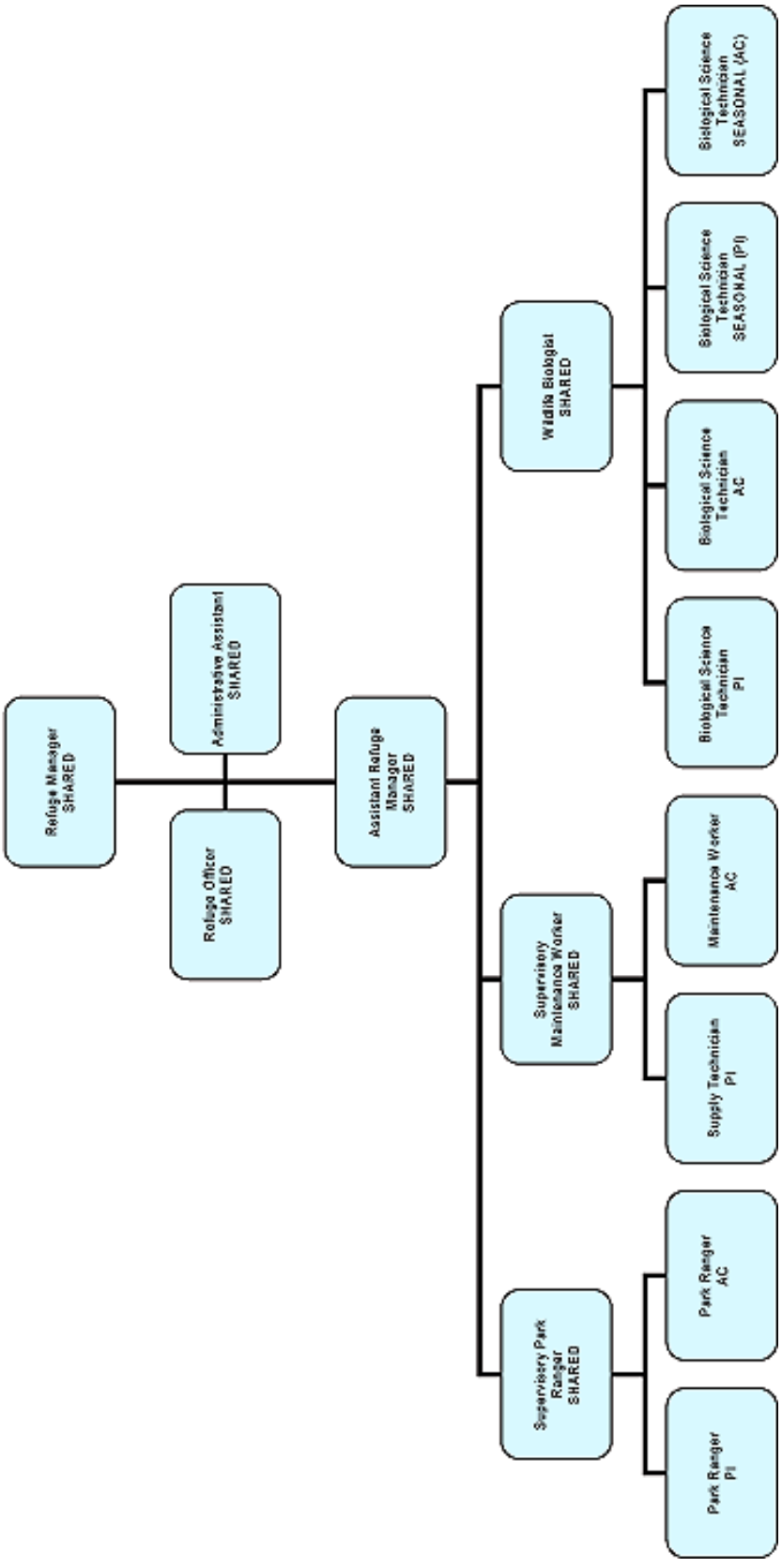
Table 9. Summary of projects.
(Staff may be shared among projects; for proposed staffing levels see organization chart, Figure 13.)

PROJECT NUMBER	PROJECT TITLE	FIRST YEAR COST ($1,000)	RECURRING ANNUAL COST ($1,000)	STAFF
1	SURVEYS AND MONITORING	50	35	BIOLOGICAL SCIENCE TECHNICIAN
2	GIS DATABASE	50	35	WILDLIFE BIOLOGIST (SHARED)
3	EXOTIC PLANT CONTROL	120	80	BIOLOGICAL SCIENCE TECHNICIAN
4	SCRUB MANAGEMENT	60	40	BIOLOGICAL SCIENCE TECHNICIAN
5	MANGROVE MANAGEMENT	60	40	BIOLOGICAL SCIENCE TECHNICIAN (SHARED)
6	RESTORE & MAINTAIN COASTAL DUNE SYSTEM & CONTROL BEACH/DUNE EROSION	50	35	BIOLOGICAL SCIENCE TECHNICIAN (SHARED)
7	TURTLE PREDATOR CONTROL	30	20	BIOLOGICAL SCIENCE TECHNICIAN, SEASONAL (TRAPPER)
8	VEHICLE-WILDLIFE COLLISIONS	60	40	WILDLIFE REFUGE SPECIALIST (ASSISTANT MANAGER) (SHARED)
9	LAW ENFORCEMENT	50	40	REFUGE OFFICER (SHARED)
10	SURVEY & PROTECT ARCHAEOLOGICAL RESOURCES	50	40	REFUGE OFFICER (SHARED)
11	DEVELOP MANAGEMENT AGREEMENTS FOR PARTNER LANDS	60	40	WILDLIFE REFUGE SPECIALIST (ASSISTANT

PROJECT NUMBER	PROJECT TITLE	FIRST YEAR COST ($1,000)	RECURRING ANNUAL COST ($1,000)	STAFF
				MANAGER) (SHARED)
12	EVALUATE INHOLDINGS FOR PURCHASE	60	40	WILDLIFE REFUGE SPECIALIST (ASSISTANT MANAGER) (SHARED)
13	ADDRESS UNAUTHORIZED DUNE TRAILS AND NIGHTTIME BEACH ACCESS	75	50	PARK RANGER
14	MINIMIZE IMPACTS OF FISHING	75	50	PARK RANGER (SHARED)
15	OUTREACH AND ENVIRONMENTAL EDUCATION AND INTERPRETATION	120	80	PARK RANGER (SHARED)
16	IMPROVE WILDIFE OBSERVATION & PHOTOGRAPHY OPPORTUNITIES	60	40	PARK RANGER (SHARED)
17	LITTER & OCEAN DEBRIS	60	40	PARK RANGER
18	MAINTENANCE, OPERATIONS, AND FACILITIES MANAGEMENT	150	100	MAINTENANCE WORKER

The Refuge System currently faces a backlog of project, operational, maintenance, and equipment needs. The current RONS database provides a list of proposed projects for the refuge, over and above the current base operating budget of the refuge, which was $697,000 in fiscal year 2007. The refuge's RONS and SAMMS needs would continue under this plan. Once the CCP is approved, the RONS and SAMMS databases will be updated to reflect the needs and proposed actions outlined in the plan.

Figure 13. Proposed organizational chart for Archie Carr NWR.



PARTNERSHIP OPPORTUNITIES

Archie Carr National Wildlife Refuge functions as a partnership refuge where a variety of partners help further the purposes, vision, goals, and objectives of the refuge through wildlife and habitat management activities, outreach, environmental education, other visitor services, and cultural resource protection. The Service will continue to work with existing and new partners where refuge partnerships will predominantly operate through the Archie Carr Working Group. Bringing together public, nonprofit, research-oriented, and private interests, the Archie Carr Working Group provides a forum for interested partners and area land managers to exchange ideas and coordinate and integrate management activities.

STEP-DOWN MANAGEMENT PLANS

The Service will prepare several step-down management plans to provide more detail, including strategies and implementation schedules for meeting the goals and objectives identified in this Comprehensive Conservation Plan. The refuge's step-down plans are:

- Fire Management Plan (completed 2001)
- Predator Control Plan (completed 2003)

Table 10 lists the needed step-down management plans and their anticipated completion dates.

Table 10. Step-down management plans to be developed during the 15-year life of the plan.

Step-down Management Plan	Anticipated Completion Date
Wildlife and Habitat Management Plan	2009
Visitor Services Plan	2010
Cultural Resources Management Plan	2013

MONITORING AND ADAPTIVE MANAGEMENT

Monitoring the Service's performance, while implementing this comprehensive conservation plan, is critical to the plan's successful implementation. Monitoring and evaluation allow the Service, other government agencies, the public, and the partners to measure and evaluate progress. Following approval of the comprehensive conservation plan and public notification of the decision, the Service will begin implementing the proposed actions identified in the plan. The Service will monitor, evaluate, and determine whether or not progress is being made towards achieving the refuge's purposes, vision, and goals. Monitoring will address habitat or population objectives and the effects of management activities. Through adaptive management and evaluation of monitoring and research, results may indicate the need to modify refuge objectives and/or strategies.

PLAN REVIEW AND REVISION

The Service will review this plan annually to decide if it requires any revisions. The plan will be modified along with associated management activities whenever this review or other monitoring and evaluation determine that changes are needed to achieve refuge purposes, vision, and goals. The

Service will revise this plan when significant new information becomes available, ecological conditions change, major refuge expansion occurs, or when the Service identifies the need to do so during plan review. At a minimum, plan revision will occur every 15 years. All plan revisions will follow the procedures outlined in current policy and will require compliance with the National Environmental Policy Act. The Service will conduct ongoing public involvement and continue informing and involving the public regarding management of this refuge.

Appendix I. Glossary

Accidentals:	Bird species that are observed on single or very few occasions very far from their normal range.
Adaptive Management:	Refers to a process in which policy decisions are implemented within a framework of scientifically driven experiments to test predictions and assumptions inherent in management plan. Analysis of results help managers determine whether current management should continue as is or whether it should be modified to achieve desired conditions.
Alternative:	1. A reasonable way to fix the identified problem or satisfy the stated need (40 CFR 1500.2). 2. Alternatives are different sets of objectives and strategies or means of achieving refuge purposes and goals, helping fulfill the Refuge System mission, and resolving issues (Service Manual 602 FW 1.6B).
Biological Diversity:	The variety of life and its processes, including the variety of living organisms, the genetic differences among them, and the communities and ecosystems in which they occur (USFWS Manual 052 FW 1. 12B). The System's focus is on indigenous species, biotic communities, and ecological processes. Also referred to as Biodiversity.
Carrying Capacity:	The maximum population of a species able to be supported by a habitat or area.
Categorical Exclusion (CE,CX, CATEX, CATX):	A category of actions that do not individually or cumulatively have a significant effect on the human environment and have been found to have no such effect in procedures adopted by a federal agency pursuant to the National Environmental Policy Act (40 CFR 1508.4).
CFR:	Code of Federal Regulations.
Compatible Use:	A proposed or existing wildlife-dependent recreational use or any other use of a national wildlife refuge that, based on sound professional judgment, will not materially interfere with or detract from the fulfillment of the National Wildlife Refuge System mission or the purpose(s) of the national wildlife refuge (50 CFR 25.12 (a)). A compatibility determination supports the selection of compatible uses and identifies stipulations or limits necessary to ensure compatibility.

Comprehensive Conservation Plan (CCP):	A document that describes the desired future conditions of a refuge or planning unit and provides long-range guidance and management direction to achieve the purposes of the refuge; helps fulfill the mission of the Refuge System; maintains and, where appropriate, restores the ecological integrity of each refuge and the Refuge System; helps achieve the goals of the National Wilderness Preservation System; and meets other mandates (Service Manual 602 FW 1.6 E).
Cover Type:	The present vegetation of an area.
Cultural Resource Inventory:	A professionally conducted study designed to locate and evaluate evidence of cultural resources present within a defined geographic area. Inventories may involve various levels, including background literature search, comprehensive field examination to identify all exposed physical manifestations of cultural resources, or sample inventory to project site distribution and density over a larger area. Evaluation of identified cultural resources to determine eligibility for the National Register follows the criteria found in 36 CFR 60.4 (Service Manual 614 FW 1.7).
Cultural Resource Overview:	A comprehensive document prepared for a field office that discusses, among other things, its prehistory and cultural history, the nature and extent of known cultural resources, previous research, management objectives, resource management conflicts or issues, and a general statement on how program objectives should be met and conflicts resolved. An overview should reference or incorporate information from a field offices background or literature search described in Section VIII of the Cultural Resource Management Handbook (Service Manual 614 FW 1.7).
Cultural Resources:	The remains of sites, structures, or objects used by people in the past.
Designated Wilderness Area:	An area designated by the United States Congress to be managed as part of the National Wilderness Preservation System (Draft Service Manual 610 FW 1.5).
Dessication:	The state of extreme dryness, or the process of extreme drying.
Disturbance:	Significant alteration of habitat structure or composition. May be natural (e.g., fire) or human-caused events (e.g., aircraft overflight).
Ecosystem:	A dynamic and interrelating complex of plant and animal communities and their associated non-living environment.
Ecosystem Management:	Management of natural resources using system-wide concepts to ensure that all plants and animals in ecosystems are maintained at viable levels in native habitats and basic ecosystem processes are perpetuated indefinitely.

Endangered Species (Federal):	A plant or animal species listed under the Endangered Species Act that is in danger of extinction throughout all or a significant portion of its range.
Endangered Species (State):	A plant or animal species in danger of becoming extinct or extirpated in the state within the near future if factors contributing to its decline continue. Populations of these species are at critically low levels or their habitats have been degraded or depleted to a significant degree.
Environmental Assessment (EA):	A concise public document, prepared in compliance with the National Environmental Policy Act, that briefly discusses the purpose and need for an action, alternatives to such action, and provides sufficient evidence and analysis of impacts to determine whether to prepare an environmental impact statement or finding of no significant impact (40 CFR 1508.9).
Environmental Impact Statement (EIS):	A detailed written statement required by section 102(2)(C) of the National Environmental Policy Act, analyzing the environmental impacts of a proposed action, adverse effects of the project that cannot be avoided, alternative courses of action, short-term uses of the environment versus the maintenance and enhancement of long-term productivity, and any irreversible and irretrievable commitment of resources (40 CFR 1508.11).
Estuary:	The wide lower course of a river into which the tides flow. The area where the tide meets a river current.
Finding of No Significant Impact (FONSI):	A document prepared in compliance with the National Environmental Policy Act, supported by an environmental assessment, that briefly presents why a federal action will have no significant effect on the human environment and for which an environmental impact statement, therefore, will not be prepared (40 CFR 1508.13).
Goal:	Descriptive, open-ended, and often broad statement of desired future conditions that conveys a purpose but does not define measurable units (Service Manual 620 FW 1.6J).
Habitat:	Suite of existing environmental conditions required by an organism for survival and reproduction. The place where an organism typically lives.
Habitat Restoration:	Management emphasis designed to move ecosystems to desired conditions and processes, and/or to healthy ecosystems.
Habitat Type:	See Vegetation Type.
Improvement Act:	The National Wildlife Refuge System Improvement Act of 1997.

Issue:	Any unsettled matter that requires a management decision, e.g., an initiative, opportunity, resource management problem, threat to the resources of the unit, conflict in uses, public concern, or other presence of an undesirable resource condition (Service Manual 602 FW 1.6K).
Management Alternative:	See Alternative
Management Concern:	See Issue
Management Opportunity:	See Issue
Migration:	The seasonal movement from one area to another and back.
Mission Statement:	Succinct statement of the unit's purpose and reason for being.
Monitoring:	The process of collecting information to track changes of selected parameters over time.
National Environmental Policy Act of 1969 (NEPA):	Requires all agencies, including the Service, to examine the environmental impacts of their actions, incorporate environmental information, and use public participation in the planning and implementation of all actions. Federal agencies must integrate NEPA with other planning requirements, and prepare appropriate NEPA documents to facilitate better environmental decision making (40 CFR 1500).
National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57):	Under the Refuge Improvement Act, the U.S. Fish and Wildlife Service is required to develop 15-year Comprehensive Conservation Plans for all National Wildlife Refuges outside Alaska. The Act also describes the six public uses given priority status within the NWRS (i.e., hunting, fishing, wildlife observation, photography, environmental education, and interpretation).
National Wildlife Refuge System Mission:	The mission is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.
National Wildlife Refuge System:	Various categories of areas administered by the Secretary of the Interior for the conservation of fish and wildlife, including species threatened with extinction; all lands, waters, and interests therein administered by the Secretary as wildlife refuges; areas for the protection and conservation of fish and wildlife that are threatened with extinction; wildlife ranges; games ranges; wildlife management areas; or waterfowl production areas.

National Wildlife Refuge:	A designated area of land, water, or an interest in land or water within the System.
Native Species:	Species that normally live and thrive in a particular ecosystem.
Notice of Availability (NOA):	A notice that an environmental document is available. Published in the Federal Register.
Notice of Intent (NOI):	A notice that an environmental document will be prepared and considered (40 CFR 1508.22). Published in the Federal Register.
Noxious Weed:	A plant species designated by federal or state law as generally possessing one or more of the following characteristics: aggressive or difficult to manage; parasitic; a carrier or host of serious insect or disease; or nonnative, new, or not common to the United States, according to the Federal Noxious Weed Act (PL 93-639), a noxious weed is one that causes disease or had adverse effects on man or his environment and therefore is detrimental to the agriculture and commerce of the Untied States and to the public health.
Objective:	A concise statement of what we want to achieve, how much we want to achieve, when and where we want to achieve it, and who is responsible for the work. Objectives derive from goals and provide the basis for determining strategies, monitoring refuge accomplishments, and evaluating the success of strategies. Making objectives attainable, time-specific, and measurable (Service Manual 602 FW 1.6N).
Passerines:	A category of birds that includes medium to small, perching landbirds. Most are territorial singers and migratory. Also called songbirds.
Plant Association:	A classification of plant communities based on the similarity in dominants of all layers of vascular species in a climax community.
Plant Community:	An assemblage of plant species unique in its composition; occurs in particular locations under particular influences; a reflection or integration of the environmental influences on the site such as soils, temperature, elevation, solar radiation, slope, aspect, and rainfall; denotes a general kind of climax plant community.
Preferred Alternative:	This is the alternative determined [by the decision maker] to best achieve the Refuge purpose, vision, and goals; contributes to the Refuge System mission, addresses the significant issues; and is consistent with principles of sound fish and wildlife management.
Prescribed Fire:	The application of fire to wildland fuels to achieve identified land use objectives (Service Manual 621 FW 1.7). May be from natural ignition or intentional ignition.

Priority Species: Fish and wildlife species that the Washington Department of Fish and Wildlife believe require protective measures and/or management guidelines to ensure their perpetuation. Priority species include the following: (1) state-listed and candidate species; (2) species or groups of animals susceptible to significant population declines within a specific area or statewide by virtue of their inclination to aggregate (e.g., seabird colonies); and (3) species of recreation, commercial, and/or tribal importance.

Public Involvement: A process that offers impacted and interested individuals and organizations an opportunity to become informed about, and to express their opinions on Service actions and policies. In the process, these views are studied thoroughly and thoughtful consideration of public views is given in shaping decisions for refuge management.

Public: Individuals, organizations, and groups; officials of federal, state, and local government agencies; Indian tribes; and foreign nations. It may include anyone outside the core planning team. It includes those who may or may not have indicated an interest in Service issues and those who do or do not realize that Service decisions may affect them.

Purposes of the Refuge: "The purposes specified in or derived from the law, proclamation, executive order, agreement, public land order, donation document, or administrative memorandum establishing, authorizing, or expanding a refuge, refuge unit, or refuge sub-unit." For refuges that encompass Congressionally designated wilderness, the purposes of the Wilderness Act are additional purposes of the refuge (Service Manual 602 FW 106 S).

Recommended Wilderness: Areas studied and found suitable for wilderness designation by both the Director and Secretary, and recommended for designation by the President to Congress. These areas await only legislative action by congress in order to become part of the Wilderness System. Such areas are also referred to as "pending in Congress" (Draft Service Manual 610 FW 1.5).

Record of Decision (ROD): A concise public record of decision prepared by the federal agency, pursuant to NEPA, that contains a statement of the decision, identification of all alternatives considered, identification of the environmentally preferable alternative, a statement as to whether all practical means to avoid or minimize environmental harm from the alternative selected have been adopted (and if not, why they were not), and a summary of monitoring and enforcement where applicable for any mitigation (40 CFR 1505.2).

Refuge Goal: See Goal.

Refuge Purposes: See Purposes of the Refuge

Step-down Management Plan:	A plan that provides specific guidance on management subjects (e.g., habitat, public use, fire, safety) or groups of related subjects. It describes strategies and implementation schedules for meeting CCP goals and objectives (Service Manual 602 FW 1.6 U).
Strategy:	A specific action, tool, technique, or combination of actions, tools, and techniques used to meet unit objectives (Service Manual 602 FW 1.6 U).
Study Area:	The area reviewed in detail for wildlife, habitat, and public use potential. For purposes of this CCP/EIS the study area includes the lands within the currently approved Refuge boundary and potential Refuge expansion areas.
Threatened Species (Federal):	Species listed under the Endangered Species Act that are likely to become endangered within the foreseeable future throughout all or a significant portion of their range.
Threatened Species (State):	A plant or animal species likely to become endangered in the state within the near future if factors contributing to population decline or habitat degradation or loss continue.
Tiering:	The coverage of general matters in broader environmental impact statements with subsequent narrower statements of environmental analysis, incorporating by reference, the general discussions and concentrating on specific issues (40 CFR 1508.28).
U.S. Fish and Wildlife Service Mission:	The mission of the U.S. Fish and Wildlife Service is working with others to conserve, protect, and enhance fish and wildlife and their habitats for the continuing benefit of the American people.
Unit Objective:	See Objective
Vagrants:	Bird species found close to, but outside of their normal range and can be expected to be observed on rare occasions.
Vegetation Type, Habitat Type, Forest Cover Type:	A land classification system based upon the concept of distinct plant associations.
Vision Statement:	A concise statement of what the planning unit should be, or what we hope to do, based primarily upon the Refuge System Mission and specific refuge purposes, and other mandates. We will tie the vision statement for the refuge to the mission of the Refuge System; the purpose(s) of the refuge; the maintenance or restoration of the ecological integrity of each refuge and the Refuge System; and other mandates (Service Manual 602 FW 1.6 Z).

Wilderness Study Areas: Lands and waters identified through inventory as meeting the definition of wilderness and undergoing evaluation for recommendation for inclusion in the Wilderness System. A study area must meet the following criteria:

- Generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable
- Has outstanding opportunities for solitude or a primitive and unconfined type of recreation
- Has at least 5,000 contiguous roadless acres or is sufficient in size as to make practicable its preservation and use in an unimpaired condition (Draft Service Manual 610 FW 1.5)

Wilderness: See Designated Wilderness

Wildfire: A free-burning fire requiring a suppression response; all fire other than prescribed fire that occurs on wildlands (Service Manual 621 FW 1.7).

Wildland Fire: Every wildland fire is either a wildfire or a prescribed fire (Service Manual 621 FW 1.3

ACRONYMS AND ABBREVIATIONS

ACNWR Archie Carr National Wildlife Refuge
AICP American Institute of Certified Planners
ARC Acquisition and Restoration Council
ATV All Terrain Vehicle
^{o}C Degrees Celsius
CARL Conservation and Recreation Lands
CBC Christmas Bird Count
CBRA Coastal Barrier Resources Act
CBRS Coastal Barrier Resources System
CCAFS Cape Canaveral Air Force Station
CCC Caribbean Conservation Corporation
CCP Comprehensive Conservation Plan
CE Commercially Exploited
CFR Code of Federal Regulations
cm Centimeters
E Endangered
EA Environmental Assessment
EEL Environmentally Endangered Lands
EIS Environmental Impact Statement
^{o}F Degrees Fahrenheit
FCWCS Florida Comprehensive Wildlife Conservation Strategy
FDACS Florida Department of Agriculture and Consumer Services
FDEP Florida Department of Environmental Protection
FDOF Florida Division of Forestry
FDOT Florida Department of Transportation
FIT Florida Institute of Technology
FNAI Florida Natural Areas Inventory
FOCR Friends of the Carr Refuge
FONSI Finding of No Significant Impact
Ft Feet
FTE Full-time Equivalent
FWC Florida Fish and Wildlife Conservation Commission
FWS U.S. Fish and Wildlife Service
FY Fiscal Year
GIS Global Information System
GPS Global Positioning System
ha Hectares
HSWRI Hubbs-SeaWorld Research Institute
in Inches
IRL Indian River Lagoon
LAPS Land Acquisition Priority System
M Meters
MEP Minor Expansion Proposal
MPA Marine Protected Area
MRC Marine Resources Council
NABCI North American Bird Conservation Initiative
NASA National Aeronautics and Space Administration
NEP National Estuary Program
NEPA National Environmental Policy Act

NESTS Neighbors Ensuring Sea Turtle Survival
NMFS National Marine Fisheries Service
NOA Notice of Availability
NOAA National Oceanic and Atmospheric Administration
NOI Notice of Intent
NWR National Wildlife Refuge
NWRS National Wildlife Refuge System
NVCS National Vegetation Classification System
OPA Otherwise Protected Area
PINWR Pelican Island National Wildlife Refuge
ROD Record of Decision
RONS Refuge Operating Needs System
SAMMS Service Asset and Maintenance Management System
Service U.S. Fish and Wildlife Service
SFWMD South Florida Water Management District
SHPO State Historic Preservation Office
SISP Sebastian Inlet State Park
SJRWMD St. Johns River Water Management District
SMM Sanctuary Management Manual
SOC Save Our Coasts
SR State Road
SSC Species of Special Concern
STSL Sea Turtle Survival League
SWIM Surface Water Improvement and Management
T Threatened
TNR Trap/Neuter/Release
UCF University of Central Florida
UF University of Florida
UNC University of North Carolina
USC United States Code
USFWS U.S. Fish and Wildlife Service
WHMSI Western Hemisphere Migratory Species Initiative
YCC Youth Conservation Corps

Appendix II. References and Literature Cited

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Appendix III. Relevant Legal Mandates and Executive Orders

STATUE	DESCRIPTION
Administrative Procedures Act (1946)	Outlines administrative procedures to be followed by federal agencies with respect to identification of information to be made public; publication of material in the Federal Register; maintenance of records; attendance and notification requirements for specific meetings and hearings; issuance of licenses; and review of agency actions.
American Antiquities Act of 1906	Provides penalties for unauthorized collection, excavation, or destruction of historic or prehistoric ruins, monuments or objects of antiquity on lands owned or controlled by the United States. The Act authorizes the President to designate as national monuments objects or areas of historic or scientific interest on lands owned or controlled by the Unites States.
American Indian Religious Freedom Act of 1978	Protects the inherent right of Native Americans to believe, express, and exercise their traditional religions, including access to important sites, use and possession of sacred objects, and the freedom to worship through ceremonial and traditional rites.
Americans With Disabilities Act of 1990	Intended to prevent discrimination of and make American Society more accessible to people with disabilities. The Act requires reasonable accommodations to be made in employment, public services, public accommodations, and telecommunications for persons with disabilities.
Archaeological Resources Protection Act of 1979, as amended.	This act strengthens and expands the protective provisions of the Antiquities Act of 1906 regarding archaeological resources. It also revised the permitting process for archaeological research.
Architectural Barriers Act of 1968	Requires that buildings and facilities designed, constructed, or altered with federal funds, or leased by a federal agency, must comply with standards for physical accessibility.
Bald and Golden Eagle Protection Act of 1940, as amended	Prohibits the possession, sale or transport of any bald or golden eagle, alive or dead, or part, nest, or egg except as permitted by the Secretary of the Interior for scientific or exhibition purposes, or for the religious purposes of Indians.
Clean Air Act of 1970	Regulates air emissions from area, stationary, and mobile sources. This Act and its amendments charge federal land managers with direct responsibility to protect the “sir quality and related values” of land under their control. These values include fish, wildlife, and their habitats.

STATUE	DESCRIPTION
Clean Water Act of 1974, as amended	This Act and its amendments have as its objective the restoration and maintenance of the chemical, physical, and biological integrity of the Nation's waters. Section 401 of the Act requires that federally permitted activities comply with the Clean Water Act standards, state water quality laws, and any other appropriate state laws. Section 404 charges the U.S. Army Corps of Engineers with regulating discharge of dredge or fill materials into waters of the United States, including wetlands.
Coastal Barrier Resources Act of 1982 (CBRA)	Identifies undeveloped coastal barriers along the Atlantic and Gulf coasts and included them in the John H. Chafee Coastal Barrier Resources System (CBRS). The objectives of the act are to minimize loss of human life, reduce wasteful federal expenditures, and minimize the damage to natural resources by restricting most federal expenditures that encourage development within the CBRS.
Coastal Barrier Improvement Act of 1990	Reauthorized the CBRA, expanded the CBRS to include undeveloped coastal barriers along the Great Lakes and in the Caribbean, and established "Otherwise Protected Areas (OPAs)". The Service is responsible for maintaining official maps, consulting with federal agencies that propose spending federal funds within the CBRS and OPAs, and making recommendations to Congress about proposed boundary revisions.
Coastal Wetlands Planning, Protection, and Restoration (1990)	Authorizes the Director of the Fish and Wildlife Service to participate in the development of a Louisiana coastal wetlands restoration program, participate in the development and oversight of a coastal wetlands conservation program, and lead in the implementation and administration of a National coastal wetlands grant program.
Coastal Zone Management Act of 1972, as amended	Established a voluntary national program within the Department of Commerce to encourage coastal states to develop and implement coastal zone management plans and requires that "any Federal activity within or outside of the coastal zone that affects any land or water use or natural resource of the coastal zone" shall be "consistent to the maximum extent practicable with the enforceable policies" of a state's Coastal Zone Management Plan. The law includes an Enhancement Grants Program for protecting, restoring or enhancing existing coastal wetlands or creating new coastal wetlands. It also established the National Estuarine Reserve Research System, guidelines for estuarine research, and financial assistance for land acquisition.

STATUE	DESCRIPTION
Emergency Wetlands Resources Act of 1986	This Act authorized the purchase of wetlands from Land and Water Conservation Fund moneys, removing a prior prohibition on such acquisitions. The Act requires the Secretary to establish a National Wetlands Priority Conservation Plan, required the states to include wetlands in their Comprehensive Outdoor Recreation Plans, and transfers to the Migratory Bird Conservation Fund amounts equal to import duties on arms and ammunition. It also established entrance fees at National Wildlife Refuges.
Endangered Species Act of 1973, as amended	Provides for the conservation of threatened and endangered species of fish, wildlife, and plants by federal action and by encouraging the establishment of state programs. It provides for the determination and listing of endangered and threatened species and the designation of critical habitats. Section 7 requires refuge managers to perform internal consultation before initiating projects that affect or may affect endangered species.
Environmental Education Act of 1990	This act established the Office of Environmental Education within the Environmental Protection Agency to develop and administer a federal environmental education program in consultation with other federal natural resource management agencies, including the Fish and Wildlife Service.
Estuary Protection Act of 1968	Authorized the Secretary of the Interior, in cooperation with other federal agencies and the states, to study and inventory estuaries of the United States, including land and water of the Great Lakes, and to determine whether such areas should be acquired for protection. The Secretary is also required to encourage state and local governments to consider the importance of estuaries in their planning activities relates to federal natural resource grants. In approving any state grants for acquisition of estuaries, the Secretary was required to establish conditions to ensure the permanent protection of estuaries.
Estuaries and Clean Waters Act of 2000	This law creates a federal interagency council that includes the Director of the Fish and Wildlife Service, the Secretary of the Army for Civil Works, the Secretary of Agriculture, the Administrator of the Environmental Protection Agency and the Administrator for the National Oceanic and Atmospheric Administration. The Council is charged with developing a national estuary habitat restoration strategy and providing grants to entities to restore and protect estuary habitat to promote the strategy.
Federal Advisory Committee Act (1972), as amended	Governs the establishment of and procedures for committees that provide advice to the federal government. Advisory committees may be established only if they will serve a necessary, nonduplicative function. Committees must be strictly advisory unless otherwise specified and meetings must be open to the public.

STATUE	DESCRIPTION
Federal-Aid Highways Act of 1968	Established requirements for approval of federal highways through wildlife refuges and other designated areas to preserve the natural beauty of such areas. The Secretary of Transportation is directed to consult with the Secretary of the Interior and other federal agencies before approving any program or project requiring the use of land under their jurisdiction.
Federal Noxious Weed Act of 1990, as amended	The Secretary of Agriculture was given the authority to designate plants as noxious weeds and to cooperate with other federal, state, and local agencies; farmers associations; and private individuals in measures to control, eradicate, prevent, or retard the spread of such weeds. The Act requires each federal land-managing agency including the Fish and Wildlife Service to designate an office or person to coordinate a program to control such plants on the agency's land and implement cooperative agreements with the states including integrated management systems to control undesirable plants.
Fish and Wildlife Act of 1956	Establishes a comprehensive national fish, shellfish, and wildlife resources policy with emphasis on the commercial fishing industry but also includes the inherent right of every citizen and resident to fish for pleasure, enjoyment, and betterment and to maintain and increase public opportunities for recreational use of fish and wildlife resources. Among other things, it authorizes the Secretary of the Interior to take such steps as may be required for the development, advancement, management, conservation and protection of fish and wildlife resources including, but not limited to, research, development of existing facilities, and acquisition by purchase or exchange of land and water or interests therein.
Fish and Wildlife Conservation Act of 1980, as amended	Requires the Service to monitor non-gamebird species, identify species of management concern, and implement conservation measures to preclude the need for listing under the Endangered Species Act.
Fish and Wildlife Coordination Act of 1958	Promotes equal consideration and coordination of wildlife conservation with other water resource development programs by requiring consultation with the Fish and Wildlife Service and the state fish and wildlife agencies where the "waters of a stream or other body of water are proposed or authorized, permitted or licensed to be impounded, diverted…or otherwise controlled or modified" by any agency under federal permit or license.

STATUE	DESCRIPTION
Improvement Act of 1978	This act was passed to improve the administration of fish and wildlife programs and amends several earlier laws, including the Refuge Recreation Act, the National Wildlife Refuge Administration Act, and the Fish and Wildlife Act of 1956. It authorizes the Secretary to accept gifts and bequests of real and personal property on behalf of the United States. It also authorizes the use of volunteers on Service projects and appropriations to carry out volunteer programs.
Fish and Wildlife Programs Improvement and National Wildlife Refuge System Centennial Act of 2000	Recognizes the vital importance of the Refuge System and the fact that the System will celebrate its centennial anniversary in the year 2003. Established the National Wildlife Refuge System Centennial Commission to prepare a plan to commemorate the 100th anniversary of the System, coordinate activities to celebrate that event, and host a conference on the National Wildlife Refuge System. The commission is also responsible for developing a long-term plan to meet the priority operations; maintenance and construction needs for the System, and improve public use programs and facilities.
Fishery (Magnuson) Conservation and Management Act of 1976	Established Regional Fishery Management Councils comprised of federal and state officials including the Fish and Wildlife Service. It provides for regulation of foreign fishing and vessel fishing permits.
Freedom of Information Act, 1966	Requires all federal agencies to make available to the public for inspection and copying administrative staff manuals and staff instructions, official, published and unpublished policy statements, final orders deciding case adjudication, and other documents. Special exemptions have been reserved for nine categories of privileged material. The Act requires the party seeking the information to pay reasonable search and duplication costs.
Lacey Act of 1900, as amended	Originally designed to help states protect their native game animals and to safeguard U.S. crop production from harmful foreign species. This Act prohibits interstate and international transport and commerce of fish, wildlife or plant taken in violation of domestic or foreign laws. It regulates the introduction to America of foreign species into new locations.
Land and Water Conservation Fund Act of 1948	This act provides funding through receipts from the sale of surplus federal land, appropriations from oil and gas receipts from the outer continental shelf, and other sources for land acquisition under several authorities. Appropriations from the fund may be used for matching grants to states for outdoor recreation projects and for land acquisition by various federal agencies including the Fish and Wildlife Service.

STATUE	DESCRIPTION
Marine Mammal Protection Act of 1972, as amended	The 1972 Marine Mammal Protection Act established a federal responsibility to conserve marine mammals with management vested in the Department of Interior for sea otter, walrus, polar bear, dugong, and manatee. The Department of Commerce is responsible for cetaceans and pinnipeds, other than the walrus. With certain specified exceptions, the Act establishes a moratorium on the taking and importation of marine mammals as well as products taken from them.
Migratory Bird Conservation Act of 1929	Established a Migratory Bird Conservation Commission to approve areas recommended by the Secretary of the Interior for acquisition with Migratory Bird Conservation Funds. The role of the Commission was expanded by the North American Wetland Conservation Act to include approving wetlands acquisition, restoration, and enhancement proposals recommended by the North American Wetlands Conservation Council.
Migratory Bird Hunting and Conservation Stamp Act of 1934	Also commonly referred to as the Duck Stamp Act", requires waterfowl hunters 16 years of age or older to possess a valid federal hunting stamp. Receipts from the sale of the stamp are deposited into the Migratory Bird Conservation Fund for the acquisition of migratory bird refuges.
Migratory Bird Treaty Act of 1918, as amended	This Act implements various treaties and conventions between the U.S. and Canada, Japan, Mexico and the former Soviet Union for the protection of migratory birds. Except as allowed by special regulations, this Act makes it unlawful to pursue, hunt, kill, capture, possess, buy, sell, purchase, barter, export or import any migratory bird, part, nest, egg or product.
National and Community Service Act of 1990	Authorizes several programs to engage citizens of the U.S. in full- and/or part-time projects designed to combat illiteracy and poverty, provide job skills, enhance educational skills, and fulfill environmental needs. Among other things, this law establishes the American Conservation and Youth Service Corps to engage young adults in approved human and natural resource projects, which will benefit the public or are carried out on federal or Indian lands.
National Environmental Policy Act of 1969	Requires analysis, public comment, and reporting for environmental impacts of federal actions. It stipulates the factors to be considered in environmental impact statements, and requires that federal agencies employ an interdisciplinary approach in related decision-making and develop means to ensure that unqualified environmental values are given appropriate consideration, along with economic and technical considerations.
National Historic Preservation Act of 1966, as amended	It establishes a National Register of Historic Places and a program of matching grants for preservation of significant historical features. Federal agencies are directed to take into account the effects of their actions on items or sites listed or eligible for listing in the National Register.

STATUE	DESCRIPTION
National Trails System Act (1968), as amended	Established the National Trails System to protect the recreational, scenic and historic values of some important trails. National Recreation Trails may be established by the Secretaries of Interior or Agriculture on land wholly or partly within their jurisdiction, with the consent of the involved state(s), and other land managing agencies, if any. National Scenic and National Historic Trails may only be designated by an Act of Congress. Several National Trails cross units of the National Wildlife Refuge System.
National Wildlife Refuge System Administration Act of 1966	Prior to 1966, there was no single federal law that governed the administration of the various wildlife refuges that had been established. This Act defines the National Wildlife Refuge System and authorizes the Secretary of the Interior to permit any use of an area provided such use is compatible with the major purposes(s) for which the area was established.
National Wildlife Refuge System Improvement Act of 1997	This Act amends the National Wildlife Refuge System Administration Act of 1966. This Act defines the mission of the National Wildlife Refuge System, establishes the legitimacy and appropriateness of six priority “wildlife-dependent” public uses, establishes a formal process for determining ‘compatible uses’ of System lands, identifies the Secretary of the Interior as responsible for managing and protecting the System, and requires the development of a comprehensive conservation plan for all refuges outside of Alaska.
Native American Graves Protection and Repatriation Act of 1990	Requires federal agencies and museums to inventory, determine ownership of, and repatriate certain cultural items and human remains under their control or possession. The Act also addresses the repatriation of cultural items inadvertently discovered by construction activities on lands managed by the agency.
Neotropical Migratory Bird Conservation Act of 2000	Establishes a matching grants program to fund projects that promote the conservation of Neotropical migratory birds in the United States, Latin America, and the Caribbean.
North American Wetlands Conservation Act of 1989	Provides funding and administrative direction for implementation of the North American Waterfowl Management Plan and the Tripartite Agreement on wetlands between Canada, U.S. and Mexico. North American Wetlands Conservation Council is created to recommend projects to be funded under the Act to the Migratory Bird Conservation Commission. Available funds may be expended for up to 50 percent of the United States share cost of wetlands conservation projects in Canada, Mexico, or the United States (or 100 percent of the cost of projects on federal lands).

STATUE	DESCRIPTION
Refuge Recreation Act of 1962, as amended	This Act authorizes the Secretary of the Interior to administer refuges, hatcheries, and other conservation areas for recreational use, when such uses do not interfere with the area's primary purposes. It authorizes construction and maintenance of recreational facilities and the acquisition of land for incidental fish and wildlife-oriented recreational development or protection of natural resources. It also authorizes the charging fees for public uses.
Partnerships for Wildlife Act of 1992	Establishes a Wildlife Conservation and Appreciation Fund, to receive appropriated funds and donations from the National Fish and Wildlife Foundation and other private sources to assist the state fish and game agencies in carrying out their responsibilities for conservation of nongame species. The funding formula is no more that 1/3 federal funds, at least 1/3 Foundation funds, and at least 1/3 state funds.
Refuge Revenue Sharing Act of 1935, as amended	Provided for payments to counties in lieu of taxes from areas administered by the Fish and Wildlife Service. Counties are required to pass payments along to other units of local government within the county, which suffer losses in tax revenues due to the establishment of Service areas.
Rehabilitation Act of 1973	Requires nondiscrimination in the employment practices of federal agencies of the executive branch and contractors. It also requires all federally assisted programs, services, and activities to be available to people with disabilities.
Rivers and Harbors Appropriations Act of 1899, as amended	Requires the authorization by the U.S. Army Corps of Engineers prior to any work in, on, over, or under a navigable water of the United States. The Fish and Wildlife Coordination Act provides authority for the Service to review and comment on the effects on fish and wildlife activities proposed to be undertaken or permitted by the Corps of Engineers. Service concerns include contaminated sediments associated with dredge or fill projects in navigable waters.
Sikes Act (1960), as amended	Provides for the cooperation by the Department of the Interior and Defense with state agencies in planning, development, and maintenance of fish and wildlife resources and outdoor recreation facilities on military reservations throughout the U.S. It requires the Secretary of each military department to use trained professionals to manage the wildlife and fishery resource under his jurisdiction, and requires federal and state fish and wildlife agencies be given priority in management of fish and wildlife activities on military reservations.

STATUE	DESCRIPTION
Transfer of Certain Real Property for Wildlife Conservation Purposes Act of 1948	This Act provides that upon determination by the Administrator of the General Services Administration, real property no longer needed by a federal agency can be transferred, without reimbursement, to the Secretary of the Interior if the land has particular value for migratory birds, or to a state agency for other wildlife conservation purposes.
Transportation Equity Act for the 21st Century (1998)	Established the Refuge Roads Program, requires transportation planning that includes public involvement, and provides funding for approved public use roads and trails and associated parking lots, comfort stations and bicycle/pedestrian facilities.
Uniform Relocation and Assistance and Real Property Acquisition Policies Act (1970), as amended	Provides for uniform and equitable treatment of persons who sell their homes, businesses, or farms to the Service. The Act requires that any purchase offer be no less than the fair market value of the property.
Water Resources Planning Act of 1965	Established Water Resources Council to be composed of Cabinet representatives including the Secretary of the Interior. The Council reviews river basin plans with respect to agricultural, urban, energy, industrial, recreational and fish and wildlife needs. The act also established a grant program to assist states in participating in the development of related comprehensive water and land use plans.
Wilderness Act of 1964, as amended	The Wilderness Act of 1964 directs the Secretary of the Interior to review every roadless area of 5,000 acres (2,023 ha) or more and every roadless island regardless of size within the National Wildlife Refuge System and to recommend suitability of each such area. The Act permits certain activities within designated Wilderness Areas that do not alter natural processes. Wilderness values are preserved through a “minimum tool” management approach, which requires refuge managers to use the least intrusive methods, equipment and facilities necessary for administering the areas.
Youth Conservation Corps Act of 1970	Established a permanent Youth Conservation Corps (YCC) programs within the Department of Interior and Agriculture. Within the Service, YCC participants perform many tasks on refuges, fish hatcheries, and research stations.

EXECUTIVE ORDERS	DESCRIPTIONS
EO 11593, Protection and Enhancement of the Cultural Environment (1971)	States that if the Service proposes any development activities that may affect the archaeological or historic sites, the Service will consult with federal and state Historic Preservation Officers to comply with Section 106 of the National Historic Preservation Act of 1966, as amended.
EO 11644, Use of Off-road Vehicles on Public Land (1972)	Established policies and procedures to ensure that the use of off-road vehicles on public lands will be controlled and directed so as to protect the resources of those lands, to promote the safety of all users of those lands, and to minimize conflicts among the various uses of those lands.
EO 11988, Floodplain Management (1977)	The purpose of this Executive Order is to prevent federal agencies from contributing to the “adverse impacts associated with occupancy and modification of floodplains” and the “direct or indirect support of floodplain development.” In the course of fulfilling their respective authorities, federal agencies “shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by floodplains.
EO 11989 (1977), Amends Section 2 of EO 11644	Directs agencies to close areas negatively impacted by off-road vehicles.
EO 11990, Protection of Wetlands (1977)	Federal agencies are directed to provide leadership and take action to minimize the destruction, loss of degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands.
EO 12372, Intergovernmental Review of Federal Programs (1982)	Seeks to foster intergovernmental partnerships by requiring federal agencies to use the state process to determine and address concerns of state and local elected officials with proposed federal assistance and development programs.
EO 12898, Environmental Justice (1994)	Requires federal agencies to identify and address disproportionately high and adverse effects of its programs, policies, and activities on minority and low-income populations.

EXECUTIVE ORDERS	DESCRIPTIONS
EO 12906, Coordinating Geographical Data Acquisition and Access (1994), Amended by EO 13286 (2003). Amendment of EO's & other actions in connection w/ transfer of certain functions to Secretary of DHS.	Recommended that the executive branch develop, in cooperation with state, local, and tribal governments, and the private sector, a coordinated National Spatial Data Infrastructure to support public and private sector applications of geospatial data. Of particular importance to CCP planning is the National Vegetation Classification System (NVCS), which is adopted, standard for vegetation mapping. Using NVCT facilitates the compilation of regional and national summaries, which in turn, can provide an ecosystem context for individual refuges.
EO 12962, Recreational Fisheries (1995)	Federal agencies are directed to improve the quantity, function, sustainable productivity, and distribution of U.S. aquatic resources for increased recreational fishing opportunities in cooperation with states and Tribes.
EO 13007, Native American Religious Practices (1996)	Provides for access to, and ceremonial use of, Indian sacred sites on federal lands used by Indian religious practitioners and direction to avoid adversely affecting the physical integrity of such sites.
EO 13061, Federal Support of Community Efforts Along American Heritage Rivers (1997)	Established the American Heritage Rivers initiative for the purpose of natural resource and environmental protection, economic revitalization, and historic and cultural preservation. The Act directs federal agencies to preserve, protect, and restore rivers and their associated resources important to our history, culture, and natural heritage.
EO 13084, Consultation and Coordination With Indian Tribal Governments (2000)	Provides a mechanism for establishing regular and meaningful consultation and collaboration with tribal officials in the development of federal policies that have tribal implications.
EO 13112, Invasive Species (1999)	Federal agencies are directed to prevent the introduction of invasive species, detect and respond rapidly to and control populations of such species in a cost effective and environmentally sound manner, accurately monitor invasive species, provide for restoration of native species and habitat conditions, conduct research to prevent introductions and to control invasive species, and promote public education on invasive species and the means to address them. This EO replaces and rescinds EO 11987, Exotic Organisms (1977).

EXECUTIVE ORDERS	DESCRIPTIONS
EO 13186, Responsibilities of Federal Agencies to Protect Migratory Birds. (2001)	Instructs federal agencies to conserve migratory birds by several means, including the incorporation of strategies and recommendations found in Partners in Flight Bird Conservation plans, the North American Waterfowl Plan, the North American Waterbird Conservation Plan, and the United States Shorebird Conservation Plan, into agency management plans and guidance documents.

Appendix IV. Public Involvement

SUMMARY OF PUBLIC SCOPING COMMENTS

The issues, ideas, concerns, and comments raised by the general public during the public scoping meetings were varied. Comments were submitted addressing:

- fish, wildlife, and plants (including controlling sea turtle nest predators, controlling feral and free-roaming animals; controlling exotic, invasive, and nuisance species; protecting land crabs; protecting sea turtles; managing for scrub-jays; and protecting feeding, loafing, and nesting birds);
- habitat management (including addressing the impacts of beach renourishment and armoring activities; controlling exotic, invasive, and nuisance species; managing scrub habitat;);
- land protection and conservation (including aggressively acquiring additional lands and waters and increasing law enforcement activities);
- education and visitor services [including addressing threats, impacts, and disturbance of public use activities on wildlife and habitats; addressing lighting impacts; expanding environmental education efforts and partnerships; conducting much more outreach to the community and visitors; developing visitor facilities and a visitor center (e.g. in concert with Pelican Island NWR); increasing signage, especially along A1A to warn of wildlife crossings; expanding the number of sea turtle interpretative walks; developing only small parking lots along the beach (by any of the public landowners); charging user fees; and increasing the volunteer base];
- administration (including increasing funding and staffing and increasing coordination with the governmental and nongovernmental partners); and
- archaeological and cultural resources.

The Intergovernmental Coordination Planning Team identified a variety of issues and developed a list of recommended priority issues to be addressed by the CCP, as follows:

- Increase land acquisition efforts.
- Coordinate land management activities with other public landowners (develop one plan to address all the lands and waters within the 20.5 miles of the refuge, including properties owned by the governmental partners).
- Increase funding and staffing.
- Protect native diversity and species listed by federal and state governments, as well as those listed by other entities (e.g., Florida Natural Areas Inventory, Florida Committee on Rare and Endangered Plants and Animals, and Audubon).
- Address beach Issues (e.g., armoring, lighting, and renourishment).
- Provide environmental education.
- Increase and encourage needed research.
- Address impacts of human use of the refuge.
- Address impacts of encroachment and adjacent development.
- Expand public relations and outreach.

SUMMARY OF PUBLIC COMMENTS ON THE DRAFT CCP/EA AND SERVICE RESPONSES

All comments that were received on the Draft Comprehensive Conservation Plan and Environmental Assessment (Draft CCP/EA) for Archie Carr National Wildlife Refuge are summarized in this section. Public comments on this draft document were accepted from June 26 to July 28, 2008, while comments from the State of Florida were submitted through the State Clearinghouse on August 7, 2008. A total of 12 individuals, organizations, businesses, and governmental agencies submitted comments on the Draft CCP/EA, including two organizations, three individuals, and five state and local governmental agencies (including the Florida Department of Environmental Protection, Florida Department of Agriculture and Consumer Services, East Central Florida Regional Planning Council, Treasure Coast Regional Planning Council, and Brevard County).

Under the State Clearinghouse review, the proposed activities were found to be consistent with the Florida Coastal Management Program; the Strategic Regional Policy Plan's Goals, Objectives, and Policies of the East Central Florida Regional Planning Council; and the Strategic Regional Policy Plan of the Treasure Coast Regional Planning Council, including Regional Goal 6.8 and Policy 6.8.1.3.

Under the National Environmental Policy Act (NEPA), the Service must respond to substantive comments. For purposes of this CCP, a substantive comment is one that was submitted during the public review and comment period which is within the scope of the proposed action (and the other alternatives outlined in the EA); is specific to the proposed action; has a direct relationship to the proposed action; and includes reasons for the Service to consider it. (For example, a substantive comment might be that the document referenced 500 individuals of a particular species, but that current research found 600. In such a case, the Service would likely update the plan to reflect the 600, citing the current research. While a comment that would not be considered substantive would be: "We love the refuge.")

The page numbers referenced relate to the original page numbers in the Draft CCP/EA that was released for public review and comment.

AFFILIATIONS OF COMMENTERS

Twelve individuals, organizations, businesses, and governmental agencies submitted comments, as listed.

Commenter	Affiliation and Location
Noah Kahn	Federal Lands Associate, Defenders of Wildlife, Washington DC
Jessica Koelsch	Florida Marine Wildlife Program Manager, Ocean Conservancy, St. Petersburg, FL
Sally B Mann	Director, Office of Intergovernmental Programs, Florida Department of Environmental Protection, Tallahassee, FL
Ray Mojica	Land Manager, Environmentally Endangered Lands Program, Brevard County, Melbourne Beach, FL
B Sachau	Florham Park, NJ
Staff	East Central Florida Regional Planning Council, Maitland, FL

Commenter	Affiliation and Location
Staff	Treasure Coast Regional Planning Council, Stuart, FL
SM Stover	Sarasota, FL
Terry Stoms	Parks Planner, Parks and Recreation Department, Brevard County, Viera, FL
Max Taylor	Melbourne Beach, FL
Sharon Tyson	Environmental Specialist III, East Central Florida Aquatic Preserves, Office of Coastal and Aquatic Managed Areas, Florida Department of Environmental Protection, Cocoa, FL
R. Sherman Wilhelm	Director, Division of Aquaculture, Florida Department of Agriculture and Consumer Services, Tallahassee, FL

SUMMARY OF CONCERNS AND THE SERVICE'S RESPONSES

The comments submitted during the public review and comment period were evaluated, summarized, and grouped into several categories: Wildlife and Habitat Management; Resource Protection; Visitor Services; Refuge Administration; and Other. Comments on like topics were grouped together. The Service's responses to the comments are provided below, by category.

Wildlife and Habitat Management

Exotic, Invasive, and Nuisance Species

Comment: It seems that a normal ecological scheme cannot exist in this area without this agency making value judgments on which animals are nuisance and which it wants. Let the animals work it out without human interference. The plan proposes to kill raccoons and feral cats. All of this is completely murderous in nature, particularly when other parts of the agency are giving permits to kill Florida scrub-jays in other parts of Florida.

Service Response: Comment noted. The U.S. Fish and Wildlife Service is mandated under federal law and policy (e.g., under the Endangered Species Act and Biological Integrity Policy, 601 FW 3) to manage threats to endangered species and retain biological integrity to their habitats. Human population growth and increased development have impacted ecosystems, resulting in: habitat loss, extirpation of top predators, endangerment of rare and vulnerable species, disruption of food chains, disruption of predator/prey balances, infestation of exotic plants and animals, increased populations of urban-adapted wildlife, and increased populations of feral domestic animals. At Archie Carr NWR, this has been manifested in higher and unnatural populations of raccoons and feral cats. The objective of the existing Refuge Predator Control Plan is to minimize the impacts to threatened and endangered species from exotic and nuisance animals that prey on them. For example, in the case of sea turtle protection, the refuge only targets those predators that have targeted sea turtle nests. The CCP aims to reduce nest predation to less than five percent. This comment is further addressed under Wildlife and Habitat Management objectives 1.a(2) and 4.b.

Fire Management

Comment: This crooked management wants to burn up the site for some claimed improvement. Fine particulate matter is released from burning that travels thousands of miles causing lung cancer, heart attacks, strokes, asthma, pneumonia, and allergies for millions of fellow American citizens, just so they can get fire pay.

Service Response: Comment noted. This comment is addressed under Wildlife and Habitat Management objectives 1.c(1), 1.d, 3.d, and 4.a. Under the Service's biological integrity policy (see 601 FW 3), refuges are charged with maintaining and restoring biological integrity, diversity, and environmental health. The refuge is also directed by the 2001 Federal Wildland Fire Management Policy, the Interagency Strategy for the Implementation of Federal Wildland Fire Management Policy, and Fish and Wildlife Service Manual 6RM7 to suppress all unwanted wildland fires that ignite within the boundaries of the refuge through the use of appropriate management response. These policies also state that the refuge shall prepare and implement a fire management plan that encompasses all fire management activities on the refuge, including prescribed fire, wildfire suppression, memorandums of understanding, and annual operating plans with cooperators (e.g., federal, state, and local governments and agencies). The use of prescribed fire is an invaluable tool in preventing wildfires and promoting the natural ecological processes of a fire-dependent ecosystem. Many of the habitats in Florida evolved with the natural and regular occurrence of fire, requiring fire to maintain these natural communities. However, due to a variety of factors, naturally occurring fire has been excluded from many areas, increasing the threat to public health and safety from wildfires. Prescribed fire is one of the management tools that helps fulfill the purposes of Archie Carr National Wildlife Refuge and the mission of the National Wildlife Refuge System, including helping to restore and maintain the biological integrity of refuge habitats and helping to manage for threatened and endangered species and wildlife diversity. Prescribed fire offers two primary benefits: providing for habitat management and reducing threats to public health and safety from wildfires.

In protecting public health and safety, prescribed fire maintains healthy levels of fuel loads, limits the occurrence of catastrophic fire, and provides for the direction of smoke (e.g., away from population centers). The refuge coordinates with land management partners and with local emergency management services and fire departments on all prescribed fires and wildfires. Further, the refuge notifies the public when prescribed burns are planned to allow neighbors to take any needed precautions. And, all prescribed fire is conducted using sound professional judgment under Service and Department policy and specified conditions, including under an approved plan, which minimizes smoke impacts, helping to protect public health and safety. For additional information regarding the Service's Fire Management Policy, please refer to: http://www.fws.gov/policy/621fw1.html.

Mechanical Cutting

Comment: Ban mechanical cutting. It costs taxpayers too much and is not necessary.

Service Response: Comment noted. Exotic vegetation control and management activities are located under Wildlife and Habitat Management Objective 4.a. Directly related issues and reasons for exotic vegetation management is addressed under Wildlife and Habitat Management objectives 1.c(1), 1.d, 3.c, 3.d, 3.e, 3.f, and 3.g. Further, under the Service's Biological Integrity Policy (see 601 FW 3), refuges are charged with maintaining and restoring biological integrity, diversity, and environmental health. Mechanical cutting is one of numerous effective tools employed by the Service to restore and maintain certain habitats. Mechanical cutting is essential to reduce vegetation density to prepare for a safe prescribed burn or where burning is not practical. Mechanical cutting (and chemical treatment) is also effective in removing invasive, exotic, and nuisance species of plants.

Mechanical cutting is also effective in managing forest canopy, midstory, and ground cover for the benefit of threatened and endangered species. These types of land management techniques help to serve the vision, purposes, goals, and objectives of the refuge.

Climate Change

Comment: In order to strengthen the final CCP's treatment of climate change, list climate change as a refuge priority in the final CCP. The complexity and range of challenges that climate change poses for a barrier island refuge such Archie Carr NWR merits its listing as a priority on its own (Draft CCP, p. 70). Climate change is among the most significant problems affecting plants and animals today. Thus, the potential impacts of climate change should be a central consideration in the development of refuge CCPs under the provisions of the National Wildlife Refuge System Improvement Act.

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IPCC, 2007: Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M.Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

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National Marine Fisheries Service and U.S. Fish and Wildlife Service. ____. Recovery Plan for the Northwest Atlantic Population of the Loggerhead Sea Turtle (Caretta caretta), Second Revision. National Marine Fisheries Service, Silver Spring, MD.

Nelson, K., R. Trindell, B. Witherington, and B. Morford. 2002. An analysis of reported disorientation events in the State of Florida. Pages 323-324 in Mosier, A., A. Foley, and B. Brost (compilers). Proceedings of the Twentieth Annual Symposium on Sea Turtle Biology and Conservation. NOAA Technical Memorandum NMFS-SEFSC-477.

Petition Pursuant to the Endangered Species Act to Designate the Western North Atlantic Subpopulations of the Loggerhead Sea Turtle (Caretta caretta) as a Distinct Population Segment and to Reclassify the Western North Atlantic Subpopulations as Endangered, Oceana and Center for Biological Diversity (Nov. 15 , 2007).

Scavia et al. 2002. Climate Change Impacts on U.S. Coastal and Marine Ecosystems. Estuaries 25(2): 149-169.

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Weishampel, J., Bagley, D., Ehrhart, L. Earlier nesting by loggerhead sea turtles following sea surface warming. Global Change Biology, 2004.

Williams, Ted, Hitting the Beach, National Audubon Society Magazine (January 2006).

Witherington, B.E. and R.E. Martin. 1996. Understanding, assessing, and resolving light pollution problems on sea turtle nesting beaches. Florida Marine Research Institute Technical Report TR-2. 73 pages.

Service Response: The EA considered climate change in the development and analysis of alternatives and the Draft CCP considered climate change in the development of objectives for implementation. To elevate climate change and its associated impacts on the refuge and its resources for future managers, the priority issues listed on page 70 of the Draft CCP was updated to include "Impacts of climate change" as the last bullet. Further, the Wildlife and Habitat Management paragraph on pages 70-71 of the Draft CCP was also updated to include climate change. The following sentence was added between the first and second sentences of that paragraph:

> Climate change and its associated impacts, which are not well understood for the refuge, relate to and can exacerbate all of these impacts.

Climate Change – Sea Level Rise

Comment: The CCP should prioritize consideration of the impacts of climate change on sea turtles. Without question, climate change poses pronounced threats to the continued survival of sea turtles, and the biological integrity, diversity, and environmental health of Archie Carr NWR.

As a barrier island refuge, Archie Carr NWR is particularly susceptible to sea level rise induced by climate change. In 2007, the Intergovernmental Panel on Climate Change (IPCC) concluded that average sea level will rise between 18 to 59 cm by the year 2100 (IPCC 2007). Under this scenario, coastal areas are at elevated risk of increased beach erosion, saltwater intrusion, storm surges, and hurricane winds (Scavia et al. 2002). Rising sea level poses its own set of problems for nesting sea turtles by limiting females to more restricted areas of nesting habitat, and increasing egg vulnerability with higher high tides. As noted in the Draft CCP, the refuge is fragmented and development has spread throughout the barrier island system, which restricts available nesting sites for sea turtles (Draft CCP, p.71). Defenders appreciates that the Draft CCP recognizes this threat and has stated intention to monitor sea level and saltwater encroachment.

Service Response: Comment noted. This comment is addressed under Wildlife and Habitat Management objectives 1.a(1), 5.a, and 5.b. As more information becomes available for the refuge regarding the impacts of climate change, the Service will adapt management as appropriate.

Climate Change – Beach Armoring

Comment: The CCP should prioritize consideration of the impacts of climate change on sea turtles. Without question, climate change poses pronounced threats to the continued survival of sea turtles, and the biological integrity, diversity, and environmental health of Archie Carr NWR.

In response to rising sea level and increased beach erosion from climate change, people will likely increase beach armoring and beach nourishment; practices that already pose a threat to sea turtles, shorebirds, invertebrates and other wildlife, and natural coastal processes. Beach armoring involves the placement of rigid structures parallel to the beach to prevent the loss of residential and commercial structures. Residents along the coast currently rely on armoring to protect structures built close to shore. Beach armoring not only physically blocks female sea turtles from reaching otherwise suitable nesting sites, but also permanently degrades nesting habitat by encouraging erosion, as sea wall structures redirect the tremendous energy from crashing waves seaward (Williams 2006). We agree with the Draft CCP's acknowledgment that the construction of sea walls, rock revetments, and geotextile tubes are often ineffective and that instead, more beneficial practices of dune stabilization should be adopted to combat erosion (Draft CCP, p. 111). In light of the fact that these costly structures are continually battered by waves and storms, and are likely to become even more vulnerable with increased frequency and strength of hurricanes caused by warming seas, the refuge should endeavor to educate and discourage private property owners from building these largely ineffective structures in order to better preserve natural processes on coastal beaches and enable female sea turtles to nest properly. Only through outreach efforts will local communities and decision-makers realize that viable, less environmentally destructive alternatives exist for safeguarding both wildlife habitat and human infrastructure.

Service Response: Comment noted. This comment is addressed under Wildlife and Habitat Management objectives 5.a and 5.b. The Service will continue to work with research and land management partners to address this issue. The majority of the refuge is within Brevard County, which currently prohibits the construction of hard armoring, such as sea walls. Coastal armoring in the Indian River County segment of the refuge is regulated by the Indian River County Habitat Conservation Plan, which permits only emergency armoring. In relation to permit applications related to the refuge, the Service does not have regulatory authority, but will continue to work with the permitting agency to minimize impacts. Beyond the refuge's boundaries, the Service also works with other governmental agencies (e.g., through county and state habitat conservation plans) to address the issues and impacts associated with beach armoring. For instance, the Florida Department of Environmental Protection has recently begun to seek an Incidental Take Permit (ITP) from the Service and develop a Habitat Conservation Plan (HCP) as per Section 10 of the ESA for its Coastal Construction Control Line permitting activities, such as beach armoring and coastal development. This HCP will assess the impacts to sea turtle, beach mice, and shorebirds from these activities and this HCP will include minimization and mitigation measures. The Service will continue to work with the partners of the Archie Carr Working Group, including the Service's South Florida Ecological Services Field Office, which is very engaged in the Florida Beaches Habitat Conservation Plan development.

Climate Change – Beach Nourishment

Comment: The CCP should prioritize consideration of the impacts of climate change on sea turtles. Without question, climate change poses pronounced threats to the continued survival of sea turtles, and the biological integrity, diversity, and environmental health of Archie Carr NWR.

Another frequent response to the natural and beneficial process of coastal erosion is so-called beach nourishment, the practice of pumping sand onto an eroded beach, which often proves ineffective, costly, and environmentally harmful. Although nourishment may provide a beach for sea turtle nesting, the sand deposited on beaches is typically dredged from elsewhere, which adversely impacts the dredge site and has different mineral content and size characteristics. This difference in composition may alter nest site selection and digging behavior, while sand color can alter the incubation temperature and thus the hatchling's sex ratio (NMFS, Office of Protected Resources 2007). These unnatural alterations compromise sea turtle nesting habitat and can result in

decreased nesting success, abnormal nest construction and reduced survivorship of eggs and hatchlings. Therefore, Defenders strongly urges the refuge to maintain its position that "if nourishment or other sand placement projects are to be implemented in the Archie Carr NWR area, then extra steps should be taken to ensure that the sand placement is designed to mimic the natural beach profile as close as possible and that the area of alteration be minimized as much as possible to allow beach organisms … enough nearby natural beach to withstand major impacts to the micro-environment in the project area" (Draft CCP, p. 111). We support this emphasis on mimicking natural processes and encourage the development of a similar position regarding beach armoring. Further, interesting and useful work regarding the application methods and design shapes of beach nourishment projects has been researched and conducted by biologists at Pea Island NWR in North Carolina, and we encourage dialogue with FWS staff from that station.

The refuge should also note that the frequency of proposed beach nourishment projects may increase due to the impacts of global warming, such as sea level rise and massive erosion due to intense storm events. Rising seas may eventually inundate off-refuge beaches as human development and impermeable barriers halt natural beach migration inland and upland (Velasquez-Manoff 2007). A concerted effort should therefore be made to prevent beach armoring or unnecessary beach nourishment on Archie Carr NWR to allow for natural migration of habitats, if possible, and only if such migration can happen at a sufficient rate that sea turtles and other wildlife are not stranded without habitat.

Service Response: Comment noted. This comment is addressed in detail under Wildlife Management objectives 1.a(1), 1.b(1), 1.g, 2.b(2), 3.f, and 5.a. The Service will continue to work with the partners through the Archie Carr Working Group (ACWG) to address beach nourishment impacts on the resources of the refuge and the larger Archie Carr Refuge partnership. The refuge supports properly designed beach nourishment projects, which are preferable to beach armoring projects. All beach nourishment projects will continue to be encouraged to mimic natural beach characteristics with appropriate sand quality, texture, and topography. The refuge will continue to work with partners to minimize impacts to the beach ecosystem through limiting the size and scope of nourishment projects. Project planning with other agencies and partners through the Archie Carr Working Group will assist in the appropriate timing and implementation to reduce impacts to sea turtles and migrating shorebirds. Further, the refuge is committed to supporting ongoing research, including through the University of Central Florida (UCF), as well as Hubbs-SeaWorld Research Institute, FWC's Fish and Wildlife Research Institute, and the University of Florida. Continuing standardized nesting surveys and physiological information on sea turtles is important, but concentrating efforts towards sea turtle nesting success in relation to nest site selection, sand texture, beach/dune slope, topography, and shape will guide future refuge management decisions on beach/dune nourishment projects. Ongoing research through UCF has provided the refuge with long-term sea turtle nesting data which will continue to aid in planning processes for the beach/dune ecosystem as climate change is placed at the forefront. The refuge has coordinated and will continue to coordinate with other refuges such as Pea Island NWR along with other agencies inside and outside the core ACWG.

Climate Change – Sex Ratio Changes

Comment: The CCP should prioritize consideration of the impacts of climate change on sea turtles. Without question, climate change poses pronounced threats to the continued survival of sea turtles, and the biological integrity, diversity, and environmental health of Archie Carr NWR.

Besides sea level rise, climate change may pose other challenges to nesting sea turtles, including the alteration of population sex ratios. As an ectothermic species whose sex is determined by the ambient temperature during incubation, the temperature of the sand directly affects the sex of sea

turtle hatchlings (Weishampel et al. 2004). At higher temperatures more female offspring are produced, while at lower temperatures more male offspring are produced (Hawkes 2007). Florida's beaches, the primary nesting beaches for sea turtles such as loggerheads in the U.S., are already skewed towards females, with less than 10 percent of eggs producing males (Hawkes 2007). In fact, an increase in only 1° Celsius could completely eliminate the birth of male turtles. The Draft CCP makes note of possible future changes in sex ratios and Defenders supports efforts to increase research related to this phenomenon. We recommend that the final CCP including provisions that direct FWS to monitor the ambient temperatures of nesting sites, in order to enable the refuge to anticipate and better understand changes in the sex ratios of sea turtle hatchlings.

Service Response: The CCP was updated on the Draft CCP page 75 under Wildlife and Habitat Management Objective 1.a(1) to include the following text before the last sentence of the first paragraph on that page:

> Further, the refuge will work with research partners to implement appropriate monitoring to better understand the impacts of climate change on the sex ratios of sea turtle hatchings within the larger Archie Carr Refuge partnership. The sex of sea turtles is determined by the nest temperature surrounding the egg during development, with higher temperatures causing more females to be produced (Yntema and Mrosovsky 1980, Graeme et al. 2003, Hawkes 2007). Multiyear studies of the sex ratio of loggerheads at Cape Canaveral, to the north of the refuge, indicated that a strong female bias already exists (87-99% female) (Mrosovsky and Provancha 1989 and 1992). Slight changes in atmospheric temperatures due to climate change could further alter ratios, eliminating the production of males altogether in this region. The U.S. Fish and Wildlife Service is mandated by the Endangered Species Act to protect threatened and endangered sea turtles populations and accomplish target population goals for each species. Thus, the refuge will coordinate with researchers at various east coast locations to monitor rates of change in relation to sex ratios in sea turtle hatchlings, increases in temperature, and other related factors. This will require coordination with nesting beaches in northerly locations along the U.S. eastern seaboard.

These issues are also discussed under Wildlife and Habitat Management Objective 5.b, addressing climate change impacts.

Climate Change – Research and Monitoring

Comment: The CCP should prioritize consideration of the impacts of climate change on sea turtles. Without question, climate change poses pronounced threats to the continued survival of sea turtles, and the biological integrity, diversity, and environmental health of Archie Carr NWR.

Defenders supports the continued monitoring of sea turtles and their nesting areas in order to maintain the targets required by the refuge under the Endangered Species Act of 1973 (Draft CCP, p. 74), and plans to increase coordination with researchers to anticipate impacts of climate change (Draft CCP, p. 87). Specific surveys and data collection will be vital to anticipate the impacts of climate change on sea turtles, and establishing a scientific baseline for appropriately responding with adaptive management practices. Obtaining information whenever possible about potential shifts in the coast due to sea level rise and erosion will help the refuge respond more effectively to the threats that climate change poses for nesting sea turtles and their greater ecosystem.

Service Response: Comment noted. This comment is addressed under Wildlife and Habitat Management objectives 1.a(1), 5.a, and 5.b. The Service recognizes the importance of research and monitoring to better understand the impacts of climate change on the resources of the refuge. The

refuge will continue its long-standing partnership with UCF to continue monitoring the beach/dune ecosystem and changes that occur. Further, within the Archie Carr Working Group, the refuge will continue to work with the partners to seek new innovative techniques and strategies to monitor, understand, and adapt management to any changes or shifts to the coast that could potentially cause threats to the nesting sea turtles, as well as to the entire beach/dune ecosystem.

Climate Change – Shifts in Range and Land Acquisition

Comment: The CCP should prioritize consideration of the impacts of climate change on sea turtles. Without question, climate change poses pronounced threats to the continued survival of sea turtles, and the biological integrity, diversity, and environmental health of Archie Carr NWR.

Defenders supports FWS's pledge in the Draft CCP to "Evaluate inholdings for potential acquisition from willing sellers," (Draft CCP, p. 113). However, in order for such acquisitions to be effective, FWS must first gather and assemble information regarding shifts in the timing or location of nesting. This exercise will aid the refuge in adjusting to changes in sea turtle nesting patterns and determine if beaches currently outside the refuge will become important habitat for sea turtles. Because sea turtle species exhibit genetically-determined natal beach homing with strong nest-site fidelity, it is unknown whether sea turtles will adapt to new nesting sites if existing sites become submerged or are otherwise unsuitable, as mentioned in the *Petition to Designate the Western North Atlantic Subpopulations of the Loggerhead Sea Turtle* ("Petition") submitted by Oceana and the Center for Biological Diversity in 2007. Monitoring of any shift in the timing or location of nesting will help the refuge make strategic decisions about opportunities to acquire or cooperatively manage land currently now outside the refuge. Defenders thus recommends that the final CCP prioritize the collection of information concerning the potential range shifts on the Archie Carr NWR, and subsequently work to establish refugia and new nesting beaches where appropriate.

Service Response: Comment noted. Information regarding land acquisition is addressed under Resource Protection Objective 2. In addition, as more information becomes available in relation to the climate change impacts on the refuge, the Service will adapt management, including the land acquisition priorities for the refuge. Currently the refuge owns and manages properties on both the east and west sides of SR A1A. Further, land acquisition priorities include properties west of SR A1A. The Service will continue working with the partners to expand the conservation lands managed in and around the refuge to protect these important resources and to enable management responses to the impacts of climate change.

Climate Change – Additional Stressors – including Artificial Lighting, Pollution, Invasive Species, Vehicular Impacts

Comment: The CCP should prioritize consideration of the impacts of climate change on sea turtles. Without question, climate change poses pronounced threats to the continued survival of sea turtles, and the biological integrity, diversity, and environmental health of Archie Carr NWR.

Defenders supports the Draft CCP provisions to address other stressors to sea turtles, including protecting sea turtles from predators, as addressed in Project 7 of the Draft CCP, reducing vehicle-wildlife collisions (Draft CCP, p. 112), and limiting night time beach access during sea turtle nesting season in Project 13 (Draft CCP, p. 114). In addition to these measures, Defenders recommends that the final CCP contain additional measures to ensure that sea turtles are safeguarded from other stressors including pollution and trash, the encroachment of nonnative, invasive vegetation, harassment and hunting of turtles and their eggs by humans, and artificial beach lighting. Artificial lighting not only impacts adult behavior, but also hatchlings, as they instinctively rely on visual cues to find the sea. As page 42 of the

Draft Loggerhead Recovery Plan states: "reports of hatchling disorientation events in Florida describe several hundred nests each year and are likely to involve tens of thousands of hatchlings" (Nelson et al. 2002). However, this number calculated from disorientation reports is likely a vast underestimate. In data collected in 1993 and 1994, Witherington et al. surveyed hatchling orientation at nests located at 23 representative beaches in six counties around Florida and found that approximately 10% to 30% of nests showed evidence of hatchlings disoriented by lighting. From this survey and from measures of hatchling production (Florida Fish and Wildlife Conservation Commission, unpublished data), the number of hatchlings disoriented by lighting in Florida is estimated to be in the range of hundreds of thousands per year (emphasis added).

The impacts of artificial lighting may increase as beach levels rise from beach nourishment projects. Defenders supports the refuge's proposed measures to increase law enforcement and to work with local jurisdictions to assist and educate them about lighting ordinances and enforcement (Draft CCP, p. 76).

Service Response: Comments noted. These issues are addressed throughout the CCP. Solutions for pollution and litter are addressed under Wildlife and Habitat Management Objective 1.a(3) and within Project 17. Solutions for invasive vegetation are addressed specifically under Wildlife and Habitat Management Objective 4.a and within Project 3. Solutions for artificial beach lighting, disorientation, harassment, and hunting is addressed under Wildlife and Habitat Management Objective 1.a(3) and Visitor Services Objective 6.b. These types of issues are not easily solved, as they require a larger and more collaborative effort between the refuge and partners. However, the Service is committed to protecting sea turtles and will continue to work with the partners through the Archie Carr Working Group to address these types of issues. In the aforementioned refuge projects and management objectives, increasing public education with support from partners and increasing law enforcement presence will be the most effective strategy in potentially decreasing the impacts of both human and environmental type stressors.

Climate Change – Loggerhead Turtles Face Endangerment

Comment: The CCP should prioritize consideration of the impacts of climate change on sea turtles. Without question, climate change poses pronounced threats to the continued survival of sea turtles, and the biological integrity, diversity, and environmental health of Archie Carr NWR.

Though the loggerhead sea turtle is federally listed as threatened under the Endangered Species Act of 1973, the best available science currently shows that the species is now at the point of endangerment (Petition at 3). At Archie Carr NWR, loggerhead nesting has declined by 63 percent since 1998 (Appelson and Donnelly 2008). Due to the recent decline of the northern and Florida populations of loggerheads, and Archie Carr NWR's importance as a nesting site for loggerheads, Defenders recommends that the final CCP include all the various measures referenced above to safeguard loggerhead nesting sites in order to avoid the extirpation of the species.

Service Response: Comment noted. Currently, speculation exists regarding reasons for recent declines in loggerhead sea turtle population numbers. Specific reasons and theories are wide and varied. Although loggerhead numbers recently seem to be declining in the refuge, green and leatherback numbers seem to be increasing. At this point, climate change does not appear to be the driving force causing the decline in loggerhead numbers, at least as far as their nesting environment is concerned. As new information becomes available, the refuge will adapt management as necessary. For the management actions at the refuge level, this comment is addressed under Wildlife and Habitat Management objectives 1.a(1), 1.a(2), 1.a(3), 3.f, 5.a, and 5.b.

Climate Change – Do Nothing

Comment: Do not plant, leave it alone. With global warming and higher seas, this area might be covered up soon.

Service Response: Comment noted. The Service recognizes the importance of considering and planning for the impacts of climate change. The effects of climate change include sea level rise and changes in severe weather patterns that could potentially cause increased erosion and reduction of beach/dune habitat on the refuge. However, the rate at which environmental change is occurring is widely debated. One factor needing further study is the rate at which natural ecosystems adapt to environmental changes through sediment accretion and organic deposition. Goals for the refuge within the life of this CCP are to manage for the beach/dune ecosystem that support threatened, endangered, and migratory wildlife. Further, under the Service's Biological Integrity Policy (see 601 FW 3), refuges are directed to maintain and restore biological integrity, diversity, and environmental health. This comment is further addressed under Wildlife and Habitat Management objectives 3.f, 5.a, and 5.b.

Ocean Acidification

Comment: The CCP should prioritize consideration of the impacts of climate change on sea turtles. Without question, climate change poses pronounced threats to the continued survival of sea turtles, and the biological integrity, diversity, and environmental health of Archie Carr NWR.

Ocean acidification is a problem that the Draft CCP did not consider, but should. Although ocean acidification is unrelated to climate change, both problems do share the same cause, the high input of carbon into the atmosphere by humans. As oceans become more acidic from atmospheric carbon deposition, the shells of preferred sea turtle prey such as mollusks and crustaceans have difficulty forming, which could significantly impact the entire ocean food web but sea turtle prey in particular (Environmental News Network 2007). Defenders recommends that FWS identify and describe the potential impacts of ocean acidification on the Archie Carr NWR in the final CCP, and identify measures to address that threat. In addition, Defenders encourages the refuge to work in partnership with local, state and federal agencies to monitor ocean acidity and the status of the sea turtle prey populations of mollusks and crustaceans. In this way, the refuge will be aware and more prepared to deal with this building threat.

Environmental News Network, Conservation Groups Act to Protect Loggerhead Sea Turtle: Commercial Fishing and Climate Change May Soon Cause Extinction (Nov. 15, 2007).

Service Response: Comment noted. Ocean acidification was not specifically addressed in the Draft CCP. However, comprehensive environmental monitoring in relation sea turtle management and research was addressed under Wildlife and Habitat Management Objective 1.a(1) and within projects 1 and 2. The Service works with the partners through the Archie Carr Working Group to address management issues as they arise. The Service supports efforts to understand the impacts of ocean acidification on sea turtles and would foster research into these impacts. The Service would adapt management of the refuge as necessary to respond to these impacts.

Resource Protection

Future Acquisitions

Comment: It is critical to identify and prioritize properties for future acquisition.

Service Response: Comment noted. This comment is addressed under Resource Protection objectives 1.a, 1.b, and 2 (respectively numbered Objective 1 on page 88, Objective 2 on page 89, and Objective 2 on page 96 of the Draft CCP).

Refuge Boundary

Comment: It is critical to resolve discrepancies with the current refuge boundary.

Service Response: Comment noted. This comment is addressed under Resource Protection Objective 1.a(1) (incorrectly numbered Objective 1 on page 88 of the Draft CCP). Further, the Service is continuing to work within the agency and with the partners to assure the accuracy of the refuge's acquisition and management boundaries, as well as of the boundaries of the larger Archie Carr Refuge Partnership.

Visitor Services

Access

Comment: The public should not lose its right to access the beach. State and county tax dollars were utilized to purchase much of these lands for conservation and recreation, yet the plan completely ignores the recreational component originally promised and explicitly recognized in the purchases by state and local taxpayers. While the leases between the State of Florida and the Fish and Wildlife Service do not qualify as sales, they area virtually a transfer of title. Further, the plan states that there is adequate access, which is wrong. There is inadequate access now and it will become even more apparently inadequate in the years ahead. The plan contemplates no new accesses and suggests closing the small number of sand paths dotted along the shoreline.

Service Response: Comment noted. The Draft CCP only applies to U.S. Fish and Wildlife Service-owned and managed lands and does not apply to those lands owned and managed by the State of Florida, Brevard County, Indian River County, or Hubbs-SeaWorld Research Institute, representing about 2,411 acres. The Service manages a total of 119 acres on the east side of A1A (where 49 acres are leased from the state and 70 acres are Service-owned). The Service-owned lands were purchased for conservation management and will remain as managed conservation lands. Any state-leased lands that were purchased under the Save Our Coasts program for improving beach access would be considered for public access development should the partners express the need for increased public access on these lands. Other state-leased lands that were purchased through the Conservation and Recreation Lands program for conservation are and will remain designated as managed conservation areas.

For clarification, Table 8 identifies the mix of current public access points, parks, and parking spaces located within the larger Archie Carr partnership, demonstrating that the existing land management partners are currently providing adequate levels of visitor facilities on lands acquired primarily for public access and recreation. As a result, Service-owned and/or managed lands within the Archie Carr National Wildlife Refuge will continue to be managed for conservation. Developing major Service visitor beach accesses or facilities on Service lands would only duplicate our partners' efforts.

This comment is also addressed under Visitor Services Objective 2.a(2) which states that the Service will work with partners to direct fishing activities to designated access points and close all undesignated access points through refuge properties managed for conservation.

Barrier Island Center

Comment: Consider emphasizing the newly opened Barrier Island Center as a primary resource for welcoming and orienting visitors. The text at the bottom of page 63 should be updated to reflect the importance of the Center. The section of Environmental Education and Interpretation on page 64 could also be expanded and updated.

Service Response: To emphasize that the new Barrier Island Center is now serving as the primary resource for visitors to the larger Archie Carr Refuge partnership, the CCP was updated in the Draft CCP pages 63, 64, 65, and 98.

The last sentence of the first paragraph on Draft CCP page 63 was updated to include the Barrier Island Center.

The second sentence of the second paragraph on that same page was replaced with the following text:

> Brevard County's Barrier Island Sanctuary Management and Education Center, which opened in May 2008, will serve as the focal visitor contact point for the refuge. This new Center and the existing public facilities and accesses are currently providing and planning for adequate levels of visitor services on lands acquired primarily for public access and recreation within the larger Archie Carr Refuge partnership.

And the second sentence of the third paragraph was also updated to include the Barrier Island Center.

Further, Table 8 was updated to remove “future” from the description of the Barrier Island Center.

The Welcoming and Orienting Visitors section, the last paragraph in the Draft CCP page 63, was modified to read as follows:

> Welcome signs to the Archie Carr NWR are posted at both the northernmost and southernmost boundaries on SR A1A to let the general public know they are driving within the boundary of the refuge. The main visitor contact point within the Archie Carr NWR is the newly opened (May 2008) Barrier Island Sanctuary Management and Education Center on SR A1A, owned and operated by the Brevard County Environmentally Endangered Lands Program. Since no Service-operated visitor center exists, this new sea turtle and barrier island habitat education facility will serve as the focal point for welcoming and orienting visitors entering the Archie Carr NWR. This facility is a state-of-the-art visitor center and provides visitors with important information on recreational opportunities within the entire Archie Carr partnership, features exhibits on sea turtles and other wildlife within the barrier island ecosystem, and offers ongoing orientation and educational movies.
>
> Other major visitor contact points within the Archie Carr NWR include:
>
> - Sebastian Inlet State Park - north and south Ranger Station entrances, an administration office, one foot trail, and one public beach access;
> - Brevard County Parks and Recreation - eight public beach accesses;
> - Indian River County Parks and Recreation - three public beach accesses;
> - Brevard County Environmentally Endangered Lands Program - three foot trails.

With exception to lifeguards at the Treasure Shores and Golden Sands beach accesses in Indian River County, all county beach accesses are unstaffed, but have entrance signs visible from SR A1A posted by their respective county or state-managing entity. Once inside all beach accesses, visitors will find a sea turtle etiquette informational sign at the dune crossovers which identifies the beach as within the Archie Carr NWR. Two major beach accesses, one in Brevard County and one in Indian River County, and the foot trail at Sebastian Inlet State Park have a three-panel Service informational kiosk that provides a refuge map, as well as information on the refuge's history, sea turtles, and Dr. Archie Carr. Each of the three foot trails managed by Brevard County host a trailhead kiosk to welcome and orient visitors, but do not specifically mention the Archie Carr NWR.

The Environmental Education and Interpretation section in the Draft CCP, page 65, was updated to read as follows:

Due to the lack of environmental education facilities and education staff, neither the Service nor the Barrier Island Sanctuary Management and Education Center will focus directly on environmental education and interpretive programming. Instead, the Barrier Island Center's focus is on conducting teacher workshops for teacher-guided school visits with Brevard County students. The Center also conducts summer camps and environmental education and interpretive programs by special request for home school, scout, and other groups. The Barrier Island Center itself provides an excellent opportunity for passive environmental education through its youth-friendly exhibits and audiovisual facility. The major interpretive themes of the Center's programs revolve around barrier island wildlife and habitats, while emphasizing sea turtle conservation. Several partners, including the Caribbean Conservation Corporation, Friends of the Carr Refuge, the Sea Turtle Preservation Society, Sebastian Inlet State Park, Disney's Vero Beach Resort, and the Environmental Learning Center are providing opportunistic offsite environmental education to schools and/or children in the area. The mainstay interpretive program within the Archie Carr NWR is the sea turtle watch programs conducted by the Service, the Caribbean Conservation Corporation, and Sebastian Inlet State Park in the months of June and July.

The last sentence of the second paragraph in the Draft CCP page 65 was updated to state, "All three trails were designated as Great Florida Birding Trail (GFBT) sites in January 2008, bringing the total number of GFBT sites in the refuge to five."

The third paragraph on that page was moved up to the second paragraph and replaced by the following text:

Coconut Point Beach Park and Sebastian Inlet State Park were incorporated into the GFBT system in 2000. Currently, bird watching in the refuge is promoted mainly through the GFBT program, with the most common bird watching activities occurring on the beach. Interpretive guided walks and programs on EEL properties of the refuge are conducted by staff at the Barrier Island Sanctuary Management and Education Center by request.

Also in the Draft CCP page 65, the fourth, fifth, and sixth sentences of paragraph 4 were replaced with the following text:

Since no Service-owned facilities are located in the Archie Carr NWR, CCC and refuge staff rely on both state and county facilities to conduct the sea turtle watch programs. For years, the indoor portion of the program was conducted at the Sebastian Inlet State Park Administrative Building. Starting in summer of 2008, both CCC and refuge staff began

conducting the indoor portion of the program from the new Barrier Island Sanctuary Management and Education Center. Approximately 800 people per year participate in a sea turtle watch program within the Archie Carr NWR, although this is still not meeting the public demand for these programs. With the new Barrier Island Center in place and a partnership with CCC to conduct up to four sea turtle watch programs per week, that figure has the potential to increase by 600 participants, which will help meet the increasing demand.

On page 98 of the Draft CCP, Visitor Services Objective 1.a(4) was updated to read, "Within one year of plan approval, provide the Archie Carr NWR brochure at the Barrier Island Sanctuary Management and Education Center, Sebastian Inlet State Park, and kiosks within Pelican Island National Wildlife Refuge."

Educating and Informing the Public

Comment: The goals and objectives under Visitor Services are greatly needed. Much of the public that passes through or uses the beaches and other resources of the refuge may be unaware that they are on a national wildlife refuge.

Service Response: Comment noted. This comment is addressed under Visitor Services objectives 1.a(1), 1.a(4), 1.a(5), 1.a(6), 1.c(2), 1.c(4), and 1.d. The Service is committed to working with its land management and visitor services partners to continue to improve public awareness of the Archie Carr National Wildlife Refuge.

Refuge Administration

Staffing

Comment: The Personnel, Operations, and Maintenance section on page 67 indicates that the Park Ranger position is targeted for elimination. Our understanding is that this position will only be eliminated if it is vacated. Make this distinction in the document. Also, it would be valuable to include a footnote indicating when/if a revised Workforce Management Plan will be forthcoming, possibly preserving some of these positions.

Service Response: Comment noted. The Service is currently working under the existing Workforce Plan, which identifies the elimination of the existing Park Ranger position for the refuge.

Comment: Securing dedicated staff for the refuge is essential and necessary to implement the goals and projects outlined in the plan.

Service Response: Comment noted. This comment is addressed under Refuge Administration objectives 1.a(1), 1.a(2), 1.a(3), and 1.a(4); under the proposed projects; and in Figure 13.

Other

Aquaculture Use Zones

Comment: Would the draft plan preclude a positive response by the Archie Carr National Wildlife Refuge to allow shellfish harvest and culture in Aquaculture Use Zones on sovereign submerged lands below mean high water?

Service Response: Question noted. The refuge contains very little aquatic habitat. Any proposal of this nature for lands and waters managed as part of the refuge must meet Service policies, most

notably appropriateness (603 FW 1) and compatibility (603 FW 2), which require that the proposed use be appropriate for a national wildlife refuge and compatible with the purposes for which the refuge was established and managed (to conserve threatened and endangered species, especially sea turtles; to protect native wildlife and habitat; and to conserve migratory birds) and which also require that the proposed use be in accord with the mission of the National Wildlife Refuge System (to conserve, manage, and restore wildlife and habitats for the American people). Any proposed use of the refuge that conflicted with these purposes or the mission of the Refuge System or any proposed use that was anticipated to have unacceptable wildlife or habitat impacts or that was anticipated to conflict with existing approved uses would not be approved for the refuge.

However, the comment seems to address proposed aquaculture use zones adjacent to or near the refuge, not on the refuge. In this case, the Service would evaluate each individual project on its own merits, based upon anticipated impacts to the refuge and the resources for which it is managed. Thus, it is impossible for the Service to render a conclusion about future aquaculture proposals in relation to Archie Carr NWR. The Service is committed to working with the State of Florida in evaluating specific proposals as they arise.

Alternatives

Comment: Two comments supported the selection of Alternative B as the Proposed Action.

We support the Proposed Action, Alternative B, which focuses refuge management actions on the needs of rare, threatened, and endangered species. This is the only one of the four alternatives that is comprehensive enough to perform all of the actions necessary for the refuge; provides a net-positive effect to the majority of key topics identified under wildlife and habitat management, resource protection, visitor services, and refuge administration; and provides staff to accomplish these actions.

The serious threats that sea turtles and other species face now and in the future at the Archie Carr NWR lead Defenders to support Alternative B because of its comprehensive approach aimed at minimizing and mitigating the effects of climate change, while protecting sea turtles and other species from detrimental or inappropriate human activities. Monitoring variables affecting sea turtles and other imperiled species on the refuge, maintaining adequate law enforcement presence, and working in partnership with local communities and stakeholders will likely provide the refuge with the tools necessary to fulfill its conservation. Monitoring and understanding climate-related changes in real time, and other modern threats to wildlife and habitats, will be essential as the FWS works to adaptively manage and conserve the wildlife resources Archie Carr NWR was established to protect.

Service Response: Comments noted. These comments are addressed in the EA.

Typographical Errors and Updates

Comment: Page 24, paragraph 3, 4th sentence – Remove “live” from “animals that live utilize them.”

Service Response: Page 24 of the Draft CCP was updated to delete “live” from the fourth sentence of the third paragraph.

Comment: Page 63, last paragraph, sentence 6 – Remove CCC reference after “In 2006, the Brevard County Environmentally Endangered Lands Program.” The EEL program built the facility and CCC is a partner in operations. CCC was not involved with the construction of the facility.

Service Response: The Welcoming and Orienting Visitors section on page 63 of the Draft CCP was modified (see the Service's response under the Barrier Island Center subheading).

Comment: Page 263, paragraph 2 – Change the references to the Barrier Island Center to indicate that it is currently open.

Service Response: The CCP was updated to reflect this change (see the Service's response under the Barrier Island Center subheading).

Comment: Table 6, page 53 – Indialantic is north of the refuge, not within the refuge.

Service Response: Table 6 on page 53 of the Draft CCP was modified to show that Indialantic is just north of the refuge.

Comment: Table 8, page 64 – This table requires several corrections to Brevard County Parks and Recreation entries, including:

- Coconut Point Park should include 64 parking spaces;
- Juan Ponce DeLeon Landing should include 47 parking spaces;
- Atlantic Drive Beach Access should include 10 parking spaces;
- River Drive should include 6 parking spaces;
- Judith Resnick Park should include 7 parking spaces;
- Bonsteel Park should include 53 parking spaces; and
- River Oaks Road should include 15 parking spaces.

Service Response: The Refuge staff has coordinated with Brevard County to update Table 8 and a citation was added to the document.

Comment: Table 8 – Change Barrier Island Center from future to active, since the Barrier Island Center opened on May 10, 2008.

Service Response: Table 8 on page 64 of the Draft CCP was modified to show that the Barrier Island Center is the visitor center.

Comment: Page 45 – The gopher tortoise was upgraded from species of special concern to threatened, as listed by the state.

Service Response: All references to the state listing status of the gopher tortoise throughout the Draft CCP/EA were updated to reflect the change from species of special concern to threatened.

Comment: Page 47 – The plan describes the listing status of manatees, but the wording may not reflect the current listing status accurately. Although the listing status is under review, it may be tabled and the CCP should merely list the current state and federal designations and omit the additional discussion.

Service Response: Comment noted. The discussion lists both the existing status and the fact that the status is under review.

Maps

Comment: Figure 6-3 shows Australian pines west of Bonsteel Park and the Barrier Island Center, but there are no pines there. However, pines do exist on the Hubbs and FWS parcels to the south.

Comment: Figure 7-3 shows a slice of green (indicating FWS) north of Bonsteel Park on the east side of A1A. This area is all owned and managed by the Brevard County EEL Program.

Comment: Figure 3-1 on page 4 shows a County/County site west of A1A that should be State/County (SOC).

Comment: Figure 3-3 on page 6 shows a State/County (SOC) site across from Bonsteel Park that should be County/County (EEL).

Comment: Figure 3-4 on page 7 shows a County/County site east of Long Point campground that should be State.

Comment: Figure 3-4 on page 7 shows a County/County (Parks) site north of the Long Point campground that should be County/County (Mosquito Control).

Comment: The East Central Florida Aquatic Preserves Office of FDEP requests inclusion of the Indian River Aquatic Preserve (IRAP, a State MPA) on the Visitor Services map.

Service Response: The refuge coordinated with the land management partners to update the maps and associated databases to show the most current and correct information available for all the partners. These maps and databases will be utilized by the Archie Carr Working Group to coordinate management activities within the larger Archie Carr Refuge partnership.

Appendix V. Appropriate Use Determinations

Archie Carr National Wildlife Refuge Appropriate Use Determinations

An appropriate use determination is the initial decision process a refuge manager follows when first considering whether or not to allow a proposed use on a refuge. The refuge manager must find that a use is appropriate before undertaking a compatibility review of the use. This process clarifies and expands on the compatibility determination process by describing when refuge managers should deny a proposed use without determining compatibility. If a proposed use is not appropriate, it will not be allowed and a compatibility determination will not be undertaken.

Except for the uses noted below, the refuge manager must decide if a new or existing use is an appropriate refuge use. If an existing use is not appropriate, the refuge manager will eliminate or modify the use as expeditiously as practicable. If a new use is not appropriate, the refuge manager will deny the use without determining compatibility. Uses that have been administratively determined to be appropriate are:

- Six wildlife-dependent recreational uses – As defined by the National Wildlife Refuge System Improvement Act of 1997, the six wildlife-dependent recreational uses (hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation) are determined to be appropriate. However, the refuge manager must still determine if these uses are compatible.
- Take of fish and wildlife under state regulations – States have regulations concerning take of wildlife that includes hunting, fishing, and trapping. The Service considers take of wildlife under such regulations appropriate. However, the refuge manager must determine if the activity is compatible before allowing it on a refuge.

Statutory Authorities for this policy:

National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997, 16 U.S.C. §668dd-668ee. This law provides the authority for establishing policies and regulations governing refuge uses, including the authority to prohibit certain harmful activities. The Act does not authorize any particular use, but rather authorizes the Secretary of the Interior to allow uses only when they are compatible and "under such regulations as he may prescribe." This law specifically identifies certain public uses that, when compatible, are legitimate and appropriate uses within the Refuge System. The law states, ". . . it is the policy of the United States that . . . compatible wildlife-dependent recreation is a legitimate and appropriate general public use of the System . . .compatible wildlife-dependent recreational uses are the priority general public uses of the System and shall receive priority consideration in refuge planning and management; and . . . when the Secretary determines that a proposed wildlife-dependent recreational use is a compatible use within a refuge, that activity should be facilitated . . . the Secretary shall . . . ensure that priority general public uses of the System receive enhanced consideration over other general public uses in planning and management within the System . . . ." The law also states, "in administering the System, the Secretary is authorized to take the following actions: . . . issue regulations to carry out this Act." This policy implements the standards set in the Act by providing enhanced consideration of priority general public uses and ensuring other public uses do not interfere with our ability to provide quality, wildlife-dependent recreational uses.

Refuge Recreation Act of 1962, 16 U.S.C. 460k. The Act authorizes the Secretary of the Interior to administer refuges, hatcheries, and other conservation areas for recreational use, when such uses do not interfere with the area's primary purposes. It authorizes construction and maintenance of recreational facilities and the acquisition of land for incidental fish and wildlife-oriented recreational development or protection of natural resources. It also authorizes the charging of fees for public uses.

Other Statutes that Establish Refuges, including the Alaska National Interest Lands Conservation Act of 1980 (ANILCA) (16 U.S.C. §410hh - 410hh-5, 460 mm - 460mm-4, 539-539e, and 3101 - 3233; 43 U.S.C. 1631 et seq.).

Executive Orders. The Service must comply with Executive Order 11644 when allowing use of off-highway vehicles on refuges. This order requires the Service to designate areas as open or closed to off-highway vehicles in order to protect refuge resources, promote safety, and minimize conflict among the various refuge users; monitor the effects of these uses once they are allowed; and amend or rescind any area designation as necessary based on the information gathered. Furthermore, Executive Order 11989 requires the Service to close areas to off-highway vehicles when it is determined that the use causes or will cause considerable adverse effects on the soil, vegetation, wildlife, habitat, or cultural or historic resources. Statutes, such as ANILCA, take precedence over executive orders.

Definitions:

Appropriate Use
A proposed or existing use on a refuge that meets at least one of the following four conditions.

1) The use is a wildlife-dependent recreational use as identified in the Improvement Act.
2) The use contributes to fulfilling the refuge purpose(s), the Refuge System mission, or goals or objectives described in a refuge management plan approved after October 9, 1997, the date the Improvement Act was signed into law.
3) The use involves the take of fish and wildlife under state regulations.
4) The use has been found to be appropriate as specified in section 1.11.

Native American. American Indians in the conterminous United States and Alaska Natives (including Aleuts, Eskimos, and Indians) who are members of federally recognized tribes.

Priority General Public Use. A compatible wildlife-dependent recreational use of a refuge involving hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation.

Quality. The criteria used to determine a quality recreational experience include:

- Promotes safety of participants, other visitors, and facilities.
- Promotes compliance with applicable laws and regulations and responsible behavior.
- Minimizes or eliminates conflicts with fish and wildlife population or habitat goals or objectives in a plan approved after 1997.
- Minimizes or eliminates conflicts with other compatible wildlife-dependent recreation.
- Minimizes conflicts with neighboring landowners.
- Promotes accessibility and availability to a broad spectrum of the American people.
- Promotes resource stewardship and conservation.
- Promotes public understanding and increases public appreciation of America's natural resources and the Service's role in managing and protecting these resources.

- Provides reliable/reasonable opportunities to experience wildlife.
- Uses facilities that are accessible and blend into the natural setting.
- Uses visitor satisfaction to help define and evaluate programs.

Wildlife-dependent Recreational Use. As defined by the Improvement Act, a use of a refuge involving hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation.

Appropriate use findings are listed below for the following uses: beach use, beach renourishment, recreational ATV use, research and dog walking.

FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Archie Carr National Wildlife Refuge

Use: Beach Use (including Jogging and Bicycling)

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	X	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	X	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	X	
(d) Is the use consistent with public safety?	X	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	X	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?		X
(g) Is the use manageable within available budget and staff?	X	
(h) Will this be manageable in the future within existing resources?	X	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?		X
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?	X	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. **Yes** _X_ **No** ___

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate_____ **Appropriate**_X_

Refuge Manager: Signed _____ Date: 8/14/08

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.
If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.
If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Acting Refuge Supervisor: Signed _____ Date: 9/4/08

A compatibility determination is required before the use may be allowed.

FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Archie Carr National Wildlife Refuge

Use: Beach Renourishment /Dune Reconstruction

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	X	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	X	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	X	
(d) Is the use consistent with public safety?	X	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?		X
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?		X
(g) Is the use manageable within available budget and staff?	X	
(h) Will this be manageable in the future within existing resources?	X	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?		X
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?	X	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. **Yes** _X_ **No** ___

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate____ **Appropriate**_X_

Refuge Manager: Signed Date: 8/14/08

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.
If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.
If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Acting Refuge Supervisor: Signed Date: 9/4/08

A compatibility determination is required before the use may be allowed.

FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Archie Carr National Wildlife Refuge

Use: Recreational ATV Use

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	X	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?		X
(c) Is the use consistent with applicable Executive orders and Department and Service policies?		X
(d) Is the use consistent with public safety?		X
(e) Is the use consistent with goals and objectives in an approved management plan or other document?		X
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?		X
(g) Is the use manageable within available budget and staff?		X
(h) Will this be manageable in the future within existing resources?		X
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?		X
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?		X

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. **Yes _X_ No ___**

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate_X__ **Appropriate_____**

Refuge Manager: Signed Date: 8/14/08

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.
If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.
If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Acting Refuge Supervisor: Signed Date: 9/4/08

A compatibility determination is required before the use may be allowed.

FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Archie Carr National Wildlife Refuge

Use: Research

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	X	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	X	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	X	
(d) Is the use consistent with public safety?	X	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	X	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	X	
(g) Is the use manageable within available budget and staff?	X	
(h) Will this be manageable in the future within existing resources?	X	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	X	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?	X	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. **Yes** _X_ **No** ___

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate____ **Appropriate**_X_

Refuge Manager: Signed Date: 8/14/08

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.
If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.
If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Acting Refuge Supervisor: Signed Date: 9/4/08

A compatibility determination is required before the use may be allowed.

FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Archie Carr National Wildlife Refuge

Use: Walking and/or Releasing Dogs or Cats

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	X	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?		X
(c) Is the use consistent with applicable Executive orders and Department and Service policies?		X
(d) Is the use consistent with public safety?		X
(e) Is the use consistent with goals and objectives in an approved management plan or other document?		X
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?		X
(g) Is the use manageable within available budget and staff?		X
(h) Will this be manageable in the future within existing resources?		X
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?		X
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?		X

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. **Yes** _X_ **No** ___

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate _X_ **Appropriate** _____

Refuge Manager: Signed Date: 8/14/08

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.
If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.
If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor: Signed Date: 9/4/08

Acting

A compatibility determination is required before the use may be allowed.

Appendix VI. Compatibility Determinations

Refuge Name:
Archie Carr National Wildlife Refuge

Establishing and Acquisition Authorities:
Endangered Species Act of 1973
Fish and Wildlife Act of 1956
Emergency Wetlands Resources Act of 1986

Refuge Purposes:
Archie Carr NWR was authorized in 1989 and established in 1991 with the following purposes:

- ..."to conserve (A) fish or wildlife which are listed as endangered species or threatened species...or (B) plants..." 16 USC §1534 (Endangered Species Act of 1973)

- "...for the development, advancement, management, conservation, and protection of fish and wildlife resources..." 16 USC §742f(a)(4) "...for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude..." 16 USC §742f(b)(1) (Fish and Wildlife Act of 1956)

- "..the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions..." 16 USC §3901(b), 100 STAT. 3583 (Emergency Wetlands Resources Act of 1986)

- "to protect sea turtle populations and their nesting habitat along the central Atlantic coastline of Florida …" (Final Environmental Assessment for the Proposed Archie Carr National Wildlife Refuge, August 1990)

National Wildlife Refuge System Mission:
As outlined in the National Wildlife Refuge System Improvement Act of 1997, the mission of the National Wildlife Refuge System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Public Review and Comment Period:
Public scoping for the CCP commenced on April 24, 2000, including notices in the *Federal Register* (on April 24, 2000 and May 12, 2000) and in local newspapers (on April 28-30, 2000 and May 19-20, 2000). Additional information about the planning process and the public scoping meetings were provided through informational flyers, planning updates, several articles in the local newspapers, and postings on the Fish and Wildlife Service's Internet websites (http://merrittisland.fws.gov and http://pelicanisland.fws.gov). Given the proximity of the two refuges, several shared issues, and many overlapping interested parties, joint public meetings were held for the Pelican Island and Archie Carr refuges.

Utilizing existing public mailing lists of the two refuges, as well as public mailing lists from various governmental partners, more than 1,200 informational flyers were initially mailed. This first flyer invited participation in the planning process through a variety of means, including public meetings, letters, faxes, telephone calls, e-mail messages, and personal visits. The flyer also announced the times and locations of the public meetings, provided other information, and described the purposes of the two refuges. Afterwards, three neighborhood meetings were conducted on May 3, May 25, and June 1, 2000. Outlining the planning process and highlighting the issues and concerns raised to date, a June 2, 2000 Planning Update was mailed out to over 2,800 interested parties. Following this Planning Update, two summary, countywide meetings were held on June 14 and June 15, 2000, in Sebastian (Indian River County) and Melbourne (Brevard County).

The public meetings were attended by a total of 90 individuals representing a variety of interests and organizations. Approximately 117 individuals, organizations, and governmental entities submitted comments regarding the plans for Pelican Island and Archie Carr refuges. Letters, faxes, email messages, and phone calls were received from across the country. Comments from the public were submitted by a variety of entities, ranging from a local middle school student to a coalition of six organizations representing more than 700,000 members.

Due to a variety of factors, including the Centennial for the National Wildlife Refuge System and Pelican Island NWR, Centennial, the Archie Carr NWR CCP process was put on hold in 2003. The Service re-started the planning process in 2006 with professional reviews of the refuge to determine the status, trends, and conditions of refuge resources and facilities.

A Notice of Availability of the Draft CCP/EA for Archie Carr NWR for public review was published in the *Federal Register* on June 26, 2008. Public comments were accepted from June 26 to July 28, 2008, while comments from the State of Florida were submitted through the State Clearinghouse on August 7, 2008. A total of 12 individuals, organizations, businesses, and governmental agencies submitted comments on the Draft CCP/EA, including two organizations, three individuals, and five state and local governmental agencies (including the Florida Department of Environmental Protection; Florida Department of Agriculture and Consumer Services; East Central Florida Regional Planning Council; Treasure Coast Regional Planning Council; and Brevard County). Under the State Clearinghouse review, the proposed activities were found to be consistent with the Florida Coastal Management Program; the Strategic Regional Policy Plan's goals, objectives, and policies of the East Central Florida Regional Planning Council; and the Strategic Regional Policy Plan of the Treasure Coast Regional Planning Council, including Regional Goal 6.8 and Policy 6.8.1.3. Appendix IV summarizes the comments received during the public review and comment period and the Service's responses to those comments.

Description of Use: *Fishing*

Fishing was identified as a priority wildlife-dependent activity under the National Wildlife Refuge System Improvement Act and is a traditional use at the refuge. Fishing was identified as a wildlife-related activity that would be offered where compatible with refuge objectives in the preferred alternative of the Final Environmental Assessment for the Proposed Archie Carr National Wildlife Refuge, August 1990. Only fishing from shore is analyzed in this compatibility determination due to the fact that the refuge does not own or manage the waters (Atlantic Ocean and Indian River Lagoon) along its shoreline, with the exception of a few minor portions of the Indian River Lagoon. Fishing is permitted on the refuge along the Atlantic Ocean beaches if accessed from the beach (i.e., east of the dunes) or from approved access points on partner properties. These access points are from partner properties and not from Service properties. With the exception of a few minor foot paths, the only portion of Service properties along the Atlantic Ocean that are open to public use are those

areas eastward of the seaward extent of the dune vegetation to mean high water. Along the Indian River Lagoon, the fishing public is permitted to access the lagoon and associated waterways from designated and open trails on partner properties. These trails are not on Service properties. Access is generally by foot, but users also carry kayaks and canoes down partner trails to access the water. Users park along SR A1A at designated parking areas (e.g., county beach parks and EEL trailhead parking areas). The only portion of Service properties along the Indian River Lagoon that are open to public use are the open water areas of the lagoon over submerged lands owned by, leased to, or otherwise managed by the refuge. Fishing is regulated in accordance with state regulations.

Availability of Resources: Annual refuge operation funds support the Visitor Services program and activities. Funds needed to support law enforcement activities associated with fishing are identified in the proposed staffing plan of the CCP. Infrastructure used to support this recreational activity is managed by local and state partners.

Anticipated Impacts of the Use: Anticipated impacts were identified and evaluated based on best professional judgment and published scientific papers. Overfishing has been known to cause the local extinction of certain fish species and precedes all other human disturbance (Jackson, et al. 2001). In recent history, overfishing in Florida has led to the decline of certain species (Coleman et al. 2004). In an attempt to minimize overfishing, the State of Florida monitors fish populations and sets seasons, slot and size limits, and total bag limits for most sport fish. Collectively, the state fishing regulations should minimize the likelihood of fish stocks declining in waters surrounding the refuge. Additional impacts are associated with access to fishing areas and include minor trampling of vegetation along trails and to the water on partner properties and unauthorized access to and through Service properties. Although not permitted, littering and abandoned and discarded fishing gear pose additional potential impacts to wildlife and habitats.

Determination:

____Use is Not Compatible
_X__Use is Compatible, with the Listed Stipulations

Stipulations Necessary to Ensure Compatibility: Fishing is allowed on the refuge in accordance with state regulations. Access to fishing must be through approved access points (e.g., county park dune crossovers, designated beach foot paths, and designated and open trails). If wildlife populations suffer as a result of fishing activities, fishing quality declines, or other wildlife or habitat impacts occur, additional restrictions may be implemented. The refuge will modify or eliminate any use with unacceptable impacts. The Service will work with the partners to increase awareness and understanding to help limit the impacts from fishing activities.

Justification: Fishing is a priority wildlife-dependent use under the National Wildlife Refuge System Improvement Act. Fishing, as described, was determined to be compatible, in view of the potential impacts that fishing can have on the Service's ability to achieve purposes and goals of the refuge. Fishing densities and use levels are currently and are anticipated to remain relatively low during most days, minimizing impacts and sufficient opportunities are available for other priority wildlife-dependent recreation, minimizing user group conflicts.

NEPA Compliance for Refuge Use Description:

_____Categorical Exclusion without Environmental Action Statement
_____Categorical Exclusion and Environmental Action Statement
__X__Environmental Assessment and Finding of No Significant Impact
_____Environmental Impact Statement and Record of Decision

Mandatory 15-Year Re-evaluation Date: _____9/18/2023_____

Description of Uses: *Wildlife Observation and Photography*

Wildlife observation and photography are considered simultaneously in this compatibility determination. Wildlife observation and photography were identified in the National Wildlife Refuge System Improvement Act of 1997 as priority wildlife-dependent recreational uses. This compatibility determination applies only to personal photography and not to other forms of photography (e.g., commercial photography and filming). Wildlife observation and photography may occur during daylight hours throughout all open areas of the refuge. With the exception of a few minor foot paths, the only portion of Service properties along the Atlantic Ocean that are open to public use are those areas eastward of the seaward extent of the dune vegetation to mean high water. Wildlife viewing and photography improvements have been made by local and state partners along their hiking trails and at other locations adjacent to refuge properties to provide exposure to different habitat types and diverse flora and fauna. Beach access for wildlife viewing and photography is generally provided by refuge partners on lands adjacent to refuge properties. Trails and beach access points are on partner properties and not on Service properties. Access is generally by foot, but users also carry kayaks and canoes on partner dune crossovers and partner trails to access the water. Users park along SR A1A at designated parking areas (e.g., county beach parks and EEL trailhead parking areas). Wildlife observation opportunities are also provided on refuge-led sea turtle watch programs.

Availability of Resources: Annual refuge operation funds support the Visitor Services program and activities. Interns, volunteers, partners and Friends of the Carr Refuge members provide the staffing to support these uses. Funds needed to support law enforcement associated with this activity, particularly at night, are identified in the proposed staffing plan of the CCP. Numerous unauthorized sea turtle walks take place on the refuge at night during the nesting season, resulting in the increased potential for disturbance to nesting sea turtles. The Zone Officer and officers from the Refuge Complex Headquarters are available for targeted operations. Infrastructure used to support this recreational activity is managed by local and state partners.

Anticipated Impacts of the Uses: This purpose of this section is to critically and objectively evaluate the potential effects that wildlife observation and photography could have on the wildlife, habitat, and other public use activities based on available information and best professional judgment. Each activity has the potential to have impacts, but the focus is to minimize impacts to within acceptable limits. This is based on the impacts at the existing and projected level of use.

Short-term Impacts: Wildlife observation has the potential for disturbing wildlife species. Night-time human activity can cause nesting females to abort nesting attempts (Murphy 1985). The use of flashlights on nesting beaches disorients hatchlings and can deter nesting females (Mortimer 1979). Approaching water birds can reduce time spent foraging and can cause them to avoid foraging habitats adjacent to the areas of disturbance (Klein 1993). Walking on wildlife observation trails tends to

displace birds and can cause localized declines in the richness and abundance of wildlife species (Riffell et al. 1996). Bicycling and people walking causes more disturbances to waterfowl than vehicles (Pease et al. 2005). Wildlife photographers tend to have the largest disturbance impacts (Klein 1993; Morton 1995; Dobb 1998). While wildlife observers frequently stop to view wildlife, wildlife photographers are much more likely to approach wildlife (Klein 1993). Even slow approach by wildlife photographers tends to have behavioral consequences to wildlife (Klein 1993). Other impacts include the potential for some photographers to remain close to wildlife for extended periods of time (Dobb 1998) and the tendency of casual photographers with low power lenses to get much closer to their subject than other activities would require (Morton 1995). Minor trampling of vegetation may also result.

Long-term Impacts: Disturbance resulting from night-time human activities and lighting can cause sea turtles to shift their nesting beaches, delay egg laying, and select poor nesting sites (Murphy 1985). Further, other wildlife may abandon use of an area due to increased disturbances from human use and activities.

Determination:

____Use is Not Compatible
_X__Use is Compatible, with the Listed Stipulations

Stipulations Necessary to Ensure Compatibility: By design, wildlife observation and photography should have minimal wildlife and habitat impacts. Wildlife observation and photography activities are limited to daylight hours and authorized guided walks, which include nighttime sea turtle walks. Nighttime sea turtle walks are limited to only state-permitted, authorized groups led by the Service or led by one of the partners. These walks are constrained by the conditions of the state permit. If evidence of unacceptable wildlife and/or habitat impacts begins to appear, it will be necessary to change the activity or the program, move the activity or program, or eliminate the program. Actions to be taken include the establishment of buffer zones that minimize disturbance around sensitive areas and the designation of additional no-entry zones, as well as the education of visitors that their actions can have negative impacts on wildlife and habitat. Access for wildlife observation and photography activities must be through approved access points (e.g., county park dune crossovers, designated beach foot paths, and designated and open trails). If wildlife populations or habitats suffer as a result of these activities or if other wildlife or habitat impacts occur, additional restrictions may be implemented. The refuge will modify or eliminate any use with unacceptable impacts.

Justification: Wildlife observation and photography are priority public uses of the National Wildlife Refuge System. Providing quality, appropriate, and compatible opportunities for these activities contributes toward fulfilling provisions of the National Wildlife Refuge System Improvement Act. Wildlife observation and photography would provide excellent forums for promoting increased awareness, understanding, and support of refuge resources and programs and of the Service. The stipulations outlined above should minimize potential impacts relative to wildlife/human interactions. At the current and anticipated levels of visitation, these wildlife-dependent uses would not conflict with the national policy to maintain the biological diversity, integrity, and environmental health of the refuge.

NEPA Compliance for Refuge Use Description:

Categorical Exclusion without Environmental Action Statement
_____Categorical Exclusion and Environmental Action Statement
__X__Environmental Assessment and Finding of No Significant Impact
_____Environmental Impact Statement and Record of Decision

Mandatory 15-Year Re-evaluation Date: _____9/18/2023_____

Description of Uses: *Environmental Education and Interpretation*

Environmental education and interpretation consist primarily of youth and adult education and interpretation of the natural resources of the refuge. Activities include onsite staff-led, volunteer-led, or teacher-led environmental education programs; offsite volunteer-led or teacher-led classroom programs; teacher workshops; and interpretation of wildlife, habitat, other natural features, and/or management activities occurring on the refuge. These activities seek to increase the public's knowledge and understanding of wildlife and their habitats and to contribute to wildlife conservation and support of the refuge. Environmental education and interpretation were identified in the National Wildlife Refuge System Improvement Act as priority public use activities, provided they are appropriate and compatible with the purposes for which the refuge was established. With the exception of a few minor foot paths, the only portion of Service properties along the Atlantic Ocean that are open to these public use activities are those areas eastward of the seaward extent of the dune vegetation to mean high water.

Environmental education and interpretation programs may be conducted by the Service or by the partners on Service or on partner properties. Other than state-permitted nighttime sea turtle walks, any environmental education and interpretation activities proposed for Service properties must be reviewed and approved by the Service through a special use permit issued by the refuge. These permits will contain conditions to minimize impacts and ensure compatibility.

Availability of Resources: Annual refuge operation and maintenance funds support the Visitor Services program and activities. The CCP outlines proposed staffing and projects to support Visitor Services during the 15-year life of the plan. Interns, volunteers, partners and Friends of the Carr Refuge members also provide the staffing to support these uses.

Anticipated Impacts of the Uses: Environmental education primarily occurs outdoors and can cause disturbance and habitat destruction through trampling.

Short-term Impacts: Night-time human activity can cause nesting females to abort nesting attempts (Murphy 1985). Approaching water birds can reduce time spent foraging and can cause them to avoid foraging habitats adjacent to the areas of disturbance (Klein 1993). Walking on trails tends to displace birds and can cause localized declines in the richness and abundance of wildlife species (Riffell et al. 1996). People walking cause more disturbances to waterfowl than vehicles (Pease et al. 2005). Minor trampling of vegetation may also result.

Long-term Impacts: Disturbance resulting from night-time human activities and lighting can cause sea turtles to shift their nesting beaches, delay egg laying, and select poor nesting sites (Murphy 1985). Further, other wildlife may abandon use of an area due to increased disturbances from human use and activities. Service and partner programs and refuge special use permits are designed to limit these impacts.

Determination:

____Use is Not Compatible
_X__Use is Compatible, with the Listed Stipulations

Stipulations Necessary to Ensure Compatibility: While impacts are anticipated to be minimal, stipulations are required to ensure that wildlife resources are adequately protected. Other than Service programs, any other environmental education or interpretation activity or program conducted on Service properties will be required to obtain a refuge special use permit. These permits will contain

conditions to help ensure that impacts are minimized to ensure compatibility. The environmental education program and interpretation activities would avoid sensitive sites and vulnerable wildlife populations. Built into all curriculums will be a section on wildlife etiquette. Where possible, environmental education programs and activities will be held at or near established facilities so that impacts may be minimized. As part of the special use permit application and renewal process, evaluations of sites and programs would be conducted annually to assess if objectives are being met and that the natural resources are not being adversely impacted. Impacts associated with interpretive programs are also anticipated to be minimal. One overarching aspect of the interpretive program is to build understanding and appreciation for the refuge and its natural resources. As use increases, the chance of wildlife disturbances may also increase, but through interpretive materials (e.g., brochures, signs, and kiosk panels) proper wildlife etiquette will be stressed. Education and interpretive activities and programs are critical for making visitors aware that their actions can have both positive and negative impacts on wildlife. Interpretive activities and programs will be conducted at developed sites where impacts can be minimized. Wildlife impacts will be carefully monitored. If impacts are detected, adaptive strategies will be developed, such as approach-zones, to lessen wildlife disturbance. As part of the special use permit application and renewal process, annual evaluations will be conducted to assess if objectives are being met and that the natural resources are not being adversely affected. The refuge will modify or eliminate any use that results in unacceptable impacts.

Justification: Environmental education and interpretation are identified as two priority wildlife-dependent recreational activities under the National Wildlife Refuge System Improvement Act. Environmental education and interpretation are key components of the Service's initiative to connect children with nature. Environmental education and interpretation are used to encourage all citizens to act responsibly in protecting natural resources. They are tools the refuge can use to build understanding, appreciation, and support for the refuge and the National Wildlife Refuge System. For example, the refuge and its partners have developed interpretive signs that are posted on every public beach access, including one on Service property. The refuge and its partners have also developed interpretive kiosks at three major beach accesses. As long as stipulations to insure compatibility are followed, the programs should remain compatible with the purposes of the refuge. At such time that unacceptable wildlife impacts are detected, the refuge will modify or eliminate the activity to minimize or eliminate the impacts. Both programs are essential to inform the public of the missions of the Service and Refuge System, as well as the refuge's vision and purposes. Minimal anticipated impacts are anticipated from the implementation of the environmental education and interpretation programs and the benefits that should arise through public education, participation, and involvement.

NEPA Compliance for Refuge Use Description:

_____Categorical Exclusion without Environmental Action Statement
_____Categorical Exclusion and Environmental Action Statement
__X__Environmental Assessment and Finding of No Significant Impact
_____Environmental Impact Statement and Record of Decision

Mandatory 15-Year Re-evaluation Date: _____9/18/2023_____

Description of Use: *Beach Use*

This use consists of a variety beach activities such as swimming, sunbathing, surfing, picnicking, and beach combing, as well as bicycling and jogging. Other activities include beach games such as throwing Frisbees and balls and flying kites. This is not a priority public use. This use is likely to occur along all of the refuge's ocean beaches. Access to Service properties would be from the north and south along the ocean, from partner properties. Several partner parking lots with boardwalks access the beach and are owned and managed by state and local agencies. Beach use tends to be concentrated around these access points. Beaches are open to public use year round and potentially 24 hours a day. This is a traditional activity on the refuge and is enjoyed by thousands of visitors annually. With the exception of a few minor foot paths, the only portion of Service properties along the Atlantic Ocean that are open to public use are those areas eastward of the seaward extent of the dune vegetation to mean high water.

Availability of Resources: Funds needed to support law enforcement associated with this activity are identified in the proposed staffing plan of the CCP. Infrastructure used to support this recreational activity is managed by local and state partners.

Anticipated Impacts of the Use: Refuge beaches are utilized year-round, but the summer months are the busiest. The high concentration of people on the beach may displace birds using the beach. Migratory shorebirds utilize the refuge during their seasonal migrations as foraging and resting areas. Repeated human disturbance of foraging or resting shorebirds at a migratory stopover site has several negative impacts on shorebirds. Human disturbance can reduce the amount of time shorebirds spend foraging or roosting, reducing their ability to accumulate and conserve fat stores, which provide the energy needed for their long-distance flights. Disturbance also forces birds to use up valuable energy reserves while fleeing, resulting in lower weight birds. Finally, chronic disturbance may partly or entirely displace a bird from an area (Pfister et al. 1992).

Human disturbance can also affect five federally listed sea turtle species that utilize the refuge. At night, during the sea turtle nesting season, visitor use can cause nesting females to retreat before laying their eggs. Repeated disturbance may cause the turtles to nest on substandard beaches where hatchling survival may be lower (Murphy 1985). Beach goers may also inadvertently dig up nests.

In addition to the direct effects described above, beach use can have indirect negative impacts on wildlife. Heavy beach use can contribute to erosion, especially in areas where unauthorized beach access trails traverse trough coastal strand and dune habitats. Additionally, trash (food) left on the beach can attract predators that feed on nesting or roosting shorebirds, as well as on sea turtle eggs and hatchlings. Furthermore, the removal of shells, wrack, and other natural debris from the beach may have indirect biological and ecological effects by reducing food availability and microhabitat used by invertebrates that are in turn preyed upon by shorebirds.

A critical and objective evaluation of the potential effects that bicycles and jogging could have on the wildlife, habitat, and other public use activities is based on available information and best professional judgment. Although bicycling and jogging have potential impacts, the focus is to minimize these negative effects.

Short-term Impacts: Wildlife disturbance relative to bicycle riding has been poorly studied with most references using other activities such as walking, hiking, and operating vehicles and their impacts on wildlife; therefore, bicycle impacts are inferred (unless noted). A study conducted at Back Bay National Wildlife Refuge indicated that jogging and bike riding in an open habitat, such as marshes where the activity is highly visible to wading birds, shorebirds, and waterfowl, is disruptive (Pease et

al. 2005). As a result, marsh birds in open areas flee from joggers and bike riders (Laskowski 1999). Similar results have been documented on beaches (Burger and Gochfeld 1991; Burger 1995; Burger et al. 2004). Wildlife may receive different cues from different modes of transportation. For instance, animals do not flee as readily from cars, perhaps because the person is hidden in the vehicle and not perceived as a threat (Klein 1993). A 2005 study at Back Bay National Wildlife NWR (Pease et al. 2005) compared five different human activities (i.e., motorized tram, slow moving truck, fast moving truck, bicyclist, and pedestrian) in relation to waterfowl disturbance. The study found that people walking and biking disturbed waterfowl more than vehicles.

Long-term Impacts: Considering the high level of use and variety of activities occurring at the refuge, appropriate solutions to minimize impacts need to be developed. For example, during the fall migration and over-wintering seasons, wildlife observation, photography, environmental education, and interpretation are all occurring simultaneously and are at the highest levels of the year. Techniques to limit disturbance must be evaluated, implemented, and monitored. This stems from the hypothesis that prolonged and extensive disturbance may cause migratory birds to abandon the wetlands most disturbed by humans and winter elsewhere. Current use may not be at a level to cause this shift, but anticipated increases relative to the expansion of the population and the growth of visitor opportunities could result in seasonal shifts in migratory bird use of the refuge's beach habitats. Bicycling would add to the level of disturbance and strategies need to be implemented to limit wildlife impacts.

Current and anticipated levels of beach use are predicted to have minimal impacts. Where impacts are found to be unacceptable, the Service would work with the partners to modify or eliminate these uses. Modifications may include the establishment of temporary closed areas around roosting or nesting wildlife.

Determination:

____Use is Not Compatible
_X__Use is Compatible, with the Listed Stipulations

Stipulations Necessary to Ensure Compatibility: Beach use, especially bicycling and jogging, can cause and increase wildlife impacts and can disrupt other individuals viewing wildlife. Evaluation of beach use activities, especially bike riding and jogging, will be conducted annually to assess if objectives are being met, if habitat impacts are within a tolerable range, and if wildlife populations are not being adversely affected. If evidence of unacceptable impacts begins to appear, it may be necessary to change the activity, move the activity, or eliminate the activity. Several stipulations are necessary to ensure compatibility of beach use activities, as follows:

- Enforce laws aimed at minimizing disturbance to nesting sea turtles.
- Enforce nighttime closures of beach accesses during sea turtle nesting season to minimize disturbance to nesting sea turtles.
- The Service will work with the partners to encourage visitors to access the beach only through approved access points (e.g., established boardwalks).
- Utilize a volunteer program to educate the public about the importance of minimizing disturbance to sea turtles and shorebirds.
- Implement zone closures if disturbance levels are determined to be unacceptable (e.g., create temporary closed areas around shorebird nesting and important roosting areas).
- Monitor shorebird use during fall migration to better assess foraging and resting areas.

Justification: Although these uses are forms of nonwildlife-oriented recreation, they are historic activities that occur in areas where the refuge has limited jurisdiction. These uses have been ongoing since the early 1960s, and sea turtle populations on the refuge continue to remain high despite the increases in beach uses. From a biological standpoint, restrictions are in place to assure the protection of the migratory shorebirds and sea turtles. At the current and anticipated levels of visitation, beach use activities on the refuge do not seem to conflict with the national policy to maintain the biological diversity, integrity, and environmental health of the refuge. The Service would work with the partners to modify or eliminate any use with unacceptable impacts.

NEPA Compliance for Refuge Use Description:

_____Categorical Exclusion without Environmental Action Statement
_____Categorical Exclusion and Environmental Action Statement
__X__Environmental Assessment and Finding of No Significant Impact
_____Environmental Impact Statement and Record of Decision

Mandatory 10-Year Re-evaluation Date: _____9/18/2018_____

Description of Use: *Research*

Research is the planned, organized, and systematic gathering of data to discover or verify facts. In principle, research conducted on the refuge by universities, cooperative units, nonprofit organizations, and other research entities furthers refuge management and serves the purposes, vision, and goals of the refuge. The refuge hosts research from a variety of research institutions, including various universities and private research groups. All research activities, whether conducted by governmental agencies, public research entities, universities, private research groups, or any other entity, shall be required to obtain special use permits from the refuge. Approved refuge special use permits will contain conditions under which researchers must operate to help minimize negative impacts to refuge resources. All research activities will be overseen by the Refuge Biologist and Refuge Manager. Projects that are fish and wildlife management-oriented, which will provide needed information to refuge operation and management, will receive priority consideration and will even be solicited.

Availability of Resources: Other than the administration of associated special use permits, no refuge resources are generally required for this use.

Anticipated Impacts of the Use: All-terrain vehicles (ATVs) have been used on the refuge by non-Service scientists to conduct research on the refuge. Many areas (e.g., beaches) are inaccessible to larger vehicles and researchers use ATVs as part of their scientific studies. Approved refuge special use permits are required and contain conditions under which researchers and their use of ATVs must operate to help minimize negative impacts to refuge resources. The compatibility of ATV use on the refuge is evaluated in a separate compatibility determination.

Generally, adverse impacts from research are minimal. Occasionally, slight or temporary wildlife or habitat disturbances may occur (e.g., minor trampling of vegetation may occur when researchers access monitoring plots). However, these impacts are not significant, nor are they permanent. Also, a small number of individual plants or animals might be collected for further scientific study, but these collections are anticipated to have minimal impact on the populations

from which they came. All collections will adhere to the Service's specimen collection policy (Director's Order 109, dated March 28, 2005).

Determination (check one below):

____Use is Not Compatible
_X__Use is Compatible, with the Listed Stipulations

Stipulations Necessary to Ensure Compatibility: All research conducted on the refuge must further the purposes of the refuge and the mission of the National Wildlife Refuge System. All research will adhere to established refuge policy on research and policy on collecting specimens (Directors Order Number 109). To ensure that research activities are compatible, the refuge requires that a special use permit be obtained before any research activity may occur. Research proposals and/or research special use permit applications must be submitted in advance of the activity to allow for review by refuge staff to ensure minimal impacts to the resources, staff, and programs of the refuge. Each special use permit may contain conditions under which the research will be conducted. Each special use permit holder will submit annual reports or updates to the refuge on research activities, progress, findings, and other information. Further, each special use permit holder will provide copies of findings, final reports, publications, and/or other documentation at the end of each project. The refuge will deny permits for research proposals that are determined to not serve the purposes of the refuge and the mission of the National Wildlife Refuge System. The refuge will also deny permits for research proposals that are determined to negatively impact resources or that materially interfere with or detract from the purposes of the refuge. All research activities are subject to the conditions of their permits.

Justification: Research activities provide important benefits to the refuge and to the natural resources supported by the refuge. Supporting management, research conducted on the refuge can lead to new discoveries, new facts, verified information, and increased knowledge and understanding of resource management, as well as track current trends in fish and wildlife habitat and populations to enable better management decisions. Research has the potential to further the purposes and goals of the refuge and the mission of the National Wildlife Refuge System.

NEPA Compliance for Refuge Use Description:

_____Categorical Exclusion without Environmental Action Statement
_____Categorical Exclusion and Environmental Action Statement
__X__Environmental Assessment and Finding of No Significant Impact
_____Environmental Impact Statement and Record of Decision

Mandatory 10-year Re-evaluation Date: _____9/18/2018_____

Description of Use: *All-terrain Vehicle Use to Support Research Activities*

All-terrain vehicles (ATVs) have been used on the refuge by non-Service scientists to conduct research on the refuge. Many areas (e.g., beaches) are inaccessible to larger vehicles and researchers use ATVs as part of their scientific studies. ATV use on the refuge by the public will remain prohibited. Approved refuge special use permits are required and contain conditions under which researchers and their use of ATVs must operate to help minimize negative impacts to refuge resources.

Availability of Resources: Operational funds to support this activity would be minimal and limited to issuing permits to researchers and enforcing regulations prohibiting recreational ATV use.

Anticipated Impacts of the Use: A critical and objective evaluation of the potential effects that ATVs could have on the wildlife, habitat, and other public use activities is based on the most current information available and best professional judgment. Although ATVs have the potential to have impacts, the focus is to minimize their negative effects. This is based on the impacts at the existing and projected level of use. Improperly used ATVs can have very serious and long-term consequences due to destruction of habitat and disturbance to wildlife (Webb and Wilshire 1983, Defenders of Wildlife 2002). However, based upon special use permit conditions, the impacts from approved ATV use to support research activities are anticipated to be minimal.

Determination:

____Use is Not Compatible
__X__Use is Compatible, with the Listed Stipulations

Stipulations Necessary to Ensure Compatibility: ATV use can have substantial negative impacts on refuge resources. However, this activity will be limited to qualified researchers, a relatively small number (generally less than 20 annually) of scientists/biologists. In addition, all ATV users will be permitted to only use their ATVs in specific areas on the refuge where they are conducting their studies, and only during the timeframes and under the conditions outlined in a refuge-approved protocol and special use permit. All research on the refuge is reviewed by the staff prior to implementation. Approved ATV users will stay on trails and beaches and adhere to all applicable procedures.

Justification: Scientific research conducted on the refuge will contribute to a better understanding the resources and natural processes that occur on the refuge. In some cases, these scientific studies will allow the Service to more effectively protect and manage wildlife and plant populations. Providing opportunities for these activities contributes toward fulfilling provisions of the National Wildlife Refuge System Improvement Act. For some scientific studies, ATV-use is an important tool in meeting research objectives, and with proper precautions, this mode of transportation can be utilized with minimal environmental impacts.

NEPA Compliance for Refuge Use Description:

_____Categorical Exclusion without Environmental Action Statement
_____Categorical Exclusion and Environmental Action Statement
__X__Environmental Assessment and Finding of No Significant Impact
_____Environmental Impact Statement and Record of Decision

Mandatory 10-year Re-evaluation Date: _____9/18/2018_____

Description of Use: *Beach Renourishment/Dune Reconstruction*

Brevard and Indian River counties have periodically conducted permitted beach renourishment and dune reconstruction on or near Service lands when part of a larger beach restoration project. Beach renourishment includes a variety of activities, such as dredging and pumping sand material onto the beach, using pipes and heavy equipment to deliver and distribute sand along the beach

and into the dune, building sand fencing to retain sand in the newly built areas, and planting native vegetation to stabilize dunes. Dune reconstruction includes a variety of activities, such as using heavy equipment to deliver and distribute sand along the beach to build the dune, building sand ramps to access the beach with heavy equipment, staging equipment at access sites on the beach during reconstruction activities, building sand fencing to retain sand in the newly built areas, and planting native vegetation to stabilize dunes.

Beach renourishment and dune rebuilding (if implemented with Service concurrence on sand type, timing, and other vital factors essential for the protection of listed species) would be preferable to typical beach armoring structures such as sea walls, geotextile tubes, and rock revetments installed on adjacent private properties. Impacts from beach armoring (including lower nesting success) tend to be long-term and cumulative. Any impacts from beach nourishment and dune rebuilding (including lower nesting success) tend to be short-term.

Availability of Resources: Operational funds to support this activity would be minimal and limited to issuing permits to government agencies proposing dune reconstruction activities.

Anticipated Impacts of the Use: Impacts include, but are not limited to: dune escarpment formation resulting in potentially reduced sea turtle nesting success (Brock et al. 2008); changes to the physical characteristics of the beach and dunes resulting in potentially reduced hatching success (Nelson and Dickersonson 1989); negatively sloped dunes resulting in potentially increased sea turtle hatchling disorientation (Witherington, pers. comm.); potential temporary loss of dune vegetation that is buried (sea oats, seashore dropseed, sea purslane, beach elder, and southern sea rocket) and coastal strand vegetation (saw palmetto, sea grape, Hercules' club, inkberry, and southern prickly pear) (Witherington, pers. comm.); potential loss of ghost crabs and white beach tiger beetles (Witherington, pers. comm.); and potential loss of macroinvertebrates, such as mole crabs, amphipods, polychaetes, and mollusks that are important for foraging shorebirds (Peterson et al. 2006).

Determination:

____Use is Not Compatible
_X__Use is Compatible, with the Listed Stipulations

Stipulations Necessary to Ensure Compatibility: Dune reconstruction projects should be coordinated with the refuge and permitted by the Florida Department of Environmental Protection and U.S. Army Corps of Engineers in consultation with the Service and National Marine Fisheries Service to ensure that the proposed project will not result in take to listed species or long-term adverse impacts to the refuge's biotic community.

Justification: Dune reconstruction activities are justified when shoreline erosion results in threats to sea turtle nesting habitat, beach mouse habitat, or other native resources. Dune reconstruction may also be justified when the scope of shoreline erosion threatens the human environment to the extent that public policy options (e.g., beach armoring) would result in long-term threats to sea turtle nesting habitat, beach mouse habitat, or other resources.

NEPA Compliance for Refuge Use Description:

_____Categorical Exclusion without Environmental Action Statement
_____Categorical Exclusion and Environmental Action Statement
__X__Environmental Assessment and Finding of No Significant Impact
_____Environmental Impact Statement and Record of Decision

Mandatory 10-year Re-evaluation Date: _____9/18/2018_____

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APPROVAL OF COMPATIBILITY DETERMINATIONS

The signature of approval is for all compatibility determinations considered within the Comprehensive Conservation Plan for Archie Carr National Wildlife Refuge. If one of the descriptive uses is considered for compatibility outside of the Comprehensive Conservation Plan, the approval signature becomes part of that determination.

Refuge Manager: Signed 8/14/08
(Signature/Date)

Regional Compatibility Coordinator: Signed 9/6/08
(Signature/Date)

Refuge Supervisor: Acting Signed 9/10/08
(Signature/Date)

Regional Chief, National Wildlife Refuge System, Southeast Region: Signed 9-12-08
(Signature/Date)

Appendix VII. Intra-Service Section 7 Biological Evaluation

SOUTHEAST REGION
INTRA-SERVICE SECTION 7 BIOLOGICAL EVALUATION FORM

Originating Person: Paul Tritaik, Refuge Manager, Pelican Island National Wildlife Refuge and Archie Carr National Wildlife Refuge

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Date: 2/19/2008

PROJECT NAME: Archie Carr National Wildlife Refuge Comprehensive Conservation Plan

I. Service Program:

___ Ecological Services

___ Federal Aid

___ Clean Vessel Act

___ Coastal Wetlands

___ Endangered Species Section 6

___ Partners for Fish and Wildlife

___ Sport Fish Restoration

___ Wildlife Restoration

___ Fisheries

_X_ Refuges/Wildlife

II. State/Agency:
n/a

III. Station Name:
Archie Carr National Wildlife Refuge, FL

IV. Description of Proposed Action:
The proposed project is to implement the Archie Carr National Wildlife Refuge (ACNWR) Comprehensive Conservation Plan (CCP) as required under the National Wildlife Refuge System Improvement Act of 1997. The purpose of a CCP is to describe the desired future conditions of a refuge and provide long-range guidance and management direction to accomplish the purposes of a refuge, to contribute to the mission of the Refuge System, and to meet other relevant mandates.

The CCP details the proposed action to improve refuge management in the following areas: wildlife and habitat management, resource protection, visitor services, and refuge administration. The proposed action (Alternative B) focuses refuge management actions on the needs of rare, threatened, and endangered species.

Wildlife and Habitat Management
The refuge would expand management activities to protect federally and state-listed species, migratory birds, and native wildlife and habitat diversity; expand management activities to control exotic, invasive, and nuisance species; and develop management activities to address the impacts of climate change on the refuge's resources.

Sea Turtles. From March 1 through September 30, the refuge would continue to conduct daily sea turtle nest surveys along eight kilometers of beach in Indian River County, with some surveys continuing into November, as needed. The University of Central Florida Marine Turtle Research Group and Sebastian Inlet State Park) would continue to survey the 13 miles (21 km) in Brevard County and the three miles (five km) in the Sebastian Inlet State Park (SISP) respectively that comprise the remainder of the Archie Carr Refuge partnership. The refuge would coordinate all the sea turtle survey work conducted by the refuge and the partners within the refuge's acquisition boundary and facilitate funding and support, if possible. It is estimated, based on prior experience, that nest depredation rates would be lowered from 10% to less than five percent through the use of a Biological Science Technician position dedicated to trapping and through intensified monitoring and targeted trapping and euthanization of nuisance animals. The refuge would continue to coordinate with Brevard and Indian River counties and the Archie Carr Working Group to address lighting issues and un-permitted beach activities. The refuge would continue to participate in rescuing stranded and injured sea turtles. Further, the refuge would foster needed research to support sea turtle recovery and would work with Ecological Services to develop sea turtle recovery targets for the refuge. Management activities would include oversight of beach and dune restoration and mitigation of effects from erosion control efforts. In addition, the refuge would work with private landowners and beach goers to minimize impacts to sea turtles (e.g., barriers to nesting, harassment of nesting and hatching sea turtles, and lighting). The refuge would work with the partners to understand and manage the nearshore habitats.

Southeastern Beach Mouse. Under the proposed alternative, Southeastern beach mouse management activities would be expanded. The refuge would continue to work with the Service's South Florida Ecological Services Field Office, University of Central Florida (UCF), and Cape Canaveral Air Force Station (CCAFS) to translocate beach mice from CCAFS to reestablish an extirpated population on the refuge, at locations just north of Sebastian Inlet. The refuge would continue to work with SISP to conduct needed habitat management and monitoring activities to support this translocation effort. Further, the refuge would work with Ecological Services to develop beach mouse recovery targets for the refuge and to locate additional release sites (e.g., in Indian River County, south of Sebastian Inlet). The refuge would work with the partners to evaluate the genetic composition of donor populations for compatibility with populations south of Sebastian Inlet. The refuge would actively modify and restore habitats to serve beach mice, including mechanical cutting of vegetation, prescribed burning, and planting of sea oats and other forage plants. Management activities would be coordinated between Archie Carr and Pelican Island refuges and SISP. Predator control, telemetry, mark-recapture sampling, and intensive presence/absence surveys would be conducted.

Gopher Tortoise. The refuge would develop management activities to address the needs of gopher tortoises. This would include working with the partners to evaluate the feasibility of, locate, and develop wildlife underpasses, especially during roadway maintenance work, including along SR A1A. Gopher tortoise crossing signs, barriers to movement, and other measures would be undertaken to minimize vehicle collisions. Where barriers are developed, the refuge would work to provide for their foraging

needs. Gopher tortoise surveys would be conducted to help the refuge assess population status and trends, including diseases. The refuge would identify sites in need of additional management activities to support gopher tortoises. The refuge would assess the need for relocation and would identify sites for translocations from non-Service sites. The refuge would support the genetic analysis of barrier island versus mainland populations to assess the feasibility of receiving translocated tortoises.

Florida Scrub-jay. Since only one known Florida scrub-jay family is known to occur on the refuge, the Service would evaluate the refuge's ability to meet the needs of scrub-jays. The refuge would coordinate with the scrub-jay recovery team to evaluate management of refuge habitats to support the species. If determined to be feasible for scrub-jay recovery, the refuge would work with partners to restore former scrub-jay habitat on tracts in Segment 1, especially in the area of Twin Shores Park and Coconut Point Park. Restoration would involve cutting some of the young hardwoods, creating open space for food caches and fire breaks, conducting prescribed burns, removing exotic plants, and monitoring recruitment of native scrub plants.

Wood Storks. The refuge would work with the partners to minimize impacts to wood storks and the conflicts with humans (e.g., at fish cleaning stations). Further, the refuge would work with the partners to increase the ability to rehabilitate injured wood storks, as well as other birds (e.g., pelicans) in the vicinity of the refuge.

Other Species. The refuge would expand management activities in relation to the bald eagle, piping plover, Eastern indigo snake, and West Indian manatee. Where bald eagle nesting is discovered, the refuge would institute protection measures (e.g., closed area buffers around the nests). Through wintering surveys, the refuge would be able to detect piping plover use and would adapt management as necessary, including creating closed areas. Additional surveys in suitable habitats would help determine the presence or absence of the Eastern indigo snake.

The refuge would work with the partners to conduct Christmas Bird Counts to identify the mix of neotropical migratory birds, shorebirds, wading and water birds, and waterfowl. Closed areas would be created as necessary to minimize impacts to nesting shorebirds. The refuge would work with the partners (including FDOT) to minimize wildlife impacts from vehicle collisions, through the use of wildlife underpasses, speed limits, no passing lanes, rumble strips, outreach, increased awareness, and signage. Expanded surveys would help the refuge to better understand the diverse wildlife using the refuge. Management activities would be adapted as necessary and the refuge would identify any rare or listed species in need of additional protection and management.

Land Crabs. Harvesting of land crabs is not allowed on the refuge or on the rights-of way within the Indian River county portion of the refuge. The refuge would continue to coordinate with FWC to regulate land crab harvest on partner lands. Further, the refuge would increase law enforcement patrols to control harvesting activities. The need for wildlife underpasses, especially for SR A1A, would be evaluated. The refuge would work with the partners to increase and install bilingual regulatory signage and to incorporate land crab protection into outreach efforts. Further, interpretive signage would also be installed at Pelican Island NWR to promote land crab protection.

Habitat Management. Habitat management activities would be expanded or developed for scrub, the beach and dune system, and mangroves and wetlands. The refuge would continue to conduct regular prescribed burns in scrub habitat to help increase the amount and quality of scrub acreage managed on the refuge. The beach and dune system would be actively modified and restored to serve beach mice. The refuge would coordinate with the partners to conduct mangrove restoration activities.

Exotic, Invasive, and Nuisance Species. Control of exotic, invasive, and nuisance species activities would be expanded and focused on high priority habitats serving rare, threatened, and endangered species. Volunteers and partners would continue to conduct exotic plant control efforts. The refuge would identify and locate new infestations of Florida Exotic Pest Plant Council categories I and II invasive upland plants. Initial attack would be conducted with an emphasis on elimination. Control efforts would focus on limiting the spread of exotic, invasive, and nuisance species to high priority habitats serving rare, threatened, or endangered species. Further, the refuge would coordinate with the partners to control feral and free-roaming animals to minimize adverse impacts to rare, threatened, and endangered species.

Climate Change. The refuge would institute management activities to address the impacts of climate change on refuge resources. The refuge would coordinate with researchers and partners to identify climate change research needs for the refuge, investigating the impacts of climate change on rare, threatened, and endangered species and their habitats (e.g., sea turtle nesting habitat changes, sex ratio changes of sea turtles, extent and duration of sea turtle nesting seasons, and changes of habitat composition in relation to salt water intrusion). Further, the refuge would work with the partners to establish benchmarks in relation to sea level rise and shoreline changes and to monitor the migration of the dunes and salt water intrusion into existing wells. Increased land acquisition and restoration efforts would help the refuge and partners to respond to the impacts of climate change in an effort to maintain the ability to manage habitats for rare, threatened, and endangered species and to reduce the federal, state, and local cost of protecting private property threatened by erosion.

Resource Protection

Land Acquisition, Land Swaps, and Consolidated Management. The Service would pursue completion of the acquisition boundary from willing sellers through prioritized active acquisition efforts on those properties east of SR A1A. The refuge would consider using land swaps, if necessary, to protect high priority properties. Management to protect important habitats and wildlife corridors would increase under this alternative. The refuge, would work with the partners to identify and protect sites that serve rare, threatened, and endangered species. It would consider coordinating land management and consolidate those areas publicly held by multiple partners under management of one entity (e.g., through management agreements and land swaps).

Cultural Resources. The refuge would continue to respond to cultural resource issues as they arise, but would expand efforts in relation to protection of the Oak Lodge Site. The refuge would actively work with the partners to acquire or otherwise manage, protect, and interpret the historically important Oak Lodge site due to its contributions to research and historical data for the barrier island. Further, these sites would be incorporated into an interpretive program.

Law Enforcement. A PINWR Law Enforcement Officer would be shared with ACNWR to conduct both nighttime and daytime patrols. Nighttime patrols would be conducted during sea turtle nesting season to protect sea turtles from poaching and harassment and to educate a law-abiding public to avoid disturbing nesting sea turtles. Nighttime patrols would also accomplish lighting ordinance compliance through coordination with local jurisdictions. Daytime patrols would be scheduled to enforce refuge regulations on Service lands, particularly during the seasonal harvest for land crabs and palmetto berries.

Visitor Services

Welcome and Orientation, Signage, and Access. The Service would continue to maintain two entrance signs for the refuge: at the north and south ends. All permitted visitor activities within the larger Archie Carr Refuge partnership would continue to occur on partner properties. Other than special tours and research activities, the refuge's properties would remain closed to public

access (although users would continue to access the beach from partner properties). Service messages would be focused on rare, threatened, and endangered species and the refuge would work with the partners to incorporate these messages into their visitor activities and signage. The refuge would continue to work directly with the partners to maintain develop and install kiosks at all approved beach access points, as well as to simplify regulatory signage to limit confusion of the users. The refuge would continue to coordinate with Sebastian Inlet State Park to develop a dune crossover on State Park property near the refuge's Spanish House site. Further, the refuge would coordinate with the partners to develop a visitor counting process to estimate the numbers of visitors at all Carr Refuge partner lands.

Information about the refuge would be improved. The refuge would work with the partners to actively maintain and update associated websites, including providing cross links between refuge and partner sites. The refuge would coordinate with the partners to develop an overall map of all the visitor facilities available in the area. The Service would continue to develop and update the first Service brochure for the refuge. Brevard County opened the Barrier Island Sanctuary Management and Education Center in May 2008, within the larger Carr Refuge partnership, as a visitor center with kiosks, exhibits, an auditorium, and night viewing scopes. Various partners, including the Service, conduct programs from this site. The Barrier Island Center serves as the primary visitor center for this area and for the refuge. The refuge would work with the partners to enhance the rare, threatened, and endangered species messages delivered at the Barrier Island Center.

Fishing. All fishing activities would continue to occur or originate on partner properties. Unapproved access through closed refuge lands would be eliminated and fishing activities would be directed to approved access points. The refuge would work with the partners to provide information to anglers regarding the impacts of fishing activities on rare, threatened, and endangered species. The refuge would work with the partners to evaluate the need to develop additional dune crossovers and to expand the monofilament recycling program. Dune crossovers would be considered on Save Our Coast parcels, ahead of refuge and other conservation lands. Dune crossovers would also be considered for existing foot paths and dune blowouts before considering sites with intact dunes and unaltered habitats.

Wildlife Viewing and Photography. Wildlife viewing and photography opportunities would continue to occur on partner properties. The refuge would annually conduct 10 sea turtle viewing programs, while the partners would conduct an additional 40 programs. The refuge would work with partners to expand sea turtle viewing programs. More guided turtle watch programs should help alleviate the demand of the public to view sea turtles, as well as reduce unauthorized and potentially harassing turtle encounters. Other wildlife viewing and photography opportunities would mostly occur from beach access points or along Brevard County Environmentally Endangered Lands' (EEL) trails west of A1A.

Environmental Education and Interpretation. Environmental education and interpretive opportunities would be increased. The refuge would develop on-and offsite curriculum-based and interpretive programs with messages focused on rare, threatened, and endangered species and the minimization of human impacts. Staff, volunteers, teachers, and tour operators would be trained to conduct these programs and incorporate interpretive themes into their programs. The refuge would coordinate with the State of Florida to develop the key messages to be conveyed to all sea turtle walk participants. The refuge would develop staff- and/or volunteer-led interpretive programs focused on rare, threatened, and endangered species. The refuge would work with the Brevard EEL Program, Caribbean Conservation Corporation, and other partners to offer formal environmental education and interpretive programs at the Barrier Island Center.

Inappropriate Uses. The refuge would work with the partners to control inappropriate uses. All unapproved foot trails through refuge properties would be closed and dune blow-outs would be restored. Approved foot trails that had dune blowouts would also be restored and improved with dune crossovers. All public nighttime access to the beach from refuge properties would be eliminated (e.g., through barriers and law enforcement). The refuge would work with the partners to eliminate nighttime access to the beach from their properties.

Outreach and the Archie Carr Working Group. The refuge would focus its outreach efforts on rare, threatened, and endangered species. Outreach would continue to be conducted by the partners, the refuge, and sea turtle researchers. Increased outreach activities would be conducted by the volunteers, the Friends of the Carr Refuge (FOCR), and others (e.g., the lifeguards would be provided with outreach materials). The Archie Carr Working Group would continue to coordinate several outreach activities. The refuge would provide outreach support and core messages to the Working Group.

Volunteers. The refuge would increase the number of active volunteers and focus their efforts on projects to benefit rare, threatened, and endangered species. The volunteers would be coordinated by staff. The refuge would coordinate with the partners to develop a volunteer cadre to be shared amongst the partners.

Friends of the Carr Refuge. The refuge would help the FOCR become a 501(c)(3) nonprofit organization, with a Cooperating Agreement. The friends group would seek agreements with other organizations to expand opportunities to assist the refuge. The refuge would work with FOCR to focus its efforts and activities to benefit rare, threatened, and endangered species. Further, the refuge would support increased numbers of members and levels of activities.

Litter and Ocean Debris. In an effort to address litter and ocean debris, the refuge would work with the partners and volunteers to develop a regular cleanup program for the expanse of refuge and partner beaches. The refuge would schedule major cleanup efforts prior to and after sea turtle nesting season and would periodically assess the need to conduct other cleanups (e.g., after hurricanes and winter storms). The refuge would coordinate with the partners to conduct outreach to area boaters and users of the Port of Canaveral (e.g., cruise ships) to minimize litter and ocean debris from these vessels. Further, the refuge and the partners would work to increase awareness and understanding of area dump stations for boats (e.g., might provide GPS locations of existing stations and might work to develop additional dump stations).

Refuge Administration

Refuge Management. The refuge would continue to share facilities, equipment, utilities, and some staff with PINWR, but would have its own budget and its own full-time staff members. Much of the facilities would continue to be managed together with PINWR, including the researcher beach house and dune crossover, deteriorating beach structure (slated for demolition and removal), planned bunk house, garage at SISP, maintenance facility at PINWR, Seaview dune crossover, planned dune crossover near Spanish House, and administrative offices at Ecological Services. The refuge would demolish the deteriorating beach structure. Further, it would seek to locate needed maintenance and office facilities closer to the refuge.

Staffing. Staff would be increased with some positions shared with and some positions separate from PINWR. The refuge would share seven positions with Pelican Island NWR: Wildlife Refuge Manager, Assistant Refuge Manager, Refuge Officer, Administrative Assistant, Supervisory Refuge Ranger, Supervisory Maintenance Worker, and Wildlife Biologist. The staff specific to the refuge would include 3.5 positions: Refuge Ranger, Maintenance Worker, Biological Science Technician,

and a seasonal Biological Science Technician. See Figure 13 in the Draft CCP/EA for an organizational chart of the proposed staffing levels.

Partnerships. The refuge would enhance and increase partnership efforts to support management and recovery of rare, threatened, and endangered species. The refuge would continue to work with the government and nongovernment partners through the Archie Carr Working Group. Beyond the Working Group, the refuge would also continue to work directly with Ecological Services, SISP, Brevard and Indian River counties, the mosquito control districts, and the State of Florida.

CCP Progress and Future Permits. Throughout the life of the CCP, the refuge will report on progress towards meeting the objectives outlined in the plan (e.g., in Refuge annual narratives and through the Refuge Management Information System). Further, the refuge, any contractors, researchers, and other consultants will acquire all future needed permits before commencement of a project.

V. Pertinent Species and Habitat:

A. Refuge Location & Habitats:

No species occurrence maps are provided. However, general species occurrence maps are included in the South Florida Multi-Species Recovery Plan (Service 2002).

The proposed project area is located on Archie Carr NWR in Brevard and Indian River counties, on the east coast of Florida, on the barrier island, between the Atlantic Ocean and the Indian River Lagoon. Refuge habitats include beach and dunes, coastal strand, coastal scrub, maritime hammock, saltmarsh, mangrove swamp, and vegetated and nonvegetated wetlands. The refuge includes nonnative vegetation such as citrus groves, Australian pine, and Brazilian pepper.

B. Federally Listed Species:

The Refuge currently serves 20 federally threatened or endangered species, as listed.

SPECIES	CRITICAL HABITAT	STATUS
West Indian manatee (*Trichechus manatus*)	designated	endangered
Southeastern beach mouse (*Peromyscus polionotus niveiventris*)	none	threatened
Right whale (*Eubalaena glacialis*)	designated	endangered
Humpback whale (*Megaptera novaeangliae*)	none	endangered
Sperm whale (*Physeter macrocephalus*)	none	endangered
Atlantic green sea turtle (*Chelonia mydas*)	designated	endangered

SPECIES	CRITICAL HABITAT	STATUS
Hawksbill sea turtle (*Eretmochelys imbricata*)	designated	endangered
Kemp's ridley sea turtle (*Lepidochelys kempii*)	none	endangered
Leatherback sea turtle (*Dermochelys coriacea*)	designated	endangered
Loggerhead sea turtle (*Caretta caretta*)	none	threatened
Eastern indigo snake (*Drymarchon corais copueri*)	none	threatened
American alligator (*Alligator mississippiensis*)	none	threatened (s/a)
American crocodile (*Crocodylus acutus*)	designated	threatened
Atlantic salt marsh snake (*Nerodia clarkii taeniata*)	none	threatened
Florida scrub-jay (*Aphelocoma coerulescens*)	none	endangered
Piping plover (*Charadrius melodus*)	designated	threatened
Wood stork (*Mycteria americana*)	none	endangered
Smalltooth sawfish (*Pristis pectinata*)	none	endangered
Fragrant prickly-apple (*Harrisia fragrans (Cereus eriophorus var. fragrans)*)	none	endangered
Johnson's seagrass (*Halophila johnsonii*)	designated	threatened

VI. Location:

A. Ecosystem Number and Name:
Ecosystem 53, South Florida

B. County and State:
Brevard and Indian River counties, Florida.

C. Latitude and longitude:
North 27° 48' 14" West 80° 25' 46"

D. Distance and direction to nearest town:
2 miles east of Sebastian, FL

E. Species/habitat occurrence:

Three species of sea turtles are known to nest on the sandy beaches and dunes of the refuge: green, leatherback, and loggerhead. Hawksbills have been documented, but very rarely. Kemp's ridley turtles have not been documented nesting on the refuge but have nested on Florida's east coast on rare occasions. Approximately 25% of all loggerhead and 35% of all green turtle nests in the United States occur within the refuge's 20.5-mi boundary. The leatherback sea turtle nests on the refuge in small, but rapidly growing numbers. The refuge's long stretches of quiet, undisturbed sandy beaches, with little or no artificial lighting, are essential to the reproductive success and survival of the 10,000 to 20,000 sea turtles nesting here annually (USFWS 2007).

Gopher tortoises, listed by the State of Florida, are most abundant (~100) in the scrub and coastal strand habitat in the northern part of the refuge (Segment 1), but are also found in smaller numbers throughout the refuge (segments 2-4) where the populations appear to be surviving, but not sustaining (Ehrhart, pers. comm.) . The eastern indigo snake has been observed on rare occasions (~10 over 15 years) in coastal scrub, maritime hammocks, and mangrove islands. Alligators are found rarely in the lagoon near the refuge, usually in canals and impoundments where salinities are lower. There no records of them nesting on the refuge.

Manatees forage in seagrass beds of the lagoon bordering the western boundary of the refuge, and utilize Sebastian Inlet to move between the estuary and ocean. Herds of mating manatees sometimes are seen in the surf and occasionally seen beaching themselves on the refuge. Southeastern beach mice have been documented on the dunes at Sebastian Inlet State Park (south of the Inlet) and Treasure Shores and Golden Sands parks in Indian River County, as well as in adjacent old fields at Pelican Island NWR. The type specimen was found in the area of present-day Aquarina in Brevard County by Frank Chapman in 1889. Beach mice were found in the southern Brevard County at least until the late 1970s (Ehrhart, pers. comm.).

The refuge area once supported 11 scrub-jay families (Brevard County 1995). Now, only one known scrub-jay family remains on the refuge. Piping plovers are currently not known to breed on the refuge, but utilize it as a migratory stop-over site. Piping plovers have been observed at Sebastian Inlet State Park (DePue, pers. comm.) and in the Brevard County portion of the refuge (Witherington, pers. comm.). Wood storks are not known to breed on the refuge, but they do breed on adjacent conservation lands at Pelican Island NWR and in the Indian River Lagoon Aquatic Preserve, and they utilize the salt marsh and mangrove fringes along the Indian River Lagoon, as well as the beaches of the Archie Carr Refuge for foraging. Wood storks also congregate around the fish cleaning stations at Sebastian Inlet State Park.

VII. Determination of Effects:

A. Explanation of effects:

The impacts to all the listed species occurring on the refuge (listed in Table V.B) are anticipated to be beneficial over the long-term. The Draft CCP/EA for Archie Carr includes a table that summarizes the environmental consequences of plan implementation (see Table 12 in the EA).

SPECIES/ CRITICAL HABITAT	IMPACTS TO SPECIES/CRITICAL HABITAT
Sea Turtles (Loggerhead, Green, and Leatherback, Kemp's Ridley and Hawksbill)	Positive. Increased information about sea turtles and their habitats. Decreased predation rates. Increased protection and law enforcement. Decreased impacts from landowners and beach goers.
Southeastern Beach Mouse	Positive. Increased habitat quality and management. Increased information. Decreased predators. Potential for additional relocations to the refuge.
Florida Scrub-jay	Positive. Increased habitat quality and acreages. Potential for increased population.
Wood Stork	Positive. Impacts minimized. Increased rehabilitation of injured birds.
Piping Plover	Neutral to positive. Increased information and protection, when present.
Eastern Indigo Snake	Positive. Enhanced habitat quality. Increased information. Decreased roadkill.
West Indian Manatee	Positive. Minimized impacts to manatees.
American Alligator and American Crocodile	Neutral to positive. Increased information.
Atlantic Salt Marsh Snake	Neutral to positive. Increased information.
Smalltooth Sawfish	Neutral to positive. Increased information.
Whales (Right, Humpback, and Sperm)	Neutral to positive. Increased information.
Fragrant Prickly-apple	Neutral to positive. Increased information.
Johnson's Seagrass	Neutral to positive. Increased information.

B. Explanation of actions to be implemented to reduce adverse effects:
The implementation of all goals, objectives, and strategies outlined in the CCP will follow the refuge's best management practices and will pursue avoidance and minimization of impacts to federally threatened and endangered species, to the extent possible and practicable. Whenever and wherever prudent, the avoidance and minimization measures outlined in Table VII.B will be incorporated into the implementation of the CCP to minimize the effect to federally threatened or endangered species.

SPECIES/ CRITICAL HABITAT	ACTIONS TO MINIMIZE IMPACTS
All federally threatened and endangered species on the refuge	**Earthmoving Activities** All earthmoving activities on the refuge will obtain all applicable permits before commencement. During the application for permits, conditions may be imposed to minimize any impacts that may be anticipated from proposed earthmoving activities. Major earthmoving activities in listed species' habitat would be expected to require future Section 7 consultations. The refuge provides orientation information regarding federally threatened and endangered species found on the refuge to all new employees, volunteers, and contractors involved in earthmoving activities. The refuge will make all efforts possible and practicable to limit long-term wildlife impacts of earthmoving activities. During earthmoving activities associated with exotic plant control and habitat restoration, measures to limit wildlife impacts include preliminary assessments by qualified individuals to avoid burrows, nests, and other obvious signs of wildlife activity.
	Fire Management Activities Fire management is a tool employed for the benefit of wildlife, including improving habitat, controlling wildfires, and controlling or removing exotic plants. The refuge will make all efforts possible and practicable to limit long-term wildlife impacts of management activities. Measures employed to limit wildlife impacts related to fire management activities include scheduling fire preparation and burns around nesting seasons and other periods of increased wildlife activity.

SPECIES/ CRITICAL HABITAT	ACTIONS TO MINIMIZE IMPACTS
	Exotic Plant Control and Removal Activities Refuges regularly and commonly use Garlon to control exotic plants with no measurable effects on federally listed threatened and endangered species. The refuge provides orientation information regarding federally threatened and endangered species found on the refuge to all new employees, volunteers, and contractors involved in controlling and removing exotic plants. All pesticides and herbicides are applied in accordance with label directions. The refuge will make all efforts possible and practicable to limit long-term wildlife impacts from management activities. Measures to limit wildlife impacts during the control and removal of exotic plants include preliminary assessments by qualified individuals to avoid burrows, nests, and other obvious signs of wildlife activity.
	Research Activities All researchers on the refuge must obtain all applicable permits, including a refuge special use permit before the commencement of research activities on the refuge. During the application for permits, conditions may be imposed to eliminate or minimize any impacts that may be anticipated from a research proposal. The refuge provides orientation information regarding federally threatened and endangered species found on the refuge to all researchers.
	Increased Visitation Working with the partners, the refuge will make all efforts possible and practicable to limit wildlife impacts related to increased visitation. Measures to limit wildlife impacts related to increased visitation include establishing and enforcing closed areas (e.g., for bird rookeries), controlling access, conveying ethical wildlife viewing messages (e.g., through brochures, interpretive talks, and presentations), and controlling or eliminating inappropriate and incompatible uses.
	Construction Activities All construction activities on the Refuge will obtain all applicable permits before commencement. During the application for permits, conditions may be imposed to eliminate or minimize any impacts that may be anticipated from proposed construction. Future construction activities would be expected to require future consultations, once specific sites and structure footprints have been identified (e.g., another Section 7 would be required for the siting and building of a visitor center). The Refuge will make all efforts possible and practicable to limit long-term wildlife impacts of management activities.

VIII. Effect Determination and Response Requested:

SPECIES / CRITICAL HABITAT	DETERMINATION[1]			RESPONSE[1] REQUESTED
	NE	NA	AA	
West Indian manatee / designated (*Trichechus manatus*)		X		Concurrence
Southeastern beach mouse / none (*Peromyscus polionotus niveiventris*)		X		Concurrence
Right whale / designated (*Eubalaena glacialis*)		X		Concurrence
Humpback whale / none (*Megaptera novaeangliae*)		X		Concurrence
Sperm whale / none (*Physeter macrocephalus*)		X		Concurrence
Atlantic green sea turtle / designated (*Chelonia mydas*)		X		Concurrence
Hawksbill sea turtle / designated (*Eretmochelys imbricata*)		X		Concurrence
Kemp's ridley sea turtle / none (*Lepidochelys kempii*)		X		Concurrence
Leatherback sea turtle / designated (*Dermochelys coriacea*)		X		Concurrence
Loggerhead sea turtle / none (*Caretta caretta*)		X		Concurrence
Eastern indigo snake / none (*Drymarchon corais copueri*)		X		Concurrence
American alligator / none (*Alligator mississippiensis*)		X		Concurrence
American crocodile / designated (*Crocodylus acutus*)		X		Concurrence

SPECIES / CRITICAL HABITAT	DETERMINATION[1]			RESPONSE[1] REQUESTED
	NE	NA	AA	
Atlantic salt marsh snake / none (*Nerodia clarkii taeniata*)		X		Concurrence
Wood stork / none (*Mycteria americana*)		X		Concurrence
Piping plover / none (*Charadrius melodus*)		X		Concurrence
Florida scrub-jay / none (*Aphelocoma coerulescens*)		X		Concurrence
Smalltooth sawfish / none (*Pristis pectinata*)		X		Concurrence
Fragrant prickly-apple / none (*Harrisia fragrans (Cereus eriophorus var. fragrans)*)		X		Concurrence
Johnson's seagrass / designated (*Halophila johnsonii*)		X		Concurrence

[1]*DETERMINATION/ RESPONSE REQUESTED:*

NE = no effect. This determination is appropriate when the proposed action will not directly, indirectly, or cumulatively impact, either positively or negatively, any listed, proposed, candidate species or designated/proposed critical habitat. Response Requested is optional, but a "Concurrence" is recommended for a complete Administrative Record.

NA = not likely to adversely affect. This determination is appropriate when the proposed action is not likely to adversely impact any listed, proposed, candidate species or designated/proposed critical habitat or there may be beneficial effects to these resources. Response Requested is a "Concurrence."

AA = likely to adversely affect. This determination is appropriate when the proposed action is likely to adversely impact any listed, proposed, candidate species or designated/proposed critical habitat. Response Requested for listed species is "Formal Consultation." Response requested for proposed and candidate species is "Conference."

Signed

Signature (originating station) — Date: May 2, 2008

Wildlife Refuge Manager

Title

IX. Reviewing Ecological Services Office Evaluation:

A. Concurrence ✓ Non-concurrence _____

B. Formal consultation required _____

C. Conference required _____

D. Informal conference required _____

E. Remarks (attach additional pages as needed):

Signed

Signature — Date: 5-9-08

FL — FWS

Title — Office

Appendix VIII. Wilderness Review

The Wilderness Act of 1964 defines a wilderness area as an area of federal land that retains its primeval character and influence, without permanent improvements or human inhabitation, and is managed so as to preserve its natural conditions and which:

1. generally appears to have been influenced primarily by the forces of nature, with the imprint of man's work substantially unnoticeable;

2. has outstanding opportunities for solitude or primitive and unconfined types of recreation;

3. has at least 5,000 contiguous roadless acres (2,023 ha) or is of sufficient size to make practicable its preservation and use in an unimpeded condition; or is a roadless island, regardless of size;

4. does not substantially exhibit the effects of logging, farming, grazing, or other extensive development or alteration of the landscape, or its wilderness character could be restored through appropriate management at the time of review; and

5. may contain ecological, geological, or other features of scientific, educational, scenic, or historic value.

The lands within Archie Carr National Wildlife Refuge were reviewed for their suitability in meeting the criteria for wilderness, as defined by the Wilderness Act of 1964. No units of the refuge meet the minimum Wilderness Area size criteria of 5,000 acres (2,023 ha), nor does the refuge contain any islands. The refuge is only 258.05 acres (104.43 ha) in four segments spanning about 20.5 miles (33 km) through two counties. In many cases the Service owns individual or a group of a few residential lots which front along State Highway A1A. All segments are bounded by or divided by roadways, including State Highway A1A. The average annual daily traffic on A1A in this area was 14,400 in 2004 (Florida Department of Transportation 2005). Commercial and residential development dominates the landscape with shopping centers, neighborhoods, community centers, and parking lots. The small size and fragmentation of the refuge, the presence of public roads, and the proximity of commercial and residential development as well as high beach use, all preclude the opportunity for a wilderness experience at Archie Carr NWR.

In review of the federally owned lands and waters within the boundary of Archie Carr NWR, no areas were found suitable for designation as Wilderness. The lands and waters of the refuge:

- do not meet the wilderness minimum size requirement of 5,000 contiguous roadless acres (2,023 ha);
- do not contain any units of sufficient size for preservation as wilderness;
- have been altered by historic and ongoing human activities;
- do not include outstanding opportunities for solitude or for primitive recreation; and
- are fragmented by roadways and human development.

Therefore, no units of Archie Carr NWR are suitable for designation as wilderness at this time and the suitability of refuge lands for wilderness designation is not further analyzed in this plan.

Appendix IX. Refuge Biota

Refuge biota lists include bird, mammal, reptile, amphibian, insect, and plant species lists, as well as state and federally listed species.

List of priority migratory birds likely to be present at Archie Carr National Wildlife Refuge. This list is adapted from the list of priority bird species in Bird Conservation Region 31 (Peninsular Florida) derived through the Partners In Flight scoring method and the Strategic Wildlife Conservation Strategy. It does not include waterfowl.

Common Name	Scientific Name
Northern Bobwhite	*Colinus virginianus*
Greater Shearwater (pelagic)	*Puffinus gravis*
Audubon's Shearwater (pelagic)	*Puffinus lherminieri*
Northern Gannet (pelagic)	*Morus bassanus*
American White Pelican	*Pelecanus erythrorhynchos*
Brown Pelican	*Pelecanus occidentalis*
Double-crested Cormorant	*Phalacrocorax auritus*
Anhinga	*Anhinga anhinga*
Magnificent Frigatebird	*Fregata magnificens*
Least Bittern	*Ixobrychus exilis*
Green Heron	*Butorides striatus*
Little Blue Heron	*Egretta caerulea*
Tricolored Heron	*Egretta tricolor*
Great Egret	*Egretta alba*
Reddish Egret	*Egretta rufescens*
Great White Heron	*Ardea herodias occidentalis*
Snowy Egret	*Egretta thula*
Great Blue Heron	*Ardea herodias*
Yellow-crowned Night-heron	*Nyctanassa violacea*
Black-crowned Night-heron	*Nycticorax nycticorax*
White Ibis	*Eudocimus albus*

Common Name	Scientific Name
Roseate Spoonbill	*Ajaia ajaja*
Wood Stork	*Mycteria americana*
Bald Eagle	*Haliaeetus leucocephalus*
Osprey	*Pandion haliaetus*
Swallow-tailed Kite	*Elanoides forficatus*
Mississippi Kite	*Ictinia mississippiensis*
Short-tailed Hawk	*Buteo brachyurus*
Red-shouldered Hawk	*Buteo lineatus*
American Kestrel	*Falco sparverius*
Clapper Rail	*Rallus longirostris*
Wilson's Plover	*Charadeius wilsonia*
Snowy Plover	*Charadrius alexandrinus*
Piping Plover	*Charadrius melodus*
Semipalmated Plover	*Charadrius semipalmatus*
American Golden-plover	*Pluvialis dominica*
Black-bellied Plover	*Pluvialis squatarola*
American Oystercatcher	*Haematopus palliatus*
American Avocet	*Recurvirostra americana*
Lesser Yellowlegs	*Tringa flavipes*
Greater Yellowlegs	*Tringa melanoleuca*
Willet	*Catoptrophorus semipalmatus*
Whimbrel	*Numenius phaeopus*
Long-billed Curlew	*Numenius americanus*
Marbled Godwit	*Limosa fedoa*
Ruddy Turnstone	*Arenaria interpres*
Red Knot	*Calidris canutus*
Sanderling	*Calidris alba*
Semipalmated Sandpiper	*Calidris pusilla*
Western Sandpiper	*Calidris mauri*
Least Sandpiper	*Calidris minutilla*

Common Name	Scientific Name
Dunlin	*Calidris alpina*
Short-billed Dowitcher	*Limnodromus griseus*
Laughing Gull	*Larus atricilla*
Bonaparte's Gull	*Larus philadelphia*
Brown Noddy	*Anous stolidus*
Least Tern	*Sterna antillarum*
Gull-billed Tern	*Sterna nilotica*
Forster's Tern	*Sterna forsteri*
Royal Tern	*Sterna maxima*
Sooty Tern	*Sterna fuscata*
Sandwich Tern	*Sterna sandvicensis*
Black Skimmer	*Rynchops niger*
Common Ground-Dove	*Columbina passerina*
Common Nighthawk	*Chordeiles minor*
Chuck-will's-widow	*Caprimulgus carolinensis*
Red-bellied Woodpecker	*Melanerpes carolinus*
Northern Flicker	*Colaptes auratus*
Gray Kingbird	*Tyrannus dominicensis*
Loggerhead Shrike	*Lanius ludovicianus*
Black-whiskered Vireo	*Vireo altiloquus*
White-eyed Vireo	*Vireo griseus*
Florida Scrub-Jay	*Aphelocoma coerulescens*
Purple Martin	*Progne subis*
White-breasted Nuthatch	*Sitta carolinensis*
Brown-headed Nuthatch	*Sitta pusilla*
Cuban Yellow Warbler	*Dendroica petechia gundlachi*
Prairie Warbler	*Dendroica discolor*
Yellow-throated Warbler	*Dendroica dominica*
Prothonotary Warbler	*Protonotaria citrea*
Kirtland's Warbler	*Dendroica kirtlandi*

Common Name	Scientific Name
Cape May Warbler	*Dendroica tigrina*
Black-throated Blue Warbler	*Dendroica cerulea*
Connecticut Warbler	*Oporornis agilis*
Eastern Towhee	*Pipilo erythrophthalmus*
Painted Bunting	*Passerina ciris*
Eastern Meadowlark	*Sturnella magna*

Refuge mammals, reptiles, amphibians, and fishes
Key: N = nonnative

Common Name	Scientific Name
MAMMALS	
Bobcat	*Lynx rufus*
Bottlenose Dolphin	*Tursiops truncatus*
Cotton Rat	*Sigmodon hispidus*
Deer Mice	*Peromyscus sp.*
Eastern Cottontail	*Sylvilagus floridanus*
Florida Mouse	*Podomys floridanus*
Marsh Rabbit	*Sylvilagus palustris*
Raccoon	*Procyon lotor*
Red Fox	*Vulpes vulpes*
Spotted Skunk	*Spilogale putorius*
Virginia Opossum	*Didelphis virginiana*
West Indian Manatee	*Trichechus manatus*
REPTILES	
American Alligator	*Alligator mississippiensis*
American Crocodile	*Crocodylus acutus*
Common Snapping Turtle	*Chelydra serpentina*
Corn Snake	*Elaphe guttata*
Eastern Box Turtle	*Terrepene carolina*
Eastern Coachwhip	*Masticophis flagellum*
Eastern Coral Snake	*Micrurus fulvius*
Eastern Glass Lizard	*Ophisaurus ventralis*

Common Name	Scientific Name
Eastern Indigo	*Drymarchon corais*
Eastern Rattlesnake	*Crotalus adamanteus*
Eastern Ribbon Snake	*Thamnophis sauritus*
Florida Soft Shell Turtle	*Apalone ferox*
Florida Water Snake	*Nerodia fasciata*
Gopher Tortoise	*Gopherus polyphemus*
Green Anole	*Anolis carolinensis*
Green Turtle	*Chelonia mydas*
Ground Skink	*Scincella lateralis*
Hawksbill	*Eretmochelys imbricata*
Leatherback	*Dermochelys coriacea*
Loggerhead	*Caretta caretta*
Peninsula Mole Skink	*Eumeces egregius*
Pygmy Rattlesnake	*Sistrurus miliarius*
Rough Green Snake	*Opheodrys aestivus*
Saltmarsh Snake	*Nerodia clarkii*
Scarlet Kingsnake	*Lampropeltis triangulum elapsoides*
Scarlet Snake	*Cemophora coccinea*
Six-lined Racerunner	*Cnemidophorus sexlineatus*
Southeastern Five-lined Skink	*Eumeces inexpectatus*
Southern Black Racer	*Coluber constrictor*
Southern Ringneck Snake	*Diadophis punctatus*
Striped Mud Turtle	*Kinosternon baurii*
Yellow Rat Snake	*Elaphe obsoleta*
AMPHIBIANS	
Eastern Narrow-mouthed Frog	*Gastrophryne carolinensis*
Green Treefrog	*Hyla cinerea*
Pig Frog	*Rana grylio*
Southern Leopard Frog	*Rana utricularia*
Southern Toad	*Bufo terrestris*
Spadefoot Toad	*Scaphiopus holbrooki*
Squirrel Treefrog	*Hyla squirella*

Common Name	Scientific Name
FISHES	
Smalltooth sawfish	*Pristis pectinata*
Atlantic sturgeon	*Acipenser oxyrinchus oxyrinchus*
Opossum pipefish	*Microphis brachyurus lineatus*
Amphibious mangrove killifish	*Kryptolebias marmoratus*
Striped croaker	*Bairdiella sanctaeluciae*
Sand tiger shark	*Carcharias taurus*
River goby	*Awaous tajasica*
Bigmouth sleeper	*Gobiomorus dormitor*
Slashcheek goby	*Ctenogobius pseudofasciatus*
Spottail goby	*Ctenogobius stigmaturus*
Mountain mullet	*Agonostomus monticola*
Common snook	*Centropomus undecimalis*
Fat snook	*Centropomus parallelus*
Tarpon snook	*Centropomus pectinatus*
Atlantic tarpon	*Megalops atlanticus*
Spotted seatrout	*Cynoscion nebulosus*
Flounder	*Paralichthys* spp.
Black mullet	*Mugil cephalus*
Red drum	*Sciaenops ocellatus*
Black drum	*Pogonias cromis*
Ladyfish	*Elops saurus*
Spanish mackerel	*Scomberomorus maculates*
Bluefish	*Pomatomus saltatrix*
American eel	*Anguilla rostrata*

Nonnative species occurring on the refuge.

Common Name	Scientific Name
INVERTEBRATES	
	Cyphomyrmex rimosus
	Eurhopalthrix floridana
	Pheidole moerens
	Strumigenys eggersi
Asian ambrosia beetle	*Xyleborus glabratus*
Asian green mussel	*Perna viridis*
Bromeliad-eating weevil	*Metamasius callizona*
Green porcelain crab	*Petrolisthes armatus*
Little red fire ant	*Wasmannia auropunctata*
Red imported fire ant	*Solenopsis invicta*
Serrated swimming crab	*Scylla serrata*
Striped barnacle	*Balanus amphitrite*
FISHES	
Blackchin Tilapia	*Sarotherodon melanotheron*
Walking catfish	*Clarias batrachus*
AMPHIBIANS	
Cuban tree frog	*Osteopilus septentrionalis*
Greenhouse frog	*Hyla cinerea*
REPTILES	
Boa Constrictor	*Boa constrictor constrictor*
Brahminy Blind Snake	*Ramphotyphlops bramina*
Brown anole	*Anolis sagrei*
Indo-Pacific gecko	*Hemidactylus garnoti*
Mediterranean gecko	*Hemidactylus turcicus*
Redeared Slider	*Trachemys scripta elegans*
BIRDS	
Cattle Egret	*Bubulcus ibis*
Eurasian Collared Dove	*Streptopelia decaocto*
European Starling	*Sturnus vulgaris*
Glossy Ibis	*Plegadis falcinellus*
House Sparrow	*Passer domesticus*

Common Name	Scientific Name
Rock Pigeon	*Columba livia*
MAMMALS	
Black Rat	*Rattus rattus*
Brown Rat	*Rattus norvegicus*
Feral Cat	*Felis catus*
House Mouse	*Mus musculus*
Nine-banded Armadillo	*Dasypus novemcinctus*

Refuge Insects
Key: N = nonnative

Common Name	Scientific Name
ANTS	
	Camponotus decipiens
Florida bull (=carpenter) ant	*Camponotus floridanus*
Tortugas bull ant	*Camponotus tortuganus*
	Crematogaster ashmeadi
	Cyphomyrmex minutus
	Forelius pruinosus
	Hypoponera opacior
Snap-jaw ant	*Odontomachus brunneus*
	Pheidole floridanus
Florida harvester ant	*Pogonomyrmex badius*
	Pseudomyrmex ejectus
	Solenopsis abdita
	Solenopsis nickersoni
	Solenopsis picta
	Solenopsis tennesseensis
	Strumigenys louisianae
	Trachymyrmex septentrionalis
BUTTERFLIES	
White Peacock	*Anartia jartrophae*
Monarch	*Danaus plexippus*

Common Name	Scientific Name
Gulf Fritillary	*Dione vanillae*
Small sulphur	*Eurema sp.*
Zebra	*Heliconius charitonius*
Carolina Satyr	*Hermeuptypchia hermes*
Giant Swallowtail	*Papilio cresphontes*
Eastern Tiger Swallowtail	*Papilio glaucus*
Black Swallowtail	*Papilio polyxenes*
Cloudless Sulphur	*Phoebis sennae*
Pearl Crescent	*Phyciodes tharos*
Common Buckeye	*Precis coenia*
Long-tailed Skipper	*Urbanus proteus*
Red Admiral	*Venessa atalanta*
OAK-GALL INSECTS	
	Amphibolips murata
	Amphibolips quercuscitriformis
	Andricus quercusfoliatus
	Belonocnema quercusvirens
	Callirhytis difficilis
	Callirhytis myrtifolia
	Callirhytis quercusbatatoides
	Callirhytis quercusclavigera
	Callirhytis quercusmedullae
	Disholcaspis quercussuccinipes
	Disholcaspis quercusvirens
	Neuroterus quercusminutissimus
	Neuroterus sp.

Refuge plants
Key: N = nonnative

Common Name	Scientific Name
American Beautyberry	*Callicarpa americana*
Asparagus fern (N)	*Asparagus aethiopicus*
Asparagus fern (N)	*Asparagus aethiopicus*
Australian Pine	*Casuarina* spp.
Balsampear	*Momordica charantia*
Basket Grass	*Oplismemus hirtellus*
Beach naupaka (N)	*Scaevola taccada*
Beach naupaka (N)	*Scaevola taccada*
Beggerticks	*Bidens alba*
Bermuda Grass	*Cynodon dactylon*
Black Ironwood, Leadwood	*Krugiodendron ferreum*
Bowstring hemp (N)	*Sansevieria hyacinthoides*
Bowstring hemp N)	*Sansevieria hyacinthoides*
Bracken	*Pteridium aquilinum*
Brazilian pepper (N)	*Schinus terebinthifolius*
Butterbough (N)	*Exotheca paniculata*
Buttonsage	*Lantana involucrata*
Cabbage Palm	*Sabal palmetto*
Camphorweed	*Heterotheca subaxillaris*
Cardinal Airplant	*Tillandsia fasciculata*
Carrotwood	*Cupaniopsis anacardioides*
Carrotwood (N)	*Cupaniopsis anacardioides*
Coastal Mock-vervain	*Glandularia maritima*
Coral Bean	*Erythrina herbacea*
Dogfennel	*Eupatorium capillifolium*
Dune Sunflower	*Helianthus debilis*
Earleaf Greenbrier	*Smilax auriculata*
Eastern Poison Ivy (N)	*Toxicodendron radicans*
Erect Pricklypear	*Opuntia stricta*
False Mastic	*Sideroxylon foetidissium*
Firewheel	*Gaillardia pulchella*
Florida Fiddlewood	*Citharexylum spinosum*

Common Name	Scientific Name
Florida Keys Hempvine	*Mikania cordifilia*
Florida Shrubverbena	*Lantana depressa var. floridana*
Florida Swampprivet	*Forestiera segregata*
Forked bluecurls	*Trichostema dichotomum*
Giant Airplant	*Tillandsia utriculata*
Giant Leather Fern	*Acrostichum danaeifolium*
Golden Polypody	*Phlebodium aureum*
Gopher Apple	*Licania michauxii*
Greytwig	*Schoepfia chrysophylloides*
Groundsel Tree, Sea Myrtle	*Baccharis halimifolia*
Gumbo-Limbo	*Bursera simaruba*
Hairy Bluestem (N)	*Andropogon longiberbis*
Half-flower (N)	*Scaevola taccada*
Half-flower (N)	*Scaevola taccada*
Hercules' Club	*Zanthoxylum clava-herculis*
Inkberry, Gallberry	*Ilex glabra*
Jamaica Swamp Sawgrass	*Cladium jamaicense*
Lancewood	*Ocotea coriacea*
Lantana	*Lantana camara*
Lantana (Hybrid)	*Lantana camera x depressa*
Lead tree (N)	*Leucaena leucocephala*
Leafless Swallowwort	*Cynanchum scoparium*
Life plant (N)	*Kalanchoe pinnata*
Madagascar Periwhinkle	*Catharanthus roseus*
Manyflower Marshpennywort	*Hydrocotyle umbellata*
Marlberry	*Ardisia escallonioides*
Muscadine Grape	*Vitis rotundifolia*
Myrsine	*Rapanea punctata*
Natal grass (N)	*Rhynchelytrum repens*
Papaya	*Carica papaya*
Partridge Pea	*Chamaecrista fasciculata*
Pigeon Plum	*Coccoloba diversifolia*

Common Name	Scientific Name
Poorman's patch	*Mentzelia floridana*
Pricklypear	*Opuntia humifusa*
Red Bay	*Persea borbonia*
Red Mulberry	*Morus rubra*
Resurrection Fern	*Polypodium polypodioides*
Rosary pea (N)	*Abrus precatorius*
Russian thistle (N)	*Salsola kali*
Saw Palmetto	*Serenoa repens*
Seagrape	*Coccoloba uvifera*
Seaside Goldenrod	*Solidago sempervirens*
Seaside maho (N)	*Thespesia populnea*
Shoestring Fern	*Vittaria lineata*
Simple-leaf chaste tree (N)	*Vitex trifolia*
Sisal hemp (N)	*Agave sisalana*
Snowberry	*Chiococca alba*
Southern Needleleaf	*Tillandsia setacea*
Spanish bayonet	*Yucca aliofolia*
Spanish Moss	*Tillandsia usneoides*
Spanish Stopper	*Eugenia foetida*
Spotted Beebalm	*Monarda punctata*
Strangler Fig	*Ficus aurea*
Tallow Wood, Hog Plum	*Ximenia americana*
Tick Trefoil	*Desmodium spp.*
Torpedo grass (N)	*Panicum repens*
Tough Bully	*Sideroxylon tenax*
Tread Softly	*Cnidoscolus stimulosus*
Tropical signal gra ss (N)	*Urochloa distachya*
Twinberry	*Myrcianthes fragrans*
Umbrella tree (N)	*Schefflera actinophylla*
Unnamed	*Tillandsia simulata*
Virginia Creeper	*Parthenocissus quinquefolia*
Virginia Live Oak	*Quercus virginiana*

Common Name	Scientific Name
Wax Myrtle	*Myrica cerifera*
Wedelia (N)	*Sphagneticola trilobata*
White Indigoberry	*Randia aculeata*
White Stopper	*Eugenia axillaris*
White Twinevine	*Sarcostemma clausum*
Whitemouth Dayflower	*Commelina erecta*
Wild Coffee (N)	*Psychotria nervosa*
Yellow Necklacepod	*Sophora tomentosa*

Rare, threatened, and endangered species of Archie Carr NWR

Scientific Names	Common Names	Agency Status	
		FWC	FWS
Mammals			
Peromyscus polionotus niveiventris	Southeastern Beach Mouse	T	T
Trichechus manatus	West Indian Manatee	E	E
Eubalaena glacialis	Right Whale	E	E
Megaptera novaeangliae	Humpback Whale	E	E
Physeter macrocephalus	Sperm Whale	E	E
Birds			
Aphelocoma coerulescens	Florida Scrub-jay	T	T
Charadrius melodus	Piping Plover	T	T
Mycteria americana	Wood Stork	E	E
Haliaeetus leucocephalus	Bald eagle	T	-
Falco peregrinus	Peregrine Falcon	E	-
Falco sparverius paulus	Southeastern American Kestrel	T	-
Sterna antillarum	Least Tern	T	-
Pelecanus occidentalis carolinensis	Eastern Brown Pelican	SSC	-
Haematopus palliatus	American Oystercatcher	SSC	-
Egretta rufescens	Reddish Egret	SSC	-
Egretta caerulea	Little blue Heron	SSC	-
Egretta thula	Snowy Egret	SSC	-

Scientific Names	Common Names	Agency Status	
		FWC	FWS
Egretta tricolor	Tricolored Heron	SSC	-
Ajaia ajaja	Roseate Spoonbill	SSC	-
Eudocimus albus	White Ibis	SSC	-
Rynchops niger	Black Skimmer	SSC	-
Reptiles			
Alligator Mississippiensis	American Alligator	SSC	T(S/A)
Crocodylus acutus	American Crocodile	E	T
Caretta caretta	Loggerhead	E	T
Chelonia mydas	Green Turtle	E	E
Dermochelys coriacea	Leatherback	E	E
Lepidochelys kempi	Kemp's Ridley	E	E
Eretmochelys imbricata	Hawksbill	E	E
Gopherus polyphemus	Gopher Tortoise	T	-
Nerodia clarkii taeniata	Atlantic Salt Marsh Snake	T	T
Drymarchon couperi	Eastern Indigo Snake	T	T
Fishes			
Pristis pectinata	Smalltooth sawfish	-	E
Acipenser oxyrinchus oxyrinchus	Atlantic sturgeon	SSC	C
Kryptolebias marmoratus	Amphibious Mangrove Killifish	SSC	SC
Microphis brachyurus lineatus	Opossum pipefish	-	SC
Bairdiella sanctaeluciae	Striped croaker	-	SC
Carcharias taurus	Sand tiger shark	-	SC
Centropomus undecimalis	Common snook	SSC	-

Key: E=endangered, T=threatened, T(S/A)= listed due to similarity in appearance of a threatened species (American crocodile), C=candidate, SC=species of concern (NOAA), SSC=species of special concern (FWC)

Appendix X. Budget Requests

The refuge's budget requests are contained in the Refuge Operating Needs System (RONS) and Service Asset and Maintenance Management System (SAMMS) databases that include a wide variety of new and maintenance refuge projects. The RONS and SAMMS lists are constantly updated and include priority projects. Contact the refuge for the most current RONS and SAMMS lists. Please refer to Chapter V, Plan Implementation, for the key budget requests associated with the proposed projects and staffing. Chapter V includes the proposed projects, which are linked to the applicable objectives, and Table 9, which identifies staff, first-year costs, and recurring costs for the outlined projects.

Appendix XI. List of Preparers

- Mike Carlson, former Fish and Wildlife Biologist, South Florida Ecological Services Field Office, USFWS
- Cheri M. Ehrhardt, AICP, Natural Resource Planner, USFWS
- Charles Mathis, former Assistant Refuge Manager, Pelican Island and Archie Carr NWRs, Merritt Island NWR Complex, USFWS
- William G. Miller, Wildlife Biologist, USFWS
- Paul Tritaik, Wildlife Refuge Manager, Pelican Island and Archie Carr NWRs, Merritt Island NWR Complex, USFWS
- Oliver van den Ende, Contractor, Dynamac Corporation
- Joanna Webb, Park Ranger, Pelican Island and Archie Carr NWRs, Merritt Island NWR Complex, USFWS
- Nick Wirwa, Wildlife Refuge Specialist, Pelican Island and Archie Carr NWRs, Merritt Island NWR Complex, USFWS
- Barry Wood, Information Technology Specialist (GIS), South Florida Ecological Services Field Office, USFWS

Appendix XII. Consultation and Coordination

OVERVIEW

The Archie Carr National Wildlife Refuge CCP process involved a wide variety of participants, including federal, state, and local governments; universities and other researchers; private nonprofit groups; and the friends of the refuge, as well as a wide variety of local residents, local businesses, concerned citizens from all over the country, local schools, universities, and state and national organizations. Outreach efforts by the refuge and news coverage by the media have spread across the country. The list of participants, beyond those individuals and organizations providing comments during the public scoping process, includes the Core CCP Planning Team, the Wildlife and Habitat Management Review Team, the Visitor Services Review Team, the Wilderness Review Team, the Intergovernmental Coordination Planning Team, and the Archie Carr Working Group.

CORE CCP PLANNING TEAM

The Core Planning Team included representatives from the Service and the CCP contractor, Dynamac. The team met as a whole to review the all the issues, determine the priority issues, and identify potential solutions or approaches.

U.S. Fish and Wildlife Service:

- Paul Tritaik, Wildlife Refuge Manager, Pelican Island and Archie Carr NWRs, Merritt Island NWR Complex
- Cheri M. Ehrhardt, AICP, Natural Resource Planner
- Oliver van den Ende, Environmental Scientist, Dynamac Corporation
- Mike Carlson, Fish and Wildlife Biologist, South Florida Ecological Services Field Office, Ecological Services
- Barry Wood, Information Technology Specialist (GIS), South Florida Ecological Services Field Office, Ecological Services
- Joanna Webb, Park Ranger, Pelican Island and Archie Carr NWRs, Merritt Island NWR Complex
- Charles Mathis, Wildlife Refuge Specialist, Pelican Island and Archie Carr NWRs, Merritt Island NWR Complex
- William Miller, Wildlife Biologist

WILDLIFE AND HABITAT MANAGEMENT REVIEW TEAM

The Wildlife and Habitat Management Review Team included a core group of Service staff with invited participants. The invited participants included local and regional experts, researchers, and individuals with intimate knowledge of and expertise with the resources of the refuge. These participants included representatives from state and county agencies and universities. Members of the Archie Carr Working Group also provided input into the review. The wildlife and habitat management review was conducted during September of 2006.

- Stefani Melvin, Assistant Nongame Migratory Bird Coordinator, Division of Migratory Birds, Southeast Regional Office, USFWS
- Cheri M. Ehrhardt, AICP, Natural Resource Planner, USFWS

- Paul Tritaik, Wildlife Refuge Manager, Pelican Island and Archie Carr NWRs, Merritt Island NWR Complex, USFWS
- Mike Carlson, Fish and Wildlife Biologist, South Florida Ecological Services Field Office, USFWS
- Sandy MacPherson, Southeast Region's Sea Turtle Recovery Coordinator, North Florida Ecological Services Field Office, USFWS
- Annie Dziergowski, Wildlife Biologist, North Florida Ecological Services Field Office, USFWS
- Mike Legare, Refuge Biologist, Merritt Island NWR, USFWS
- Trish Adams, Fish and Wildlife Biologist, South Florida Ecological Services Field Office, USFWS
- Dave Martin, Fish and Wildlife Biologist, South Florida Ecological Services Field Office, USFWS
- Nichole Perna, Assistant Land Manager, Environmentally Endangered Lands Program, Brevard County
- Duane DeFreese, Vice President, Hubbs-SeaWorld Research Institute
- Llewellyn M. Ehrhart, PhD., Professor Emeritus, University of Central Florida/Hubbs-SeaWorld Research Institute
- Ray Mojica, Land Manager, Environmentally Endangered Lands Program, Brevard County
- Virginia Barker, Beach Management Coordinator/Supervisor, Natural Resources Management Office, Brevard County
- Mike McGarry, Environmental Specialist, Natural Resources Management Office, Brevard County
- Ron Johns, Park Manager, Sebastian Inlet State Park, Florida Department of Environmental Protection
- Ed McKenzie, Assistant Park Manager, Sebastian Inlet State Park, Florida Department of Environmental Protection
- Beth Powell Conservation Lands Manager, Parks Division, Public Works Department, Indian River County
- Alice Bard, District Biologist, Division of Recreation and Parks, Florida Department of Environmental Protection
- Jim Roth, Ph.D., Professor, Department of Biology, University of Central Florida
- Chris Parkinson, Ph.D., Assistant Professor, Department of Biology, University of Central Florida
- Jeff Van Zant, Graduate Student, Department of Biology, University of Central Florida
- Haakon Kalkvik, Graduate Student, Department of Biology, University of Central Florida
- Ray Carthy, Ph.D., Assistant Unit Leader/Assistant Professor, Florida Cooperative Fish and Wildlife Research Unit, University of Florida
- Meg Lamont, Ph.D., Post-Doctoral Associate, Florida Cooperative Fish and Wildlife Research Unit, University of Florida
- Rick Herren, Environmental Specialist, Coastal Engineering, Indian River County

VISITOR SERVICES REVIEW TEAM

The Visitor Services Review Team consisted of Service staff from the Southeast Regional Office and other refuges. The Archie Carr Working Group also provided input to the Review. The Visitor Services Review for the refuge was conducted in September 2006.

U.S. Fish and Wildlife Service:

- Garry Tucker, Acting Chief, Division of Visitor Services and Outreach, Southeast Regional Office, USFWS
- Shawn Gillette, Park Ranger, Okefenokee NWR, USFWS
- David Underwood, Park Ranger, Arthur R. Marshall Loxahatchee NWR, USFWS
- Cheri M. Ehrhardt, AICP, Natural Resource Planner, USFWS
- Joanna Taylor, Park Ranger, Pelican Island and Archie Carr NWR, Merritt Island NWR Complex, USFWS
- Paul Tritaik, Wildlife Refuge Manager, Pelican Island and Archie Carr NWRs, Merritt Island NWR Complex, USFWS

The following partners contributed to the Visitor Services Review:

- Ray Mojica, Land Manager, Environmentally Endangered Lands Program, Parks and Recreation Department, Brevard County
- Nichole Perna, Assistant Land Manager, Environmentally Endangered Lands Program, Parks and Recreation Department, Brevard County
- Marsha Cantrell, Parks Support Services Manager, Parks and Recreation, Brevard County
- Jeff Whitehead, Manager, South Area Parks Operations, Parks and Recreation, Brevard County
- Ron Johns, Park Manager, Sebastian Inlet State Park, Florida Department of Environmental Protection
- Ed McKenzie, Assistant Park Manager, Sebastian Inlet State Park, Florida Department of Environmental Protection
- Beth Powell Conservation Lands Manager, Parks Division, Public Works Department, Indian River County
- David Godfrey, Executive Director, Caribbean Conservation Corporation
- Dan Evans, Outreach and Field Programs Coordinator, Caribbean Conservation Corporation
- Jessica Koelsch, Florida Marine Wildlife Program Manager, Ocean Conservancy
- Jerry Heyes, President, Friends of the Carr Refuge
- Kristi Boogaard, Graduate Student, Florida Institute of Technology

WILDERNESS REVIEW TEAM

The Wilderness Review Team involved the Wildlife Refuge Manager and the Natural Resource Planner. The review was completed in July 2006.

- Cheri M. Ehrhardt, AICP, Natural Resource Planner, USFWS
- Paul Tritiak, Wildlife Refuge Manager, Pelican Island and Archie Carr NWRs, Merritt Island NWR Complex, USFWS

INTERGOVERNMENTAL COORDINATION PLANNING TEAM

The Intergovernmental Coordination Planning Team included local, state, and federal government field staff representatives involved with the resources at the local level. This included staff from the Fish and Wildlife Research Institute (Florida Fish and Wildlife Conservation Commission), St. Sebastian River State Buffer Preserve (Florida Department of Environmental Protection), Sebastian Inlet State Park (Florida Department of Environmental Protection), Indian River Lagoon Program (St. Johns River Water Management District), Community Development Department (Indian River

County), Parks Department (Indian River County), County Commission (Indian River County), and Indian River Mosquito Control District.

U.S. Fish and Wildlife Service:

- Cheri M. Ehrhardt, AICP, Natural Resource Planner, USFWS
- Paul Tritaik, Refuge Manager, Pelican Island and Archie Carr NWRs, Merritt Island NWR Complex, USFWS

Florida Fish and Wildlife Conservation Commission:

- Blair Witherington, Assistant Research Scientist, Fish and Wildlife Research Institute
- Meghan Koperski, Environmental Specialist, Imperiled Species Management

Florida Department of Environmental Protection:

- Ron Johns, Park Manager, Sebastian Inlet State Park
- Ed McKenzie, Assistant Park Manager, Sebastian Inlet State Park
- Terry O'Toole, Parks Services Specialist, Sebastian Inlet State Park
- Alice Bard, District Biologist, Division of Recreation and Parks
- Jason DePue, District Biologist, Division of Recreation and Parks

St. Johns River Water Management District:

- Robert Day, Environmental Scientist, Indian River Lagoon Program

Indian River County:

- Ken Oristaglio, Senior Environmental Planner, Environmental Planning and Code Enforcement, Community Development Department
- Beth Powell Conservation Lands Manager, Parks Division, Public Works Department
- Jonathan Gorham Ph.D., Coastal Resources Manager, Coastal Engineering Division, Public Works Department
- James Gray, Coastal Engineer, Coastal Engineering Division, Public Works Department
- Rick Herren, Environmental Specialist, Coastal Engineering Division, Public Works Department

Brevard County:

- Virginia Barker, Beach Management Coordinator/Supervisor, Natural Resources Management Office
- Mike McGarry, Environmental Specialist, Natural Resources Management Office
- Paula Berntson, Environmental Specialist, Natural Resources Management Office
- Marsha Cantrell, Parks Support Services Manager, Parks and Recreation Department
- Ray Mojica, Land Manager, Environmentally Endangered Lands Program, Parks and Recreation Department
- Nichole Perna, Assistant Land Manager, Environmentally Endangered Lands Program, Parks and Recreation Department
- Jeff Whitehead, Manager, South Area Parks Operations, Parks and Recreation Department
- Brandon Smith, Environmental Program Coordinator, Riverwalk Nature Center, Riverwalk-A Family Park, Parks and Recreation Department
- Mark Knowles, South Area Parks Operations, Parks and Recreation Department

ARCHIE CARR WORKING GROUP

The Archie Carr Working Group was established in 1994 to coordinate efforts amongst all partners and parties interested in Archie Carr NWR. The Archie Carr Working Group has met quarterly for over 12 years to discuss issues related to land acquisition, species protection, biological research, land management, and education and outreach. Many members of the Archie Carr Working Group have participated in the CCP in some capacity, but the entire Archie Carr Working Group has regularly provided input on a variety of issues that have been incorporated into the CCP. The members of the Archie Carr Working Group represent: federal, state, and county agencies; federal, state, and local elected officials; universities; nonprofit conservation organizations; research institutions; homeowner associations; recreational organizations; and private citizens. The Archie Carr Working Group currently has over 100 members.

Appendix XIII. Finding of No Significant Impact

INTRODUCTION

The U.S. Fish and Wildlife Service (Service) proposes to protect and manage certain fish and wildlife resources in Brevard and Indian River counties, Florida, through the Archie Carr National Wildlife Refuge (ACNWR). An Environmental Assessment (EA) has been prepared to inform the public of the possible environmental consequences of implementing the Comprehensive Conservation Plan (CCP) for Archie Carr National Wildlife Refuge. A description of the alternatives, the rationale for selecting the preferred alternative, the environmental effects of the preferred alternative, the potential adverse effects of the action, and a declaration concerning the factors determining the significance of effects, in compliance with the National Environmental Policy Act of 1969, are outlined below. The supporting information can be found in the Environmental Assessment (Section B) of the Draft Comprehensive Conservation Plan.

ALTERNATIVES

In developing the Comprehensive Conservation Plan for Archie Carr National Wildlife Refuge, the Fish and Wildlife Service evaluated four alternatives:

The Service adopted Alternative B, the preferred alternative, for implementation in the CCP to guide the direction of the refuge for the next 15 years. The overriding concern reflected in this plan is that wildlife conservation assumes first priority in refuge management; wildlife-dependant recreational uses are allowed if they are appropriate and compatible with wildlife conservation and the purposes of the refuge.

ALTERNATIVE A. CURRENT MANAGEMENT (NO ACTION ALTERNATIVE)

Alternative A represents no change from current management of the refuge.

Wildlife and Habitat Management
The refuge currently conducts limited management activities to protect sea turtles and other listed species; enhance biodiversity; and control exotic, invasive, and nuisance species.

From March 1 through September 30, the refuge conducts daily sea turtle nest surveys along five miles (eight km) of beach in Indian River County, with some surveys continuing into November, as needed. Comprising the remainder of the larger Archie Carr Refuge partnership, the partners survey the 13 miles (21 km) in Brevard County and the 3 miles (5 km) in the Sebastian Inlet State Park (SISP). Completion of the surveys is dependent upon volunteers and partners. Nest depredation rates are targeted at 10% or less through monitoring, trapping in target areas, and euthanizing nuisance animals. The refuge coordinates with Brevard and Indian River counties and the Archie Carr Working Group to address lighting issues and unauthorized beach activities. The refuge also participates in rescuing stranded and injured sea turtles. Further, the refuge annually supports about six sea turtle research studies on and around the refuge.

Minimal Southeastern beach mouse activities are conducted by the refuge, with occasional surveys conducted by researchers. However, the refuge is currently working with the Service's North Florida Ecological Services Field Office, University of Central Florida, and Cape Canaveral Air Force Station (CCAFS) to translocate beach mice from CCAFS to the refuge to reestablish an extirpated population on the refuge, located just north of Sebastian Inlet. The refuge is working with SISP to conduct needed habitat management and monitoring activities to support this translocation effort.

Harvesting of land crabs is not allowed on the refuge or on the rights-of way within the Indian River county portion of the refuge. The refuge is coordinating with the partners to regulate land crab harvest on partner lands.

The primary habitat management activity conducted by the refuge involves the implementation of prescribed burns in scrub habitat on a five-year rotation. Fire suppression and prescribed burns are conducted by the Merritt Island NWR fire crew in close coordination with the Brevard County Environmentally Endangered Program (EEL) and the Florida Division of Forestry.

An important activity with management implications that has taken place within the refuge is artificial dune construction and artificial placement of beach fill. These activities have been conducted as responses to erosion and inlet maintenance. The refuge coordinates with the partners to regulate some of this activity to minimize potential impacts. Minimal refuge management activities address the control of exotic, invasive, and nuisance species beyond the trapping of raccoons in relation to sea turtle nest protection. Although volunteers annually treat about 5 acres (2 ha) of refuge lands for exotic plants, the partners are actively conducting exotic plant control efforts on their properties. The refuge also seeks grants to control invasive exotics.

Resource Protection
The refuge responds to cultural resource issues as they arise by coordinating with Merritt Island NWR Law Enforcement officers and the Regional Archaeologist. Currently no law enforcement presence exists at Archie Carr or Pelican Island NWRs, hence resource protection is minimal.

Visitor Services
The Service maintains two entrance signs for the refuge: at the north and south ends. All authorized visitor activities within the refuge originate on partner properties. Other than special tours and research activities, the refuge's properties are closed to public access. However, the refuge works directly with the partners to maintain three kiosks, as well as informational and regulatory signs on partner properties. Sea turtle educational signs are located at all 14 approved beach access sites. The refuge is coordinating with SISP to develop a dune crossover on State Park property near the refuge's Spanish House site.

Information about the refuge is available from Friends of the Carr Refuge (FOCR), the refuge's partners, and the refuge's website. The Friends of the Carr Refuge maintain and distribute a brochure for the refuge. The Service is currently in the process of developing the first Service brochure for the refuge. Brevard County is constructing the Barrier Island Sanctuary Management and Education Center within the larger Archie Carr Refuge partnership as a visitor center with a variety of visitor facilities, including kiosks, exhibits, an auditorium, and night viewing scopes. Various partners, including the Service, will conduct programs from this site. The Barrier Island Center will serve as the primary visitor center for this area and for the refuge.

All fishing activities occur on partner properties; however, unapproved access to some sites currently occurs through closed refuge lands.

Wildlife viewing and photography opportunities occur on partner properties. The refuge annually conducts 10 sea turtle viewing programs, while the partners conduct an additional 40 programs. These programs are quickly saturated with participants each year. Unregulated, unpermitted, and unguided encounters with sea turtles making nesting attempts within the refuge are common. Other wildlife viewing and photography opportunities mostly occur from beach access points or along four EEL's trails west of SR A1A.

Opportunistic environmental education and interpretive programs are conducted by the Friends of the Carr Refuge and refuge volunteers. Once constructed, the Barrier Island Center will offer formal environmental education and interpretive programs by the partners.

Outreach is conducted by the partners, the refuge, sea turtle surveyors, volunteers, and Friends of the Carr Refuge. The Archie Carr Working Group coordinates several outreach activities.

Approximately 20 active volunteers annually contribute about 400 hours to the refuge. The refuge relies heavily volunteers to conduct a variety of refuge management activities.

The Friends of the Carr Refuge is not an independent group, but is currently part of a larger group, the Sea Turtle Preservation Society. The friends group does not conduct regular meetings, but does maintain and distribute a brochure about the refuge (since a Service brochure does not exist for the refuge).

Refuge Administration
All facilities, equipment, utilities, and staff are shared with the nearby Pelican Island NWR. Both Archie Carr and Pelican Island NWRs are administered under the Merritt Island NWR Complex. The headquarters office is shared with Pelican Island NWR and co-located with the South Florida Ecological Services Field Office in Vero Beach. Pelican Island and Archie Carr NWRs share four full-time staff, with two targeted for elimination: Wildlife Refuge Manager, Wildlife Refuge Specialist (Assistant Manager), Park Ranger (targeted for elimination), and Administrative Office Assistant (targeted for elimination). The positions of Wildlife Biologist and Biological Science Technician were previously eliminated. Archie Carr historically received endangered species recovery funding to support sea turtle monitoring and protection and to fund a seasonal Biological Science Technician, but funding for those activities ends in 2008.

The refuge works with governmental and nongovernmental partners through the Archie Carr Working Group. The Archie Carr Working Group provides a forum for communication and coordination regarding management activities and protection of the barrier island's resources. Beyond the Working Group, the refuge also works directly with Ecological Services, SISP, Brevard and Indian River counties, the mosquito control districts, and the State of Florida.

ALTERNATIVE B. RARE, THREATENED, AND ENDANGERED SPECIES (PREFERRED ALTERNATIVE)

The preferred alternative, Alternative B, is considered to be the most effective management action for meeting the purposes of the refuge and serving the goals outlined for future management.

Wildlife and Habitat Management
The refuge would expand management activities to protect federally and state-listed species, migratory birds, and native wildlife and habitat diversity; expand management activities to control exotic, invasive, and nuisance species; and develop management activities to address the impacts of climate change on the refuge's resources.

From March 1 through September 30, the refuge would continue to conduct daily sea turtle nest surveys along five miles (eight km) of beach in Indian River County, with some surveys continuing into November, as needed. The partners would continue to survey the 13 miles (21 km) in Brevard County and the three miles (five km) in the SISP that comprise the remainder of the larger Archie Carr Refuge partnership. The refuge would coordinate all the sea turtle survey work conducted by the refuge and the partners within the refuge's acquisition boundary and facilitate funding and support, if possible. In addition, the refuge would work with research partners to implement appropriate monitoring to better understand the impacts of climate change on the sex ratio of sea turtles hatching within the larger Archie Carr Refuge partnership. Nest depredation rates would be lowered from 10% to less than five percent through the use of a Biological Science Technician position dedicated to trapping and through intensified monitoring and targeted trapping and euthanization of nuisance animals. The refuge would continue to coordinate with Brevard and Indian River counties and the Archie Carr Working Group to address lighting issues and un-permitted beach activities. The refuge would continue to participate in rescuing stranded and injured sea turtles. Further, the refuge would foster needed research to support sea turtle recovery and would work with Ecological Services to develop sea turtle recovery targets for the refuge. Management activities would include oversight of beach and dune restoration and mitigation of effects from erosion control efforts. The refuge would work with private landowners and beach goers to minimize impacts to sea turtles. The refuge would work with the partners to understand and manage the nearshore habitats.

Under this alternative, Southeastern beach mouse management activities would be expanded. The refuge would continue to work with the Service's South Florida Ecological Services Field Office, University of Central Florida, and Cape Canaveral Air Force Station (CCAFS) to translocate beach mice from CCAFS to re-establish an extirpated population on the refuge, at locations just north of Sebastian Inlet. The refuge would continue to work with SISP to conduct needed habitat management and monitoring activities to support this translocation effort. Further, the refuge would work with Ecological Services to develop beach mouse recovery targets for the refuge and to locate additional release sites. The refuge would work with the partners to evaluate the genetic composition of donor populations for compatibility with populations south of Sebastian Inlet. The refuge would actively modify and restore habitats to serve beach mice, including mechanical cutting of vegetation, prescribed burning, and planting of sea oats and other forage plants. Management activities would be coordinated between Archie Carr and Pelican Island refuges and SISP. Predator control, telemetry, mark-recapture sampling, and intensive presence/absence surveys would be conducted.

The refuge would develop management activities to address the needs of gopher tortoises. This would include working with the partners to evaluate the feasibility of, locate, and develop wildlife underpasses, especially during roadway maintenance work, including along SR A1A. Gopher tortoise crossing signs, barriers to movement, and other measures would be undertaken to minimize vehicle collisions. Where barriers are developed, the refuge would work to provide for their foraging needs. Gopher tortoise surveys would be conducted to help the refuge assess population status and trends, including diseases. The refuge would identify sites in need of additional management activities to support gopher tortoises. The refuge would assess the need for relocation and would identify sites for translocations from non-Service sites. The refuge would support the genetic analysis of barrier island versus mainland populations to assess the feasibility of receiving translocated tortoises. The refuge would develop and implement translocation policies and, in conjunction with the partners, tag and monitor translocated tortoises. Together with the partners, it would assess population status and trends, including diseases and perform carrying capacity studies. The refuge would also identify sites in need of additional management activities.

Since only one known Florida scrub-jay family is known to occur on the refuge, the Service would evaluate the refuge's ability to meet the needs of scrub-jays. The refuge would coordinate with the

scrub-jay recovery team to evaluate management of refuge habitats to support the species. If determined to be feasible for scrub-jay recovery, the refuge would work with partners to restore former scrub-jay habitat on tracts in Segment 1, especially in the area of Twin Shores Park and Coconut Point Park. Restoration would involve cutting some of the young hardwoods, creating open space for food caches and fire breaks, and conducting prescribed burns.

The refuge would work with the partners to minimize impacts to wood storks and the conflicts with humans. Further, the refuge would work with the partners to increase the ability to rehabilitate injured wood storks, as well as other birds in the vicinity of the refuge.

The refuge would expand management activities in relation to the bald eagle, piping plover, Eastern indigo snake, and West Indian manatee. Where bald eagle nesting is discovered, the refuge would institute protection measures. Through wintering surveys, the refuge would be able to detect piping plover use and would adapt management as necessary, including creating closed areas. Additional surveys in suitable habitats would help determine the presence or absence of the Eastern indigo snake.

The refuge would work with the partners to conduct Christmas Bird Counts to identify the mix of neotropical migratory birds, shorebirds, wading and water birds, and waterfowl. Closed areas would be created as necessary to minimize impacts to nesting shorebirds.

Harvesting of land crabs is not allowed on the refuge or on the rights-of way within the Indian River county portion of the refuge. The refuge would continue to coordinate with FWC to regulate land crab harvest on partner lands. Further, the refuge would increase law enforcement patrols to control harvesting activities. The need for wildlife underpasses, especially for SR A1A, would be evaluated. The refuge would work with the partners to increase and install bilingual regulatory signage and to incorporate land crab protection into outreach efforts. Further, interpretive signage would also be installed at Pelican Island NWR to promote land crab protection.

The refuge would work with the partners (including the Florida Department of Transportation) to minimize wildlife impacts from vehicle collisions, including the construction of wildlife underpasses, speed limits, no passing lanes, rumble strips, outreach, increased public awareness, and signage.

Expanded surveys would help the refuge to better understand the diverse wildlife using the refuge. Management activities would be adapted as necessary and the refuge would identify any rare or listed species in need of additional protection and management.

Habitat management activities would be expanded or developed for scrub, the beach and dune system, and mangroves and wetlands. The refuge would continue to conduct regular prescribed burns in scrub habitat to help increase the amount and quality of scrub acreage managed on the refuge. The beach and dune system would be actively modified and restored to serve beach mice. The refuge would coordinate with the partners to conduct mangrove restoration activities.

Control of exotic, invasive, and nuisance species activities would be expanded and focused on high priority habitats serving rare, threatened, and endangered species. Volunteers and partners would continue to conduct exotic plant control efforts. The refuge would identify and locate new infestations of Florida Exotic Pest Plant Council categories I and II invasive upland plants. Initial treatment would be conducted with an emphasis on elimination. Control efforts would focus on limiting the spread of exotic, invasive, and nuisance species to high priority habitats serving rare, threatened, or endangered species. Further, the refuge would coordinate with the partners to control feral and free-roaming animals to minimize adverse impacts to rare, threatened, and endangered species. This

would include working with the partners to discourage the establishment of Trap-Neuter-Return programs near refuge lands.

The refuge would institute management activities to address the impacts of climate change on refuge resources. The refuge would coordinate with researchers and partners to identify climate change research needs for the refuge, investigating the impacts of climate change on rare, threatened, and endangered species and their habitats. Further, the refuge would work with the partners to establish benchmarks in relation to sea level rise and shoreline changes and to monitor the migration of the dunes and salt water intrusion into existing wells. Increased land acquisition and restoration efforts would help the refuge and partners to respond to the impacts of climate change in an effort to maintain the ability to manage habitats for rare, threatened, and endangered species and to reduce the federal, state, and local cost of protecting private property threatened by erosion.

Resource Protection
The Service would pursue completion of the acquisition boundary from willing sellers through prioritized active acquisition efforts on those properties east of SR A1A. The refuge would consider using land swaps, if necessary, to protect high priority properties.

Management to protect important habitats and wildlife corridors would increase under this alternative. The refuge would work with the partners to identify and protect sites that serve rare, threatened, and endangered species. It would consider coordinating land management and consolidate those areas publicly held by multiple partners under management of one entity.

The refuge would continue to respond to cultural resource issues as they arise, but would expand efforts in relation to protection of the Oak Lodge Site. The refuge would actively work with the partners to acquire or otherwise manage, protect, and interpret the historically important Oak Lodge site due to its contributions to research and historical data for the barrier island. Further, these sites would be incorporated into an interpretive program.

A Pelican Island NWR Law Enforcement Officer would be shared with ACNWR to conduct both nighttime and daytime patrols. Nighttime patrols would be conducted during sea turtle nesting season to protect sea turtles from poaching and harassment and to educate a law-abiding public to avoid disturbing nesting sea turtles. Nighttime patrols would also accomplish lighting ordinance compliance through coordination with local jurisdictions. Daytime patrols would be scheduled to enforce refuge regulations on Service lands, particularly during the seasonal harvest for land crabs and palmetto berries.

Visitor Services
The Service would continue to maintain two entrance signs for the refuge: at the north and south ends. All permitted visitor activities within the larger Archie Carr Refuge partnership would continue to occur on partner properties. Other than special tours and research activities, the refuge's properties would remain closed to public access (although users would continue to access the beach from partner properties). Service messages would be focused on rare, threatened, and endangered species and the refuge would work with the partners to incorporate these messages into their visitor activities and signage. The refuge would continue to work directly with the partners to maintain develop and install kiosks at all approved beach access points, as well as to simplify regulatory signage to limit confusion of the users. The refuge would continue to coordinate with SISP to develop a dune crossover on State Park property near the refuge's Spanish House site. Further, the refuge would coordinate with the partners to develop a visitor counting process to estimate the numbers of visitors at all Archie Carr Refuge partner lands.

Information about the refuge would be improved. The refuge would work with the partners to actively maintain and update associated websites, including providing cross links between refuge and partner sites. The refuge would coordinate with the partners to develop an overall map of all the visitor facilities available in the area. The Service would continue to develop and update the first Service brochure for the refuge. Brevard County is constructing the Barrier Island Sanctuary Management and Education Center, within the larger Archie Carr Refuge partnership, as a visitor center with kiosks, exhibits, an auditorium, and night viewing scopes. Various partners, including the Service, would conduct programs from this site. The Barrier Island Center will serve as the primary visitor center for this area and for the refuge. The refuge would work with the partners to enhance the rare, threatened, and endangered species messages delivered at the Barrier Island Center.

All fishing activities would continue to occur or originate on partner properties. Unapproved access through closed refuge lands would be eliminated and fishing activities would be directed to approved access points. The refuge would work with the partners to provide information to anglers regarding the impacts of fishing activities on rare, threatened, and endangered species. The refuge would work with the partners to evaluate the need to develop additional dune crossovers and to expand the monofilament recycling program. Dune crossovers would be considered on Save Our Coast parcels, ahead of refuge and other conservation lands. Dune crossovers would also be considered for existing foot paths and dune blowouts before considering sites with intact dunes and unaltered habitats.

Wildlife viewing and photography opportunities would continue to occur on partner properties. The refuge would annually conduct 10 sea turtle viewing programs, while the partners would conduct an additional 40 programs. The refuge would work with partners to expand sea turtle viewing programs. More guided turtle watch programs should help alleviate the demand of the public to view sea turtles, as well as reduce unauthorized and potentially harassing turtle encounters. Other wildlife viewing and photography opportunities would mostly occur from beach access points or along Brevard EEL's trails west of A1A.

Environmental education and interpretive opportunities would be increased. The refuge would develop on- and offsite curriculum-based and interpretive programs with messages focused on rare, threatened, and endangered species and the minimization of human impacts. Staff, volunteers, teachers, and tour operators would be trained to conduct these programs and incorporate interpretive themes into their programs. The refuge would coordinate with the State of Florida to develop the key messages to be conveyed to all sea turtle walk participants. The refuge would develop staff- and/or volunteer-led interpretive programs focused on rare, threatened, and endangered species. The refuge would work with the Brevard EEL Program, Caribbean Conservation Corporation, and other partners to offer formal environmental education and interpretive programs at the Barrier Island Center.

The refuge would work with the partners to control inappropriate uses. All unapproved foot trails through refuge properties would be closed and dune blow-outs would be restored. Approved foot trails that had dune blowouts would also be restored and improved with dune crossovers. All public nighttime access to the beach from refuge properties would be eliminated. The refuge would work with the partners to eliminate nighttime access to the beach from their properties.

The refuge would focus its outreach efforts on rare, threatened, and endangered species. Outreach would continue to be conducted by the partners, the refuge, and sea turtle researchers. Increased outreach activities would be conducted by the volunteers, the Friends of the Carr Refuge, and others. The Archie Carr Working Group would continue to coordinate several outreach activities. The refuge would provide outreach support and core messages to the Working Group.

The refuge would increase the number of active volunteers and focus their efforts on projects to benefit rare, threatened, and endangered species. The volunteers would be coordinated by staff, and the refuge would coordinate with the partners to develop a volunteer cadre to be shared amongst the partners.

The refuge would help the Friends of the Carr Refuge become a 501(c)(3) nonprofit organization, with a Cooperating Agreement. The friends group would seek agreements with other organizations to expand opportunities to assist the refuge. The refuge would work with FOCR to focus its efforts and activities to benefit rare, threatened, and endangered species. Further, the refuge would support increased numbers of members and levels of activities.

In an effort to address litter and ocean debris, the refuge would work with the partners and volunteers to develop a regular cleanup program for the expanse of refuge and partner beaches. The refuge would schedule major cleanup efforts prior to and after sea turtle nesting season and would periodically assess the need to conduct other cleanups. The refuge would coordinate with the partners to conduct outreach to area boaters and users of the Port of Canaveral to minimize litter and ocean debris from these vessels. Further, the refuge and the partners would work to increase awareness and understanding of area dump stations for boats.

Refuge Administration
The refuge would continue to share facilities, equipment, utilities, and some staff with Pelican Island NWR, but would have its own budget and its own full-time staff members. Much of the facilities would continue to be managed together with Pelican Island NWR, including the researcher beach house and dune crossover, deteriorating beach structure, planned bunk house, garage at SISP, maintenance facility at Pelican Island NWR, Seaview dune crossover, planned dune crossover near Spanish House, and administrative offices at Ecological Services. The refuge would demolish the deteriorating beach structure. Further, it would seek to locate needed maintenance and office facilities closer to the refuge.

Staff would be increased and some positions would be separated from Pelican Island NWR. The refuge would share a Wildlife Refuge Manager, Assistant Refuge Manager, Refuge Officer, Administrative Assistant, Supervisory Park Ranger, Supervisory Maintenance Worker and Wildlife Biologist with Pelican Island NWR, but 3.5 staff positions would be assigned to ACNWR. The staff specific to the refuge would include: Park Ranger (volunteer coordinator/outreach and environmental education), Maintenance Worker, Biological Technician, and a seasonal Biological Technician (trapper).

The refuge would enhance and increase partnership efforts to support management and recovery of rare, threatened, and endangered species. The refuge would continue to work with the government and nongovernmental partners through the Archie Carr Working Group. Beyond the Working Group, the refuge would also continue to work directly with Ecological Services, SISP, Brevard and Indian River counties, the mosquito control districts, and the State of Florida.

ALTERNATIVE C. MIGRATORY BIRDS

The primary focus under Alternative C would be migratory birds.

Wildlife and Habitat Management
Under this alternative, management of listed species would increase slightly. Sea turtle monitoring and patrol efforts would be altered to minimize their effects on nesting shorebirds. If sea turtle surveys and other beach-side activities associated with these species were determined to have a negative effect on nesting shorebirds, these efforts would have to be altered. Likewise,

Southeastern beach mouse monitoring would have to be scaled-back or otherwise adjusted if these activities conflicted with migratory bird management needs. Gopher tortoise, Florida scrub-jay, wood stork, Eastern indigo snake, and West Indian manatee management would remain unchanged. For bald eagles, potential future nest sites would be protected. If eagles were found to be present, the refuge would adapt management as necessary, including creating closed areas to protect the species from human and pet disturbance. Management of piping plovers would increase with annual wintering surveys.

Migratory bird management would increase under this alternative. Survey and monitoring efforts would be expanded for neotropical migrants, shorebirds, wading birds, water birds, and waterfowl. The refuge would consider using mist nets and banding, where applicable. For neotropical migrants, important habitats would be managed to improve forage and nesting availability. Potential nest parasites would be identified and controlled as needed. In addition, the refuge would work with partners to identify the potential for larger, unfragmented forests to serve the needs of these trust species. Shorebird management would include the closure of key areas to limit disturbance, including the alteration or elimination of sea turtle surveys in locations where shorebirds are particularly vulnerable. Law enforcement would be increased to enforce "no dogs on beach" zones, where applicable. For wading and water birds, the refuge would work with the partners to increase the ability in the area to rehabilitate injured birds. With regards to waterfowl, the refuge would work with the partners to manage impoundments to also benefit waterfowl and consider installing wood duck boxes, where appropriate.

Efforts to maintain or increase the biodiversity on the refuge would increase slightly, primarily in areas such the hammocks and mangroves/wetlands, which are utilized by some migratory birds.

Control of exotic, invasive, nuisance and free-roaming/feral species would be expanded. The refuge would focus exotic plant control efforts on high priority habitats for migratory birds and identify and locate new infestations of Category I and Category II invasive upland plants. Initial attack would be conducted with an emphasis on elimination. In key habitats, existing exotic plants would be controlled to reduce their impact on migratory birds. In addition, the refuge would coordinate with the partners to control feral and free-roaming animals to minimize adverse impacts to migratory birds.

The refuge would increase management efforts in response to climate change under this alternative. It would coordinate with researchers and partners to investigate the impacts of climate change on migratory birds using the refuge.

Resource Protection
Under this alternative, the refuge would complete the boundary survey and prioritize active acquisition efforts on those properties with high migratory bird values. The refuge would pursue completion of the acquisition boundary from willing sellers and consider using land swaps as one of the tools to meet this objective. Through collaboration with partners, wildlife corridors and other important habitats would be identified and protected to serve migratory birds. The refuge would consider a coordinated land management approach and consolidate those areas publicly held by multiple partners under management of one entity.

Under this alternative, a complete archaeological and historical survey of the refuge would be conducted. The refuge would also actively work with the partners to acquire or otherwise manage and protect the historically important Oak Lodge site due to its contributions to research and historical data on migratory birds of the barrier island. It would incorporate this site into an interpretive program.

Visitor Services
Visitor service programs would be expanded under this alternative. Visitor informational resources would be altered with messages emphasizing migratory birds. An interpretive kiosk would be added to the Oak Lodge site and a bird list would be developed. The refuge would work with the partners to incorporate messages into their signage and to simplify regulatory signage to limit confusion. It would actively maintain and regularly update the refuge's website and collaborate with the partners to provide cross links between the refuge's and partners' web sites. In addition, the refuge would coordinate with the partners to develop an overall map of the visitor facilities available on the refuge's and partners' properties. A cooperative effort to develop a visitor counting process to estimate the numbers of visitors would be developed with the partners. Archie Carr NWR information would be made available at all Pelican Island NWR visitor contact sites.

Under this alternative, management of fishing would be increased. The refuge would work with the partners to provide information to the fishing public regarding the impacts of fishing activities on migratory birds. It would close all unapproved foot trails to public access through refuge properties and direct the fishing public to approved access points. The need to create additional dune crossovers would be evaluated. The refuge would coordinate with the partners to expand the monofilament recycling program.

Wildlife viewing and photography would be changed from current management efforts. The sea turtle walk programs conducted by the Service would be eliminated. The refuge would work with the partners to develop informational materials for partners' trails to include migratory bird messages of the refuge. Staff and/or volunteer-led migratory bird walks would be developed by the refuge.

Environmental education, interpretation and outreach activities would be expanded under this alternative. The refuge would coordinate with the partners to incorporate migratory bird messages of the refuge into existing education programs. In addition, it would work with the partners to enhance the migratory bird messages delivered at the Barrier Island Center's exhibits, brochures, kiosks, and programs. Onsite and offsite interpretive programs with messages focused on migratory birds and the minimization of human impacts would be developed. The refuge would train staff, volunteers, teachers, and tour operators to incorporate interpretive themes into programs and develop staff- and/or volunteer-led seasonal migratory bird walks. Outreach efforts would be focused on migratory birds. The outreach efforts and activities of the staff and Friends of the Carr Refuge would occur. Outreach support and core messages would be provided to the Archie Carr Working Group.

Under this alternative, the refuge would eliminate nighttime access to the beach from refuge properties and close all unapproved foot trails to public access through refuge properties. For foot trails through partner properties, the refuge would work with the partners to eliminate nighttime access to the beach and to evaluate the need to close, relocate, or build dune crossovers at these sites.

Friends of the Carr Refuge and volunteer programs would likely decrease under this alternative. The refuge would likely find it more difficult to recruit members for the FOCR or volunteers, since most of these are dedicated to sea turtle recovery efforts. Volunteer efforts would be coordinated by refuge staff and focused on the needs of migratory birds. The refuge would coordinate with partners to develop a core volunteer cadre to be shared amongst the partners. The refuge would assist the FOCR to become an independent 501(c)(3) nonprofit organization, with a Cooperating Agreement.

Alternative C would increase the control of litter and ocean debris. Through increased collaboration with the partners and volunteers, the refuge would develop an annual cleanup program for the expanse of

refuge and partner beaches and lagoon shoreline prior to the arrival of shorebirds. Periodically, the need to conduct cleanups would be assessed.

Refuge Administration
Staffing levels would be increased under Alternative C. The refuge would develop staff specific to the refuge and share personnel with Pelican Island NWR. Shared staff would include: Wildlife Refuge Manager, Wildlife Refuge Specialist (Assistant Manager), Supervisory Park Ranger, Administrative Office Assistance, Law Enforcement Officer, Supervisory Maintenance Worker and Wildlife Biologist for a total of seven shared full time equivalent (FTE) employees. Full-time refuge specific staff would include a Biological Technician, Park Ranger (outreach, interpretation & volunteer coordinator), and Maintenance Worker for a total of three FTEs.

Under this alternative, refuge infrastructure would need to be increased. Equipment and facility repairs would be focused on those items needed for migratory bird management activities. Deferred maintenance priorities and API percentages would be reevaluated to reflect a focus on migratory bird management. An office facility shared by Pelican Island NWR and Archie Carr NWR staff would be made available and pole barns to house additional equipment would be acquired. The refuge would demolish deteriorating beach structures (i.e., Interland Melbourne beach structure).

ALTERNATIVE D. WILDLIFE AND HABITAT DIVERSITY

The primary focus under Alternative D would be wildlife and habitat diversity.

Wildlife and Habitat Management
Under this alternative, management of listed species would increase. For sea turtles, regular law enforcement patrols would be conducted to protect these marine reptiles from disturbance and harassment. In addition, the refuge would work with private landowners and beach goers to minimize impacts to sea turtles. The refuge would coordinate and analyze sea turtle data and work with the partners to understand and manage the nearshore habitats. Management of Southeastern beach mice would include modifying and restoring habitats utilized by these species, including maintaining and opportunistically planting sea oats and other forage plants. Beach mouse management efforts between the refuge, Pelican Island NWR, and SISP would be coordinated. The refuge would increase control of feral predators. Gopher tortoise management would be expanded under this alternative. The refuge, working with the partners, would identify locations where gopher tortoise are especially vulnerable to vehicle collisions and evaluate the feasibility of developing wildlife underpasses, especially during roadway maintenance work. Gopher tortoise crossing signs would be posted in key areas. Also, the refuge would consider barriers to turtle movement to minimize vehicle collisions and provide for foraging habitat needs inside the barriers. To improve scrub-jay conditions, the refuge would work with the partners to identify and restore scrub habitats. For wood storks, the refuge would collaborate with the partners to minimize impacts to wood storks and conflicts with humans and increase the area's bird rehabilitation services for injured wood storks, as well as other birds. Future bald eagle nests would be protected by demarking buffer zones. To minimize injury and drowning, the refuge would coordinate with partners to prevent manatees from entering water control structures. Piping plovers and Eastern indigo snakes would be included in wildlife diversity surveys in an effort to determine the extent of their presence on the refuge.

With regard to native wildlife and habitat diversity, management efforts would be expanded under this alternative. The refuge would coordinate marine mammal stranding incidents with partners. For land crabs, surveys would be conducted and increased law enforcement patrols would occur. It would work with the partners to install bilingual regulatory signage and incorporate land crab protection into outreach efforts. The refuge would work with partners to minimize vehicle-wildlife collisions by

evaluating and possibly installing wildlife underpasses to protect land crabs, as well as other species. Furthermore, it would work with the partners to evaluate, develop, and install wildlife awareness, give 'em a brake, and wildlife crossing signs. Wildlife (amphibians and reptiles in particular) surveys would be conducted to establish a more comprehensive species list for the refuge. Management of refuge habitats, including scrub, hammocks, nearshore, beach, dune, coastal strand, and mangroves and other wetlands would be increased through various restoration and improvement efforts to benefit the species utilizing these areas. Control of nonnative, feral, and nuisance species would be expanded. The refuge would locate and identify new infestations of categories I and II plants and work to eradicate these, while controlling nonnative plants already established. It would coordinate with the partners to control feral animals. The refuge would increase its efforts to minimize the effects of climate change. It would coordinate with researchers and partners to investigate the impacts of climate change on refuge resources and identify climate change research needs. It would foster and conduct needed research studies and adapt management as necessary. Cooperative efforts between the refuge and its partners to better understand the potential effects on the refuge would include: establishing benchmarks in relation to sea level rise and shoreline change, monitoring the migration of the dunes, and monitoring existing wells for salt water intrusion. Increasing land acquisition and restoration efforts in response to the effects of climate change would help the refuge maintain the ability to manage its resources.

Resource Protection

Using this alternative, the refuge would complete the boundary survey, and prioritize active acquisition efforts on those properties with high biodiversity value. The refuge would work to complete acquisition of lands within the acquisition boundary from willing sellers and use land swaps, where appropriate, as a method to meet this objective. Through collaboration with partners, areas high in biodiversity and wildlife corridors would be identified and protected. Any important properties needed for connectivity and protection that are outside of the current acquisition boundary would either be targeted by partners or proposed for addition under a Minor Expansion Proposal (MEP) of less than 10 percent of the approved acquisition boundary minus the 65 acres (26 ha) added under the last MEP (conducted in 2004). A coordinated land management approach would be considered by the refuge. It would work to consolidate those areas publicly held by multiple partners under the management of one entity.

Under this alternative, a complete archaeological and historical survey of the refuge would be conducted. The refuge would also actively work with the partners to acquire or otherwise manage and protect the Oak Lodge site due to its contributions to research and historical data on barrier island biodiversity. This site would be made part of an interpretive program.

Visitor Services

Under this alternative, visitor service programs would be expanded. Informational resources available to visitors would emphasize biodiversity on the refuge. The refuge would develop a bird list and, at the Oak Lodge site, an interpretive kiosk would be added. The refuge would work with the partners to incorporate messages into their signage. In addition, refuge and partner regulatory signage would be consolidated to limit confusion. The refuge's website would be actively maintained and regularly updated, and cross links between the refuge's and partners' web sites would be established. In addition, the refuge would coordinate with the partners to develop an overall map of the visitor facilities available on the refuge and partner properties. A cooperative effort to develop a visitor counting process to estimate the numbers of visitors would be developed with the partners. Archie Carr NWR information would be made available at all Pelican Island NWR visitor contact sites.

Under this alternative, management of fishing would be increased. The refuge would work with the partners to provide information to the fishing public regarding the impacts of fishing activities on

migratory birds. It would close all unapproved foot trails to public access through refuge properties and direct the fishing public to approved access points. The need to create additional dune crossovers would be evaluated. The refuge would coordinate with the partners to expand the monofilament recycling program.

Wildlife viewing and photography would be changed from current management efforts. Sea turtle walk programs conducted by the Service would remain the same. The refuge would work with the partners to develop informational materials for partners' trails to include wildlife and habitat diversity messages of the refuge. Staff and/or volunteer-led migratory bird walks would be developed by the refuge.

The refuge would increase environmental education, interpretation, and outreach activities under this alternative. Through collaborative efforts with the partners, the refuge would incorporate more information on biodiversity into existing education programs. It would also work with the partners to enhance the wildlife and habitat diversity messages delivered at the Barrier Island Center's exhibits, brochures, kiosks, and programs. Onsite and offsite interpretive programs aimed at maintaining or increasing biodiversity and the minimization of human impacts would be developed. Staff, volunteers, teachers, and tour operators would be trained to incorporate interpretive themes into programs and the refuge would also develop staff and/or volunteer-led wildlife walks. Outreach efforts would be focused on biodiversity. The refuge would help increase the outreach efforts and activities of the staff and Friends of the Carr Refuge, as well as provide outreach support and core messages to Archie Carr Working Group.

Nighttime access to the beach from refuge properties would be eliminated and the refuge would close all unapproved foot trails to public access through its properties. On partner properties, the refuge would collaborate to eliminate nighttime access to the beach via unapproved foot trails. In addition, the need to close, relocate, or build dune crossovers at these sites would be evaluated.

Friends of the Carr Refuge and volunteer programs would increase under this alternative. The refuge would help increase number of FOCR members and active volunteers and focus projects to benefit biodiversity. Volunteer activities would be coordinated by staff and focused on refuge biodiversity efforts. The refuge would coordinate with partners to develop a core volunteer cadre to be shared amongst the partners. The refuge would assist the FOCR to become an independent 501(c)(3) nonprofit organization, with a Cooperating Agreement.

Under this alternative, the control of litter and ocean debris would increase. The refuge would work with the partners and volunteers to develop a regular cleanup program for the expanse of refuge and partner beaches and lagoon shoreline. A major cleanup effort prior to and after the sea turtle nesting season would be scheduled. The refuge would work with partners to periodically assess the need to conduct cleanups. Through partnerships, the refuge would conduct outreach to area boaters and users of the Port of Canaveral to minimize litter and ocean debris from these vessels. In addition, the refuge would coordinate with the partners to increase awareness and understanding of area dump stations for boats.

Refuge Administration
Under Alternative D, staffing levels would be increased. The refuge would develop staff specific to the refuge and share personnel with Pelican Island NWR. Shared staff would include: Wildlife Refuge Manager, Wildlife Refuge Specialist (Assistant Manager), Supervisory Park Ranger, Administrative Office Assistance, Law Enforcement Officer, Supervisory Maintenance Worker and Wildlife Biologist for a total of seven shared FTEs. Full-time refuge specific staff would include: Biological Technician, Park Ranger (outreach, interpretation & volunteer coordinator), and Maintenance Worker with a seasonal Biological Science Technician for a total of 3.5 FTEs.

Under this alternative, refuge infrastructure would need to be increased. Equipment and facility repairs would be focused on those items needed for biodiversity management activities. Deferred maintenance priorities and API percentages would be reevaluated to reflect a focus on wildlife and habitat diversity management. An office facility shared by Pelican Island NWR and Archie Carr NWR staff would be made available and pole barns to house additional equipment would be acquired. The refuge would demolish deteriorating beach structures.

SELECTION RATIONALE

Alternative B is selected for implementation because it directs the development of programs to best achieve the refuge's purposes and goals; emphasizes rare, threatened, and endangered species; collects needed habitat and wildlife data; and ensures long-term achievement of refuge and Service objectives. At the same time, these management actions provide balanced levels of compatible public use opportunities consistent with existing laws, Service policies, and sound biological principles and focuses public use activities on the partner properties within the larger Archie Carr Refuge partnership. It provides the best mix of program elements to achieve desired long-term conditions.

Under this alternative, all lands under the management and direction of the refuge will be protected, maintained, and enhanced to best achieve national, ecosystem, and refuge-specific goals and objectives within anticipated funding and staffing levels. In addition, the action positively addresses the priority issues and concerns expressed by the public.

ENVIRONMENTAL EFFECTS

Implementation of the Service's management action is expected to result in environmental, social, and economic effects as outlined in the Draft CCP/EA. Habitat management, population management, land conservation, and visitor service management activities on Archie Carr National Wildlife Refuge would result in increased protection for rare, threatened and endangered species; increased migratory bird utilization; enhanced wildlife populations; increased detection and control of nonnative species; dune, scrub, and mangrove restoration; and enhanced opportunities for wildlife-dependent recreation and environmental education. These effects are detailed as listed.

Wildlife populations and habitat quality will improve. The refuge will have more information regarding its resources, allowing it to better protect listed species, migratory birds, and the overall biodiversity of the refuge. Threats to listed species and migratory birds will be better understood, so that the refuge can take steps to reduce or eliminate their negative effects. Dune, scrub, and other important habitats will improve in quality, capable of supporting a greater variety and number of wildlife species. The deleterious effects of exotic species will minimized, to the benefit of native habitats and wildlife species. Historical and archaeological resources will be better protected. The acquisition of additional lands will conserve these lands in the rapidly developing surrounding landscape. Public use will increase, with improved opportunities for fishing, wildlife observation, photography, environmental education, and interpretation.

POTENTIAL ADVERSE EFFECTS AND MITIGATION MEASURES

WILDLIFE DISTURBANCE

Disturbance to wildlife is an unavoidable consequence of any public use program, regardless of the activity involved. While some activities may be less disturbing than others, all public use activities proposed will be planned to avoid unacceptable levels of impacts.

Known and anticipated levels of disturbance from the proposed action are not considered to be significant. Nevertheless, the refuge will manage public use activities to minimize impacts and to ensure compatibility. Where appropriate, providing access for fishing opportunities allows the use of a renewable natural resource without adversely impacting other resources. General wildlife observation may result in minimal disturbance to wildlife. If the refuge determines that impacts from the expected additional visitor uses are above acceptable levels, those uses will be modified, discontinued, restricted, or rerouted to other less sensitive areas and/or to partner properties to minimize impacts.

VEGETATION DISTURBANCE

Negative impacts could result from the maintenance of trails and roads for Service and researcher access that require clearing of nonsensitive vegetation along their lengths. This is expected to be a minor, short-term, and discrete impact.

USER GROUP CONFLICTS

Although the vast majority of the refuge is closed, as public use increases, unanticipated conflicts between different user groups could occur (e.g., between conflicting beach users). If this should happen, the refuge will work with the partners to adjust involved programs, as needed, to eliminate or minimize any public use issues. The refuge will use methods that have proven to be effective in reducing or eliminating public use conflicts. These methods could include establishing separate use areas; different use periods; and limits on the numbers of users in order to provide safe, quality, appropriate, and compatible wildlife-dependent recreational opportunities. However, since the Service only controls the lands above mean high water, the refuge will need to work with the partners to fully address any user group conflicts that arise.

EFFECTS ON ADJACENT LANDOWNERS

Implementation of the proposed action is not expected to negatively affect owners of private lands adjacent to the refuge. Positive impacts that would be expected include higher property values, less intrusion of invasive exotic plants, increased aesthetics, and increased opportunities for viewing more diverse wildlife.

However, some negative impacts may occur. To help minimize these potential impacts on adjacent landowners, the refuge will work with the partners to provide informational signs that clearly mark refuge and partner boundaries; maintain the partners' existing parking facilities and appropriate access points; use law enforcement; and provide increased educational efforts at the visitor contact stations. Prescribed burning could negatively impact adjacent landowners, but the refuge would minimize effects by informing the public well in advance of any burns. Furthermore, prescribed burns would be relatively infrequent (less than annual basis) and of short duration (lasting hours). Prescribed burning on refuge lands will also benefit adjacent landowners by decreasing fuel loads and minimizing the risk of catastrophic fires.

LAND OWNERSHIP AND SITE DEVELOPMENT

Land acquisition efforts by the Service could lead to changes in land use. Most of the non-Service and non-partner-owned lands within the refuge's approved acquisition boundary are already developed. If additional lands are acquired, they would be restored and maintained in a natural state and managed for native wildlife populations in accordance with goals, objectives, and strategies developed in the CCP. Additional lands acquired for the refuge would be evaluated for appropriate and compatible wildlife-dependent public uses.

Potential development of any refuge structures or other improvements could lead to minor short-term discrete negative impacts on plants, soils, and some wildlife species. When building structures, efforts would be made to use recycled products and environmentally sensitive treated lumber. All construction activities would comply with all applicable laws, policies, and treaties, including the requirements of Section 404 of the Clean Water Act; the National Historic Preservation Act; and Executive Order 11988, Floodplain Management.

COORDINATION

The management action has been thoroughly coordinated with all interested and/or affected parties. Parties contacted include those listed.

- Affected Landowners, including area Homeowners Associations
- Congressional Representatives
- Other Federal Agencies
    - U.S. Department of Agriculture
    - National Oceanic and Atmospheric Administration
    - National Marine Fisheries Service
- State Government
    - Governor of Florida
    - Florida Fish and Wildlife Conservation Commission
    - Florida State Historic Preservation Officer
    - Florida Department of Agriculture and Consumer Services
    - Florida Division of Forestry
    - Florida Department of Environmental Protection
    - Florida Park Service
    - Florida Inland Navigation District
    - St. Johns River Water Management District
    - South Florida Water Management District
- Regional Tribal Governments
- Local Community Officials
    - Brevard County
    - Indian River County
    - City of Sebastian
    - Town of Melbourne Beach
    - City of Melbourne
    - City of Vero Beach
    - City of Fellsmere
    - City of Satellite Beach
    - City of Indian Harbour Beach
    - Town of Orchid Island
- Interested Citizens
- Local Businesses
- Area Libraries
- Area Chambers of Commerce
- Area Schools
- Universities and Research Entities
- Conservation Organizations
- Area Media

FINDINGS

It is my determination that the management action does not constitute a major federal action significantly affecting the quality of the human environment under the meaning of Section 102(2)(c) of the National Environmental Policy Act of 1969 (as amended). As such, an environmental impact statement is not required. This determination is based on the following factors (40 C.F.R. 1508.27), as addressed in the Environmental Assessment for the Archie Carr National Wildlife Refuge:

1. Both beneficial and adverse effects have been considered and this action will not have a significant effect on the human environment. (Environmental Assessment, pages 175-177, 186-192)

2. The actions will not have a significant effect on public health and safety. (Environmental Assessment, page 177)

3. The project will not significantly affect any unique characteristics of the geographic area such as proximity to historical or cultural resources, wild and scenic rivers, or ecologically critical areas. (Environmental Assessment, pages 176 and 187)

4. The effects on the quality of the human environment are not likely to be highly controversial. (Environmental Assessment, pages 175-177, 186-192)

5. The actions do not involve highly uncertain, unique, or unknown environmental risks to the human environment. (Environmental Assessment, pages 175-198)

6. The actions will not establish a precedent for future actions with significant effects nor do they represent a decision in principle about a future consideration. (Environmental Assessment, pages 175-198)

7. There will be no cumulatively significant impacts on the environment. Cumulative impacts have been analyzed with consideration of other similar activities on adjacent lands, in past action, and in foreseeable future actions. (Environmental Assessment, pages 196-197)

8. The actions will not significantly affect any site listed in, or eligible for listing in, the National Register of Historic Places, nor will they cause loss or destruction of significant scientific, cultural, or historic resources. (Environmental Assessment, pages 176 and 187)

9. The actions are not likely to adversely affect threatened or endangered species, or their habitats. (Environmental Assessment, pages 175-198)

10. The actions will not lead to a violation of federal, state, or local laws imposed for the protection of the environment. (Environmental Assessment, page 175-198)

SUPPORTING REFERENCES

U.S. Fish and Wildlife Service. 2008. Draft Comprehensive Conservation Plan and Environmental Assessment for Archie Carr National Wildlife Refuge. U.S. Department of the Interior, Fish and Wildlife Service, Southeast Regional Office, Atlanta, Georgia.

DOCUMENT AVAILABILITY

The Environmental Assessment was Section B of the Draft Comprehensive Conservation Plan for Archie Carr National Wildlife Refuge and was made available in June 2008. Additional copies are available by writing: Archie Carr National Wildlife Refuge, 1339 20th Street, Vero Beach, Florida 32960-3559.

Signed

Sam D. Hamilton
Regional Director

9/18/08

Date