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**DRAFT COMPREHENSIVE CONSERVATION PLAN  
AND ENVIRONMENTAL ASSESSMENT**

**PEE DEE NATIONAL WILDLIFE REFUGE**

*Anson and Richmond Counties, North Carolina*

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

*Southeast Region  
Atlanta, Georgia*

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## SECTION A. DRAFT COMPREHENSIVE CONSERVATION PLAN

# *I. Background*

### INTRODUCTION

The U.S. Fish and Wildlife Service (Service) has developed this Draft Comprehensive Conservation Plan and Environmental Assessment to provide a foundation for the management and use of Pee Dee National Wildlife Refuge in Anson and Richmond counties, North Carolina. The plan is intended to serve as a working guide for the refuge's management programs and actions over the next 15 years. 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.

The plan has been prepared in compliance with the National Wildlife Refuge System Improvement Act of 1997 and Part 602 (National Wildlife Refuge System Planning) of the Fish and Wildlife Service Manual. The plan also meets the requirements of the National Environmental Policy Act (NEPA) of 1969 through the inclusion of an environmental assessment (Section B), which describes the alternatives that are being considered and their potential effects on the environment.

A planning team developed a range of alternatives that best meet the goals and objectives of the refuge and that could be implemented within the 15-year planning period. In developing the plan, the team has incorporated the input of federal and state agencies, nongovernmental organizations, local citizens, and the general public. This public involvement and the planning process itself are described in Chapter III, Plan Development.

This plan represents the Service's proposed alternative and is being put forward after considering two other alternatives, as described in the environmental assessment (Section B). It is being made available to federal and state agencies, conservation partners, and the general public for review and comment. All public comments will be considered in the development of the final plan.

### PURPOSE AND NEED FOR THE PLAN

The purpose of the plan is to develop a proposed action that best achieves the refuge's purpose; attains the vision and goals developed for the refuge; contributes to the mission of the National Wildlife Refuge System; 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 the refuge's management direction;
- provide refuge neighbors, visitors, and government officials with an understanding of the Service's management actions on and around the refuge;
- ensure that the Service's management actions, including its land protection, recreation and education programs, are consistent with the mandates of the National Wildlife Refuge System; and
- provide a basis for development of the refuge's budget requests for operations, maintenance, and capital improvement needs.

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## **U.S. FISH AND WILDLIFE SERVICE**

The U.S. Fish and Wildlife Service is the primary federal agency responsible for the conservation, protection, and enhancement of the Nation's fish and wildlife populations and their habitats. Although the Service shares some conservation responsibilities with other federal, state, tribal, local, and private entities, it has specific trustee obligations for migratory birds, threatened and endangered species, anadromous fish, and certain marine mammals.

As part of its mission, the Service manages more than 540 national wildlife refuges and over 3,000 small waterfowl breeding and nesting sites covering nearly 100 million acres. These areas comprise the National Wildlife Refuge System, the world's largest collection of lands and waters specifically managed for fish and wildlife. The majority of these lands, 77 million acres, are in Alaska. The remaining acres are spread across the other 49 states and several U.S. island territories.

## **NATIONAL WILDLIFE REFUGE SYSTEM**

The mission of the National Wildlife 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.”

*National Wildlife Refuge System Improvement Act of 1997*

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; that the growth of refuges and the Refuge System must be strategic; and that the Refuge System serves as a model for habitat management with broad participation from others. This broad participation includes local, state, and federal government partners; organizations; local business communities; individuals; and volunteers. Volunteers continue to be a major contributor to the success of the Refuge System and in 1999, some 36,000 of them contributed more than 1.3 million hours on refuges nationwide, representing an economic value of more than \$20 million.

The National Wildlife Refuge System Improvement Act of 1997 established, for the first time, a clear legislative mission of wildlife conservation for the National Wildlife Refuge System. Activities were initiated in 1997 to implement the direction of this new legislation, including an effort to complete 15-year comprehensive conservation plans for all refuges. These plans, which are conducted with full public involvement, help guide the future management of refuges, including providing management direction for natural resources and recreation and education programs. The Improvement Act states that each refuge shall be managed to:

- fulfill the mission of the Refuge System;
- fulfill the individual purposes of each refuge;
- consider the needs of fish and wildlife first;
- fulfill the requirement of developing a comprehensive conservation plan for each unit of the Refuge System and fully involve the public in the preparation of these plans;
- maintain the biological integrity, diversity, and environmental health of the Refuge System; and

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- recognize that wildlife-dependent recreation activities, including hunting, fishing, observing wildlife, photographing wildlife, and participating in environmental education and interpretation, are legitimate and priority public uses of national wildlife refuges.

The National Wildlife Refuge System attracts more than 35 million annual visitors. Economists have found that these refuge visitors contribute more than \$400 million annually to the economies of local communities. In 2001 on conservation lands throughout the nation, approximately 37.8 million people participated in wildlife-related activities, most to observe wildlife in their natural habitats. These visitors represent nearly 40 percent of the country's adults who spent \$108 billion on wildlife-related pursuits in 2001, according to the National Survey of Fishing, Hunting, and Wildlife-Associated Recreation (U.S. Department of Interior, Fish and Wildlife Service and U.S. Department of Commerce, U.S. Census Bureau 2001). As visitation continues to grow on conservation lands and waters in general and specifically on refuges, the adjacent local communities are realizing economic benefits.

## **LEGAL 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 U.S. Fish and Wildlife Service. Management options are guided by a refuge's establishing authorities, Public Law 104, Stat. 2957 (§108, H.R. 3338), and the National Wildlife Refuge System Improvement Act of 1997 (see Appendix C for more information on legal and policy guidance for the operation of national wildlife refuges). Key guidance and direction can be found in:

- National Wildlife Refuge System Administration Act of 1966;
- Refuge Recreation Act of 1962;
- Title 50 of the Code of Federal Regulations;
- U.S. Fish and Wildlife Service Manual; and
- National Wildlife Refuge System Improvement Act of 1997.

Because refuges must be managed for wildlife first, the lands and waters within the National Wildlife Refuge System are closed to public uses unless specifically and legally opened under specified conditions providing for compatibility with each refuge's purpose(s). All programs and uses of a refuge must be evaluated based on the mandates set forth in the National Wildlife Refuge System Improvement Act, including those that:

- contribute to ecosystem goals, as well as to refuge purpose(s) 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 compatible wildlife-dependent visitor uses as those uses which benefit the conservation of fish and wildlife resources and which contribute to the enjoyment of the public (these uses include hunting, fishing, observing wildlife, photographing wildlife, and participating in environmental education and interpretation); and
- ensure that visitor activities are compatible with refuge purpose(s).

## **NATIONAL CONSERVATION PLANS AND INITIATIVES**

Because many issues affecting the protection and management of natural resources transcend geopolitical boundaries, multiple partnerships have been developed among government and private entities to address the environmental problems affecting regions. A large amount of conservation

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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 in the various plans and initiatives listed below, along with issues, problems, and trends, was reviewed and integrated where appropriate into this draft comprehensive conservation plan.

- U.S. Department of the Interior, Fish and Wildlife Service Strategic Plan
- Wildfire and Air Quality National Strategic Plan
- U.S. Fish and Wildlife Service, Fulfilling the Promise: The National Wildlife Refuge System
- North American Bird Conservation Initiative
- North American Waterfowl Management Plan
- North American Colonial Waterbird Conservation Plan
- Southeastern U.S. Region Waterbird Conservation Plan
- U.S. Shorebird Conservation Plan
- U.S. Shorebird Conservation Plan: Southeastern Coastal Plains-Caribbean Region
- Western Hemisphere Shorebird Reserve Network
- Partners in Flight Bird Conservation Plans
- USFWS Southeastern States Bald Eagle Recovery Plan

## **RELATIONSHIP TO STATE PARTNERS**

The Service is committed to encouraging and maintaining partnerships with others to improve the environmental health of ecosystems and the National Wildlife Refuge System. Partnerships are recognized by the Service as vital to fulfill the Service's mission and help share advocacy for fish and wildlife resources. Some of the current partners include federal and state agencies, environmental organizations, outdoor sporting groups, industry, local governments, and private landowners. A provision of the National Wildlife Refuge System Improvement Act of 1997 and subsequent agency policy provides that the Service shall ensure timely and effective cooperation and collaboration with other federal agencies and state fish and wildlife agencies during the course of acquiring and managing refuges.

Pee Dee National Wildlife Refuge's state agency partners include the North Carolina Wildlife Resources Commission; North Carolina Department of Environment and Natural Resources; North Carolina Forest Service; and North Carolina Department of Agriculture and Consumer Services. The North Carolina Wildlife Resources Commission (NCWRC) manages the state's fish and wildlife resources. It helps the Service with enforcement and management responsibilities relating to migratory birds, game species, and fisheries, as well as with management of the state's natural resources. The NCWRC owns, leases, or manages two million acres (809,371 hectares) of public and private lands for recreation and conservation purposes.

Various agencies within the state government have participated in a mix of refuge projects, including the planning process to develop this 15-year comprehensive conservation plan for the refuge. The State of North Carolina's participation and contribution throughout this comprehensive planning process provides for ongoing opportunities and open dialogue to improve the ecological sustainment of fish and wildlife in North Carolina. A vital part of the comprehensive planning process is the integration of common mission objectives, where appropriate.

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## II. Refuge Overview

### INTRODUCTION

Pee Dee National Wildlife Refuge was established in 1963 and is located approximately 48 miles (74 kilometers [km]) east of Charlotte, North Carolina, in Anson and Richmond counties (Figure 1). The refuge covers a total of 8,443 acres (3,417 hectares) and includes a diversity of habitats consisting of creeks, ponds, and a river; bottomland hardwoods; upland pine forests; croplands; open fields; moist soil units; and mixed pine/hardwood forests. These areas support a wide variety of fish, wildlife, and plants, including waterfowl and other migratory birds, as well as federally- and state-listed species. In addition, the refuge protects a number of historical and archaeological sites. A growing human population, along with ongoing development and other human activities, currently threaten the refuge and its surrounding environs.

The refuge straddles several miles of the Pee Dee River in southcentral North Carolina in the unique Savannah–Santee–Pee Dee Ecosystem (Figure 2). The Pee Dee River is approximately 230 miles (370 km) long and begins with its headwaters in the Blue Ridge Mountains of western North Carolina. It then flows in a southeasterly course through South Carolina into the Atlantic Ocean.

The refuge’s current habitat management activities include cooperative farming for wildlife food and cover; impoundment management for waterfowl and wading birds; selective timber thinning; prescribed burning; and old field management.

### REFUGE HISTORY AND PURPOSE

The Catawba Indians were the earliest known inhabitants to make use of the vast resources of the Pee Dee River. In the early 1700s, white settlers moved in and began clearing the rich river bottoms and nearby hillsides for farmland. By the mid-1800s, most of the land had been cleared and planted to cotton, which remained the principal crop until the 1950s.

The origin of the refuge dates to 1934 when a local landowner, Lockhart Gaddy, established a Canada goose sanctuary bordering the Pee Dee River and Brown Creek. Mr. Gaddy was an avid goose hunter and created the “Lockhart Gaddy’s Wild Goose Refuge” to provide food, shelter and protection for migratory Canada geese. He opened it to the public and allowed visitors to feed and observe the geese, and daily attendance rates of 4,000 visitors were not uncommon. Shortly before his death in 1950, the goose flock numbered approximately 10,000. In 1950, Mrs. Gaddy took over management of the refuge until her death in 1975, at which time the refuge was closed to the public.

In the 1960s, the numbers of both geese and ducks began to decline in southcentral North Carolina. However, the lands adjacent to the Pee Dee River and Brown Creek offered potential for waterfowl habitat development. With local and state support, Pee Dee National Wildlife Refuge was established in October 1963 to provide wintering habitat for migratory waterfowl.

The original purpose for which the refuge was established was “... for use as an inviolate sanctuary, or for any other management purpose for migratory birds,” including waterfowl and songbirds (Migratory Bird Conservation Act). The refuge’s objectives include:

- *Resource Protection:* Through a continued land acquisition program, complete acquisition of lands within the approved refuge boundary to ensure protection of the area’s natural and cultural resources and to help fulfill the refuge’s commitment to ecosystem management within the Yadkin–Pee Dee River focus area.

**Figure 1. Location of Pee Dee National Wildlife Refuge and its approved acquisition boundary.**

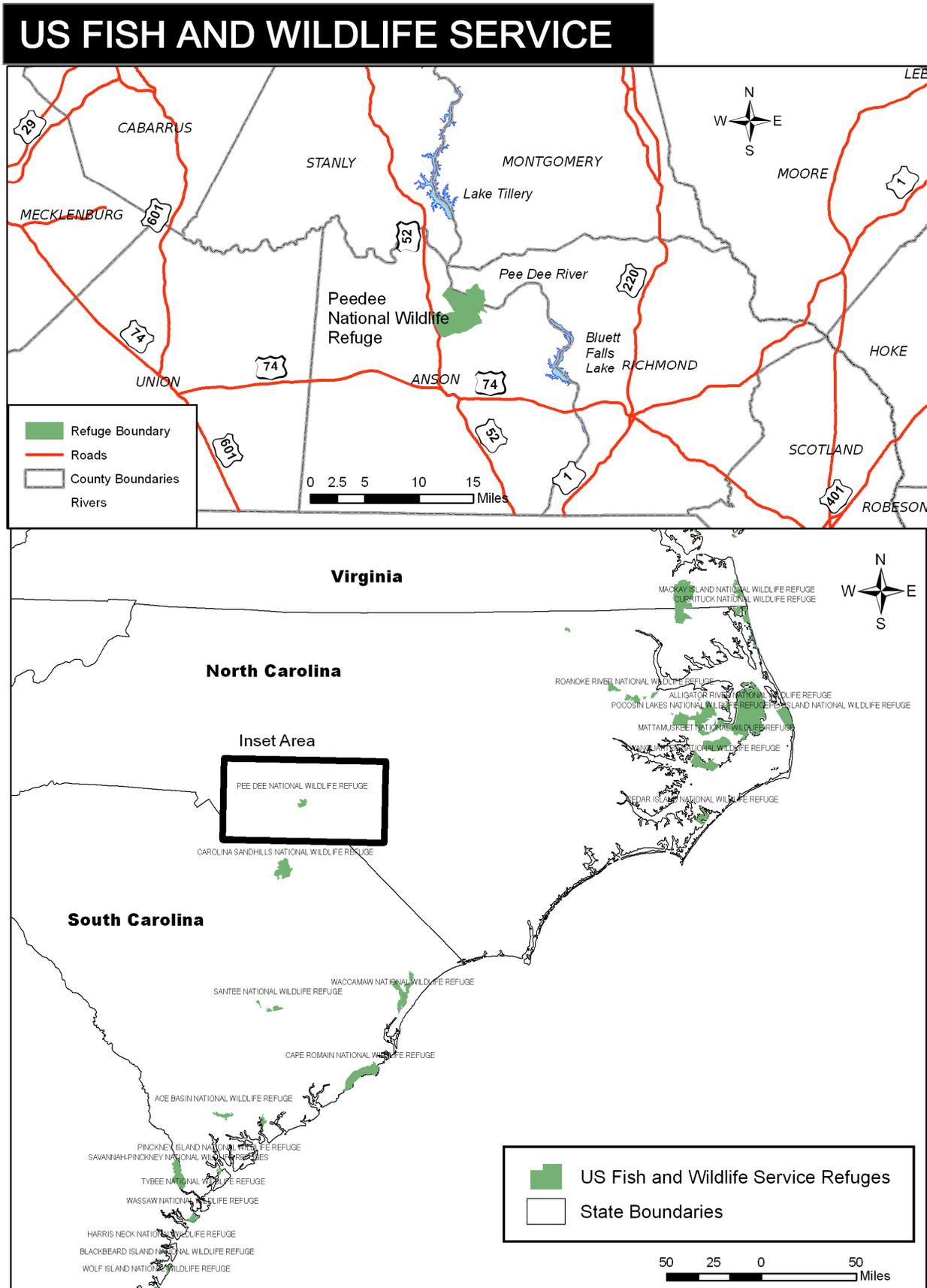
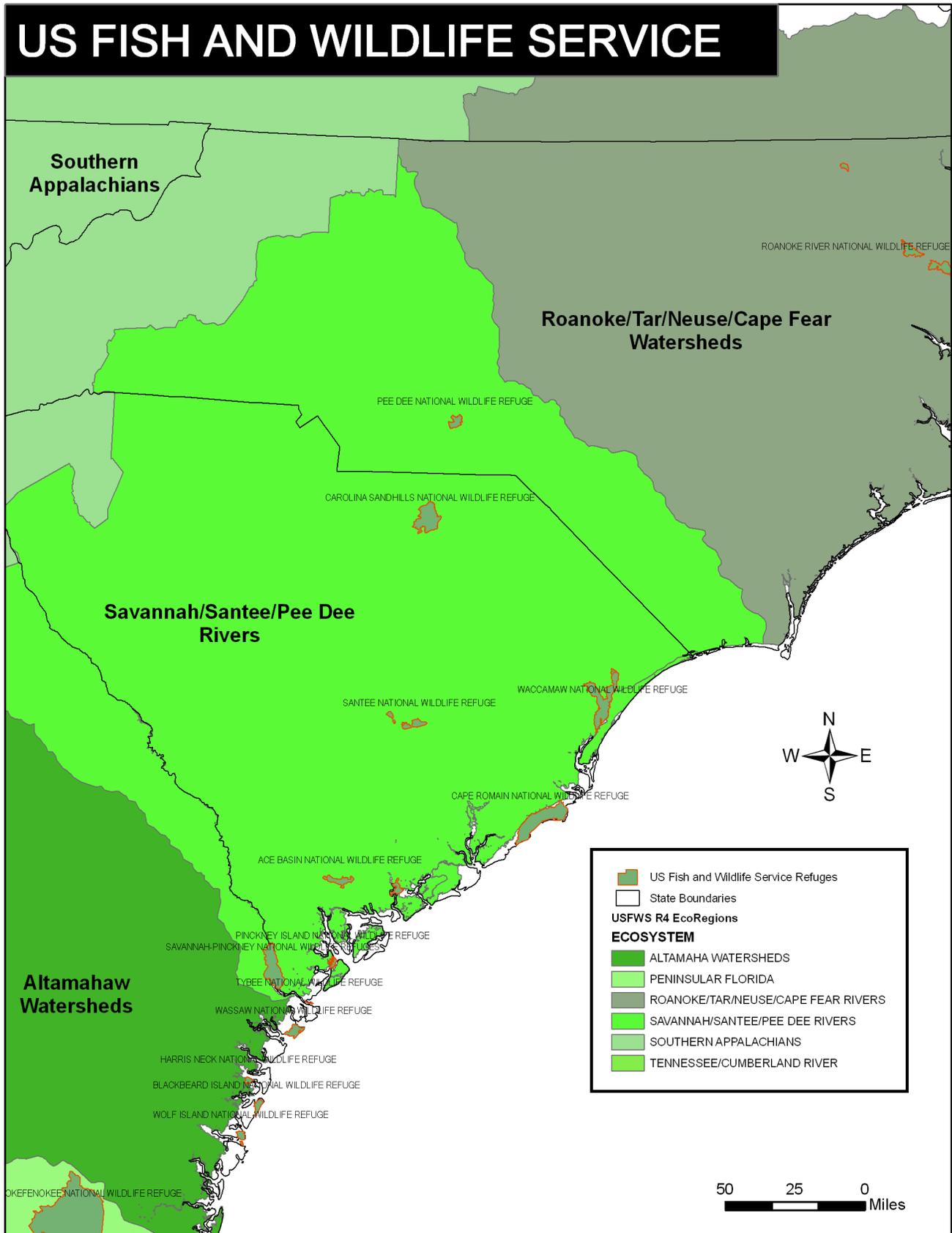


Figure 2. The Savannah–Santee–Pee Dee Ecosystem.



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- *Habitat Restoration:* With consideration to other goals and subsequent management programs, restore aquatic and terrestrial habitats throughout the refuge to provide for the needs of a diversity of native plant and animal communities including endangered and threatened species.
  - *Resource Management:* Maintain the refuge through active management programs including forestry, cooperative farming, moist soils and water management, prescribed burning, law enforcement, public use, biological monitoring, and wildlife surveys.
  - *Dynamic Partnering:* Maintain a key role in the Yadkin–Pee Dee River Focus Area of the Savannah–Santee–Pee Dee Ecosystem by maintaining and expanding partnerships with individuals, communities, agencies, and organizations to accomplish mutually beneficial natural resource conservation goals.
  - *Environmental Education and Interpretation:* Expand public awareness and appreciation of wildlife and associated habitats, natural science, land stewardship and ethics, and the National Wildlife Refuge System.
  - *Wildlife-oriented Recreation:* Provide opportunities for refuge visitors to enjoy high quality, safe and wholesome wildlife-oriented recreational experiences that are compatible with the purpose for which the refuge was established.

## **SPECIAL DESIGNATIONS**

The refuge does not include any areas with special federal designations. However, 3,000 acres (1,214 hectares) of the Brown Creek floodplain is designated as a Significant Natural Heritage Area by the North Carolina Natural Heritage Program.

## **ECOSYSTEM CONTEXT**

Expanding human populations and resulting habitat alterations are the biggest threat to natural systems and biodiversity. Protecting land is one of the most effective ways to safeguard native habitats, fish, wildlife, and plants. Pee Dee National Wildlife Refuge is located in an area of North Carolina that has dramatically changed through historical land use practices (primarily agriculture), and more recently, residential and industrial development. The refuge is important in a regional ecosystem context because it contains large areas of protected natural habitats. Together with other federal and state lands, such a network of conservation lands can help mitigate the effects of habitat fragmentation, provide protection, and serve as wildlife corridors. In addition, the refuge's vegetated areas reduce sedimentation and help improve water quality downstream. Furthermore, forested wetlands can function as water retention areas to minimize flood damage during times of excessive rainfall.

## **REGIONAL CONSERVATION PLANS AND INITIATIVES**

In 2001, Congress charged each state and territory with developing a statewide comprehensive wildlife conservation strategy as part of the Wildlife Conservation and Restoration Program and the State Wildlife Grants Program. These programs were designed to assist states by providing annual allocations for the development and implementation of programs to benefit wildlife and their habitats. The funding was intended to supplement, not duplicate, existing fish and wildlife programs, and to target species in greatest need of conservation, species indicative of the diversity and health of the states' wildlife, and species with low and declining populations, as deemed appropriate by each state's fish and wildlife agency. The state wildlife conservation plans provide an essential foundation for the future of wildlife conservation and a stimulus to engage state, federal, and other conservation

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partners to think strategically about their individual and coordinate roles in prioritizing conservation efforts across the nation. This includes the use of landscape-based conservation strategies to map existing protected areas (see Figure 3 for North Carolina conservation lands) and to identify gaps and potential wildlife corridors. The North Carolina Wildlife Action Plan (NCWAP) was finalized in 2005 as a guide to the North Carolina Wildlife Resources Commission (NCWRC) and its partners in conservation for sound management of North Carolina's fish and wildlife resources into the future.

The goals of the NCWAP are to:

- Improve the understanding of the species diversity in North Carolina and enhance the ability to make conservation or management decisions for all species;
- Conserve and enhance habitats and the communities they support;
- Foster partnerships and cooperative efforts among natural resource agencies, organizations, academia and private industry;
- Support educational efforts to improve understanding of our wildlife resources among the general public and conservation stakeholders; and
- Support and improve existing regulations and programs aimed at conserving habitats and communities.

In addition to the NCWAP, several other state and regional conservation and resource protection plans are listed below:

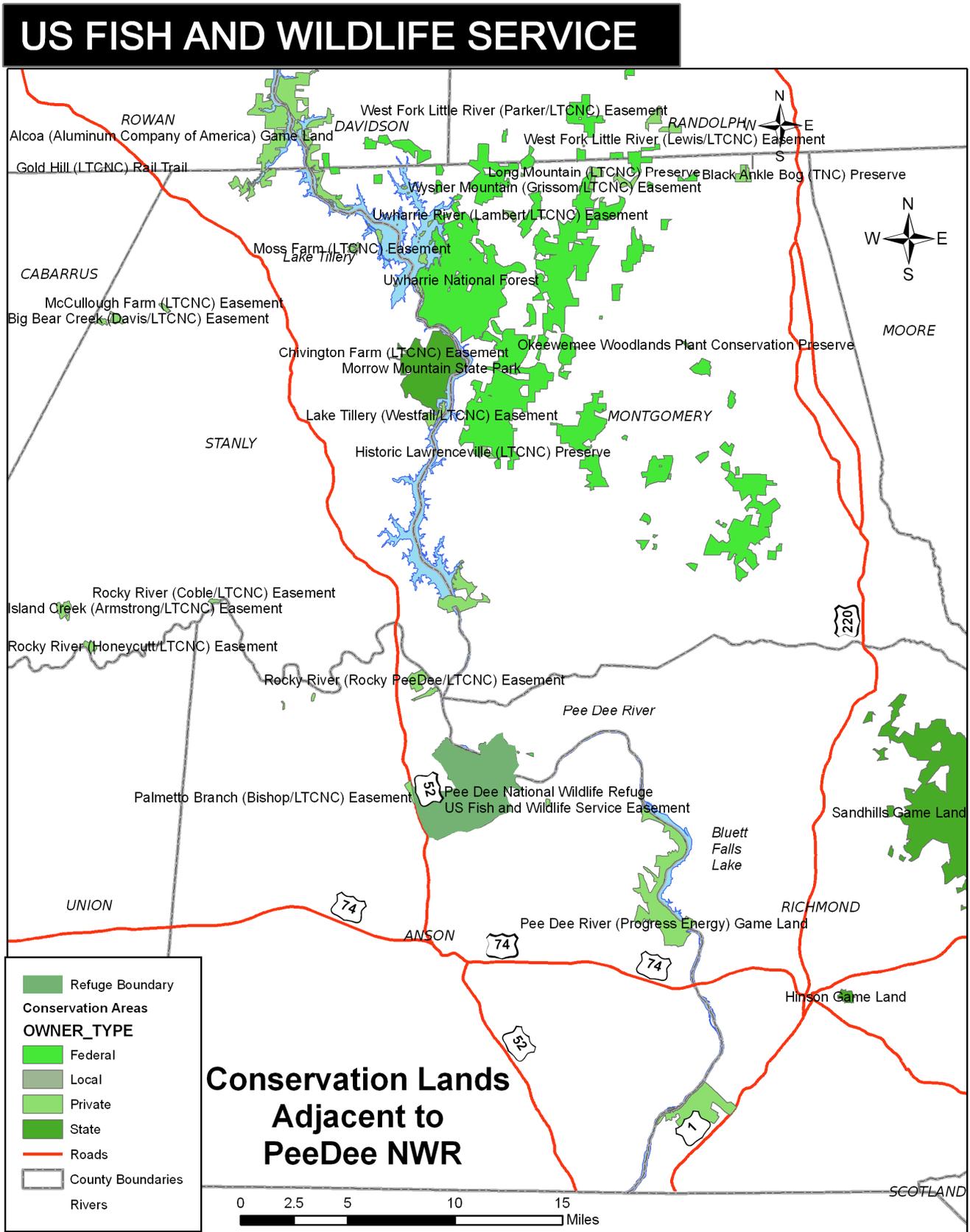
- North Carolina Working Lands Plan
- New Parks for a New Century
- State Stormwater Management Program
- Wetlands Conservation Plan
- Private Lands Protection Plan
- North Carolina Forest Plan
- Natural Heritage Program Biennial Protection Plan
- The Greater Uwharries Regional plan
- The Nature Conservancy Piedmont Ecoregional Plan

## **ECOLOGICAL THREATS AND PROBLEMS**

Pee Dee National Wildlife Refuge is an important component of the Savannah–Santee–Pee Dee Ecosystem in that it borders the Pee Dee River and its associated lowlands and uplands, encompassing a range of habitats. Human impacts and underlying threats to biological diversity on and off the refuge include:

- Direct loss of habitat due to development and other human activities
- Simplification and degradation of remaining habitats, including habitat alteration and fragmentation
- Loss and decline of species and biological diversity
- Effects of constructing navigation and water diversion facilities
- Introduction and spread of exotic, nuisance, and invasive species
- Lack of environmental regulation and enforcement
- Cumulative effects of land and water resource development projects
- Ongoing wildlife disturbance due to development and other human activities
- Impacts of nonpoint sources of pollution and water quality degradation

Figure 3. North Carolina conservation lands.



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## PHYSICAL RESOURCES

In an assessment of risk to ecosystems in the United States, seven southeastern states, including North Carolina, made the “extreme risk” category based on the number of endangered ecosystems, the percentage of imperiled species by state, and development pressures. In fact, eight of the top 21 endangered ecosystems in the United States can be found in North Carolina (Noss and Peters 1995). Several of these rare habitats are found on the refuge, including southern forested wetlands (bottomland hardwoods), large streams and rivers, and longleaf pine forests.

### CLIMATE

Pee Dee National Wildlife Refuge lies in the Southern Piedmont climate zone, an area where the interaction of south and east winds from the Atlantic Ocean and the nearby western mountain ranges creates a unique climate (State Climate Office of North Carolina [SCONC] 2006).

#### Temperature

Extremely low temperatures are infrequent because the Appalachian Mountains block much of the cold, continental air masses that move southward in the winter months. The coldest month is January. A record low of -4 degrees Fahrenheit (F°) (-20 degrees Celsius [C°]) was recorded in January 1985. Average winter lows are approximately 32 F° (0 C°), while winter highs of around 53 F° (12 C°) are the norm. During spring the temperatures quickly rise, and average May highs and lows are 80 F° (27 C°) and 58 F° (14 C°), respectively. July is the hottest month of the year with highs averaging 90 F° (32 C°) and lows near 70 F° (21 C°). Although July is the warmest month on average, record high temperatures of 107 F° (41 C°) were recorded in June and August 1983. During autumn, average high temperatures rapidly decline to 60 F° (16 C°) in early December (SCONC 2006). The average first frost occurs on November 4 (North Carolina State University 1996).

#### Relative Humidity

The average relative humidity does not vary greatly from season to season but is generally the highest in winter and lowest in spring. The lowest relative humidities are found over the southern Piedmont, where the year-round average is about 65 percent.

#### Precipitation

While there are no distinct wet and dry seasons in North Carolina, average rainfall does vary around the year. Summer precipitation is normally the greatest, and July is the wettest month averaging 5 inches (13 centimeters [cm]). Summer rainfall is also the most variable, occurring mostly in connection with showers and thunderstorms. Daily showers are not uncommon, nor are periods of one to two weeks without rain. Autumn is the driest season, and November the driest month with an average rainfall of approximately 2.9 inches (7.2 cm). Precipitation during winter and spring occurs mostly in connection with migratory low pressure storms, which appear with greater regularity and in a more even distribution than summer showers. Average annual rainfall is approximately 46.5 inches (118 cm) in the refuge vicinity. In 2007, much of the Southeast was in an “exceptional” drought with corresponding stream flows at or below the 5th percentile compared to the 30-year average (U.S. Geological Survey 2007). In December 2007, Charlotte, North Carolina had only received approximately 25 inches (64 cm) of rain, more than 16 inches (41 cm) below average (National Oceanic and Atmospheric Administration 2007).

#### Lightning

Lightning poses a hazard to refuge visitors and personnel and can cause infrastructure damage. In addition, fire management is a refuge activity that can be influenced by lightning. Historical lightning data are not available for Pee Dee National Wildlife Refuge (SCONC 2006).

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## Wind

Pee Dee National Wildlife Refuge averages approximately two severe thunderstorms annually with accompanying high winds of 40 miles per hour (mph) (64 kilometers per hour [kph]) or greater.

## Severe Weather

Windstorms, hail, ice storms, tornadoes, droughts, and tropical cyclones all have the potential to affect the refuge by altering habitat, displacing wildlife and damaging infrastructure. A 2002 ice storm severely damaged trees in Anson County and other areas of central North Carolina. Recent tropical cyclones that caused wind damage, localized flooding, and tornadoes include Hugo in 1989 and Frances and Jeanne in 2004. Currently Anson and Richmond counties are abnormally dry, with eminent drought conditions possible (North Carolina Drought Management Advisory Council 2007).

## GEOLOGY, TOPOGRAPHY, AND SOILS

### Geology

Pee Dee National Wildlife Refuge lies in an area of North Carolina defined by Triassic Basin and Piedmont geologies. The Triassic Basin gets its name from the Triassic period, which was during the Mesozoic Era between 245–208 million years ago, which lasted 37 million years. It is located all along the eastern coast of the United States. The basin was formed due to many processes. Erosion basically carved the newly raised mountains across the state of North Carolina, and after 15–20 million years of erosion, movement of material in the mantle began to produce forces that would alter and then eventually tear and separate the North American and Euro-African crustal plates. As this stress increased, the crust began to fracture. When it began to fracture, cracks developed throughout Europe, Africa, and the eastern coast of North America. These fractures formed in two separate sets. One set runs northeast to southwest and the other runs north-south. Many fractures remained exactly how they formed million of years ago. Today, the fractures can be seen across the Piedmont and Blue Ridge provinces as cracks in the older Paleozoic rocks (Horton and Zullo 1991). Within the Piedmont geology, the Carolina slate belt consists of heated and deformed volcanic and sedimentary rocks. It was the site of a series of oceanic volcanic islands about 550–650 million years ago.

### Topography

The surface relief of the Piedmont is characterized by relatively low, rolling hills with heights of between 200 feet (50 meters [m]) and 800 feet to 1,000 feet (250 m to 300 m) above mean sea level. Its geology is complex, with numerous rock formations of different materials and ages intermingled with one another. Essentially, the Piedmont is the remnant of several ancient mountain chains that have since been eroded away (Rogers 1999). Due to its topography, the rivers within the Piedmont tend to flow from north to south, rather than west to east.

### Soils

The soil types on the refuge range from sandy (Orangeburg) on a small portion of the refuge in Richmond County to a loamy clay and humid soil (Wehadkee) in the Brown Creek floodplain (Robinson and Singleton 1991). Other soil types include the well drained first bottom Riverview (Pee Dee River floodplain) and the sandy loam types (Mayodan; White Store). The refuge's soil types are described below.

*Riverview Series.* The Riverview series consists of deep, well-drained, moderately permeable soils that formed in loamy alluvium in the coastal plain. These soils are on nearly level floodplains and natural levees along rivers and large creeks. Slopes range from 0 to 5%. The soils flood mostly during the winter or early spring months. The native vegetation is forests consisting of gum (*Liquidambar styraciflua*), oak (*Quercus* spp.), beech (*Fagus grandifolia*), poplar (*Populus* spp.) and some pine (*Pinus* spp.). In a representative profile, the surface layer is dark brown loam 8 inches (20 cm) thick. The underlying material, in sequence from the top, is 14 inches (35 cm) of dark brown loam; 10 inches (25 cm) of dark brown very fine sandy loam; 6 inches (15 cm) of very dark grayish

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brown loam; 24 inches (61 cm) of brown silty clay loam; and the lower part is mottled clay loam to a depth of 80 inches (203 cm).

*Chewacla Series.* The Chewacla series consists of very deep, somewhat poorly drained soils on nearly level floodplains. They formed in loamy sediments washed largely from soils formed in residuum from schist, gneiss, granite, phyllite and other metamorphic and igneous rocks. Slopes range from 0 to 2%. Chewacla soils formed in recent alluvium on nearly level floodplains along streams that drain from the mountains and Piedmont. Most areas flood frequently. Much of the soil is cleared and is in pasture or cropland. The remainder is forest. Chewacla soils have brown loam surface layers 8 inches (20 cm) thick. The subsoil is 50 inches (127 cm) thick. It is dark yellowish brown and consists of yellowish brown loam in the middle part and light brownish gray silty clay loam in the lower portion. The underlying material is sand and extremely gravelly sand.

*Wehadkee Series.* The Wehadkee series consists of poorly drained soils on floodplains along streams that drain from the mountains and Piedmont. They are formed in loamy sediments. Slopes are generally less than 2%. Runoff is very slow as is internal drainage, while permeability is moderate. These soils are frequently flooded and are usually found in forested areas. Native vegetation is comprised of chiefly water-tolerant hardwoods such as sweetgum, blackgum (*Nyssa sylvatica*), water oak (*Quercus nigra*), willow oak (*Q. phellos*), poplar, hickories (*Carya* spp.), beech, and elm (*Ulmus* spp.). In a representative profile, the surface layer is grayish brown sandy loam about 8 inches (20 cm) thick. The subsoil, extending to a depth of 40 inches (101 cm), is dark gray loam in the upper part and gray sandy loam in the lower part. The underlying layer to a depth of 50 inches (127 cm) is gray sandy loam.

*Granville Series.* The Granville series consists of very deep, well drained, moderately permeable soils on Piedmont uplands. They formed in residuum weathered from Triassic sandstone and shale. The slope ranges from 0 to 10%. Soils are strongly acidic throughout, except when the surface is limited. Approximately two-thirds of the acreage of Granville soils is cultivated or used for pasture. Common vegetation includes white (*Quercus alba*), red (*Q. falcata*), black (*Q. velutina*) and post oaks (*Q. stellata*), hickory, sweetgum, red maple (*Acer rubrum*), sourwood (*Oxydendrum arboreum*), and dogwood (*Cornus* spp.). Shortleaf (*Pinus echinata*), Virginia (*P. virginiana*) and loblolly (*P. taeda*) pines are common, especially on old fields. In a representative profile, the surface layer is light yellowish brown sandy loam, about 3 inches (8 cm) thick. The underlying material is brownish yellow sandy clay loam saprolite weathered from Triassic material.

*Mayodan Series.* The Mayodan series consists of well drained, moderately permeable soils that formed in residuum weathered from Triassic materials of the Piedmont uplands. Slopes range from 1 to 25%. Approximately 65% of the acreage of Mayodan soils is cultivated or used for pasture. Forest vegetation includes white, red, black and post oaks, hickory, yellow poplar, sweetgum, red maple, sourwood, and flowering dogwood (*Cornus florida*). Shortleaf, Virginia, and loblolly pine are common in old fields. A representative layer consists of a surface layer of grayish brown sandy loam 3 inches (8 cm) thick. The subsoil, which extends 47 inches (119 cm), is strong brown sandy clay loam in the upper part and yellowish red sandy clay in the middle and lower parts. The underlying material is dark red and very pale brown clay.

*Creedmoor Series.* The Creedmoor series is composed of moderately well drained and somewhat poorly drained, very slow permeable soils that have formed in residuum weathered from Triassic materials of upland Piedmont origins. Slopes range from 0 to 15%. In a representative profile, the surface layer is dark gray sandy loam 2 inches (5 cm) thick. The subsurface layer is pale brown sandy loam 6 inches (16 cm) thick. The subsoil extends to 56 inches (142 cm). It is pale brown and brownish yellow sandy clay loam in the upper part; light yellowish brown clay in the middle part; and light gray clay and silty clay in the lower part. The underlying layer is fine sandy loam to 77 inches (195 cm). About one-third of the soil is under cultivation or in pasture, and the remainder is in forests of shortleaf and loblolly pine, oaks, hickory, and gum.

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*White Store Series.* The White Store series consists of moderately well drained, very firm, plastic, sticky, very slow permeable soils that have formed in residuum weathered Triassic material of the Piedmont uplands. White Store soils are on nearly level to moderately steep Piedmont uplands. Slopes range from 2 to 25%. About two-thirds of the total area is in forests of loblolly and shortleaf pines, oaks, hickories, and gums. The remainder is in cultivation or pasture. In a representative profile, the surface layer is brown, fine sandy loam about 6 inches (15 cm) thick. The subsoil extends to 35 inches (89 cm). It is strong brown clay loam in the upper part. The underlying material is dark reddish brown weathered sandstone to 38 inches (98 cm).

*Worsham Series.* Soils of the Worsham series are very deep and poorly drained. They are on uplands and formed in a mixture of colluvium and alluvium or in residuum. Typically these soils have a dark gray fine sandy loam surface layer 8 inches (20 cm) thick. The gray mottled subsoil layers (8–50 inches (20–127 cm) are sandy clay loam and sandy clay. Slopes range from 0 to 8%.

## HYDROLOGY

The refuge's hydrology is characterized by sheet-flow and stream flow. Water drains from upland areas through sheet-flow and small streams and collects in larger creeks (such as Brown Creek) which empty into the Pee Dee River. This hydrology is interrupted primarily by roads, where water is directed through culverts. Water is retained in impoundments and then slowly released to streams.

## AIR QUALITY

Air quality is high on the refuge due to its rural location. According to the Environmental Protection Agency (EPA), Anson and Richmond counties consistently maintain "attainment" (good air quality) status, which includes ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, particulates, and lead (EPA 2007). Factors that contribute to poor air quality are air stagnation due to temperature inversions and forest fires, although these episodes are typically not severe and of short duration.

## WATER QUALITY AND QUANTITY

The refuge's water quality has not been systematically assessed; however, some parameters (dissolved oxygen, pH, conductivity, and turbidity) were collected during an ichthyological survey conducted by Progress Energy (Progress Energy 2005a). Standing water in lakes and ponds is expected to be reasonably good due to limited input of sediment and pollutants. However, the streams, creeks and rivers on the refuge are thought to have fair to poor water quality. The EPA has listed Brown Creek as an impaired water body on its 2002 303(d) list (North Carolina Department of Environment and Natural Resources, Division of Water Quality 2002). Impairments include low dissolved oxygen and high sediment and turbidity levels. Low-order streams on the refuge (Canal Branch, Hurricane Creek, Pressley Creek, and Flat Fork Creek) received stream health scores of "Poor" or "Fair" using the North Carolina Index of Biotic Integrity (Progress Energy 2005a).

The water quality of two refuge ponds has been indirectly measured through mercury analyses of fish tissue (U.S. Fish and Wildlife Service 2007). All fish (catfish, sunfish, and largemouth bass) collected from Ross and Sullivan ponds contained mercury at concentrations that ranged between 0.01–0.88 parts per million (ppm) wet weight. Mercury levels were lowest in redear sunfish (median: 0.12 ppm) and highest in largemouth bass (median: 0.63 ppm). Mercury distribution nationwide can be attributed to a variety of natural (e.g., mercury deposits in certain geologic formations and soil types) and anthropogenic sources (e.g., fossil fuel combustion, solid waste incineration). All waters of the eastern United States are subject to continuous mercury loading through atmospheric deposition (EPA 2001).

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## BIOLOGICAL RESOURCES

Pee Dee National Wildlife Refuge protects a wealth of biological resources, including bottomland hardwoods, upland pine forests, mixed pine-hardwood forests, grasslands, croplands, and managed wetlands. Many species of fish, amphibians, reptiles, mammals, and birds use the refuge year-round or as part of their annual migrations, some of which are state- and federally-listed species.

### HABITAT

The refuge encompasses a variety of natural habitat types (Table 1). Artificial habitats consist of croplands, moist soil units, flooded crop impoundments, and a green tree reservoir (see Table 1 for habitat types and sizes and Figure 4 for a vegetation map).

**Table 1. Habitat types and sizes on Pee Dee National Wildlife Refuge.**

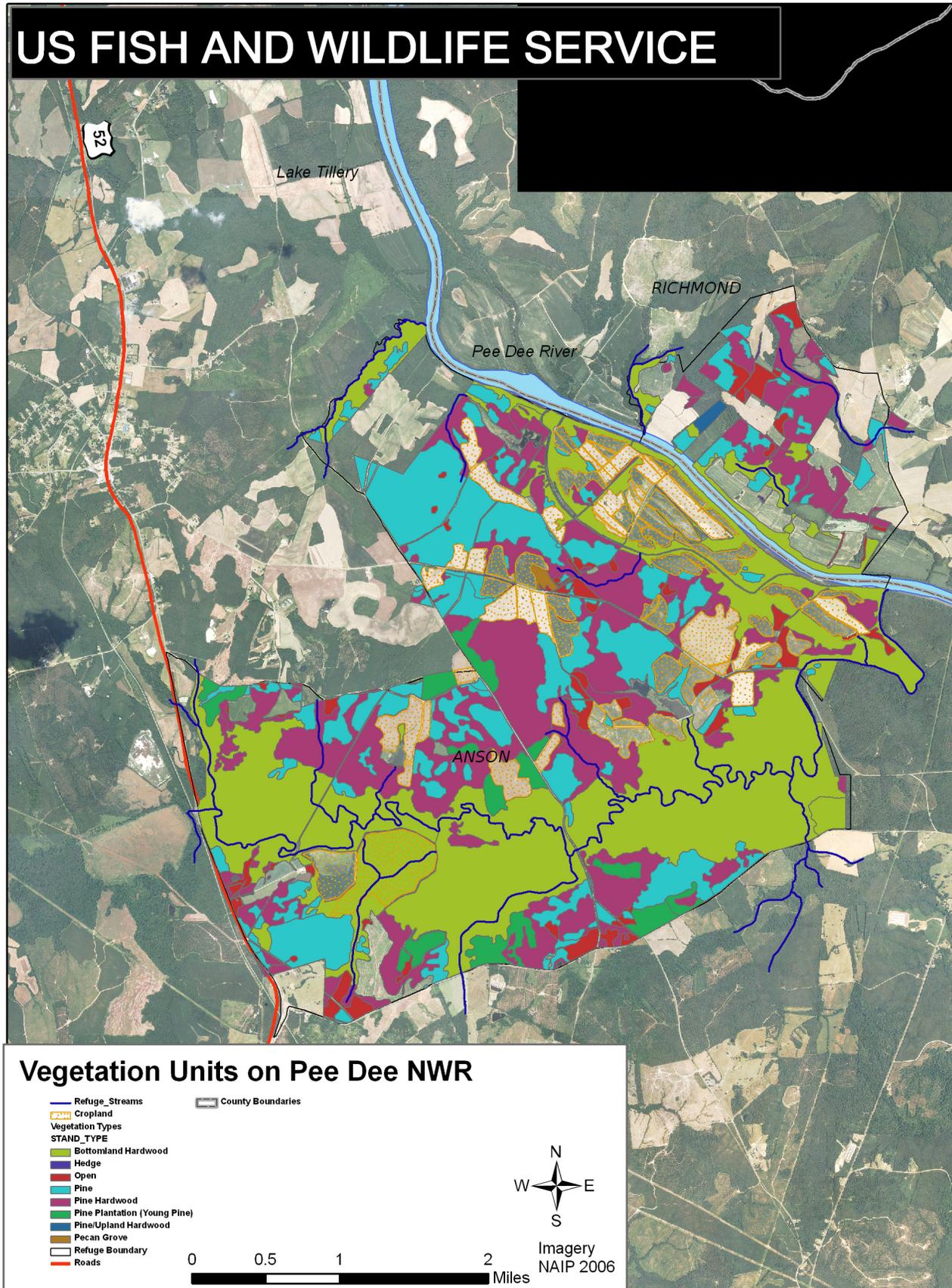
Habitat Type	Acres (Hectares)
Bottomland Hardwoods	2,895 (1,172)
Mixed Pine-Hardwoods	1,820 (737)
Upland Pine Forest	1,736 (703)
Croplands	1,161 (470)
Grasslands/Old Fields	732 (296)
Managed Wetlands	315 (127)
Open Water*	319 (129)
<b>Total</b>	<b>8,978 (3,634)</b>

\*Includes 140 acres of the Pee Dee River which flows through the refuge, but are not Service-owned

### Bottomland Hardwoods

A total of 2,895 acres (1,172 hectares) of bottomland hardwood habitat occurs on Pee Dee National Wildlife Refuge and is considered one of the largest contiguous tracts of this rare habitat type in North Carolina. The majority of this habitat type is located along the bottoms of the Pee Dee River, Brown Creek, Thoroughfare Creek, and Pressley Creek. Swamp chestnut oak (*Quercus michauxii*) and cherrybark oak (*Q. pagoda*) dominate the stands, along with lesser amounts of green and white ash (*Fraxinus pennsylvanica* and *F. americana*); mockernut and shagbark hickories (*Carya tomentosa* and *C. ovata*); white oak (*Q. alba*); and blackgum (*Nyssa sylvatica*). The understory is comprised of pawpaw (*Asimina triloba*), American hornbeam (*Carpinus caroliniana*), possumhaw (*Ilex decidua*), southern arrowwood (*Viburnum dentatum*), devils walkingstick (*Aralia spinosa*), and American holly (*Ilex opaca*).

Figure 4. Vegetation of Dee National Wildlife Refuge.



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### **Upland Pine Forests**

A total of 1,736 acres (703 hectares) of upland pine forest habitat occurs on Pee Dee National Wildlife Refuge. Of this, about 212 acres (86 hectares) consist of planted pine. This habitat type is made up of pure stands of loblolly pine (*Pinus taeda*) or mixtures in which loblolly makes up the majority of the stocking. The most common species mixed in is sweetgum (*Liquidambar* spp.). On the well drained sites, shortleaf (*P. echinata*), Virginia (*P. virginiana*) and longleaf pines (*P. palustris*) occur. The understory is rich in species diversity and numbers. Management techniques utilized in this habitat include prescribed fire and tree thinning (see Figure 5 for burn units and Figure 6 for timber stands).

### **Mixed Pine-Hardwood Forests**

A total of 1,820 acres (737 hectares) of mixed pine-hardwood forest occurs on the refuge. Loblolly and shortleaf pines are not predominant, but make up at least 25 percent of the stand. The hardwood species present differ depending on site wetness. Succession is strongly toward the hardwoods, and these sites can be considered transitional to various hardwood types. Thinning and prescribed fire (see Figures 5 and 6) are the primary management tools used in these areas, with low intensity fires (or no fire) used in areas where hardwoods dominate (to prevent hardwood tree mortality).

### **Grasslands and Old Fields**

Grassland and open areas total 732 acres (296 hectares) and include 85 acres (34 hectares) of road rights-of-way; 7.4 acres (3 hectares) of distribution rights-of way; and 18 acres (7 hectares) of a gas line right-of-way. These habitats are maintained using prescribed fire, mowing, and planting annuals and native grasses.

### **Croplands**

Croplands comprise 1,161 acres (470 hectares) of the Pee Dee National Wildlife Refuge (Figure 7). In 2006, 615 acres (249 hectares) were planted with corn and 547 acres (221 hectares) were planted with soybeans under the Cooperative Farming Program. Of these acreages, 20 percent of the crops are taken in standing corn left for wildlife or as commodity payments. A percentage of wheat is occasionally grown. In addition, in the upland fields, farmers are required to leave a 15-foot (4.6-meter) wide unplanted field border, which is left fallow or planted by refuge staff to a mix of annual wildlife food plantings.

### **Natural and Managed Wetlands**

Natural and managed wetlands are comprised of flooded crop impoundments, moist soil impoundments, manmade ponds and semipermanent wetlands, beaver ponds, and a manmade green tree reservoir (see Figure 8 for a map of the managed wetlands and Table 2 for their respective sizes). Management techniques used in these areas include prescribed fire, planting, mowing, and water level manipulation.

### **Nonnative Plants**

Nonnative plants have the potential to alter refuge habitats by displacing native plants, changing fire regimes, and altering soil hydrology (Miller 2003). Although a systematic inventory of nonnative plants has not been performed on the refuge, kudzu, Chinese privet and alligatorweed are present.

Kudzu (*Pueraria montana* var. *lobata*) is a fast-growing vine that can be a serious invader of seminatural or natural habitat. This species forms large impenetrable masses, growing over woody vegetation and engulfing unwooded areas. It kills trees by completely shutting out light, girdling woody stems and tree trunks, breaking branches or uprooting entire trees and shrubs from the sheer weight (Miller 2003). Kudzu is found on a few, relatively small areas of the refuge.

Figure 5. Burn Units, Pee Dee National Wildlife Refuge.

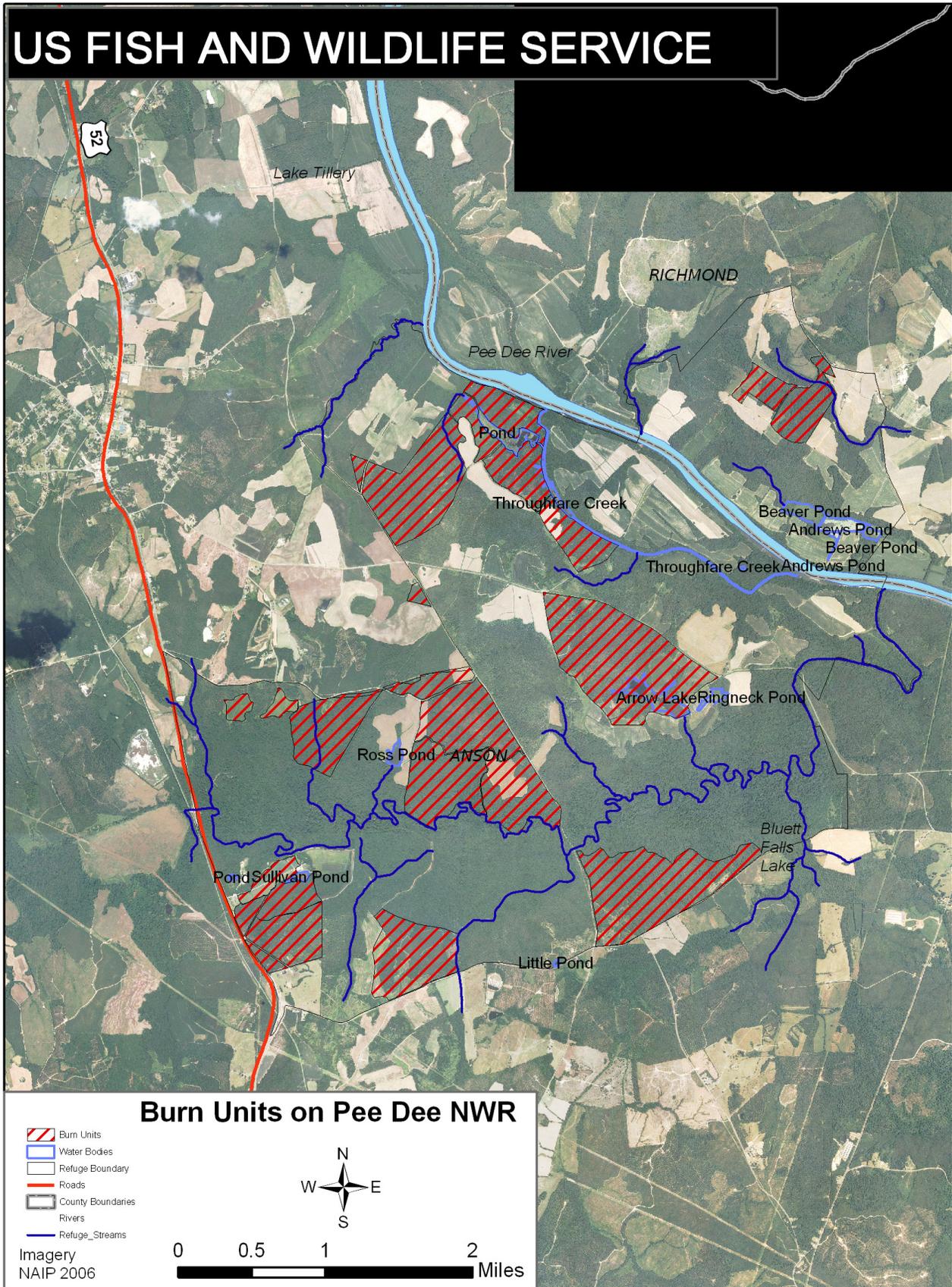


Figure 6. Timber stands, Pee Dee National Wildlife Refuge.

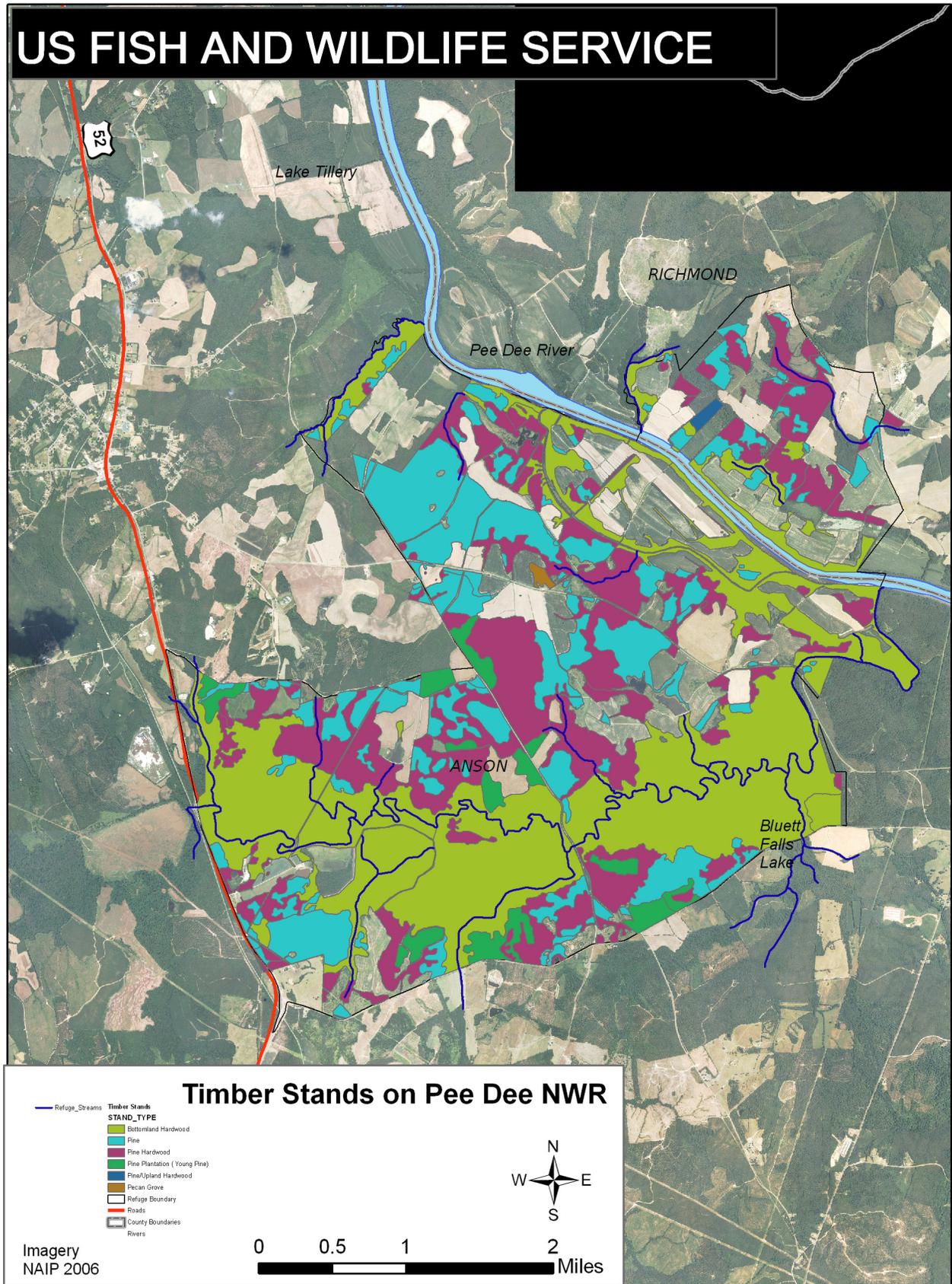


Figure 7. Croplands on Pee Dee National Wildlife Refuge.

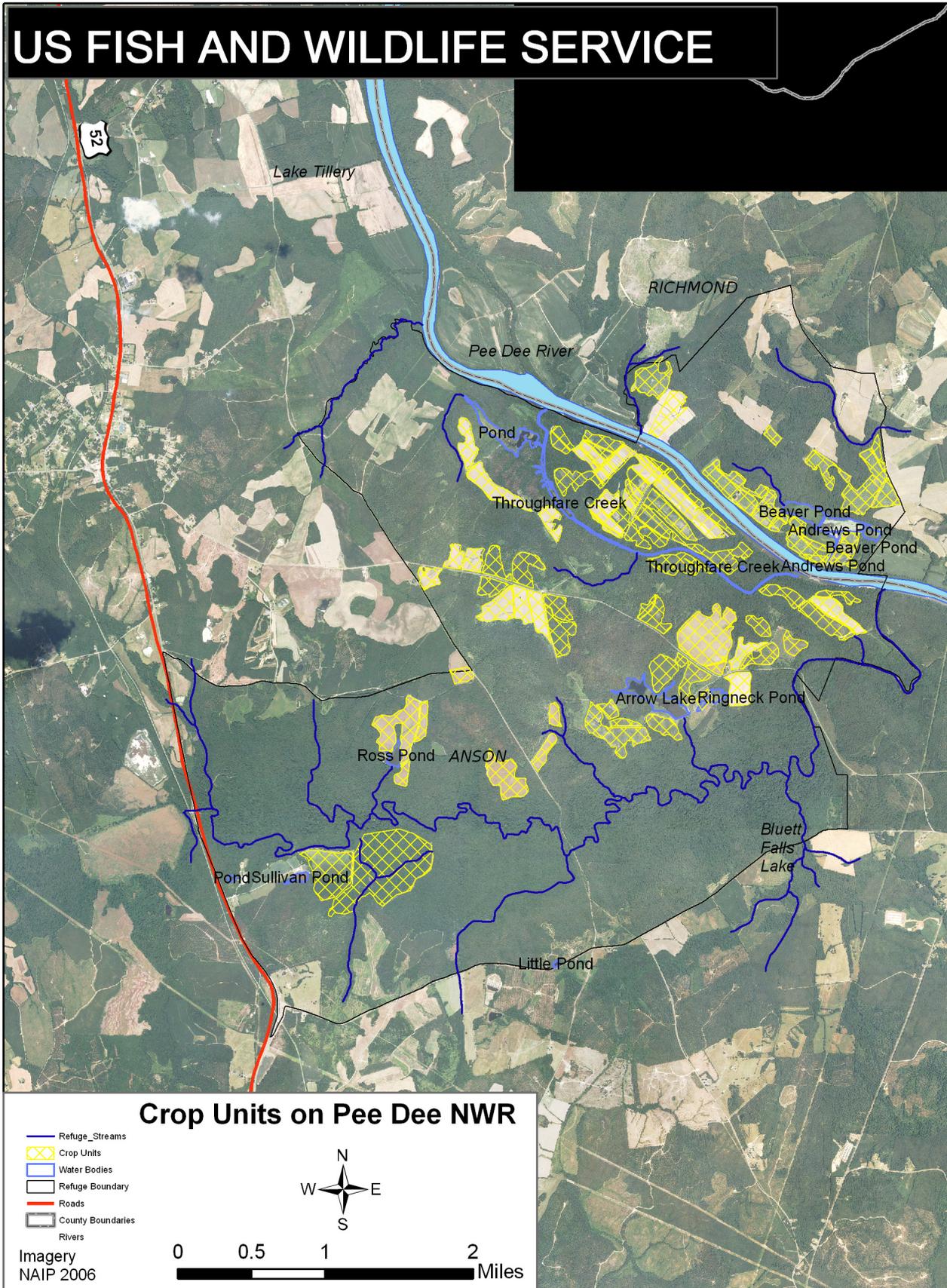
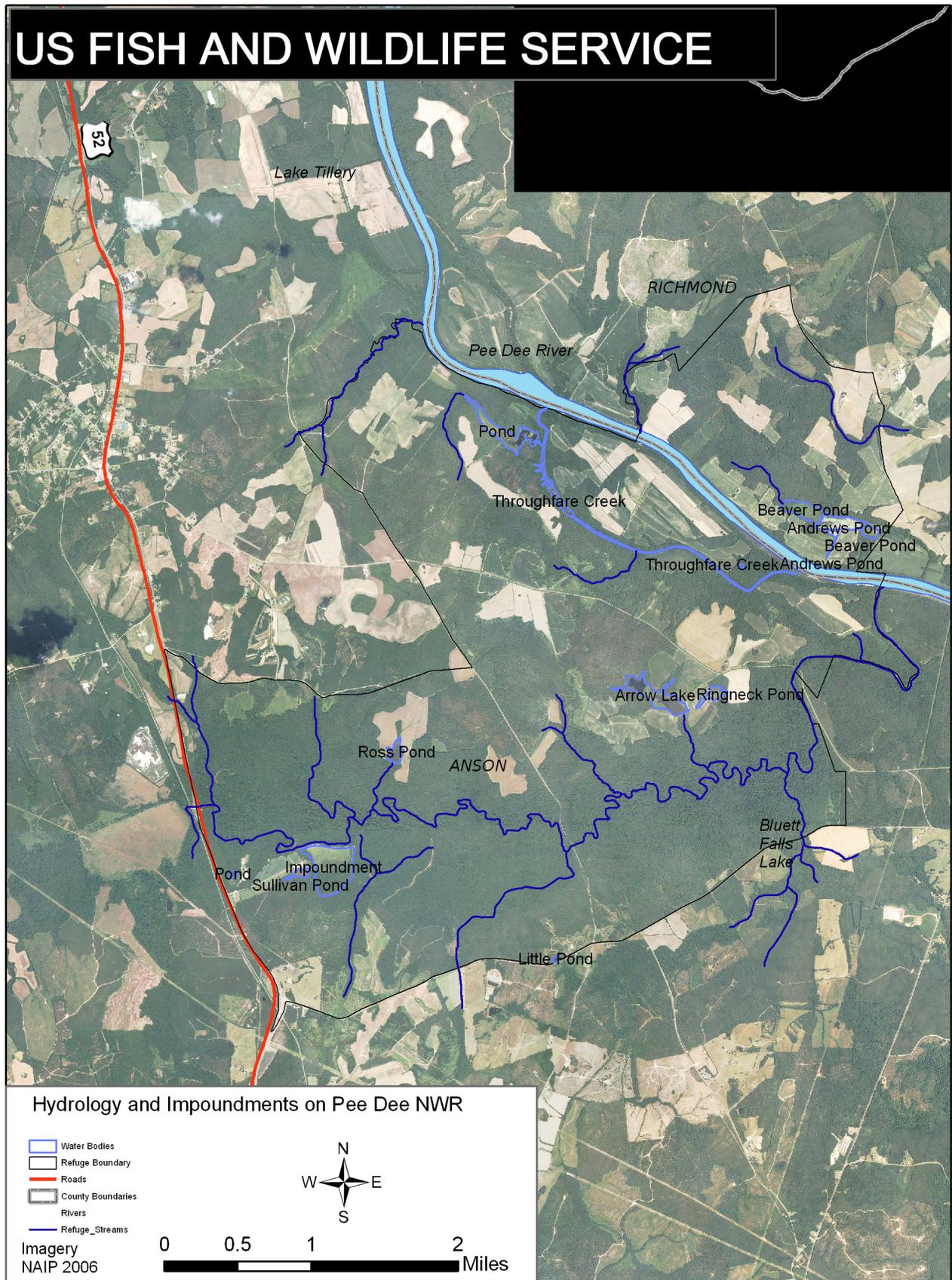


Figure 8. Managed wetlands, Pee Dee National Wildlife Refuge.



Alligatorweed (*Alternanthera philoxeroides*) displaces native plants in ditches, along banks, and in shallow water (Holm et al. 1997). It can also disrupt water flow, causing increased sedimentation; and can shade out submersed plants and animals, causing reduced oxygen levels beneath the mat (Quimby and Kay 1976). Alligatorweed has been documented in at least one of the refuge impoundments.

Chinese privet (*Ligustrum sinense*) is currently the most widespread nonnative weed on the refuge. It is an aggressive invasive, often forming dense thickets particularly in bottomland forests. Chinese privet is shade-tolerant and colonizes new areas by root sprouts and is spread widely by abundant bird- and other animal-dispersed seeds.

**Table 2. Acreages of open water and wetland habitats on Pee Dee NWR.**

<b>Unit</b>	<b>Acres / Hectares</b>	<b>Habitat Type</b>
Ross Pond	6.9 / 2.8	Manmade Pond
Sullivan Pond	3.8 / 1.5	Manmade Pond
Little Pond	0.8 / 0.3	Manmade Pond
Lower Ringneck Unit	6.4 / 2.6	Manmade Moist Soil Unit
Andrews Pond	17.8 / 7.2	Manmade Pond
Beaver Ponds	22 / 8.9	Beaver Ponds
Sullivan MSU	26.5 / 10.7	Manmade Moist Soil Unit
Arrowhead Lake	28.6 / 11.6	Manmade Lake
Unnamed Impoundments	51.6 / 20.9	Manmade Moist Soil Units
Green-tree Reservoir	135 / 54.6	Manmade Reservoir
Griffin Unit	60 / 24	Flooded Crop Impoundments
Patterson Unit	20 / 8	Flooded Crop Impoundments
Andrews Unit	10 / 4	Flooded Crop Impoundments
Upper Ringneck Unit	10 / 4	Manmade Moist Soil Unit
<b>Total</b>	<b>399.4 / 161.1</b>	

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## Wildlife

The lands and waters of Pee Dee National Wildlife Refuge provide habitat for a variety of wildlife, including invertebrates; at least 35 species of fish; 48 species of amphibians and reptiles; 28 species of mammals; and more than 175 species of birds (see Appendix I, Refuge Biota). Several representative species from each category are described below.

### Invertebrates

Aquatic invertebrates on the refuge include crayfish, snails, and mussels. More than 10 species of mussels have been documented on the refuge (Progress Energy 2005b; J. Fridell, USFWS, personal communication, 20 Nov. 2007), including the eastern elliptio (*Elliptio complanata*), Carolina lance (*E. angustata*), Carolina creekshell (*Villosa vaughaniana*), notched rainbow (*V. constricta*), eastern creekshell, (*V. delumbis*), brook floater (*Alasmidonta varicosa*) and creeper (*Strophitus undulatus*). Crayfish likely to be found on the refuge include those species in the genus *Cambarus* and *Procambarus*. Listed crayfish species were not documented during a 2005 study along the Pee Dee River (Progress Energy 2005b). An inventory of terrestrial invertebrates has not been performed on the refuge. However, at least a few state-listed insects are likely to occur on the refuge, as several dozen have been documented in Anson and Richmond counties (North Carolina Natural Heritage Program 2004).

### Fish

A total of 35 species of fish were encountered in a fishery survey on the refuge (Progress Energy 2005a). These include the longnose gar (*Lepisosteus osseus*), American eel (*Anguilla rostrata*), and gizzard shad (*Dorosoma cepedianum*). Common species included largemouth bass (*Micropterus salmoides*), black crappie (*Pomoxis nigromaculatus*), several species of sunfish (*Lepomis* spp.), catfish (*Ameiurus* and *Ictalurus* spp.), shiners (*Notropis* spp.), darters (*Etheostoma* spp.), and eastern mosquitofish (*Gambusia holbrooki*). At least one listed species, the Carolina darter (*Etheostoma collis*), has been documented.

Nonnative fish found on the refuge include common carp (*Cyprinus carpio*), comely shiner (*Notropis amoenus*), smallmouth buffalo (*Ictiobus bubalus*), blue and channel catfish (*Ictalurus furcatus* and *I. punctatus*), flathead catfish (*Pylodictis olivaris*), green sunfish (*Lepomis cyanellus*), and yellow perch (*Perca flavescens*). The ecological effects of these nonnative fish have been evaluated for only a few of these species, such as carp and flathead catfish. Carp, a bottom-feeder, are known to negatively impact native fish by removing aquatic vegetation, which, in turn, causes a decline in water quality (Hill 1999). Flathead catfish, a large predatory species, has the potential to cause changes in North Carolina freshwater fish communities (Pine et al. 2005) and has been named one of the worst nonnative species of fish in the United States (Fuller 1999).

### Amphibians

Amphibians have not been intensively surveyed on the refuge, but several species have been documented. North Carolina and the Piedmont, in particular, have a high diversity of salamanders. Nine species of salamanders have been found on the refuge. The salamanders likely to be found along streams and in wetlands on the refuge include the Eastern newt (*Notophthalmus viridescens*), two-lined salamander (*Eurycea bislineata*), and marbled salamander (*Ambystoma opacum*), while slimy salamanders (*Plethodon glutinosus*) are common in woodlands. Toads include the Eastern spade-foot (*Scaphiopus holbrooki*), which prefers sandy lowlands; Fowler's toad (*Bufo woodhousei*), which is found near wetlands; the woodland oak toad (*B. quercicus*); and the American toad (*B. americanus*), a species that can be found in a variety of habitats. At least nine species of frogs are found on the refuge. Aquatic and wetland species include the bullfrog (*Rana catesbeiana*), green frog (*R. clamitans*), and Northern cricket frog (*Acris crepitans*), whereas the gray treefrog (*Hyla chrysoscelis*) occupies woodlands.

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## Reptiles

Although a thorough survey of reptiles has not been performed on the refuge, six species of lizards, 13 species of snakes, and seven species of turtles have been documented on the refuge. The six-lined racerunner (*Cnemidophorus sexlineatus*) and the eastern fence lizard (*Sceloporus undulatus*) are likely to be found in drier habitats. Several species of skinks, such as the broadheaded skink (*Eumeces laticeps*), are found in many refuge habitats. Snakes that could be encountered on the refuge include common species such as black racers (*Coluber constrictor*), corn snakes (*Elaphe guttata*), and rat snakes (*E. obsoleta*), which utilize several different habitats. The eastern hognose snake (*Heterodon platirhinos*) usually occupies drier, sandy areas. Several water snakes may be found along the streams, ponds, and wetlands, including *Nerodia* spp. as well as brown water snakes (*Storeria dekayi*). The most common venomous snake in the Piedmont is the copperhead (*Agkistrodon contortrix*), a species that can be found in the refuge's fields and lowlands. Turtles on the refuge include mostly aquatic species such as the snapping turtle (*Chelydra serpentina*); musk turtle (*Sternotherus odoratus*); one or more species of terrapins (*Chrysemys* spp.); and possibly the softshell turtle (*Apalone spinifera*). The only terrestrial turtle on the refuge is the eastern box turtle (*Terrapene carolina*), a species that inhabits pastures and woods.

## Birds

The refuge is an important stopover area for many species of migratory birds and songbirds during the fall and spring. The refuge lies midway along the Atlantic Flyway, and thus many species of migratory birds feed and rest on the refuge during their annual migrations. The refuge impoundments also serve an important role as an inviolate sanctuary for waterfowl during the winter, since no hunting is allowed. In total, more than 188 species of birds can be found using the refuge seasonally. This includes a number of federally and state-listed avian species, several of which are discussed in the Endangered, Threatened and Imperiled Species section below. Waterfowl, wading birds, shorebirds, and neotropical migratory birds (i.e., songbirds or passerines) all depend on the diverse habitats available on the refuge.

*Waterfowl.* The planning region for the Atlantic Coast Joint Venture (ACJV) includes Pee Dee National Wildlife Refuge. The ACJV is a partnership of private and public entities working together for the conservation of native birds in the Atlantic Flyway region of the United States. The highest priority nonbreeding waterfowl species identified in the ACJV are the Canada goose (*Branta canadensis*, Atlantic and Southern James Bay populations) and the American black duck (*Anas rubripes*). These two species are found on Pee Dee National Wildlife Refuge. Other species that utilize the refuge's wetland forests, ponds, impoundments, and croplands include the wood duck (*Aix sponsa*), American wigeon (*Anas americana*), mallards (*Anas platyrhynchos*), blue-winged teal (*Anas discors*), ring-necked ducks (*Aythya collaris*), and hooded mergansers (*Lophodytes cucullatus*). Several of these species nest on the refuge, while others use it as a stopover site to feed and rest during their migrations.

*Shorebirds.* Pee Dee National Wildlife Refuge was identified in the Southeast Coastal Plain–Caribbean Shorebird Conservation Plan (Southeast SCP) as an important refuge for shorebirds. Shorebird species include the killdeer (*Charadrius vociferous*), lesser yellowlegs (*Tringa flavipes*), Wilson's snipe (*Gallinago delicata*), and several species of sandpipers (*Calidris* spp). None of these species are likely to breed on the refuge; however, the refuge provides suitable foraging habitat for spring and fall migrating and overwintering birds. Although the refuge does not support breeding populations, its role in providing stopover habitat during the spring and fall migrations is important. Availability of foraging habitats during key migratory periods has been shown to be critical for the persistence of long-distance migrants. One habitat goal stated in the Southeast SCP is to provide dedicated, high quality managed habitat to support the energetic requirements of in-transit migrants.

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**Wading Birds.** Wading birds at the refuge utilize a broad range of wetland habitat types for foraging, roosting, and nesting. Refuge habitats frequented by wading birds include both natural and manmade features, natural wetlands, impoundments, and shallow streams and creeks. Great blue herons (*Ardea herodias*) and green herons (*Butorides virescen*) are common on the refuge.

**Landbirds.** Several species of landbirds are known or likely to occur within the refuge, including priority species identified by the Southern Piedmont Bird Conservation Plan, North Carolina Partners in Flight, and the North Carolina Bird Species Assessment. However, due to their inconspicuousness or a general lack of quantitative abundance data, it remains unclear to what extent they occur on the refuge or how significantly the refuge might contribute to their conservation. The refuge's upland habitats are utilized by priority species such as wood thrush (*Hylocichla mustelina*), eastern wood-pewee (*Contopus virens*), yellow-billed cuckoo (*Coccyzus americanus*), pileated woodpecker (*Dryocopus pileatus*), and yellow-throated vireo (*Vireo flavifrons*). Priority species in riparian habitats include the Louisiana water thrush (*Seiurus motacilla*), hooded warbler (*Wilsonia citrine*), Acadian flycatcher (*Empidonax virescens*), northern parula (*Parula americana*), Kentucky warbler (*Oporornis formosus*), prothonotary warbler (*Protonotaria citrea*), and Swainson's warbler (*Limnothlypis swainsonii*).

**Nonnative Birds.** Several species of nonnative birds have been documented on the refuge, including the cattle egret (*Bubulcus ibis*), European starling (*Sturnus vulgaris*), house sparrow (*Passer domesticus*), and rock pigeon (*Columba livia*). Cattle egrets first colonized South America during the 1930s and soon thereafter invaded North America (Crosby 1972). This species has been documented to compete with native wading birds in rookeries (Burger 1978). European starlings compete aggressively for nesting cavities, often to the detriment of native birds (Kerpez and Smith 1990). Similarly, house sparrows will supplant and even kill native species attempting to use nest boxes (Gowaty 1984; Radunzel et al. 1997). The European starling is known for its propensity to damage fruit crops, sprouted seeds, and livestock feedlots (Dolbeer et al. 1978; Somers and Morris 2002). Starlings are major components of winter blackbird roosts which are noisy, smelly and generally not aesthetically pleasing (Dolbeer et al. 1978; Mott 1980).

### **Mammals**

The mammals found on Pee Dee National Wildlife Refuge are likely to include those that are relatively common state-wide. Bobcats (*Lynx rufus*) are the largest native predators on the refuge and will be found in a variety of habitats. Smaller predators include the opossum (*Didelphis virginiana*); raccoon (*Procyon lotor*); striped skunk (*Mephitis mephitis*); red fox (*Vulpes vulpes*); gray fox (*Urocyon cinereoargenteus*); and otter (*Lutra canadensis*). Conspicuous herbivores include white-tailed deer (*Odocoileus virginianus*), beaver (*Castor canadensis*), gray squirrel (*Sciurus carolinensis*), fox squirrel (*Sciurus niger*), and cottontail rabbits (*Sylvilagus floridanus*). In addition, numerous species of rats, mice, voles, bats, shrews, and moles occupy various habitats on the refuge.

Nonnative mammals include the coyote (*Canis latrans*) and feral hogs (*Sus scrofa*). Coyotes have colonized the eastern United States during the last 100 years and continue to expand their range (Hill et al. 1987). Coyotes are highly opportunistic, generalist feeders, with a varied diet that usually includes rodents, birds, and fruit (Gammons 2004). However, coyotes can also prey on larger species. Although coyotes are not known to seriously impact quail populations (Henke 2002), they can be important predators of deer (Brundige 1993; Patterson and Messier 2003), wild turkey (Ballard 2003), and livestock (Houben 2004). A potentially much more problematic species is the feral hog. This species has been listed among the world's 100 worst nonnative species by the World Conservation Union (Invasive Species Specialist Group 2007) due to its predation on native species and habitat destruction.

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## ENDANGERED, THREATENED, AND IMPERILED SPECIES

Several federally and state-listed endangered or threatened species are known to occur or potentially occur within the refuge. They include birds, mammals, reptiles, amphibians, fish, freshwater mussels, and several species of plants (Table 2).

### **Bald Eagle**

The bald eagle (*Haliaeetus leucocephalus*) is a large raptor whose populations declined through hunting, habitat loss, and pesticide poisoning (Buehler 2000). In 1967 it was listed as endangered. Through various conservation efforts, the bald eagle's status was changed to threatened in 1995 and removed from the Federal Endangered and Threatened Species List in July 2007. It remains federally protected under the 1940 Bald and Golden Eagle Protection Act and is state-listed as threatened. It is primarily associated with coasts, rivers, and lakes, usually nesting near bodies of water where it feeds. There are no documented bald eagle nests within the refuge; however, two to four eagles have been annually documented feeding and roosting in the area during winter. In addition, a few migratory bald eagles have been noted moving through the area during the colder months.

### **Little Blue Heron**

One of the wading birds, the little blue heron (*Egretta caerulea*), forages in shallow water for small fish and invertebrates. As a result of farmland expansion, residential development, and recreation, changes in water levels and flow have degraded coastal and riparian wetlands for breeding and wintering herons (Rogers and Smith 1995). The little blue heron is occasionally observed on the refuge, especially during summer and fall. This species is state-listed as one of special concern.

### **Loggerhead Shrike**

The loggerhead shrike (*Lanius ludovicianus ludovicianus*) is known for its unique behavior of impaling its prey on thorns, barbed-wire fences, and similar projections, hence its preference for nesting near areas containing such "larders." Throughout its range, its habitat typically includes grasslands interspersed with scattered trees and shrubs that provide nesting and perching sites. A variety of habitats often occur within breeding territories, including cultivated cropland, transportation rights-of-way, and shelterbelts. Loggerhead shrikes are declining nationwide. One hypothesis for their decreasing populations suggests that the abandonment of many farms and orchards, overgrown from neglect, has created unfavorable nesting habitat. Roadkills and pesticide contamination may also be factors (Yosef 1996). Though uncommon on the refuge year-round, the loggerhead shrike is known to breed on Pee Dee National Wildlife Refuge.

### **Red-cockaded Woodpecker**

The red-cockaded woodpecker (RCW) (*Picoides borealis*) is a nonmigratory bird of mature southern pine forests. Its preference for longleaf pine and the destruction of that habitat have resulted in the woodpecker becoming federally listed as an endangered species in 1970 (Hooper et al. 1980). It is a cooperative breeder and lives in family units or groups that consist of a breeding pair and previous offspring that jointly raise each successive brood. Each group inhabits a "cluster" of cavity trees. Historically, three sites or "clusters" were present on Pee Dee National Wildlife Refuge. The last known occurrence of a single male RCW was in 1999–2000. Prior to 2000, the cluster occupied by the solitary male was augmented with four artificial cavities and two female RCWs were released in an attempt to establish a breeding pair, but these efforts proved unsuccessful.

### **Rafinesque's Big-eared Bat**

Rafinesque's big-eared bats (*Corynorhinus rafinesquii rafinesquii*) typically require large hollow trees for roosting and raising their young. Throughout their range, many such roosts have been lost. The relatively few remaining colonies now survive primarily in lowland tree hollows that are subject to flooding, or in abandoned buildings that are prone to human disturbance and structural collapse from decay. Some occupy cave entrances and rock shelters, again where they are easily disturbed. The status and

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distribution of this species on the refuge is unknown, although it has been documented via echolocation (M. Kalcounis-Rueppell, University of North Carolina, personal communication, 14 Sept. 2004). These bats are federally listed as of special concern and designated as threatened by NCWRC.

### **Stream Fish**

Due to continued degradation of water quality from runoff and pollution, several species of stream fish in North Carolina have declined significantly (Warren et al. 2000). Stream fish need clean, well-oxygenated water that is free of sediments that can smother foraging areas and spawning grounds. The Carolina darter (*Etheostoma collis*), listed by the Service and NCWRC as a species of special concern, has been documented on the refuge (Progress Energy 2005a). The Carolina redhorse (*Moxostoma* sp. 2) could also be found in the section of the Pee Dee River that flows through the refuge as it has been documented from nearby areas. This species was only recently discovered (1995) as a distinct species (hence it has not been fully named to date) and has been extirpated throughout most of its former range (Dr. W. Starnes, North Carolina Museum of Natural Science, personal communication, 15 Nov. 2007).

### **Diadromous Fish**

Diadromous fish migrate between salt and freshwater to complete part of their life cycle. Some spawn in freshwater and migrate to marine habitats to mature (e.g., salmon, some shad species), while others spawn in the ocean and become adults in freshwater (e.g., eels). Prior to the European colonization of North America, several diadromous species were found in the Pee Dee River and its tributaries. These included the shortnose sturgeon (*Acipenser brevirostrum*), Atlantic sturgeon (*Acipenser oxyrinchus*), blueback herring (*Alosa aestivalis*), hickory shad (*A. mediocris*), American shad (*A. sapidissima*), American eel (*Anguilla rostrata*), and striped bass (*Morone saxatilis*). Populations of these species in North America have declined due to overfishing, loss of habitat, limited access to spawning areas (blocked by dams), and water pollution, promoting state and federal protective measures (U.S. Fish and Wildlife Service, National Marine Fisheries Service, North Carolina Wildlife Resources Commission, and South Carolina Department of Natural Resources 2006). These species cannot pass Blewett Falls dam, which is located downstream of the refuge on the Pee Dee River, and are consequently unlikely to be found on the refuge (M. Bowers, USFWS, personal communication, 12 June 2007). Only the American eel has been documented on the refuge (Progress Energy 2005a).

### **Freshwater Mussels**

The decline of freshwater mussels (Family Unionidae), which began in the late 1800s, has resulted from various habitat disturbances, and most significantly, the modification and destruction of aquatic habitats by dams and pollution (Williams et al. 1993). Nonnative bivalves such as Asian clams (*Corbicula fluminea*) and zebra mussels (*Dreissena polymorpha*) have also contributed to the decline of native freshwater mussels (Leff et al. 1990, Haag et al. 1993). In North Carolina alone, over 50 species of freshwater mussels are federally and/or State listed (NCWRC 2004). Several freshwater mussel species have been documented on the refuge (Alderman 2005), including two federal species of concern, Carolina creekshell (*Villosa vaughaniana*) and brook floater (*Alasmidonta varicosa*). State and Natural Heritage Program listed species documented in Brown Creek and Little Brown Creek include eastern creekshell, creeper, and eastern lampmussel (J. Fridell, USFWS, personal communication, 20 Nov. 2007). Table 3 lists the state- and federally protected freshwater mussels that are documented and potentially found on the refuge.

**Table 3. State and federally listed fish and wildlife species documented and potentially occurring on Pee Dee NWR.**

Common Name	Scientific Name	Status	
		NCWRC	USFWS
<b>FRESHWATER MUSSELS</b>			
Alewife Floater	<i>Anodonta implicata</i>	T	-
Brook Floater	<i>Alasmidonta varicosa</i>	E	SC
Carolina Creekshell	<i>Villosa vaughaniana</i>	E	SC
Carolina Fatmucket	<i>Lampsilis radiata conspicua</i>	T	-
Carolina Heelsplitter	<i>Lasmigona decorata</i>	E	E
Creeper	<i>Strophitus undulatus</i>	T	-
Eastern Creekshell	<i>Villosa delumbis</i>	SR	-
Eastern Lampmussel	<i>Lampsilis radiata</i>	T	-
Eastern Pondmussel	<i>Ligumia nasuta</i>	T	-
Notched Rainbow	<i>Villosa constricta</i>	SC	-
Roanoke Slabshell	<i>Elliptio roanokensis</i>	T	-
Yellow Lampmussel	<i>Lampsilis cariosa</i>	E	SC
<b>FISH</b>			
Carolina Darter	<i>Etheostoma collis</i>	SC	SC
Carolina Redhorse	<i>Moxostoma</i> sp. 2	SC	C
<b>MAMMALS</b>			
Rafinesque's Big-eared Bat	<i>Corynorhinus rafinesquii rafinesquii</i>	T	SC
<b>BIRDS</b>			
Bald Eagle	<i>Haliaeetus leucocephalus</i>	T	-
Little Blue Heron	<i>Egretta caerulea</i>	SC	-
Loggerhead Shrike	<i>Lanius ludovicianus ludovicianus</i>	SC	-
Red-cockaded Woodpecker	<i>Picoides borealis</i>	E	E

Key: C=Candidate for potential listing, E=endangered, SC= species of concern, SR=Significantly Rare (Natural Heritage Program), T=threatened

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## Listed Plants

North Carolina has a number of rare and imperiled plant species (North Carolina Department of Environment and Natural Resources 2002). These listed plants have declined due to habitat loss from urbanization and agriculture, changes in land use (e.g., fire suppression), competition with exotic plants, and changes in hydrology. The listed species of plants that potentially occur on Pee Dee National Wildlife Refuge, based on documented occurrences for Anson and/or Richmond counties (North Carolina Department of Environment and Natural Resources 2002), are shown in Table 4. This list was further developed through input from the North Carolina Natural Heritage Program (M. Schafale and B. Sorrie, personal communication, September 2007). Most of these are state-listed plants, but also include a federally endangered species, the Schweinitz's sunflower (*Helianthus schweinitzii*).

**Table 4. Listed plant species potentially occurring on Pee Dee NWR.**

Common Name	Scientific Name	Status	
		NCWRC	USFWS
Dwarf Aster	<i>Eurybia mirabilis</i>	SC	-
Flatrock Panic Grass	<i>Panicum lithophilum</i>	SC	-
Georgia Lead-plant	<i>Amorpha georgiana</i> var. <i>georgiana</i>	E	SC
Huger's Carrion-flower	<i>Smilax hugeri</i>	SC	-
Roughleaf Yellow-eyed Grass	<i>Xyris scabrifolia</i>	SC	-
Sandhills Milk-vetch	<i>Astragalus michauxii</i>	T	SC
Schweinitz's Sunflower	<i>Helianthus schweinitzii</i>	E	E
Small-leaved Meadow-rue	<i>Thalictrum macrostylum</i>	SC	-
Thick-pod White Wild Indigo	<i>Baptisia alba</i>	SC	-

Key: E=endangered, SC= species of concern

## CULTURAL RESOURCES

Several archeological studies have been performed on Pee Dee National Wildlife Refuge (Anderson and Bryant 2000; Joy 1994; Garrow 1979; Cooper and Derting 1976). The results of these studies have shown that areas surrounding the Pee Dee River and Brown Creek had appreciable prehistoric use. Although many of the findings could not unambiguously dated, some artifacts were diagnostic to the Early – Late Archaic period (8,000 – 1,000 B.C.).

## SOCIOECONOMIC ENVIRONMENT

North Carolina's estimated population growth is 34,500 people annually, with 14,500 acres (5,868 hectares) developed yearly in association with that increase (Costa and Petersen 2002). It is considered one of seven fastest-growing states in the nation (U.S. Census Bureau 2000). The state's population is currently estimated at 8,856,505 and is expected to surpass 10 million by 2025 (U.S. Census Bureau 2000). Although the populations of Anson and Richmond counties are not expected to increase substantially, certain neighboring counties such as Mecklenburg and Union will become significantly more populated by 2019, as shown in Table 5 (North Carolina State Demographic Unit 2007; South Carolina Office of Research and Statistics 2007).

In 2000, the population density of Anson County was 48 persons per square mile (mi<sup>2</sup>) or 18 persons per square kilometer (km<sup>2</sup>). There were 10,221 housing units at an average density of 19 units/mi<sup>2</sup> (7 units/km<sup>2</sup>). The racial makeup of the county was 49.53% White; 48.64% Black or African-American; 0.45% Native American; 0.57% Asian; 0.02% Pacific Islander; 0.32% from other races; and 0.46% from two or more races. About 0.83% of the population was Hispanic or Latino of any race. The major economic activities include manufacturing; retail; technical services; health care; accommodation and food services; and agriculture. The land use is primarily agricultural, followed by silviculture and urban areas (North Carolina State Demographic Unit 2007).

With the exception of population density, the demographics for Richmond County were similar to those of Anson County in 2000. The population density was 98/mi<sup>2</sup> (38/km<sup>2</sup>). There were 19,886 housing units at an average density of 42/mi<sup>2</sup> (16/km<sup>2</sup>). The racial makeup of the county was 64.84% White; 30.53% Black or African-American; 1.65% Native American; 0.68% Asian; 0.03% Pacific Islander; 1.08% from other races; and 1.18% from two or more races. About 2.83% of the population was Hispanic or Latino of any race. Manufacturing, retail, health care, and accommodation and food services were the major employment sectors in 2000. Land use consists mostly of farming, followed by urban areas (North Carolina State Demographic Unit 2007).

**Table 5. Regional county population data for Pee Dee NWR.**

County	2005 Population	Percent Increase (2000–2005)	Predicted 2019 Population*
<b>Home Counties</b>			
Anson	25,766	1.9%	27,279
Richmond	46,676	0.2%	47,335
<b>Nearby Counties</b>			
Chesterfield (SC)	<b>42,768</b>	10.9% (1990-2000)	46,850
Mecklenburg	796,232	14.5%	1,093,595
Montgomery	27,359	2.0%	30,412
Stanly	58,912	1.4%	64,265
Union	161,332	30.3%	249,559

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Fishing, hunting, and other wildlife-associated activities are an important component of the recreational opportunities available in North Carolina (U.S. Department of the Interior, Fish and Wildlife Service and U.S. Department of Commerce, U.S. Census Bureau 2001). More than two million North Carolina residents and nonresidents engaged in hunting, fishing, and wildlife-watching activities. Birdwatchers comprised the largest component (75%) of the wildlife-related activities, with over 1.3 million people engaged in this activity. In 2001, state residents and nonresidents spent nearly \$2.5 billion on wildlife-oriented recreation in North Carolina. Of that total, trip-related expenditures were \$703 million and equipment purchases were \$1.5 billion. The remaining \$227 million was spent on licenses, contributions, land ownership and leasing, and other items and services.

## **REFUGE ADMINISTRATION AND MANAGEMENT**

### **Land Protection and Conservation**

Pee Dee National Wildlife Refuge oversees 20 conservation easements, totaling approximately 1,305 acres (528 hectares) located in eight counties (Anson, Bladen, Cabarrus, Columbus, Hoke, Lincoln, Robeson and Scotland) (Figure 9). The easement properties range in size from 14 to 224 acres (5.7 to 90.6 hectares) and are predominantly wetlands with a few consisting of upland pine forests. These easements are placed under Service management as part of the Farm Service Agency's formerly Farmers Home Administration (FmHA) Inventory Property Disposal Program. The Farm Service Agency (FSA) is an agency of the U.S. Department of Agriculture. FSA provides farm ownership, farm operating, and other loans to farmers and ranchers unable to obtain credit from commercial lending institutions. In many instances, FSA obtains real property used to secure loans when those loans are defaulted. FSA obtains these properties through foreclosure actions that it or another lienholder initiates on delinquent real estate loans, or through voluntary conveyances from delinquent borrowers in lieu of foreclosure. FSA holds these properties in inventory until they can be sold to other parties or otherwise be disposed. FSA has an affirmative responsibility to protect wetlands, floodplains, and other important resources located on inventory properties prior to their disposal. Two primary mechanisms exist to conserve important resources on properties sold or otherwise transferred out of inventory status. Important resources on inventory properties can be protected from future degradation through a conservation easement or through fee title transfer for conservation purposes.

### **Visitor Services**

The purpose of the refuge's visitor services program is to provide opportunities for appropriate and compatible wildlife-oriented recreation to enable the public to enjoy the refuge (see Figure 10 for public use map). Approximately 30,000–35,000 visitors come to Pee Dee National Wildlife Refuge annually. The refuge has a visitor contact area in the Refuge Office, where visitors can obtain maps and brochures; and three informational kiosks located around the refuge. Wildlife observation and photography opportunities exist along several trails and wildlife drives. Every year, at least 6,000 hunters visit the refuge to hunt for deer, turkey, quail, dove, and small game (see Figure 11 for hunt areas). Fishing is also a popular activity on the refuge, and opportunities exist along several ponds, streams, Brown Creek, and the Pee Dee River. The refuge hosts a variety of environmental education programs for grade schools and college students. For environmental interpretation, the refuge offers brochures, a kiosk, the Tall Pines Trail, and the Gaddy Covered Bridge (Figure 10).

### **Personnel, Operations and Maintenance**

The refuge headquarters office is located near the town of Wadesboro, North Carolina, a small community population of approximately 3,500 people. The refuge occupies a unique location where the rolling hills of the Piedmont drain into the wetland and aquatic habitats of the Pee Dee River and Brown Creek. The majority of the refuge lies within Anson County, with only a very small portion in Richmond County.

Figure 9. Conservation easements, Pee Dee National Wildlife Refuge.

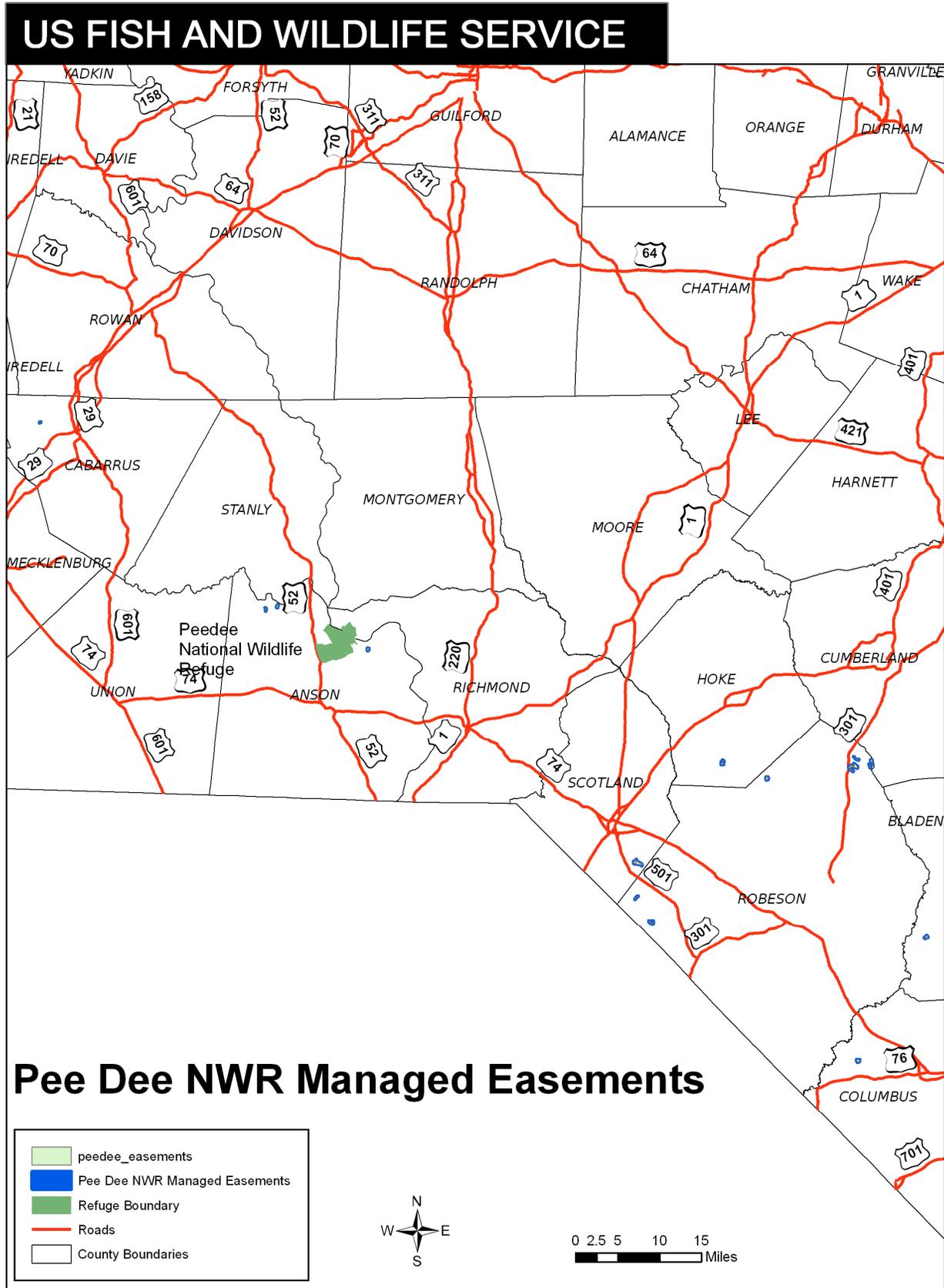


Figure 10. Public use areas, Pee Dee National Wildlife Refuge.

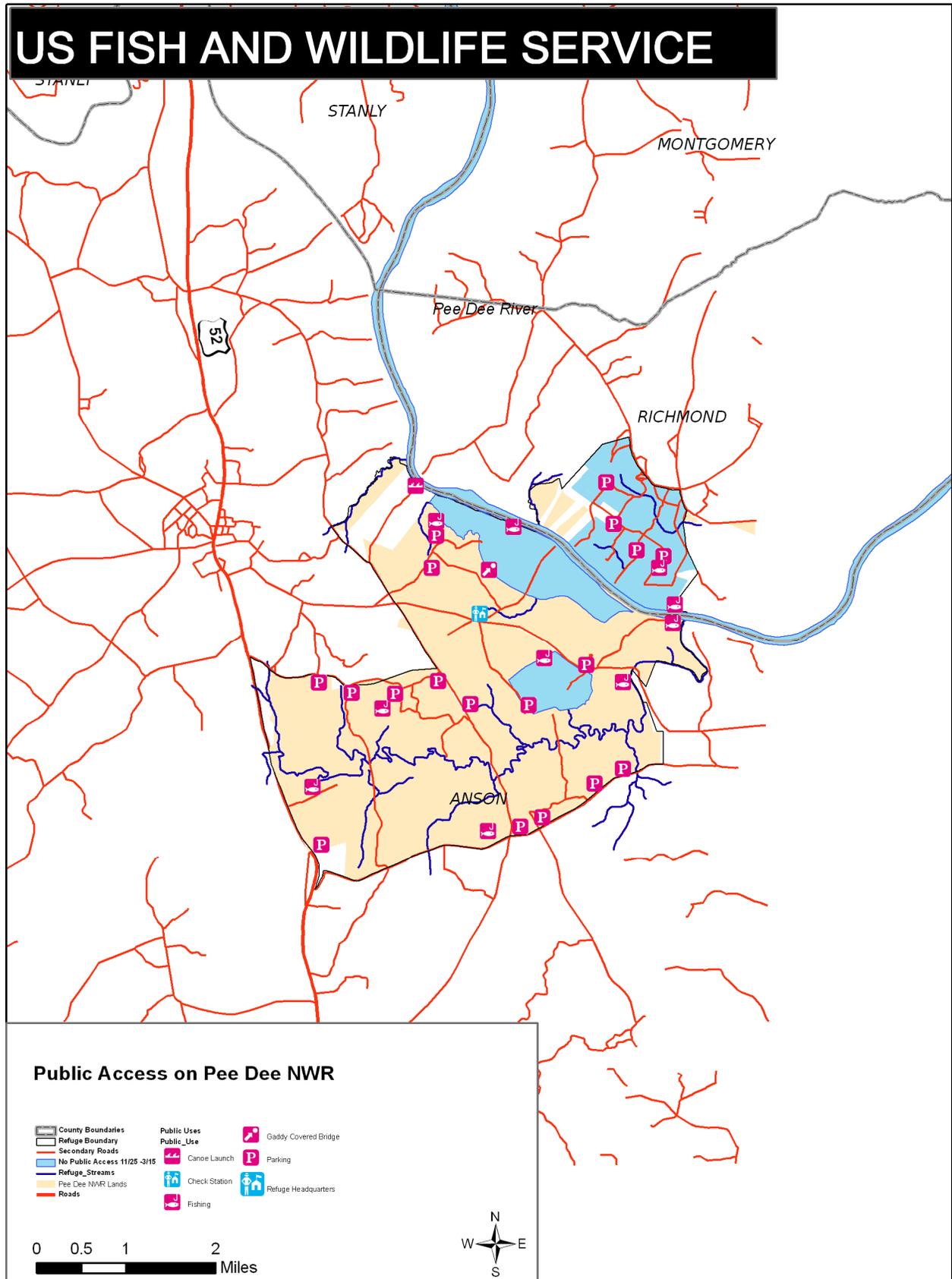
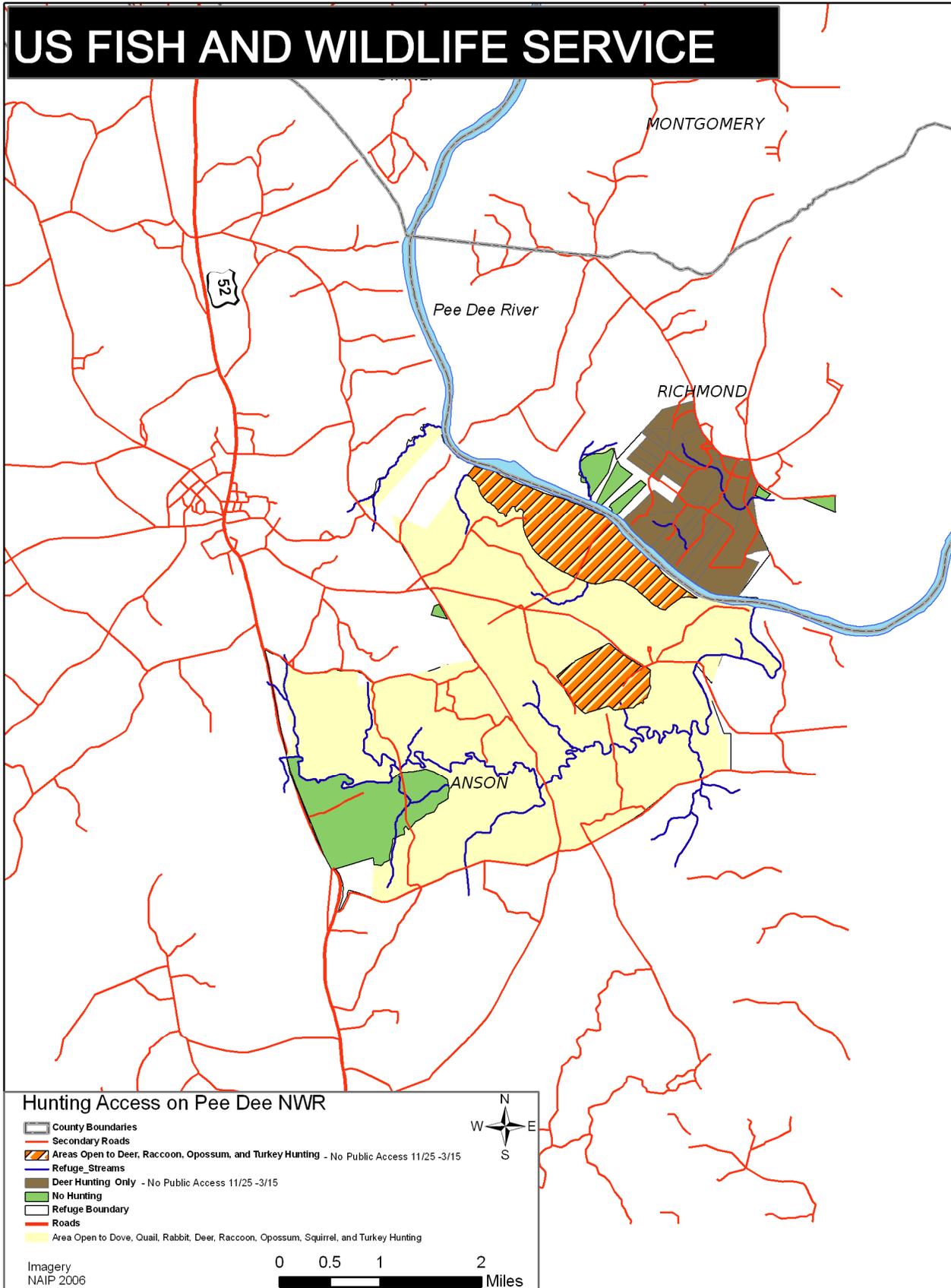


Figure 11. Hunt areas, Pee Dee National Wildlife Refuge.



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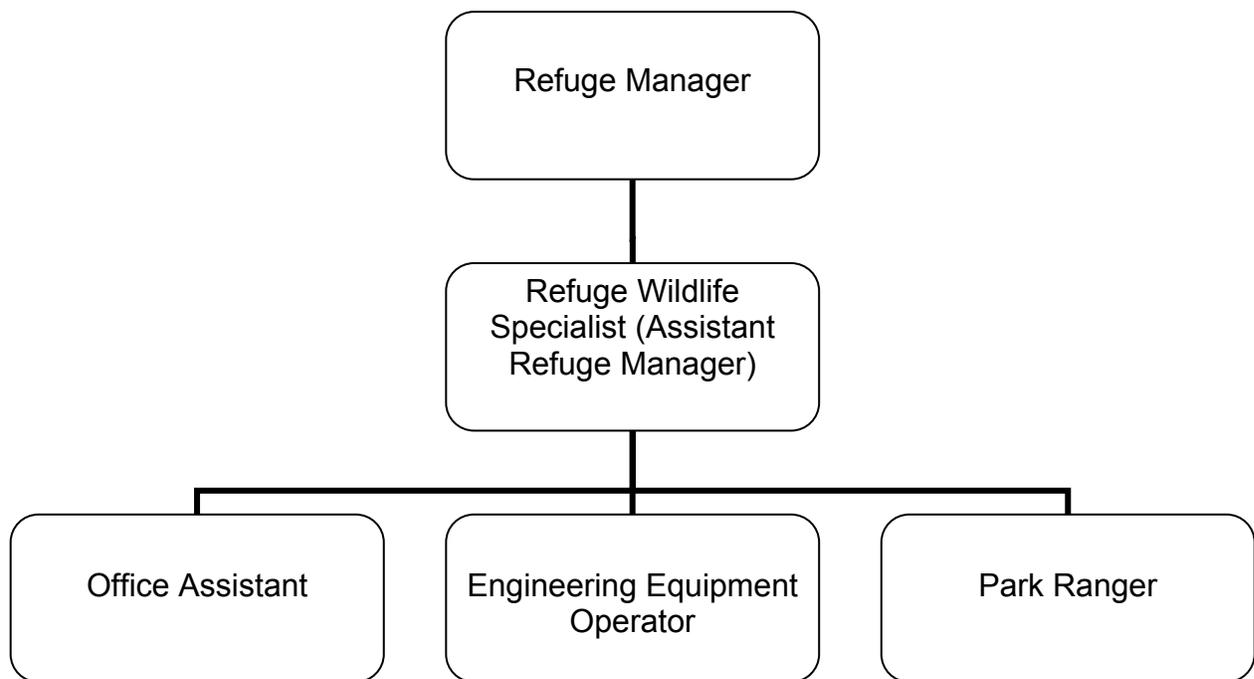
The refuge staff was reduced from eight employees in 2002 to its current number of five. These positions include the Refuge Manager, Assistant Manager, Office Assistant, Engineering Equipment Operator, and a Refuge Officer (Figure 12). The assistant manager position has also been identified for reduction under the Work Force Planning Initiatives of 2006. Two vacated maintenance worker positions and a biologist will not be refilled under current directives. There was also a full-time Forest Technician position during the 1990s that was vacated and not filled.

The refuge's equipment includes the following: John Deere (JD) 450 dozer; Cat D-5 dozer; JD 670C grader; JD 310 backhoe; JD 7510 farm tractor; JD 2155 farm tractor; Case 886 farm tractor; type-6 fire engine; all-terrain vehicles including two Honda 4- wheelers; and a Kawasaki Mule with a small water tank and hose reel.

A friends group called the Friends of the Pee Dee National Wildlife Refuge was established in 1997. Its mission is to enhance public awareness, appreciation, and understanding of the refuge's purposes, programs and projects and to assist the refuge staff in its biological and maintenance projects. The group now has more than 100 paid members and an active core membership of about 12 people. The group sponsors several annual events, including a fall wildlife night prowl, butterfly walks, the Christmas Bird Count, and the annual Kids' Fishing Day. Additionally, the group is working with other groups to provide support for a proposed environmental education center.

Refuge volunteers support the refuge during a variety of public use programs. Annually the refuge receives work campers who work four-month shifts at the refuge. Projects are dependent upon the camper's knowledge and desires. In the past they have answered phones, picked up litter, performed maintenance, and monitored nest boxes. The refuge also utilizes volunteers to help conduct Christmas Bird Count surveys.

**Figure 12. Current organizational chart, Pee Dee National Wildlife Refuge.**





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## III. Plan Development

### OVERVIEW

Although Pee Dee National Wildlife Refuge has had several step-down management plans in the past, no comprehensive conservation plan (CCP) existed to address all refuge programs. The comprehensive planning process has allowed the Service, governmental and nongovernmental partners, and the public the opportunity to take a detailed look at the refuge and its management, resources, and future. The Service's CCP planning process provides for public involvement in developing a plan for the future management of a refuge. The comprehensive conservation plans are revised every 15 years or earlier, if monitoring and evaluation determine that significant changes are needed to achieve the refuge's purposes, vision, goals, and/or objectives. The basic steps of the CCP planning process involve the gathering information; scoping for public input; developing the draft plan; gathering public input on the draft plan; developing the final plan; and implementing and monitoring the actions identified in the final plan.

### PUBLIC INVOLVEMENT AND THE PLANNING PROCESS

The planning process began with various data-gathering sessions. As part of this process, the Service conducted several reviews: a wildlife and habitat management review, a visitor services review, and a wilderness review. In addition, the Service established a Core CCP Planning Team that obtained input from the public and from an Intergovernmental Coordination Planning Team.

The Core CCP Planning Team consisted of two staff members from Pee Dee National Wildlife Refuge and a contracted consultant from the Dynamac Corporation. This team was the primary decision-making team for the CCP. The key tasks of this group involved defining and refining the vision; identifying, reviewing, and filtering the issues; defining the goals; outlining the alternatives; and providing a reality check. The Core CCP Planning Team members are:

- Jeffrey Bricken, Refuge Manager, Pee Dee National Wildlife Refuge
- Greg Walmsley, Assistant Refuge Manager, Pee Dee National Wildlife Refuge
- Oliver van den Ende, Contractor, Dynamac Corporation

The Core Planning Team met regularly to review public comments, data, and information collected to write the plan. Professional reviews of the refuge were conducted to determine the status, trends, and condition of the refuge's resources and facilities. Experts from the Service (including those from the Ecological Services Division and Carolina Sandhills National Wildlife Refuge); the State of North Carolina (including the North Carolina Wildlife Resources Commission, North Carolina Forest Service, and North Carolina Partners in Flight); Ducks Unlimited; and Gaddy's Goose Pond participated in the wildlife and habitat management review of the refuge in 2006. A visitor services review was conducted in 2006 involving staff from the Service's Southeast Regional Office, the Southeast Louisiana Refuges Complex, and Cape Romain National Wildlife Refuge. This review focused on the refuge's existing visitor use activities and provided recommendations to improve program development and public use facilities. The information garnered from these reviews helped the planning team analyze and develop recommendations for this draft comprehensive conservation plan and environmental assessment.

Following the initial gathering of information, a Notice of Intent to prepare a CCP for the refuge was published in the *Federal Register* on September 7, 2006. The Service also placed advertisements in local newspapers; posted information on the refuge's website regarding the upcoming public meeting and how to submit comments; posted information on the meeting in the local community (e.g., local

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shops, post offices, the refuge's visitor center, and local libraries); and distributed flyers announcing the public meeting. Invitations were sent to everyone on the key contact list. During January 2007, at least three CCP-related articles appeared in four local newspapers: *Richmond County Daily Journal*, *The Weekly Post News*, *Montgomery Herald*, and *The Express*. A public scoping meeting was held at the refuge on January 25, 2007, with 26 attendees. During the public scoping period, more than 15 comments were submitted by individuals and organizations spanning several states. Planning updates kept the public informed of the progress of the CCP. To date, more than 50 people are on the refuge's CCP mailing list.

The Service is now seeking comments regarding this draft plan as the next stage of public involvement. All comments are welcomed and will be considered in the development of the final plan.

## **SCOPING OF ISSUES AND CONCERNS**

The planning team identified a wide range of issues, concerns and opportunities related to fish and wildlife protection, habitat restoration, recreation, and management of threatened and endangered species. Additionally, the planning team considered federal and state mandates, as well as applicable local ordinances, regulations, and plans. The team also directed the process of obtaining public input through public scoping meetings, open planning team meetings, comment packets, and personal contacts. All public and advisory team comments were considered; however, some issues that are important to the public are beyond the scope of the Service's authority and cannot be addressed within this planning process. The team did consider all issues raised through this planning process, and has developed a plan that attempts to balance the competing opinions regarding important issues. The team identified those issues that, in its best professional judgment, are the most significant to the refuge. The priority issues for Pee Dee National Wildlife Refuge are as follows:

- Need for comprehensive wildlife and habitat management
- Lack of baseline data
- Threats to rare, threatened and endangered species
- Human population growth, increased development, and resulting impacts to Refuge and Refuge resources and management
- Need for increased partnerships and interagency cooperation
- Spread of exotic and invasive species
- Impacts to water quality, quantity and levels
- Need for Improved environmental outreach, education and interpretation
- Need for cultural resource management plan
- Need to maintain quality hunting and fishing opportunities
- Lack of sufficient staffing and funding

In addition to these priority issues, other issues also include the refuge's trust responsibilities. The issues for the refuge to address during the 15-year life of the CCP are divided into four categories: wildlife and habitat management; resource protection; visitor services; and refuge administration.

## **SUMMARY OF ISSUES**

### ***WILDLIFE AND HABITAT MANAGEMENT***

The refuge is biologically diverse, with numerous species of fish, wildlife, and plants. The habitat diversity and location of the refuge offer fish and wildlife, including federally and state-listed species, migratory birds, and native species, an undeveloped landscape of prime habitat. However, increased human population growth, urbanization and suburbanization, and the development of lands around the refuge will eventually increase public use demands on the refuge and are expected to increase

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associated impacts to the refuge. Direct and indirect activities that may impact the refuge include commercial, residential, and recreational uses (potentially resulting in reduced water quality, the spread of exotic species, and increased wildlife and habitat disturbance). Ongoing development of the landscape is consuming and fragmenting the remaining off-refuge habitats, which are also used and needed by many refuge wildlife (e.g., for breeding, nesting, loafing, feeding, migrating, and dispersing). The spread of exotic, invasive, and nuisance species; the threats to imperiled species; the management and maintenance of impounded wetlands; and the decline in migratory birds and their associated habitats are priority wildlife and habitat management issues that need to be addressed in the 15-year life of the plan.

### **Threatened, Endangered and Imperiled Species**

The protection and recovery of threatened and endangered plants and animals is an important responsibility of the Service and the Service's national wildlife refuges. Although federally listed species are currently not known to occur on the refuge, Schweinitz sunflowers grow in nearby areas and red-cockaded woodpeckers were found on the refuge until several years ago. Several state-listed species, consisting predominantly of freshwater mussels, are found on the refuge. In addition, Rafinesque's bats and loggerhead shrikes have been documented on the refuge. Rare species utilize a variety of habitats found on the refuge including open water, wetlands and upland communities. The refuge's large component of bottomland forest becomes increasingly important on a regional scale due the loss of this important habitat in North Carolina, while the refuge's uplands will serve as a sanctuary for species that are losing habitat due to accelerating development at a regional level.

### **Nonnative and Nuisance Species**

Nonnative (introduced) and nuisance (destructive) species have the potential to negatively influence native species through habitat alteration (which can change ecological processes), resource competition, predation, or any combination of these factors. All major habitats on the refuge have nonnative and nuisance species. In upland habitats, coyotes prey on native wildlife species while Chinaberry (*Melia azedarach*), privet (*Ligustrum sinense*), tree of heaven (*Ailanthus altissima*), kudzu (*Pueraria montana* var. *lobata*), wisteria (*Wisteria sinensis*), and Bermuda grass (*Cynodon dactylon*) crowd out native plants. The refuge's wetlands and aquatic habitats are inhabited by alligator weed (*Alternanthera philoxeroides*). Refuge waterways and impoundments are known to support carp, comely shiner, blue catfish, flathead catfish, green sunfish, redear sunfish, and yellow perch. Several nonnative species that are problematic in other parts of North Carolina but likely to begin colonizing areas of the refuge within the following 15 years include feral hogs, nutria, and armadillo.

### **Resident Wildlife**

Outside of the refuge, many prime habitat types are being developed, fragmented, or otherwise altered as a result of large-scale land use changes, leaving them unsuitable for many wildlife species. Large or conspicuous invertebrates include butterflies which utilize many terrestrial habitats, while crayfish and freshwater mussels inhabit the freshwater habitats. At least 28 species of fish inhabit the waterways on the refuge. Small fish such as mosquito fish and shiners reside in small streams and the shallow, weedy areas of rivers and lakes. Meanwhile, larger predatory fish such as largemouth bass, bluegill, and catfish inhabit the deeper waters. Amphibians consisting of frogs, toads, and salamanders use wetlands areas such as small upland ephemeral ponds and the impoundments and waterways of the refuge. Reptiles represent a diverse group of animals and include species of turtles, lizards, and snakes. Common refuge mammals include deer, bobcat, fox, raccoon, and opossum, as well as smaller species such as rodents and bats. Resident birds include large species such as turkey, raptors including hawks and owls as well as medium-sized woodpeckers, doves and grackles. Several smaller birds such as blackbirds and warblers also nest on the refuge.

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## **Migratory Birds**

A variety of migratory birds utilize the refuge's relatively undisturbed upland and wetland habitats. Pee Dee National Wildlife Refuge serves as an overwintering and/or stopover site for a variety of waterfowl, shorebirds, and neotropical migratory birds. Regional landscape development and degradation will place greater emphasis on the refuge as one of the remaining undeveloped tracts along the Pee Dee River corridor.

The refuge currently plays an important role for several species of wading birds, shorebirds, waterfowl, and passerines. Impoundments and backwaters are important habitat for wading birds such as the great blue heron, green heron, and great egret. The bottomland hardwood habitat, which has declined significantly elsewhere in North Carolina, supports wood ducks and woodpeckers. Pee Dee National Wildlife Refuge was originally established as a waterfowl refuge and more than 20 species of ducks and geese have been recorded, though most species occur only in small numbers. However, mallards have been estimated to number in the several thousands, primarily on refuge impoundments, while Canada geese typically number in the hundreds. The refuge's various upland habitats are utilized by passerines, including vireo, warbler, sparrow, wren, thrush, and flycatcher species as well as indigo bunting, American robin, brown thrasher and eastern phoebe. These habitats will increase in conservation value as the surrounding landscape becomes increasingly fragmented and less suitable for foraging and resting.

## **Data Needs and Comprehensive Habitat Management**

The refuge's topography and other factors have created a habitat gradient that is comprised of xeric (dry) upland plant communities which grade into wetter lowland forest types. These, in turn, connect to wetlands and open water. Each habitat is sustained by different ecological processes, primarily fire regimes and hydrology. Much of the ecology of species and their responses to fire and hydrological conditions need to be quantified via the collection of baseline data and coordinated research. This information will be invaluable in building a comprehensive habitat management program, including fire and impoundment management plans needed to maintain the ecological integrity and diversity of refuge habitats and the wildlife species that these areas support.

## **Impounded Wetlands**

The refuge's 100 acres of impounded wetlands provide relatively undisturbed habitat for many species of migratory birds, as well as resident birds and many other fish and wildlife. Wetlands are declining or being degraded nationwide, and have suffered significant losses in North Carolina as well. Refuge impoundments will increase their conservation value as similar habitat becomes less available due to increasing human impacts in the landscape.

## **Bottomland Hardwoods**

Pee Dee National Wildlife Refuge has some of the largest contiguous tracts of bottomland hardwoods remaining in central North Carolina. This unique habitat supports many wildlife species, and as these forests continue to decline regionally, the bottomland hardwoods of the refuge will play an increasingly important role in the long-term population health of species dependent on this habitat.

## **Water Quantity and Quality**

The increased demand for water for human uses and the degradation of water supplies from pollution and runoff negatively affect water quantity and quality on the refuge. These issues will intensify as a growing population occupies more land in the immediate vicinity of the refuge and in the upstream areas of the Pee Dee River watershed. Water dominates a large proportion of the habitats on the refuge. At least 30% of the refuge is comprised of impoundments, wetlands, bottomland hardwoods, and open water connected to Brown Creek and the Pee Dee River. Therefore, ensuring appropriate water quantity and quality on the refuge will be critical to the long-term ecological health of the refuge.

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## *RESOURCE PROTECTION*

The resource protection issues at Pee Dee National Wildlife Refuge consist of land acquisition, easement management, and law enforcement.

Acquiring ecologically important lands is one of the most effective ways in which to protect vulnerable habitat and associated wildlife species. The refuge is located in an area where obtaining land from willing sellers is still an option, since neighboring lands are largely undeveloped.

More than 1,300 acres of land are protected through conservation easements administered by Pee Dee National Wildlife Refuge. Such forms of cooperative land protection strategies are likely to play a larger role in an area threatened by urbanization.

Accelerating population growth in the regions surrounding the refuge will likely result in increased impacts from inappropriate and illegal activities on the refuge. The refuge contains large areas that are relatively remote and difficult to patrol. Increased law enforcement and patrols will be required to protect and maintain the refuge's resources.

## *VISITOR SERVICES*

The growing human population will increase use of the refuge as undeveloped and natural areas dwindle in the region. Higher visitation rates will result in increased use of existing facilities, roads, and parking areas; and the associated waste disposal issues will increase. The quantity of litter may rise. The need for environmental education, outreach, and interpretation will increase, particularly those that focus on helping the public appreciate the benefits of nature and the projects that foster environmentally sound behaviors. Subsequently, the refuge's staff size would need to grow to meet the increased demand for educational and interpretive opportunities and programs, and to better manage the visitor services program.

## *REFUGE ADMINISTRATION*

Important issues related to refuge administration involve staffing, funding, and intergovernmental coordination. The lack of sufficient staffing and funding to address management concerns continue to be issues for the refuge. Given the complexity of management on the refuge and the need for the involvement of multiple partners in developing and implementing solutions, intergovernmental coordination was identified as one of the priority issues that need to be addressed in the CCP.

## **WILDERNESS REVIEW**

Refuge planning policy requires a wilderness review as part of the comprehensive conservation planning process. The results of the refuge's wilderness review are provided in Appendix H.



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## *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. The National Wildlife Refuge System Improvement Act of 1997 requires the Service to maintain the ecological health, diversity, and integrity of the 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: hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation. These uses are therefore emphasized in this plan.

Described below is the proposed comprehensive conservation plan for managing the 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.

Three alternatives for managing the refuge were considered and analyzed: Alternative A, Current Management (No Action); Alternative B; and Alternative C (Proposed Action). Each of these alternatives is described in Chapter III of the Environmental Assessment (Section B). The Service chose Alternative C as the proposed management direction.

Implementing the proposed action alternative will result in an increase in the refuge's wildlife and habitat diversity. Listed species, migratory birds, and other wildlife species and habitats will continue to be protected and managed for optimal biodiversity. Resource protection activities will be enhanced, including the management of easements. Visitor services in the six priority public uses will improve and accommodate the expected rise in visitation. And finally, refuge administration activities will focus on improving wildlife and habitat diversity through streamlined efforts and the strengthening of local and regional partnerships.

### **VISION**

Pee Dee National Wildlife Refuge was established in 1963 as an important resting and feeding area for wintering migratory waterfowl. The refuge occupies a unique location where the rolling hills of the Piedmont drain into the wetland and aquatic habitats of Brown Creek and the Pee Dee River. Through the collaboration of interagency partners, volunteers and the Service, Pee Dee National Wildlife Refuge will continue to serve as an important conservation link in the Savannah–Santee–Pee Dee Ecosystem. The refuge's lands and waters will continue to support migratory birds, habitat, and species diversity through sound stewardship and habitat management.

Pee Dee National Wildlife Refuge is committed to the conservation, preservation, and enhancement of this important biological resource for the people of North Carolina. In this pursuit, the Service will work with partners to provide environmental education and promote quality wildlife-dependent recreation for all visitors. The focus of Pee Dee National Wildlife Refuge will be to help foster an interest and sense of wonder in nature by future generations.

### **GOALS, OBJECTIVES, AND STRATEGIES**

The goals, objectives, and strategies presented 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 strategies. These goals, objectives, and strategies reflect the Service's commitment

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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 Pee Dee National Wildlife Refuge. With adequate staffing and funding as outlined in Chapter V, the Service intends to accomplish these goals, objectives, and strategies within the next 15 years.

## *WILDLIFE AND HABITAT MANAGEMENT*

Wildlife and habitat management goals include rare, threatened, and endangered species; migratory birds; exotic, invasive, and nuisance species; wildlife and habitat diversity; and water resources.

### **I. RARE, THREATENED, AND ENDANGERED SPECIES**

**WILDLIFE AND HABITAT MANAGEMENT GOAL I:** Preserve, protect, enhance populations of rare, threatened, and endangered species of plants and animals at existing or increasing levels on the refuge and preserve, protect, manage, and restore their native North Carolina Piedmont habitat occurring on the refuge to contribute to recovery goals.

Discussion: Listed species are plants or animals that have been listed by a state and/or federal agency with special protection or conservation designations. Those species with regulatory protection are protected by law, such as state and federal endangered and threatened species. The refuge's expansive and protected areas provide undisturbed, natural-like habitat for many species. The refuge serves as a vital area for species such as bald eagles. Several listed plant species have been documented on the refuge. Due to its location, size, and diversity of undisturbed habitats, its level of federal protection, and its unique landscape features, the refuge lends itself to the possible future of a number of species and possible future reintroduction of declining species.

#### *I.A. Bald Eagle*

**Wildlife and Management Objective I.A:** Over plan's 15-year lifespan, continue to support bald eagle foraging habitats on the refuge.

Discussion: The bald eagle is primarily associated with coasts, rivers, and lakes, usually nesting near bodies of water where it feeds. Although bald eagles were federally delisted in July 2007, it is still designated as "threatened" by the State of North Carolina. There are no documented nests within the refuge; however, annually 2–4 eagles have been documented feeding and roosting in the area during the winter. In addition, a few migratory bald eagles have been noted moving through the area during winter. Disruption, destruction, or obstruction of roosting and foraging areas can also negatively affect bald eagles. Nesting bald eagles may inadequately feed their young if the adults are prevented or discouraged from feeding at preferred sites. Migrating and wintering bald eagles congregate at specific sites for purposes of feeding and sheltering. Bald eagles rely on established roost sites because of their proximity to sufficient food sources. Roost sites are usually in mature trees where the eagles are somewhat sheltered from the wind and weather. Human activities near or within communal roost sites may prevent eagles from feeding or taking shelter, especially if there are not other undisturbed and productive feeding and roosting sites available. Disruptive activities in the flight path between nesting and roosting sites and important foraging areas can interfere with feeding. Activities that permanently alter eagle habitat can altogether eliminate the elements that are essential for feeding and sheltering eagles. Where human activities agitate roosting or foraging bald eagles to the degree that they interfere with or interrupt breeding, feeding, or sheltering behavior, causing injury, death, or nest abandonment, constitutes a violation of the Bald and Golden Eagle Protection Act. Eagles are unlikely to be disturbed by routine use of roads, homes, and other facilities where such use pre-dates the eagles' successful nesting activity in a given area. Therefore, in most cases ongoing existing uses may proceed with the same intensity with little risk of disturbing bald eagles.

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The refuge's current forestry practices include upland forestry management (including mechanical thinning and prescribed burning) that will favor the development of potentially suitable nest trees. In addition, the refuge has extensive bottomland hardwoods that could offer suitable nesting areas. Increasing the crown size of selected trees (through mechanical thinning) may somewhat improve the potential for nesting.

*Strategies:*

- Implement the Southeast Regional Bald Eagle Management Guidelines around any newly established nest sites.
- Retain mature trees and old growth stands wherever possible, particularly within ½ mile (0.8 km) from water.
- Remove sweetgum at select locations to increase height and crown size of potential nest trees.
- Retain tall trees along the Pee Dee River and low grounds area.
- Protect foraging habitat from disturbance by the categories of management activities by adhering to activity-specific guidelines (USFWS 2006).

*I.B. Little Blue Heron*

**Wildlife and Management Objective I.B:** Over the plan's 15-year lifespan, manage habitat on the refuge to support little blue heron foraging and nesting habitat and minimize disturbance.

Discussion: Little blue herons are declining in several states, including North Carolina. Loss of foraging and nesting habitat has contributed to their decreasing numbers. This species requires shallow areas where they can prey on invertebrates, amphibians, and fish. This species is occasionally found on the refuge, which is within its breeding range.

*Strategies:*

- Adjust water level in impoundments to 0–25 cm (0–12 inches) during seasons that little blue herons are present.
- Maintain possible rookery/breeding sites.
- To reduce human disturbance, allow riparian vegetation to grow sufficiently high around impoundments to provide a visual barrier.
- Limit public access seasonally to areas with high wading bird use.

*I.C. Loggerhead Shrike*

**Wildlife and Management Objective I.C:** Over the plan's 15-year lifespan, manage habitat on the refuge to maintain breeding populations of loggerhead shrikes.

Discussion: Loggerhead shrikes are declining in many portions of their range. Possible factors causing a decrease in their populations include the loss of nesting habitat (abandonment of many farms and orchards have allowed fields to become overgrown from neglect), roadkills and pesticide contamination. This species is known to breed on the refuge. Steps could be taken to increase the breeding potential of loggerhead shrikes on the refuge.

*Strategies:*

- Work with partners to improve habitat on private lands adjacent to the refuge.
- Manage open grasslands and old fields for shrubs and trees with thorns as "larders" (to effectively feed, shrikes need to impale their prey on thorns).
- Increase surveys to monitor population status and trends.

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*I.D. Red-cockaded Woodpecker*

**Wildlife and Management Objective I.D:** During the first ten years of the plan, work with partners to document the presence or absence of red-cockaded woodpeckers near and on the refuge and adapt management as required on at least 1,000 acres (405 ha) of uplands annually.

Discussion: Red-cockaded woodpeckers (RCWs) have occurred on the refuge in the past. Historically there were three sites or “clusters” on Pee Dee NWR. The last known occurrence of a single male RCW was in 1999–2000. Prior to 2000, the cluster occupied by the solitary male was augmented with four artificial cavities and then two female RCWs were released in an attempt to establish a breeding pair. These efforts were unsuccessful. Although the species is not breeding on the refuge, occupied red-cockaded woodpecker clusters exist on conservation lands within 45 miles (72 km) of the refuge, and potentially suitable habitat exists on Pee Dee NWR. As RCW populations expand on nearby protected lands, the potential for new groups to become established on the refuge increases. Reintroduction of this listed species may be an option as suitable refuge habitat becomes available.

*Strategies:*

- Manage existing pine and mixed pine-hardwood stands to provide suitable foraging and cavity habitat for RCWs as defined by the U.S. Fish and Wildlife Service’s Recovery Guidelines criteria listed in the 2003 Revised Recovery Plan.
- Conduct annual surveys of current RCW cluster sites to determine activity status.
- Update 1992 Pee Dee NWR Forest Habitat Management Plan to incorporate revised RCW recovery criteria and recommendations from relevant USFWS guidance documents.
- Use 2005 timber stand inventory data and the RCW Foraging Matrix Application to evaluate present forest stand conditions and to identify specific habitat prescriptions for these pine stands.
- Thin pine stands every 10 years to produce an uneven-aged stand composition with a targeted basal area and density meeting RCW recovery criteria. This will also benefit a variety of other landbirds.
- Evaluate conversion of some loblolly stands to longleaf pine stands along with the associated plant community as site conditions warrant.
- Continue prescribed fire and timber management of approximately 1,000 acres (405 hectares) of uplands annually.
- Monitor presence or absence of RCWs on the refuge and coordinate with partners to monitor the proximity of active clusters on nearby lands.
- Adapt management as necessary if groups become established on the refuge.
- Consider opportunities for reintroduction.
- Conduct multiple thinnings over time to reach targeted recovery standards for basal area across pine stands for possible future RCWs foraging or nesting sites. This will also benefit a variety of other pine specialists (e.g., brown-headed nuthatches).
- Use an uneven-aged forest stand management approach to mimic natural stand conditions and to maximize plant/animal diversity.

*I.E. Rafinesque's Big-eared Bat*

**Wildlife and Management Objective I.E:** During the first ten years of the plan, work with partners to document the presence or absence of Rafinesque's big-eared bats on the refuge and adapt management as required.

Discussion: Drastic reductions in bat populations have occurred during recent years in the United States and many species are protected. Rafinesque's big-eared bats are listed by the Service as a species of special concern. Adverse human impacts include habitat destruction, direct killing, vandalism, disturbance of hibernating and maternity colonies, and the use of pesticides and other

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chemical toxicants. The refuge contains a variety of habitats that could serve as foraging and roosting areas for this species, and a baseline survey in 2004 detected this species on the refuge. Future surveys will help confirm this data and allow abundance estimates to be made.

*Strategies:*

- Implement annual bat surveys to monitor status and trends.
- Maintain snags for roosting habitat.

*I.F. Stream Fish*

**Wildlife and Management Objective I.F:** During the first ten years of the plan, work with partners to document the presence or absence of listed stream fish on the refuge and work with the partners to improve the water quality of refuge streams.

Discussion: Many of North Carolina's stream fish have been affected by degradation of their habitat due to sedimentation and pollution. Stream fish require clear, well-oxygenated water and spawning areas free of silt. Urbanization, clear-cutting, and erosion all contribute to increased sedimentation of freshwater resources. Several species of stream fish inhabit the refuge (Progress Energy 2005), including listed species such as the Carolina darter. Improving the water quality of streams through partnerships with local landowners and farmers could help increase populations and possibly allow extirpated species to return to the refuge.

Cooperative farming on the refuge includes the use of a nonrestricted herbicide such as RoundUp. The use of fertilizers is minimized by crop-rotation with nitrogen-fixing legumes such as soybeans. An annual pesticide use proposal has to be submitted to the refuge and approved for use of any chemicals. Cooperative farmers use best management practices (BMPs) and minimize runoff from their fields to refuge waters.

*Strategies:*

- Implement five-year surveys to monitor status and trends.
- Develop water quality monitoring program.
- Work with local landowners to incorporate erosion and runoff-control measures on the properties that border Brown Creek and other streams that flow through the refuge.
- Leave riparian vegetation intact and ensure that roads and trails bordering streams do not contribute sediment to refuge streams.

*I.G. Diadromous Fish*

**Wildlife and Management Objective I.G:** During the first ten years of the plan, work with partners to document the presence or absence of diadromous fish on the refuge and work with the partners to improve the water quality of refuge streams.

Discussion: Historically, the Pee Dee River and several of its tributaries were utilized by diadromous fish species (fish that must migrate between salt and freshwater to complete part of their life cycle), including American shad, hickory shad, blueback herring, striped bass, Atlantic sturgeon, shortnose sturgeon and American eel. Many of these species have since been extirpated from most of the Pee Dee River due to the construction of dams, overfishing and water quality degradation. The U.S. Fish and Wildlife Service, the National Marine Fisheries Service, the North Carolina Wildlife Resources Commission, and the South Carolina Department of Natural Resources have developed a basin-wide plan (Restoration Plan for the Diadromous Fishes of the Yadkin–Pee Dee River Basin) for restoring the diadromous fish of the Yadkin and Pee Dee River Basin (basin) of North Carolina and South Carolina (USFWS, NMFS, NCWRC and SCDNR 2006). Through implementation of this CCP, Pee Dee NWR

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will be able to contribute to the restoration efforts outlined in the diadromous fish plan, specifically with regard to helping improve water quality and maintaining suitable riverine/wetland habitat.

To date, the American eel is the only diadromous species that has been documented on the refuge (Progress Energy 2005).

*Strategies:*

- Implement surveys (every five years) to monitor population status and trends.
- Develop water quality monitoring program.
- Work with local landowners to incorporate erosion and runoff-control measures on the properties that border the Pee Dee River, Brown Creek and other streams that flow through the refuge.
- Leave riparian vegetation intact and ensure that roads and trails bordering streams do not contribute sediment to refuge streams.

*I.H. Freshwater Mussels*

**Wildlife and Management Objective I.H:** Within three years of plan adoption, work with the Asheville Ecological Services Field Office and the Regional Refuge Ecologist to determine whether refuge streams (before or after restoration) would be appropriate habitat for populations of freshwater mussels that are likely to be extirpated in the next 5–10 years due to development.

Discussion: Many species of freshwater mussels are declining in North Carolina. The Carolina Creekshell is one of the two highest priority mussels currently found on the refuge. Though considered a relatively hardy species, it is endemic to a small area in North Carolina in the area of the refuge and northern South Carolina (Price 2005a). The other high priority mussel species is the Brook Floater. Populations are found from Canada to the Savannah River Basin, and tend to be located in higher gradient mountain streams among boulders in sand (Price 2005b). The species is thought to be sensitive to sedimentation, flow alteration and low oxygen conditions. Other species also thought to be particularly sensitive to channel degradation, pollution and the aforementioned impairments include the Creeper (Price 2005c), Notched Rainbow (Price 2005d), and Carolina Lance (Price 2005e). The Eastern Creekshell is thought to be susceptible to bank erosion and loss of forested riparian zones (Price 2005f).

Freshwater mussels would benefit from improved water quality of refuge streams. Since refuge activities do not negatively impact water quality (in fact, the large riparian buffers present on the refuge may somewhat improve water quality), efforts to clean up refuge waters will likely include working with landowners upstream of the refuge.

*Strategies:*

- Implement surveys (every five years) to monitor population status and trends.
- Develop water quality monitoring program.
- Work with local landowners to incorporate erosion and runoff-control measures on the properties that border Brown Creek and other streams that flow through the refuge.
- Leave riparian vegetation intact and ensure that roads and trails bordering streams do not contribute sediment to refuge streams.
- Work with the NCWRC's Wildlife Diversity Program when designing aquatic surveys and long term recovery efforts.

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### *I.I. Schweinitz's Sunflower*

**Wildlife and Management Objective I.I:** Over the course of the 15-year plan, establish and manage one or more viable populations of Schweinitz's sunflower on appropriate refuge sites using guidance from the current species Recovery Plan and species experts.

Discussion: Schweinitz's sunflower (*Helianthus schweinitzii*) is listed as endangered. Thirty-five populations are known, 19 from North Carolina and 16 from South Carolina. All occurrences occur near Charlotte, North Carolina, and Rock Hill, South Carolina. Schweinitz's sunflower is currently known from roadsides, power line clearings, old pastures, woodland openings, and other sunny to semi-sunny situations. It is generally located on poor, clayey and/or rocky soils. Formerly, it probably occurred in prairie-like habitats or post oak-blackjack oak savannas maintained by fires set by lightning and Native Americans. Loss of this open habitat to fire suppression and urbanization has resulted in the decline of the species and its reduction to marginal and very vulnerable sites. Refuge staff and partners have identified at least one potential site on the refuge for possible establishment of the Schweinitz's sunflower. The refuge currently contains remnant natural community types that are associated with and known to support this species, namely Piedmont longleaf pine and diabase bluffs. Pee Dee NWR also contains Iredell soils, mafic in nature and geologically, Triassic basin, both associated with "Piedmont prairies."

#### *Strategies*

- Inventory upland pine stands, dry oak/hickory forests, and early successional habitats on the refuge for presence of Schweinitz's sunflower.
- Identify areas with the potential to support viable populations of the species using updated vegetation maps of the refuge and establish populations.
- Develop and implement a refuge-specific management plan for the species.
- Annually monitor established populations to measure success of relocation and management regimes and to determine population status and potential contribution toward the species' recovery goal.

### *I.J. State-listed Plants*

**Wildlife and Management Objective I.J:** Over the course of the 15-year plan, document the presence or absence of state-listed plants and maintain refuge habitats favorable for these species.

Discussion: Due to its wide range of habitats from warm coastal areas to high altitude alpine habitats, North Carolina has a high diversity of rare and endemic plants. A large number of these species are at risk due to habitat loss and degradation and competition with exotic plants. At least 100 species are listed by the state and over 20 are protected by the Service. Many of these rare plants live in habitats that are being lost across North Carolina, and some of these habitats are present on the refuge. Several state-listed plants may be found on the refuge. Many of the rare species that are possibly found on the refuge require open habitat (areas historically cleared by fire) and various forestry practices that thin the forest canopy, which would benefit these types of plants.

#### *Strategies:*

- Work with partners (e.g., Natural Heritage Program) to survey the refuge for listed plant species.
- Establish a Geographic Information System (GIS) database for listed species and refuge habitats.

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## II. MIGRATORY BIRDS

**WILDLIFE AND HABITAT MANAGEMENT GOAL II:** Maintain and actively manage refuge habitats to meet the migratory bird priorities of the refuge and the North Carolina Piedmont Physiographic Area, while providing consistency with regional and national goals.

Discussion: Pee Dee NWR's location and diversity of habitats make it suitable for a range of migratory birds, including waterfowl, shorebirds, wading birds, marsh birds, and land birds. The importance of the refuge will increase for migratory birds as their key habitats are degraded or lost regionally due to increasing development.

### *II.A. Waterfowl*

**Wildlife and Habitat Management Objective II.A.1:** Over the course of the 15-year plan, begin to increase the ratio of natural vegetation (moist soil units and GTR) to flooded cropland by 30% to support Southern James Bay geese and ducks.

Discussion: Pee Dee NWR was originally established as a waterfowl refuge. Twenty-two species of ducks and geese have been recorded and waterfowl have used the refuge in large numbers. The most common species are mallard and green-winged teal that may number several thousand during fall and winter (September–March). Wood ducks are a year-round resident species, utilizing hardwood swamp habitats for breeding and foraging. Refuge impoundments are managed as "moist soil" units and provide foraging and resting habitats for wintering ducks. Intensively managed waterfowl impoundments provide a high concentration of food for waterfowl, thereby increasing the forage carrying capacity of these artificial wetlands.

#### *Strategies:*

- Annually provide 27 acres of unharvested corn to meet the minimum population goals for ducks (10,000) and Canada geese (1,000).
- Continue to provide 164 acres (66 hectares) of natural and managed wetland habitat annually while working to increase the acres of these habitat types by 10 acres (4 hectares) a year over the next 10 years (for a total of 100 acres or 40 hectares) to meet the minimum population goals for ducks (10,000) and Canada geese (1,000).

**Wildlife and Habitat Management Objective II.A.2:** During the life of the plan, monitor the Southern James Bay geese and duck distribution and migration chronology.

Discussion: Migratory waterfowl are the primary reason the refuge was established. Consistent monitoring of waterfowl populations will help determine the management actions necessary to maintain optimal habitat for the most species at or near carrying capacities on the refuge.

#### *Strategy:*

- Conduct bimonthly waterfowl surveys in all suitable habitats (October–March) following the South Atlantic Migratory Bird Initiative (SAMBI) protocols, and enter the data into the SAMBI web-based database (<https://shorebird.ncusfws.org/login.php>)

**Wildlife and Habitat Management Objective II.A.3:** During the life of the 15-year plan, enhance wood duck breeding habitats to maintain at least 50 pairs of wood ducks.

#### *Strategies:*

- Maintain a program of 50 well-maintained nest boxes (following the Service's Regional Guidelines for wood duck nest box management).

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- Maintain an open water to vegetation ratio of 50–70% vegetation, with 30–50% open water in Andrews Pond to provide optimal brood habitat.
  - The refuge will continue to meet its current wood duck banding quota of 125 ducks.

**Wildlife and Habitat Management Objective II.A.4:** During the life of the plan, protect wintering waterfowl from human disturbance by enforcing closure of waterfowl sanctuary areas.

Discussion: Excessive human disturbance is a potential problem in the management of wintering waterfowl on any refuge. Relative to other bird groups, waterfowl are skittish, exhibit large flush distances, and tend to remain airborne for longer periods. They are also more cautious in returning to areas from which they are repeatedly disturbed. Thus, hunting, fishing, boating, wildlife observation, and other recreational activities can all pose disturbance threats to waterfowl if not properly managed. In addition to causing waterfowl to abandon otherwise suitable habitat, disturbance can negatively impact survival and productivity through the complex interrelationships of elevated energy demands, increased susceptibility to hunting or predation, poorer foraging efficiency, diminished physiological condition, prolonged molt, and interruption of courtship activities and rest periods. It is unknown if pedestrian use of the impoundment levees represents a disturbance concern (i.e., flushing resting waterfowl). If so, public use restrictions may need to be considered to provide a relatively disturbance-free sanctuary—especially during waterfowl seasons. Several areas on the refuge are seasonally closed from November 25 to March 15 to limit disturbance to migratory waterfowl. These include the impoundments and portions of the Pee Dee River.

*Strategies:*

- Monitor waterfowl use throughout refuge habitats to assess whether disturbance might be an issue and if certain “limited disturbance” areas (i.e., public use restrictions) may be warranted.
- Increase regular patrols and enforcement.

*II.B. Shorebirds*

**Wildlife and Habitat Management Objective II.B.1:** Over the life of this plan, manage water levels within the impoundments to provide shorebird foraging habitat during spring and fall migrations.

Discussion: Although the refuge does not support breeding populations of the highest priority species and employs multi-species management techniques, its role in providing stopover habitat during spring and (especially) fall should not be understated. Availability of foraging habitats during key migratory periods has been shown to be critical for the persistence of long distance migrant shorebird species. Thus, one habitat goal stated in the Southeast Coastal Plain–Caribbean Shorebird Conservation Plan is to provide dedicated, high quality managed habitat to support energetic requirements of in-transit migrants. If resources or conditions permit only one drawdown per year, a late summer/fall drawdown would take priority.

*Strategies:*

- Incorporate shorebirds into multi-species management of the impoundments.
- Maintain water levels to maximize availability of peak foraging conditions in portions of the impoundments (bare substrate or sparse vegetation and water depths 0–8 inches [0–16 cm]) starting in April and ending in late May and starting in early July and ending in late September.
- Promote the buildup of invertebrate prey between migration seasons (May through early July and October through March) by holding water in the impoundment as high as possible. Decreased shorebird use despite optimal water levels might indicate the need to “rest” the impoundment for a cycle to revitalize the prey base.
- Consider drawdowns of fishing ponds to create mudflats starting in late July through mid-August.

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**Wildlife and Habitat Management Objective II.B.2:** Over the life of the plan, monitor and protect shorebirds utilizing the refuge.

Discussion: Shorebird use of the refuge varies seasonally, and continued data collection and analysis is required to determine what the population trends are on the refuge. In addition, shorebirds are susceptible to disturbance. Human disturbance can result in decreased foraging rates among shorebirds, resulting in reduced fat reserves required for migration.

*Strategies:*

- Expand waterfowl surveys to include collecting shorebird data during early fall and spring migration periods.
- Minimize public use impacts to shorebirds, including seasonal closures of key areas.
- Increase regular law enforcement patrols of shorebird areas.

### *II.C. Wading Birds*

**Wildlife and Habitat Objective II.C.1:** Over the life of this plan, manage refuge impoundments to provide high quality foraging habitat for wading birds using water level manipulation.

*Strategies:*

- Expand foraging habitat availability to cover the entire nesting season.
- Draw down one of the impoundments to promote depths of 8–14 inches (18–28 cm) during late April. Hold water levels in this range until June.
- When using mechanical means to remove encroaching woody vegetation from the impoundments, consider leaving small patches (~1 acre or 0.4 hectare) to provide or develop into potential nest sites for wading birds. Likely patches would be in areas where human or other disturbance would be minimal and where impoundment operations would remain unimpacted.

**Wildlife and Habitat Objective II.C.2:** Within the next three years, begin gathering data to make decisions regarding wading bird conservation and management effectiveness.

Discussion: Wading bird use of the refuge varies seasonally, and continued data collection and analysis is required to determine what the population trends are on the refuge. In addition, wading birds are susceptible to disturbance. Human disturbance can result in decreased foraging rates among wading birds, resulting in reduced fat reserves required for migration.

*Strategies:*

- Increase monitoring of wading bird use of impoundments through weekly or biweekly driving surveys, especially with regard to responses of birds to any management activities. Priority should be given to conducting surveys during the spring and fall migrations.

**Wildlife and Habitat Objective II.C.3:** Over the life of the plan, manage the refuge's existing great blue heron rookery by limiting access to the rookery site between March–August to protect nesting wading birds from excessive human disturbance

Discussion: A new great blue heron rookery was established in 2006 near Arrowhead Pond. Two nests were observed. The rookery is in a swampy area not easily accessed, so disturbance by the public has not been an issue. The refuge will work to limit disturbance if that becomes necessary. Wading birds are especially vulnerable to disturbance during the nesting season. If repeatedly disturbed, they may abandon the nest site, which will likely result in a reproductive failure for the pair since the breeding season is relatively short in North Carolina, permitting little time to establish a new

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nest site. If birds were disturbed while tending nestlings, they may not be able to adequately feed their young resulting in malnourishment or starvation of the chicks.

*Strategies:*

- Through regular periodic visual surveys, assess wading bird use (i.e., numbers of birds, species, and locations) of the rookery site and adjacent impoundments to determine if seasonal closure is necessary to minimize potential disturbance to nesting wading birds.
- Monitor public use of the areas in the vicinity of the rookery and limit disturbance as needed.
- If wading birds begin nesting in the impoundments, maintain a 300-foot (100-m) buffer zone around nest sites to restrict human encroachment (including foot traffic) during active nesting.
- If wading birds begin nesting in the natural areas of the refuge, a 300-foot (100-m) buffer around the wading bird colony should be established.

**Wildlife and Habitat Objective II.C.4:** Within the next three years, work with the Service's Southeast Regional Migratory Bird Program to develop population and/or habitat objectives that more explicitly link the refuge's contributions to Joint Venture objectives for priority species.

Discussion: Pee Dee NWR provides foraging and potential nesting habitat for a variety of colonial nesting wading birds. Primary species include the great blue heron, great egret, little blue heron, green heron, least bittern, and American bittern. Several of these are identified as priorities for conservation attention in national and regional waterbird plans due to declining trends, threats to habitats, etc. Colonial wading birds forage for small aquatic organisms in the open portions of freshwater marshes, creeks, and shallow lake habitats of the refuge. The impoundments offer the best opportunity for active management focused on wading birds. Here, the mosaic of vegetation and open water provides excellent foraging habitat for all of the wading bird species mentioned above. For wading birds, the most important management activity for the refuge is providing high quality foraging habitat during the nesting season (March through June). This is particularly important late in the nesting season when adult wading birds have large young in the nest and energetic requirements are at their highest. Timing of breeding and peak nesting varies by species, and may vary annually based on weather, habitat conditions, and food resource availability. However, most species are well into the breeding cycle by late April.

Several planning documents address wading bird conservation and provide specific recommendations on habitat management, disturbance management, and survey implementation that are relevant for Pee Dee NWR. The North American Waterbird Conservation Plan, the Southeastern U.S. Waterbird Conservation Plan, and the North Carolina Wildlife Action Plan all identify priority wading bird species and conservation actions that can be taken to contribute to state, regional and larger scale population goals. These plans also identify key habitats and provide recommendations for management activities to enhance wading bird use, as well as methodology and protocols to properly conduct surveys. As with all management actions recommended in this report, the effectiveness of techniques used to generate desired plant community responses and bird use should be fully document and evaluated. Based on these evaluations, approaches should be continued, adjusted, or no longer used, as warranted.

Because Pee Dee NWR provides potential to enhance wading bird foraging opportunities through habitat management—especially in the impoundments—the development of specific population or habitat goals for wading bird conservation on the refuge is possible. The aforementioned planning documents are helpful in providing an appropriate context for considering the refuge's waterbird conservation role within the greater landscape, but more specific guidance will be needed to translate higher scale habitat or population objectives into meaningful objectives for Pee Dee NWR. The Southeast Regional Migratory Bird Program of the U.S. Fish and Wildlife Service can provide assistance in this respect.

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The Southeast Regional Migratory Bird Program has plans to work even more closely with the Division of Refuges to hold habitat objective workshops geared towards helping individual refuges more clearly define their role in the bird conservation landscape. In the interim, Pee Dee NWR should continue to generally support population and habitat goals of existing waterbird plans through protecting (quality and quantity) foraging habitats, and increasing potential nesting habitat availability.

## *II.E. Land Birds*

**Wildlife and Habitat Management Objective II.E.1:** During the first ten years of the plan, restore and maintain approximately 5,400 acres (2,185 hectares) of mixed pine hardwoods, upland pine and bottomland forests.

### *Strategies:*

- Define future desired conditions of various upland habitats, especially pine-dominated uplands. Absent specific desired characteristics, average initial target conditions across pine-dominated habitats should approximate minimum basal areas of 40–70 square feet per acre (ft<sup>2</sup>/acre), greater than or equal to ( $\geq$ ) 60% grass/forb cover, and less than ( $<$ ) 40% shrub in the midstory. The basal area recommendation is offered in the context of maintaining relatively low stem densities that are compatible with red-cockaded woodpecker foraging guidelines.
- Apply growing season prescribed burns to approximately 3,500 upland acres (1,416 upland hectares) per year on a 3-year average burn interval to begin restoring (or otherwise maintaining) habitats to the above conditions.
- On sites with heavy midstory encroachment (greater than [ $>$ ] 60% coverage), consider following up initial dormant season burns with a growing season burn 12–18 months later. Alternatively, consider sparing use of mechanical methods (e.g. chopping, mowing) subsequent to growing season burns to physically control midstory.
- Continue aggregating burn units into larger compartments to add efficiency to burn operations and promote patchier burns. Favor hand ignition over aerial ignition; or use sparser ignition rates in aerially applied burns. Continue elimination of slash/loblolly plantations. Identify sites where conditions favor restoration of longleaf pine; promote this species accordingly.
- Explore management options for protecting significant oak hammocks or shrub stringers during burn operations to maintain important resource components within the pine upland matrix. Ensure that these components are not severely reduced or eliminated from the landscape, but manage where their dominance becomes excessive. Hammocks should not exceed 20% of the overstory stand composition; similarly for shrub cover in the midstory.
- Thin sweetgum in bottomland hardwood forests to favor mast-producing species.
- Conduct assessments to develop baseline estimates of current forest stand characteristics (overstory and midstory composition, basal area, percent grass cover, etc.). Periodically assess management effectiveness relative to this baseline and desired future conditions.
- Integrate the strategies outlined here into existing or revised refuge-wide forest management plan.

**Wildlife and Habitat Management Objective II.E.2:** During the life of the plan, work with Partners in Flight, the Northern Bobwhite Conservation Initiative, the Service's Southeast Regional Migratory Bird Program, and other partners to develop population and/or habitat objectives that more explicitly link the refuge's contributions to landscape scale objectives for landbirds.

**Wildlife and Habitat Management Objective II.E.3:** Within five years of plan adoption, monitor landbird presence, abundance, distribution, and responses to management activities.

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Discussion: Through its conservation assessment process, Partners in Flight has identified numerous landbird priorities for the Southern Piedmont Physiographic Area. Priority landbirds found at Pee Dee NWR, and that the refuge can contribute meaningfully to the conservation of, include Henslow's sparrow, prairie warbler, brown-headed nuthatch, Swainson's warbler, prothonotary warbler, cerulean warbler, wood thrush, worm-eating warbler, whip-poor-will, and Kentucky warbler. Other species that are identified as priorities for this region are known or likely to occur within the refuge, but because of their inconspicuousness or a general lack of quantitative abundance data, it remains unclear to what extent they occur on the refuge or how significantly the refuge might contribute to their conservation.

Refuge habitats of importance to landbirds include the few scattered grassy habitats (breeding and wintering sparrows), open pine and pine flatwoods (sparrows, American kestrel, brown-headed nuthatch, northern bobwhite), and forested wetlands (swallow-tailed kite, prothonotary warbler). Principal landbird conservation and management considerations involve:

- prescribed burning of pine habitats to remove excessive hardwood midstory, to encourage more mature stands with herbaceous/grassy ground cover, and to promote longleaf pine where appropriate (northern bobwhite, American kestrel, chuck-will's-widow, brown-headed nuthatch, breeding and wintering sparrows);
- continued monitoring to better document and quantify occurrence of priority landbird species on the refuge (breeding season surveys as well as nonbreeding surveys for wintering sparrows and painted bunting);
- better defining linkages between national and regional landbird conservation plans and refuge objectives for landbird conservation; and
- addressing priority information gaps and assessing management effectiveness through research, inventories and monitoring (all priority species).

Unlike many refuges that primarily play a role in supporting breeding populations of priority species, Pee Dee NWR potentially plays a very important role in supporting populations of several of the species mentioned above through provision of essential wintering habitat (e.g., sparrows). Because wintering landbirds are more difficult to monitor and factors limiting their populations during nonbreeding periods remain poorly known, land managers and conservation planners are only just beginning to consider the incorporation of wintering landbird needs into objective-setting and management activities. Consequently, recommendations for wintering landbirds typically reflect attempts to balance the uncertainties with practical advice for what "seems" like the right thing to do. Implementation of such recommendations must recognize that uncertainties can affect whether anticipated conservation benefits are realized. This gives renewed importance to monitoring and assessment of management effectiveness in such cases; not only to justify continued refuge resource allocations in these directions, but to ensure that objectives are being met and to further assist in the general quest for information on how best to support bird conservation during nonbreeding seasons. Fortunately, most of the management activities that would be presumed to afford benefits to wintering landbirds at Pee Dee NWR are geared principally toward restoration (or maintenance) of upland pine and pine-oak systems.

As alluded to above, the quantitative importance of these habitats to priority landbirds has yet to be defined, but qualitatively it is reasonable to assume that management could enhance their ability to support wood thrush, eastern wood-pewee, yellow-billed cuckoo, pileated wood pecker, and yellow-throated vireo.. Presently, the scarcity of grassy and herbaceous ground cover—or conversely, the encroachment by hardwood mid-story plants—is a principal limitation in the ability of such habitats to support these species, but there are other factors, too. Availability of mature pines that afford nesting cavities will affect suitability for American kestrel (true also for brown-headed nuthatch, but less so given their smaller size), whereas the presence of shrubby "stringers" and scattered oak hammocks

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can be a determinant of suitability for eastern towhee, and a variety of frugivorous and insectivorous species that may overwinter or pass through during migration.

Approximately 1,500 acres (607 hectares) of uplands (and some wetlands) are burned on the refuge each year. Assuming an average return interval of three years, a maximum of approximately 800 acres (324 hectares) of upland (i.e., 2,500 total upland acres or 1,012 hectares divided by 3) would need to be burned each year. An important distinction to point out here is the difference between management activities designed to restore degraded habitats, versus those designed to maintain habitats that more closely approximate desired conditions. The above burn intervals and acreages speak to averages that are most appropriate under a maintenance mode. Initial restoration activities may involve more (and more frequent) burning, as well as additional midstory removal, fuel reduction, or other activities (see below).

In general, growing season (late March–June) burns will be more conducive to reducing mid-story hardwood encroachment, and may be more reflective of "natural" burn regimes (e.g., summer, lightning-ignited burns). In areas where mid-story hardwood encroachment really needs to be knocked back, it may be necessary to follow up initial dormant season burns with a growing season burn 18 months later. This burn pattern should not be sustained indefinitely; it is a short-term recommendation to advance restoration of pine habitats more rapidly into a maintenance mode where growing season burns on a three-year average return interval are the norm. Reduction of mid-story encroachment may also be accelerated through sparing use of mechanical means (e.g., mowing, chopping). Though less desirable than fire, these may be cost-effective solutions when burning is not an option, or to periodically enhance the hardwood reduction effects of prescribed burns. Mowing can decrease the height of woody undergrowth while preserving and even promoting groundcover species. A hydro-ax can be used to mechanically clear tall, thick, monotypic areas to increase understory diversity. Soil disturbance and compaction in such operations are potential drawbacks, and should be minimized so as to avoid conditions favored by less desirable native and exotic herbs and grasses.

The more that prescribed burns promote a grassy-herbaceous understory, the more likely they are to provide conditions suitable for breeding and wintering sparrows, northern bobwhite, American kestrel, chuck-will's-widow and other species that either forage in these substrates, or require the openness they afford for foraging/hunting over it. In conducting burns, it should be stressed that patchiness is preferred over cleanliness. Larger burns should promote diversity and patchiness in burn patterns on the landscape, and the continued aggregation of burn units into larger compartments should facilitate this. Patchiness will help ensure that hardwood and shrub components important to a number of bird and wildlife species are not entirely excluded from the landscape. Aerial ignition (at least at high ignition densities) may not afford desired patchiness, as numerous ignition points seem to result in cleaner burns. As a general consideration in refuge burn operations, the multitude of ignition points typical of aerial ignition techniques may also make it more difficult for wildlife to find suitable cover during or after fires. Hand ignition should be considered whenever practical. Some target habitat objectives for burns in upland pine systems (including flatwoods and areas with longleaf pine) would be to achieve a minimum basal area of approximately 40–70 ft<sup>2</sup>/acre (and low stem densities), ≥60% grass/forb cover, and <40% shrub in the midstory. Longleaf pine should be promoted in areas where it could potentially be a dominant overstory species.

The forested wetlands and hardwood forests are important to breeding neotropical migrant passerines, such as prothonotary warbler. Active management of these habitats is not required. Rather, the role that these habitats play locally (on the refuge) and regionally (on the landscape) in supporting priority species such as these needs to be recognized in actions on and off refuge that might impact their integrity (e.g., water use, water quality, forestry, adjacent burning, public use, etc.).

As with waterfowl, shorebirds, and wading birds, there exists relevant conservation planning material for landbirds. The Northern Bobwhite Conservation Initiative has developed state-by-state habitat conservation objectives for quail, and coordination with this initiative can help specify acreage goals

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for the refuge in support of quail restoration goals. Finally, the Partners in Flight North American Landbird Conservation Plan is helpful in identifying continental level landbird priorities and providing a relevant context for landbird conservation efforts at successively smaller scales. Though not prescriptive in its objectives and recommendations for local level (e.g., refuge-specific) landbird conservation efforts, this plan will provide much of the basis for ecoregional planning efforts that will clarify the specific landbird conservation roles of local partners, including refuges.

*Strategies:*

- Monitor bird population responses to prescribed burning and other management actions in pine "uplands" particular attention should be given to breeding northern bobwhite, American kestrel and Bachman's sparrow, and wintering sparrows.
- Continue to conduct refuge's "breeding bird surveys" (point counts) in these habitats on a consistent basis with an objective of linking bird responses to management actions. Add additional survey points to adequately cover refuge pine habitats and areas where burning and other management is taking place.
- Where not already part of other monitoring efforts to assess management effectiveness, employ transect surveys to document general occurrence and abundance of wintering sparrows in pine-grassland portions of the refuge.
- The following techniques could be employed and are listed from most rigorous (and most intensive) to least: Breeding Biology Research and Monitoring Database (BBIRD) plots (a measure of both relative abundance and nest productivity, ideal for localized assessments of management efforts); point counts or transects within specific habitats of interest (measure of relative abundance); and checklist development/random searches (incorporating a method of acquiring information from local birdwatchers, including migration monitoring and occurrences of wintering birds).

**Wildlife and Habitat Management Objective II.E.4:** Increase habitat patch size and provide connecting areas between similar habitat types of forests and/or scrublands to provide for the breeding, wintering, and stopover needs of several species of raptors.

Discussion: Several species of raptors utilize the refuge, including the sharp-shinned hawk, red-shouldered hawk, red-tailed hawk, barn owl, great horned owl, and eastern screech owl. These species play an important ecological role in helping to control small mammal populations (primarily rodents).

*Strategies:*

- Maintain all winter cover in early succession habitat areas for migrating and wintering raptors.
- Maintain some native grassland in association with habitat in early successional stages.
- Erect two barn owl boxes in old silos on refuge. Monitor use and expand as warranted.

### III. EXOTIC, INVASIVE AND NUISANCE SPECIES

**WILDLIFE AND HABITAT MANAGEMENT GOAL III:** Control and eliminate, where feasible, exotic, invasive, and nuisance species impacting the refuge to maintain and enhance the biological integrity of the refuge.

Discussion: The occurrence of nonnative species and future colonization by these exotic plants and animals on the refuge has been identified by staff and governmental partners as an important management issue facing the refuge. It is important to constantly monitor the occurrence of exotic species on the refuge and to be alert to new species in the state and in the vicinity of the refuge. Exotic, invasive, and nuisance species that were identified as being ecologically important on Pee Dee NWR include nonnative aquatic and terrestrial plants; exotic aquatic animals; feral hogs; coyotes; and feral and free-roaming animals.

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### *III.A. Nonnative Aquatic Plants*

**Wildlife and Habitat Management Objective III.A:** During the life of the plan, continue to work with partners to identify, locate, control, and eliminate, where feasible, aquatic exotic, invasive, and nuisance species on at least 75% of the refuge.

Discussion: Aquatic invasive plants such as alligator weed are becoming more common in refuge waters. These nonnative plants are managed by the refuge using annual drawdowns. Although nonnative aquatic plants may provide forage and shelter for native species, they have negative effects at high densities by crowding out native plants.

*Strategies:*

- Develop a GIS database for exotic aquatic plants on the refuge.
- Manipulate water levels in impoundments to control exotic aquatic plants in favor of native plants.
- Consider limited use of approved aquatic herbicides combined with mechanical means if needed.

### *III.B. Nonnative Terrestrial Plants*

**Wildlife and Habitat Management Objective III.B.1:** Throughout the life of the plan, identify and locate new infestations of invasive upland plants and conduct initial effort with an emphasis on elimination.

Discussion: State-wide, the spread of many nonnative terrestrial plants rises every year, and the occurrence of these species on the refuge will likely increase in the future. Currently, exotic terrestrial plants are not impacting a large portion of the refuge, and management can focus on detecting and eliminating new infestations.

*Strategies:*

- Routinely inspect refuge uplands for new infestations, especially along the refuge boundary.
- Routinely inspect areas of soil disturbance (e.g., construction areas) for the presence of introduced plants.
- Upon detection of invasive plants, mechanically remove and/or spray plants immediately.
- Work with partners and apply for grants to support these efforts.

**Wildlife and Habitat Management Objective III.B.2:** During the 15 years following the plan's approval, control the spread of existing exotic, invasive, and nuisance species on refuge lands to less than 5% of the total landscape.

Discussion: Existing nonnative plants (e.g., kudzu) are found primarily along roads and other disturbed areas. Management of existing populations of nonnative plants would focus on maintaining, and where possible, reducing the areas invaded.

*Strategies:*

- Conduct education and outreach to refuge neighbors concerning exotic, invasive, and nuisance species.
- Use biologically safe herbicides and/or mechanical treatments to control exotic plant infestations.
- Monitor spread of exotic or nuisance vertebrate species, and develop appropriate control measures to address these species individually.
- Clean heavy equipment shared with other refuges or partners to limit the spread of exotic, invasive, and nuisance species.

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- Build relationships with neighboring land owners to foster information sharing regarding possible exotic species that may spread to refuge lands and work to develop a coordinated approach to address the spread of these exotic and/or invasive plants.
  - Work with partners and apply for grants to support these efforts.

### *III.D. Feral Hogs*

**Wildlife and Habitat Management Objective III.D:** Within five years of plan adoption, document feral hog population levels and distributions on the refuge, and during the life of the plan, control feral hog populations on the refuge.

Discussion: Feral hogs are being documented with increasing frequency on portions of the refuge. This species is found throughout North Carolina and will likely continue to colonize the refuge in the next 15 years. These animals can have serious negative effects on native wildlife and plants through predation and habitat destruction. In addition, their rooting activities and wallows can cause erosion and subsequent degradation of streams and lakes.

Feral hogs could be controlled on the refuge as part of the deer hunt. This means feral hogs would be shot during deer hunts and would not be subject to a quota. Because this would not be a targeted hunt for feral hogs, it may not sufficiently control feral hog numbers if these nonnative animals increase substantially in the future. In addition to hunting, other control measures, including trapping, may be required to effectively manage feral hog numbers on the refuge during the course of the 15-year plan.

*Strategies:*

- Implement control through a specific feral hog hunt.
- Consider alternative control methods (i.e., trapping, etc.) in addition to hunting.

### *III.E. Coyotes*

**Wildlife and Habitat Management Objective III.E:** Within five years of plan adoption, document coyote population levels and distributions on the refuge, and during the life of the plan, control coyote populations on the refuge at or below current levels.

Discussion: The coyote is a canine (in the dog family) originally found predominantly in the western United States. In the last 30 years, this species has colonized the eastern U.S., including North Carolina. It is a generalist and opportunistic predator whose diet can include fish, reptiles, birds, and larger prey such as deer. They are a top predator on the refuge, but their numbers and distribution are unknown. The refuge currently does not actively manage coyotes, but a documented increase in their population may warrant the implementation of control efforts if negative effects on refuge biodiversity have been determined.

*Strategy:*

- Coordinate with the state to evaluate the impacts of coyotes on wildlife and habitat diversity and control where necessary.

### *III.F. Feral and Free-roaming Animals*

**Wildlife and Habitat Management Objective III.F:** Within five years of plan adoption, coordinate with partners to minimize adverse impacts of feral and free-roaming animals to native wildlife and habitats.

Discussion: Feral and free-roaming animals are domesticated animals that have become wild and unsecured pets and livestock, including cats, dogs, goats, horses, cows, and poultry. These

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animals may have a negative impact on the refuge's wildlife and habitats through predation, grazing, trampling, disease spread, and unwanted cross-breeding.

*Strategy:*

- Coordinate with partners to control feral and free-roaming animals to minimize adverse impacts to wildlife and habitat.

#### **IV. WILDLIFE AND HABITAT MANAGEMENT**

**WILDLIFE AND HABITAT MANAGEMENT GOAL IV:** Protect, manage, and enhance the refuge's diverse natural habitats to ensure that fish and wildlife populations remain naturally self-sustaining.

##### *IV.A. Mixed Pine Hardwood*

**Wildlife and Habitat Management Objective IV.A:** During the life of the plan, restore and maintain the appropriate pine-to-hardwood ratio in upland mixed pine hardwood stands.

Discussion: Approximately 1,820 acres (737 hectares) of mixed pine hardwood exist on the refuge. Historically, these areas were upland hardwoods that were converted to agriculture. After establishment of the refuge, these areas were planted with pine and natural hardwood regeneration took place. In order to optimize this habitat for wildlife, the canopy needs to be opened up (e.g., via selective thinning and prescribed burns) which will allow an understory to grow.

*Strategies:*

- Work with partners to determine the appropriate pine-to-hardwood ratio in upland stands.
- Alter the fire regime to achieve the appropriate pine-to-hardwood ratio.
- Implement monitoring program to measure and record habitat conditions and effects of management treatments.
- Update GIS forest inventory data every 10 years.

##### *IV.B. Upland Pine Forest*

**Wildlife and Habitat Management Objective IV.B:** During the life of the plan, restore and maintain 1,700 acres (688 hectares) of upland pine forests.

Discussion: Upland pine forests cover approximately 1,736 acres (703 hectares) of the refuge. They need to be restored and maintained to enhance their suitability for wildlife and to increase plant diversity. This can be accomplished primarily through prescribed burning and mechanical thinning. Currently, many of these areas are overstocked which increases competition between trees, leading to stunting. The closed canopy also limits the abundance and diversity of ground cover. Overstocked forests are also at greater risk of destructive wildfires and beetle infestations.

*Strategies:*

- Implement monitoring program to measure and record habitat conditions and effects of management treatments.
- Use prescribed fire on a three-year rotation.
- Implement midstory hardwood control through mechanical or herbicidal means.
- Utilize commercial thinning in overstocked areas to reduce basal area to an average of 60–80 square feet per acre (5.6–7.4 square meters per 0.4 hectare).
- Implement comprehensive set of GIS databases.
- Update GIS forest inventory data and update every 10 years.

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#### *IV.C. Flooded Crop Impoundments*

**Wildlife and Habitat Management Objective IV.C:** Over the life of the plan, work to convert 25% of the flooded crop impoundments to moist soil units.

Discussion: Flooded crop impoundments are planted with corn, which is a supplemental food source for waterfowl. It is beneficial to replace them with a natural food source (waterfowl are unable to utilize corn protein as well as that from natural sources). Moist soil units act more like natural wetlands and can be used to grow a variety of natural forage plants for waterfowl. The refuge contains approximately 100 acres (40 hectares) of flooded crop impoundments.

*Strategy:*

- Target the Ringneck and Patterson impoundments for conversion to moist soil units.

#### *IV.D. Moist Soil Units*

**Wildlife and Habitat Management Objective IV.D:** During the life of the plan, increase the acreage of moist soil units by at least 75% to provide native wetland vegetation as forage for wintering waterfowl.

Discussion: Although moist soil units require more intensive management than flooded crop impoundments, they provide higher nutritional value forage to waterfowl. The refuge contains ~75 acres (~30 hectares) of moist soil units.

*Strategies:*

- Conduct vegetation transects during September 1-November 1 for each year for moist soil units. Record dominant plant species and percent occurrence for each plant species in 1 m<sup>2</sup> plots.
- Evaluate the potential for the creation of additional impoundments to support wildlife and habitat diversity.
- Evaluate and record the timing and effectiveness of managements activities (disking, mowing, burning) to determine which methods produce the desired outcome.
- Determine timing for setting back succession/improving amounts and diversity of desirable wetland plants beneficial to waterfowl.

#### *IV.E. Green Tree Reservoir*

**Wildlife and Habitat Management Objective IV.E:** Over the course of the plan, maintain 135 acres (55 hectares) of a green tree reservoir to provide resting and feeding areas for wintering waterfowl.

Discussion: Green tree reservoirs (GTRs) are bottomland hardwood forests that have been impounded with levees and are temporarily flooded during fall and winter to provide food and habitat for wintering waterfowl (Rudolph and Hunter 1964). Research has suggested that this practice can negatively impact bottomland hardwood stands, leading to decreases in mast production (Francis 1983), tree vigor and growth (King 1995), and regeneration (Young et al. 1995). There is also evidence that the artificial flooding regimes applied to green tree reservoirs can shift tree species composition towards more flood-tolerant species (Karr et al. 1990; King 1995). Problems associated with these sites can often be tied to inundation that extends into the growing season (Wigley and Filer 1989), reducing soil aeration, killing less water-tolerant tree species, and increasing overstory mortality (King and Allen 1996). If managed properly, GTRs can provide a valuable habitat, including feeding and resting areas for waterfowl. The refuge contains 135 acres of a GTR.

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*Strategies:*

- Keep GTR dry once every 3 years to maintain forest health.
- Vary timing, depth, and duration of inundation of GTR to mimic “natural” conditions (flood only during the trees’ dormant season).
- Use silvicultural practices as needed to maintain stand health and vigor based on recent timber inventory.
- Monitor mast production annually.
- Ensure sufficient water levels in the GTR to support enhanced wildlife and habitat diversity.

*IV.F. Bottomland Hardwoods*

**Wildlife and Habitat Management Objective IV.F.1:** Maintain existing Natural Heritage Significant Program designation for the Brown Creek Bottomland Forest (2,000 acres [809 hectares]).

Discussion: Bottomland hardwood forests are among the rarest and most vulnerable habitats in North Carolina. These riparian forests provide wildlife habitat for a variety of species. In addition, bottomland forests help reduce the damaging effects of floods and can maintain or improve water quality by preventing shoreline erosion. The refuge contains 2,895 acres (1,172 hectares) of bottomland hardwood forests, primarily along Brown Creek, and has the largest contiguous tract of this habitat in the state.

**Wildlife and Habitat Management Objective IV.F.2:** Over the life of the plan, remove 50% of sweetgum to increase productivity of mast-producing species.

Discussion: Sweetgum trees have reached high densities in several areas of the bottomland hardwoods on the refuge. Sweetgum seeds do not provide food for many wildlife species, and these trees compete with more beneficial tree species. By crowding out desirable mast tree species, sweetgum decreases their crown size and productivity. Thinning sweetgum in hardwood bottom forests would favor mast-producing species, improve the wildlife value of this habitat, and increase the tree diversity of these areas. Thinned stands would temporarily allow an increase in the canebrake understory, but as the canopy closes the canebrake would decrease.

*IV.G. Grasslands/Old Fields/Rights-of-Way*

**Wildlife and Habitat Management Objective IV.G:** Within five years of plan adoption, work with partners to maintain grasslands and early successional scrub/shrub habitats on rights-of-way and in old fields within the refuge boundary.

Discussion: Grasslands and rights-of-way are characterized as grassy, weedy areas with some low shrubs. They are man-made habitats created by frequent plowing and/or mowing, which prevents larger woody plant species from taking hold. These habitats host insects as well as small reptiles and mammals. Several smaller bird species may forage in grassy areas and feed on insects, fruit, and seeds. The largest contiguous ruderal area on the refuge is the powerline right-of-way. Currently these areas are seeded, mowed, burned, and mechanically/herbicidally treated for invasive exotic plants. Grassland areas can be further enhanced for forage by migratory birds.

*Strategies:*

- Schedule prescribed fire, mowing, and disking to provide optimal response of native vegetation.
- Seed with native plants.
- Establish a cooperative agreement with Progress Energy and the Pee Dee Electric Membership Cooperative to restore the power and gas line easements on the refuge to native grasses.

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- Eliminate the spreading of nonnative grass seeds as ground cover following dirt work on the refuge.
  - Limit mowing to fall, spring, and/or as needed to prepare for prescribed burning.
  - Currently maintain old field areas in early successional growth with both shrubby vegetation and grassland.

#### *IV.H. Croplands*

**Wildlife and Habitat Management Objective IV.H:** During the life of the plan, continue to maintain approximately 1,161 acres (470 hectares) of croplands under the cooperative farming program to benefit wildlife species.

Discussion: Approximately 1,161 acres (470 hectares) are planted in corn, soybeans and wheat under the Cooperative Farming Program, with 20% of the crops left unharvested for wildlife and field borders (15 feet or 4.6 meters wide) left unplanted, fallow, or seeded by refuge staff with annuals as wildlife food. Roundup herbicide is used and fertilizers are applied as needed.

#### *IV.I. Native Warmwater Fish*

**Wildlife and Habitat Management Objective IV.I:** During the life of the plan, work with partners to document the native warmwater fish species present on the refuge, the habitats used by them, and their health and current population sizes.

Discussion: Warmwater fish generally are those that are able to survive water temperatures above 80° F and are generally more tolerant of poor water quality (low dissolved oxygen, high sedimentation). Typically, these are species that inhabit ponds, lakes, and slow-moving shallow rivers. On the refuge, warmwater fish include largemouth bass, sunfish, and catfish. Warmwater fish are part of the aquatic community and a prey-base for other wildlife such as birds and otters. Many of these fish species are also targeted by anglers.

#### *IV.J. Herpetological Species*

**Wildlife and Habitat Management Objective IV.J.1:** Within five years of plan adoption, document the herpetofaunal species present on the refuge, the habitats used by them, and their health and current population sizes.

Discussion: The wide diversity of habitats on the refuge support a correspondingly high number of reptile and amphibian species. Approximately 31 species of amphibians and reptiles are likely to occur on the refuge or within the refuge's acquisition boundary, based on a 1983 species list published for the refuge. Information on populations and distributions of species on the refuge are poorly known. Improving this knowledge base will help in the future management and protection of these species.

#### *Strategies:*

- Work with universities and colleges to develop inventory/research partnerships to obtain historic and existing data for herptiles on the refuge (species lists, distribution in refuge habitats, population numbers if available).
- Encourage partners to conduct quantitative surveys for specific herpetofaunal species or of specific habitats (i.e., isolated ponds).
- Enlist volunteers and the help of the NCWRC's Piedmont Herp Survey Biologist to coordinate with staff on amphibian and reptile monitoring/research opportunities.
- Develop Calling Amphibian Survey routes for refuge impoundments and/or bottomlands and wetlands using volunteers.

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**Wildlife and Habitat Management Objective IV.J.2:** During the 15-year plan, conduct management practices on refuge habitats in such a manner as to minimize adverse impacts to herpetofaunal species.

*Strategy:*

- Whenever possible, use a hydro-ax instead of a roller-chopper when clearing undergrowth to minimize impacts to reptiles and amphibians.

## **V. WATER QUANTITY, WATER QUALITY, AND MINIMUM FLOWS AND LEVELS**

**WILDLIFE AND HABITAT MANAGEMENT GOAL V:** Work with the partners to ensure adequate water quantity and quality and minimum flows and levels to support wildlife and habitat objectives of the refuge.

### *V.A. Water Quantity*

**Wildlife and Habitat Management Objective V.A.1:** Within 10 years of plan adoption, work with partners to ensure adequate water levels exist to support wildlife and habitat objectives of the refuge.

Discussion: The refuge needs adequate water quantities in order to sustain wildlife, maintain habitats, and management of impoundments. Impoundments are filled with water from Brown Creek and the Pee Dee River. As regional water use increases, ensuring that future proper water quantities are maintained on the refuge will become increasingly important.

**Wildlife and Habitat Management Objective V.A.2:** Within two years of plan adoption, annually quantify volumes of water used to fill impoundments, and document when low streamflow precludes filling.

Discussion: The refuge needs adequate water quantities in order to sustain wildlife, maintain habitats, and management of impoundments. As regional water use increases, ensuring that future proper water quantities are maintained on the refuge will become increasingly important.

*Strategies:*

- Monitor water levels in Brown Creek. Work with the North Carolina Division of Water Resources (NCDWR) and the U.S. Geological Survey to design a simple staff gage for measuring the flow of Brown Creek as it enters the Pee Dee River. Measure flow on a regular basis and provide these data to the NCDWR.
- Work with the Regional Refuge Ecologist and partners to conduct a GIS analysis of the Brown Creek watershed to determine status and trends of land usage (urban, agriculture, forested) and the effect this has on flows of Brown Creek. Use findings to determine cooperative water management agreements for Brown Creek.
- Consider additional options, including subsurface pumping to maintain needed water levels.

**Wildlife and Habitat Management Objective V.A.3:** Within 10 years of plan adoption, develop a water use plan for the refuge.

### *V.B. Water Quality*

**Wildlife and Habitat Management Objective V.B.1:** During the next 3 years, work with the Regional Refuge Ecologist to complete a survey of all streams and rivers to ensure that sufficient filter strips and other best management practices are being followed to minimize runoff of sediments, nutrients, and pesticides.

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**Discussion:** Water quality is a measure of dissolved oxygen, turbidity, and levels of pollution. Ensuring adequate water quality is essential for maintaining aquatic species and other wildlife species, as well as habitats dependent on the water supply. Water quality is generally poor in refuge streams (Progress Energy 2005a) with low dissolved oxygen levels and high amounts of sediment. Currently, water quality on the refuge is dictated by land use activities (farming, development, etc) upstream. Through future cooperative agreements, outreach programs and increased interagency coordination, the refuge aims to promote land use activities in upstream watershed areas that will improve water quality on the refuge.

**Strategies:**

- Work with landowners and other partners to protect upstream watershed areas (e.g., establish appropriate riparian buffers on lands upstream of the refuge).
- Work with counties to overlay wider buffer requirements such as conservation easements on all streams flowing into refuge
- Develop a water quality monitoring program for refuge waters.

**Wildlife and Habitat Management Objective V.B.2:** During the life of this plan, work with partners to set appropriate targets for biotic integrity scores on all refuge streams following the NCIBI protocol.

**Discussion:** The North Carolina Index of Biological Integrity (NCIBI) method was developed for assessing a stream's biological integrity by examining the structure and health of its fish community. NCIBI incorporates information about species richness and composition, trophic composition, fish abundance, and fish condition to derive a score that is a measure of a particular stream's ecological health and water quality. The NCIBI method does not require detailed water chemistry data to be analyzed to determine the environmental status of a stream. Almost all streams on the refuge were determined to have poor NCIBI scores (Progress Energy 2005a). The refuge would work with partners to set targets for biotic integrity scores and use these as benchmarks for stream restoration.

## **RESOURCE PROTECTION**

Resource protection goals include the refuge's acquisition boundary, conservation focus areas, and archaeological and historical resources.

### **I. LAND ACQUISITION**

**RESOURCE PROTECTION GOAL I:** Look for opportunities to expand refuge lands within the acquisition boundary to help meet refuge habitat, management, and population goals for federal trust resources.

**Resource Protection Objective I:** Within three years of plan adoption, develop a priority list for acquisitions by 2013.

**Discussion:** One of the most effective conservation biology tools is setting aside land for protection. Within the Pee Dee NWR acquisition boundary, several small tracts are privately owned. The refuge will continue to evaluate these properties for their conservation value and consider them for purchase as they become available.

**Strategies:**

- Work with local land trusts and nongovernmental organizations to identify willing sellers to acquire additional refuge lands. Also, consider a land-timber exchange program to meet this goal.

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- Explore opportunities to place easements on lands near the refuge that will compliment refuge objectives.
  - Consider larger landscape conservation planning efforts (e.g., the Greater Uwharries Conservation Partnership coordinated by the NCWRC) to help guide acquisitions, easements, and habitat linkages.
  - Develop relationships with adjacent landowners.

## II. GAPS AND CORRIDORS

**RESOURCE PROTECTION GOAL II:** Work to protect important habitats and wildlife corridors.

**Resource Protection Objective II:** During the 15-year life of the plan, document important habitats and wildlife corridors and work with partners to create at least one wildlife corridor.

Discussion: Wildlife corridors are an increasingly important conservation tool in a heavily developed landscape. These corridors provide safe passages for wide-ranging species. In addition, these habitats may be utilized by smaller resident species and by migratory birds. Working with the state, wildlife corridors could be established that provide greater connectivity among a network of refuges and other conservation lands.

## III. CONSERVATION EASEMENTS

**RESOURCE PROTECTION GOAL III:** Manage easements to protect characteristic habitats and wildlife of the area.

**Resource Protection Objective III.A:** During the course of the plan, manage these easements to protect and to conserve the wetland characteristics for the benefit of migratory birds and waterfowl, primarily wood ducks.

Discussion: Pee Dee National Wildlife Refuge has the designated responsibility of managing 20 conservation easement properties totaling approximately 1,300 acres (526 hectares) in eight North Carolina counties. These easements range in size from 14 to 224 acres (5.7–90.6 hectares) and most contain wetlands. All easements are administered by the National Wildlife Refuge System under the Service and Pee Dee NWR retains the right, at its sole discretion, to manage the easement areas, including the right of ingress and egress to conduct wetlands management, monitoring and easement enforcement activities. The vegetation or hydrology of either easement area will not be altered in any way or by any means or activity on the properties conveyed by the deeds, or property owned or under the control of the landowners, including (1) cutting or burning; (2) cultivation; (3) harvesting wood products; (4) burning; (5) placing of refuse, wastes, sewage, or other debris; (6) draining, dredging, channeling, filling, disking, pumping, diking, impounding and related activities; or (7) diverting or affecting the natural flow of surface or underground waters into, within, and out of the easement areas. The above conditions are subject to the discretion of the easement (refuge) manager and can be put into effect or not, depending on the needs of the habitat enhancement operations.

**Resource Protection Objective III.B:** During the 15-year plan, map easement boundaries and identify and describe habitats within these easements.

**Resource Protection Objective III.C:** During the 15-year plan, develop habitat management plans for these easements.

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#### IV. COOPERATIVE EFFORTS WITH NEARBY PRIVATE LANDOWNERS

**RESOURCE PROTECTION GOAL IV:** Work with private landowners near the refuge to promote refuge goals and objectives for federal trust resources.

**Resource Protection Objective IV:** Within 15 years of plan approval, coordinate annual meetings with the Service's Partners Program in the Raleigh Ecological Services Office and the Sandhills Sub-office to identify opportunities to enter into Cooperative Wildlife Management Agreements with private landowners near the refuge in the PFW focus areas.

*Strategies:*

- Explore opportunities to improve habitat management on neighboring lands through farm bill programs, forest stewardship program, etc.
- Work with District conservationists, Cooperative Extension, NCWRC Technical Guidance and Wildlife Diversity biologists, the Service's Partners biologist, and others to prioritize lands surrounding the refuge suitable for restoration or enhancement for wildlife.
- Refuge staff should at least once annually participate in the Greater Uwharries Conservation Partnership Working Group meetings.

#### V. ARCHAEOLOGICAL AND CULTURAL RESOURCES

**RESOURCE PROTECTION GOAL V:** Protect the archaeological and historical resources of the refuge that represent over 12,000 years of history.

**Resource Protection Objective V:** During the 15-year life of the plan, work with the Service's Regional Archaeologist and the State Historic Preservation Office and coordinate with partners to protect the archaeological and historical resources of the refuge.

Discussion: Historical and archeological resources have been well documented on the refuge through several surveys and studies (Cooper and Derting 1976; Garrow 1979; Joy 1994; Anderson and Bryant 2000). Evidence in the form of stone tools and other artifacts collected on the refuge during these studies indicate that these lands were utilized since at least 8,000 years ago. More recently, the refuge lands were inhabited by European settlers, followed by various peoples during the later stages of America's history as indicated by the remnants of bridges, homesteads and other structures. Protecting these valuable archaeological and historical resources for posterity is an important objective of the refuge.

*Strategies:*

- Continue regular patrols and enforcement.
- Conduct an archeological review prior to excavation projects.

#### VISITOR SERVICES

Visitor services include the welcoming and orientation of visitors; hunting; fishing; wildlife photography and observation; environmental outreach and education; other recreational opportunities; the Friends group; volunteer programs; and litter.

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## I. VISITOR WELCOME AND ORIENTATION

**VISITOR SERVICES GOAL I:** Continue to welcome and provide information for the public.

**Visitor Service Objective I:** During the first five years of the plan, add two new kiosks and focus the message on wildlife and habitat diversity.

*Strategies:*

- Continue to maintain 3 kiosks, visitor contact station, website, and provide brochures and maps.
- New kiosks would be located at Sullivan's Pond and Richmond County.
- Focus message on wildlife and habitat diversity.
- Add directional and entrance signs.
- Develop informational video.

## II. HUNTING

**VISITOR SERVICES GOAL II:** Continue to provide a quality hunting experience.

Discussion: Various units on the refuge provide good habitat for game species such as white-tailed deer, turkey, and small game. Achievement of habitat and population management objectives is essential to providing high quality hunting opportunities. Reviewing and updating the refuge hunt plan based on recorded biological data is essential to the continuation and expansion of hunting on the refuge. A well developed hunt program will enable land managers to control population levels, make use of a renewable resource, provide opportunities for traditional, high quality wildlife-dependent recreation activities, and will not substantially impact wildlife populations. As of the writing of this plan, the NCWRC is monitoring for Chronic Wasting Disease statewide.

### *II.A. Turkey Hunting Opportunities*

**Visitor Services Objective II.A:** Within three years of plan adoption, expand turkey hunting to include Richmond County tracts.

Discussion: Turkey populations on the refuge have steadily increased over the years, and a turkey hunt has been in place on the Anson County portion of the refuge. Public interest has been expressed to expand turkey hunting to include areas of the refuge in Richmond County. Turkey populations on those lands could sustain a hunt; and the refuge would work with the NCWRC to determine appropriate quota levels.

### *II.B. Deer Hunting Opportunities*

**Visitor Services Objective II.B:** Within five years of the plan's approval, work with the NCWRC and SCWDS to evaluate the refuge's deer population and health status to set harvest quotas.

Discussion: There are currently 8,000 acres (3,237 hectares) open to deer hunting. Deer hunting opportunities consist of a managed quota hunt that includes 13 days of gun hunting (1,250 permits) and 42 archery days (1,100 permits). Annual deer surveys help determine deer population status and trends, and the NCWRC is monitoring for Chronic Wasting Disease statewide. Without natural predators to control their numbers, deer can become overpopulated. At high densities, deer can inflict major economic losses in forestry, agriculture, and transportation and contribute to the transmission of several animal and human diseases. Their impact on natural ecosystems is also dramatic but less quantified. By foraging selectively, deer affect the growth and survival of many

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herb, shrub, and tree species, modifying patterns of relative abundance and vegetation dynamics. Cascading effects on other species extend to insects, birds, and other mammals. In forests, sustained overbrowsing reduces plant cover and diversity, alters nutrient and carbon cycling, and redirects succession to shift future overstory composition (Cote et al. 2004). Hence, deer population management is critical to maintaining the refuge's wildlife and habitat diversity.

*Strategies:*

- Update the Refuge Hunt Plan.
- Evaluate deer population for disease issues.
- As needed, provide NCWRC with deer tissue samples for disease coordination.
- Institute cooperative state/refuge hunt regulation and enforcement meetings on an annual basis.
- Estimate the refuge's deer population.
- Collect all deer harvest information at hunter check stations.
- Close the deer hunt areas to all other users during hunt days.
- Adjust hunting as adverse impacts are experienced by deer, other wildlife, and/or habitats.

*II.C. Small Game Hunting Opportunities*

**Visitor Services Objective II.D:** Within three years of plan adoption, implement quail population monitoring to determine number of hunting days and bag limit.

Discussion: Because quail are declining across much of their range due to changes in land use (Williams et al. 2004), the refuge has reduced the daily bag limit from six to two birds and limits the hunt to nine days (versus the 90 days allowed by the state). In order to ensure future hunting opportunities for this small game species, the refuge will work to manage the population at sustainable levels and adjust the hunt as necessary.

*Strategies:*

- Monitor population status and trends.
- Consider adjusting hunt days, bag limit, and number of hunters according to quail population estimates.

### **III. FISHING**

**VISITOR SERVICES GOAL III:** Optimize the fishery resources of the refuge in accordance with the refuge's primary goals and objectives.

*III. Improving Fishing Opportunities*

**Visitor Services Objective III:** During the 15-year plan, improve fishing opportunities on the refuge.

Discussion: Fishing for largemouth bass, bream, crappie, and catfish occurs on the refuge. Bank fishing is a popular activity on refuge ponds, Brown Creek, and the Pee Dee River. Boat access to the Pee Dee River is limited with the nearest boat ramp located at the Route 109 bridge, three miles (4.8 km) east of refuge. Some of the fish caught on the refuge are used for consumption. A Service study determined that all fish sampled (catfish, sunfish and largemouth bass) from two refuge ponds contained mercury (U.S. Fish and Wildlife Service 2007), with largemouth bass having the highest concentrations of mercury. Mercury is toxic and can cause developmental and neurological disorders at high concentrations. Since mercury is present everywhere at various levels, the North Carolina Division of Public Health has issued a statewide advisory for fish consumption (North Carolina Department of Health and Human Services 2007).

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*Strategies:*

- In consultation with county, state, and federal partners, revise and update the refuge fisheries management plan to provide a quality fishing experience.
- Periodically monitor fishing impacts on migratory birds, waterfowl, and threatened/endangered species.
- Evaluate the need for and location of a public boat ramp on the refuge.
- Continue to estimate the number of visits and hours spent at the refuge for the purpose of recreational fishing.
- Monitor fish populations by standard sampling techniques, keeping records of public use activity, and conducting creel census when possible.
- Maintain signs directing the public to open fishing areas.
- Investigate the possibility of improving fishing access for the handicapped.
- Keep brochure of maps and fishing regulations available to the public and up to date.
- Continue to use the refuge news release program to inform the public of fishing events (e.g., Youth Fishing Day), refuge policies and special events.
- Continue to provide and maintain fishing access areas around ponds.
- Continue to patrol fishing areas to ensure compliance with fishing regulations.
- Post current state advisory information and risk management recommendations from the Service's 2007 fish mercury study at popular fishing locations on each refuge.

#### **IV. WILDLIFE OBSERVATION AND PHOTOGRAPHY**

**VISITOR SERVICES GOAL IV:** Wildlife observers and photographers of all abilities can enjoy the diversity of refuge wildlife and support efforts to maintain high quality habitat.

##### *IV.A. Improving Wildlife and Photography Opportunities*

**Visitor Services Objective IV.A:** During the course of the plan, work to increase wildlife photography and observation opportunities by adding additional photoblinds and evaluate potential for additional birding trails.

Discussion: Pee Dee NWR is part of the North Carolina Scenic Byway, specifically the Pee Dee Valley Drive. The National Scenic Byways Program is administered by the U.S. Department of Transportation, Federal Highway Administration. The program is a grass-roots collaborative effort established to help recognize, preserve, and enhance selected roads throughout the United States. In addition to public roads, the refuge offers several trails through bottloland hardwoods and mixed pine-hardwood habitats and a photo-blind. Additional wildlife viewing opportunities could be created by adding trails along wetlands. These wetland trails would be seasonally closed to limit disturbance to migratory birds.

*Strategies:*

- Maintain and enhance observation sites to attract wildlife.
- Evaluate the need for and location of a public boat ramp on the refuge.

**Visitor Services Objective IV.B:** Within the first year of plan adoption, incorporate Pee Dee National Wildlife Refuge into the North Carolina Birding Trail Program.

Discussion: The North Carolina Birding Trail program (NCBT) is a cooperative efforts between several federal and state agencies as well as conservation organization (USFWS, NCWRC, Audubon, etc.) that aims to "... conserve and enhance North Carolina's bird habitat by promoting sustainable bird watching activities, economic opportunities and conservation education." Pee Dee NWR has been approved by NCBT as a site along the Piedmont region of the trail. Full incorporation

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of Pee Dee NWR into the Piedmont portion of the NCBT will increase awareness of the refuge, as well as provide connectivity for a regional bird watching trail system.

*Strategies:*

- Provide outreach materials regarding the refuge's incorporation into the NCBT (including the Piedmont Regional Trail Guide).
- Add signs to designate NCBTP appropriate trails on the refuge.

## **V. ENVIRONMENTAL EDUCATION AND INTERPRETATION**

**VISITOR SERVICES GOAL V:** Establish a formal environmental education/outreach program at the refuge.

*V.A. Environmental Education and Interpretation Opportunities*

**Visitor Services Objective V.A:** During the 15-year plan, construct a 10,000 square foot (743 m<sup>2</sup>) environmental education center on the refuge.

Discussion: Environmental education is a cost-effective way of educating the public about the role and importance of the refuge in the landscape. Currently 6 million people live within a 100-mile (161-km) radius of the refuge and many areas near the refuge are experiencing fast-growing population rates. The increased populations will have adverse impacts on the natural environment, including the refuge. By fostering greater awareness of the refuge and the need to conserve and protect natural areas, individuals can work to reduce their impact. Currently, the nearest Service environmental education center is located five hours away. An environmental education center on the refuge would provide a valuable resource to the North Carolina Piedmont. A separate environmental assessment or environmental impact statement would be conducted to assess the potential impacts of the construction and operation of such a facility.

**Visitor Services Objective V.B:** Over the 15-year plan, continue to expand the environmental education and interpretation program.

*Strategies:*

- Develop onsite and offsite curriculum-based educational programs with messages focused on the role and importance of the refuge in the landscape
- Hire a full-time Environmental Education/Outreach Park Ranger.
- Develop and conduct outdoor classroom activities.
- Manage the refuge website from the refuge to improve information provided therein.
- Disseminate refuge brochures, and environmental education and interpretation materials.
- Train staff, volunteers, and teachers to conduct onsite and offsite educational and interpretive programs.
- Develop lesson plans and train local teachers to use the refuge as an outdoor classroom.
- In addition to the request for Service money, continue to work with the Friends group to look at other funding sources.

*V.B. Number of Interpretive Trails*

**Visitor Services Objective V.B:** During the first five years of plan adoption, add two hiking trails near the future environmental education center.

Discussion: Current trails are Brown Creek and Tall Pines. New trails would complement the future education center. One would feature wetland habitat and the other hardwood bottom forest.

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## VI. OTHER RECREATIONAL OPPORTUNITIES

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

### *VI. Horseback Riding*

**Visitor Services Objective VI:** Within one year of plan adoption, continue to limit horseback riding on gravel roads by special use permit only.

Discussion: Horseback riding provides a quiet and natural way for visitors to enjoy the refuge. This activity is only permitted on public roads, and no negative effects have been documented. If this activity causes serious problems in the future, it would be curtailed or possibly eliminated.

## VII. OUTREACH

**VISITOR SERVICES GOAL VII:** Through increased outreach activities, the refuge will be locally recognized and its purposes supported.

**Visitor Services Objective VII:** Within ten years of plan approval, increase recognition of the refuge by local residents by 10%.

### *Strategies:*

- Expand outreach programs via the media, website, and conservation groups.
- Continue to maintain a positive working relationship with local newspapers.
- Create sampling protocols and data sheets.
- Work with the Friends group and volunteers to assist in sampling efforts.

## VIII. FRIENDS OF THE PEE DEE NATIONAL WILDLIFE REFUGE

**VISITOR SERVICES GOAL VIII:** The Friends of the Pee Dee NWR will be an advocate for the refuge, supporting refuge goals and objectives, and providing financial and volunteer staff support for refuge programs.

**Visitor Services Objective VIII:** Over the 15-year life of the plan, the refuge will continue to maintain a close working relationship with the Friends of the Pee Dee NWR, assisting in promoting the growth in membership and financial revenues, providing input on refuge needs, and working to align interests.

### *Strategies:*

- Actively recruit additional members for the Friends group.
- Maintain positive working relationship with the Friends group through meeting attendance and refuge support of Friends programs.

## IX. VOLUNTEERS

**VISITOR SERVICES GOAL IX:** A sufficient number of skilled and trained volunteers will be available to support the refuge in meeting its mission and purposes.

**Visitor Services Objective IX:** Within five years of plan approval, increase volunteer hours to 5,000 hours annually and provide volunteers with adequate training to perform assigned duties with minimal supervision.

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**Discussion:** Pee Dee NWR volunteers currently contribute approximately 2,500 hours in general maintenance, assistance with refuge programs, administrative work, and biological data collection.

**Strategies:**

- Improve recreational vehicle (RV) hookup sites with cement pads.
- Actively recruit resident volunteers, and interns.  
Develop a volunteer program that consists of resident and local volunteers and interns.

## **X. CONTROL OF TRASH AND LITTER**

**Visitor Services Goal X:** Provide refuge wildlife and visitors with a litter-free environment.

**Visitor Services Objective X:** During the 15-year plan, decrease litter on the refuge through public awareness.

**Discussion:** Trash and litter are unsightly and cause problems for wildlife. Plastic bags can be ingested by larger species, causing suffocation or fatal intestinal blockage. Bottles can cause entrapment of small animals and invertebrates. Six-pack rings and other plastic strapping materials can cause entanglement in birds and other wildlife. Most visitors will unfavorably rate their experience if they experience high levels of trash and litter.

**Strategies:**

- Increase the number of cleanups through coordination with area service groups and schools.
- Ensure that refuge is included in area cleanup projects.
- Increase public awareness on the problems associated with trash.
- Increase law enforcement surveillance.

## **REFUGE ADMINISTRATION**

Refuge administration includes infrastructure, staffing, and intergovernmental coordination.

### **I. REFUGE MANAGEMENT**

**REFUGE ADMINISTRATION GOAL I:** Provide sufficient refuge infrastructure and staff, and collaborate with intergovernmental partners to implement a comprehensive refuge management program to protect and manage the natural and cultural values of the refuge's wildlife and habitats.

#### ***I.A. Administrative Facilities, Utilities, Equipment, and Signs***

**Refuge Administration Objective I.A:** Within one year of plan adoption, focus repairs and/or new administrative facilities, utilities, equipment, and signs to implement management activities that enhance habitat and wildlife diversity and support public use activities.

**Strategies:**

- Deferred maintenance priorities and percentages will reflect a wildlife and habitat diversity management focus.
- Service Asset Maintenance Management System (SAMMS) work orders will reflect and support the management priorities of the refuge.

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## *I.B. Staff*

Discussion: The refuge currently does not have a biologist and the Assistant Refuge Manager position has been targeted for elimination. In addition, there are insufficient maintenance, fire management, and education/outreach staff to manage the refuge in accordance with its purposes and goals. There is an immediate need to complete basic inventory and begin monitoring refuge habitats and wildlife populations. Future increases in visitors and additional impacts from an increasingly developed landscape surrounding the refuge necessitate an adequately staffed refuge.

### *I.B.1. Assistant Refuge Manager*

**Refuge Administration Objective I.B.1:** Within one year of the plan, restore the Assistant Refuge Manager position.

### *I.B.2. Biologist*

**Refuge Administration Objective I.B.2:** Within two years of this review approval, add one additional Biologist to conduct biological inventorying/monitoring, monitor hydrology, and assist collaborative research efforts.

### *I.B.3. Forestry Technician*

**Refuge Administration Objective I.B.3:** Within four years of plan adoption, add one additional Forestry Technician to conduct forestry practices on the refuge, 80% of which is forested.

### *I.B.4. Maintenance Workers*

**Refuge Administration Objective I.B.4:** Within one year of plan adoption, reinstate two additional maintenance workers to conduct maintenance operations on the refuge.

Discussion: Maintenance activities on the refuge include maintaining 30 miles (48 km) of roads, managing impoundment water levels, planting 50 miles (80 km) of field borders, and a variety of other projects.

### *I.B.5. Park Ranger*

**Refuge Administration Objective I.B.5:** Within two years of plan adoption, add a Park Ranger (Outdoor Recreation Planner) to carry out education/outreach and volunteer coordination programs associated with the development and operation of the proposed environmental education center.

## **II. INTERGOVERNMENTAL COORDINATION**

**REFUGE ADMINISTRATION GOAL II:** Foster a strong and effective working relationship with existing partners and new partners for the purposes of accomplishing refuge management goals and protecting natural and cultural resources of the refuge's habitats.

Discussion: The public has an expectation that more of the Service's goals be accomplished through partnerships and that government must become more efficient. The Director of the Service has stated that the Service must emphasize working cooperatively with others; develop a more integrated approach to problem-solving and share resources to get the job done; and make choices and find efficiencies in both resource and business management practices. This focus reinvigorates the refuge's current intergovernmental coordination efforts. Numerous federal, state, and local agencies could be considered partners for the refuge. However, more could be done to inform and educate the

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partners of the value of the refuge and the refuge's goals. In the same vein, the Service is willing to help other agencies with issues, such as fire management, nuisance wildlife, exotic plant control, and specific wildlife conservation issues. Much of this coordination could be accomplished by regular meetings and by developing personal relationships with individuals within other agencies.

*II. Collaboration with the State and USGS to Monitor and Survey Wildlife*

**Refuge Administration Objective II:** Within six years of plan adoption, collaborate with the State of North Carolina and the U.S. Geological Survey (USGS) to monitor and survey the following fish and wildlife on the refuge and/or adjacent to the refuge:

- Red-cockaded woodpecker
- Stream fish
- Diadromous fish
- Freshwater mussels
- Schweinitz's sunflower
- State-listed plants
- Deer (including population health)
- Exotic and invasive species

Discussion: The North Carolina Department of Environment and Natural Resources (NCDENR) and USGS already have monitoring and survey programs in place for several species of fish and wildlife. Increased data-sharing and agreements to expand these programs to include areas of the refuge would be an effective way to fulfill refuge goals and objectives.



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# V. Plan Implementation

## INTRODUCTION

Refuge lands are managed as defined under the National Wildlife Refuge System Improvement Act of 1997. Congress has distinguished a clear legislative mission of wildlife conservation for all national wildlife refuges. National wildlife refuges, unlike other public lands, are dedicated to the conservation of the Nation's fish and wildlife resources and wildlife-dependent recreational uses. Priority projects emphasize the protection and enhancement of fish and wildlife species first and foremost, but considerable emphasis is placed on balancing the needs and demands for wildlife-dependent recreation and environmental education.

To accomplish the purpose, vision, goals, and objectives contained in this plan for Pee Dee National Wildlife Refuge, this chapter identifies the 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

Listed below are the proposed project summaries and their associated costs for fish and wildlife population management, habitat management, resource protection, visitor services, and refuge administration over the next 15 years. This proposed project list reflects the priority needs identified by the public, planning team, and refuge staff based upon available information. These projects were generated for the purpose of achieving the refuge's objectives and strategies. The primary linkages of these projects to those planning elements are identified in each summary.

### WILDLIFE AND HABITAT MANAGEMENT

#### **Project 1**

Standardize surveys and monitoring of little blue herons, loggerhead shrikes, red-cockaded woodpeckers, Rafinesque's big-eared bats, stream and diadromous fish, freshwater mussels, migratory birds (including waterfowl, shorebirds, wading birds, and land birds), mammals, warmwater fish, and herpetofauna.

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 wildlife biologist 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:** ID, IE, IF, IG, IH, II, IJ, IIA2, IIB2, IIC2, IID3, IVI, IVJ1

**Visitor Services Objectives:** IIB, IIC, IID

**Refuge Administration Objectives:** IB2, II

#### **Project 2**

Build and maintain databases containing biological resource data, habitat management activities and spatial relationships for the refuge and surrounding environments.

A fully implemented geographic information system is not in use at Pee Dee National Wildlife Refuge. This project would develop an up-to-date data management, storage, and retrieval system; obtain

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spatial information from appropriate sources; develop geographic layers for refuge management programs; and facilitate spatial analysis and creation of maps by the refuge staff.

**Wildlife and Habitat Management Objectives:** II, IJ, IIIA, IVA, IVB, IVF

**Refuge Administration Objective:** IB3

### ***Project 3***

Identify, locate and control (eliminate where possible) nonnative plants.

Invasive plant species are expanding onto refuge lands. Current known locations are along refuge roads and trails. Aquatic exotic plants are controlled through water manipulation of impoundments, but without a comprehensive control plan that includes all habitats, exotic plant species will continue to colonize areas of the refuge, degrading habitat for the several listed species, migratory birds, and a variety of herpetofauna. This project would identify invasive plant species, determine their distribution, and treat affected areas using appropriate control measures.

**Wildlife and Habitat Management Objectives:** IIIA, IIIB1, IIIB2, IIIC, IIID, IIIE

**Refuge Administration Objective:** IB2

### ***Project 4***

Expand forest and old field management to maintain/restore these communities.

An expanded prescribed burning and tree thinning program is essential to maintain diverse wildlife habitats, reduce fuel loads that could lead to devastating wildfires and minimize pine beetle outbreaks. In order to properly manage a wide array of species, including protected species such as the loggerhead shrike, it is critical that refuge lands be burned on a regular schedule and under controlled conditions. Pee Dee NWR hosts dozens of bird species throughout the year. Restoring these habitats, through the use of controlled burns, reduces the potential of wildfire, while enhancing habitat for priority migratory birds. Prescribed burning is also an effective tool to minimize the spread of invasive exotic plant species. In addition, bottomland forest habitats need to be managed to maintain their plant diversity and usefulness to certain wildlife. For instance, sweetgum need to be thinned because their densities are too high in certain areas, limiting the mast production of tree species which are more beneficial to wildlife. Prescribed burning and planting native grasses can be used to maintain and restore old fields and rights-of-way, increasing their wildlife value. A variety of techniques, including a full-time permanent forestry technician, would be used to maintain hardwood forests on the refuge.

**Wildlife and Habitat Management Objectives:** IC, ID, IE, II, IJ, IID1, IID3, IID4, IVA, IVB, IVF1, IVF2, IVG, IVJ2

**Refuge Administration Objective:** IB3

### ***Project 5***

Use prescribed fire and/or water level manipulation to manage impoundments and the green tree reservoir and develop a refuge impoundment management plan.

The impoundments on Pee Dee NWR are utilized by a large number of waterfowl, wading birds, shorebirds as well as other wildlife species and have been managed with these in mind. Through prescribed fire, water level manipulation, and other techniques, the refuge will help ensure a variety of wetlands conditions in the impoundments and impounded bottomland hardwoods needed by a diverse array of bird and other wildlife species.

**Wildlife and Habitat Management Objectives:** IA, IB, IJ, IIA, IIA3, IIB1, IIC1, IVC, IVD, IVE

**Refuge Administration Objective:** IB2

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**Project 6**

Coordinate with partners to implement sustainable water and land use practices in upstream areas of the watershed to protect water resources on the refuge.

Water resources in North Carolina are being diverted and degraded through human uses. Ensuring adequate, clean water is critical for the long-term health of the refuge. Developing a water management plan for the refuge will help establish a framework for protecting and utilizing this precious resource.

**Wildlife and Habitat Management Objectives:** IF, IG, IH, IVI, VA1, VA2, VA3, VB1, VB2

**Refuge Administration Objective:** IB1

**RESOURCE PROTECTION****Project 7**

Consider small properties within the refuge acquisition boundary for purchase as they become available; improve oversight of FSA easements, and document conservation focus areas and wildlife corridors.

Through this project the refuge would determine the wildlife value of small properties within the refuge acquisition boundary as they become available, obtain more information regarding FSA easements, and work towards improving management of these lands. Furthermore, the refuge would document conservation focus areas and wildlife corridors in the vicinity of Pee Dee NWR and work to build conservation management agreements for these lands.

**Resource Protection Objectives:** II, III, IVA, IVB, IVC, V

**Refuge Administration Objective:** IB1

**VISITOR SERVICES****Project 8**

Improve or expand hunting and fishing opportunities on the refuge.

Currently, fishing and hunting (for deer, turkey, and small game) are permitted on designated areas of the refuge. As part of this project, the refuge would expand the turkey hunt to include the Richmond County portion. In addition, quail would be more intensively monitored to determine appropriate bag limits. As part of this project, refuge hunting and fishing plans would be updated.

**Visitor Services Objectives:** IIA, IIB, IIC, III

**Refuge Administration Objective:** IB1

**Project 9**

Increase outreach and environmental education and interpretation

Pee Dee NWR hosts more than 30,000 visitors annually and is within a 100-mile radius of over 6 million people. The main focus of this project would be to construct an 10,000 square foot (929 m<sup>2</sup>) environmental education and interpretation facility on the refuge and build additional trails. In addition, the project would enable the refuge to employ an outreach and visitor services specialist to manage the education center and reach additional residents, tourists, and school children to explain the refuge's role in the Piedmont ecosystem, as well as ecological threats to the refuge and its resources. This position would improve partnership opportunities and expand educational and interpretive programs by working with sources, such as the Friends group, volunteers, and other organizations and individuals. Refuge resources would be appropriately interpreted and communication with outside audiences via news releases, web media, and special events would be coordinated. One full-time Park Ranger for Environmental Education and Outreach will be hired to develop education/outreach programs and train staff and volunteers to run the programs.

**Visitor Services Objectives:** I, IVA, IVB, VA, VB, VC, VI, VII, VIII, IX, X

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**Refuge Administration Objective: IB5****REFUGE ADMINISTRATION****Project 10**

Improve maintenance operations and facilities management.

This project would provide two maintenance workers to improve refuge operations and facilities maintenance, including trails, roads and parking lots, kiosks, signs, and water control structures. The workers would assist with maintenance of refuge buildings infrastructure and facilities. In addition, the workers would maintain over 30 miles of planted field borders to benefit wildlife.

**Refuge Administration Objectives: IA, IB4**

**FUNDING AND PERSONNEL**

Implementation of this plan will require increased funding and personnel support that will come from a variety of internal and external sources. New projects and maintenance needs for existing facilities and projects are identified through the Service Asset Maintenance Management System (SAMMS). This plan outlines proposed projects that are not substantially above current budget allocations. Table 6 lists the proposed projects, their costs and associated staffing. The plan does not constitute a commitment (from Congress) for staffing increases, operational and maintenance increases, or funding for future land acquisition, but represents wildlife resource needs based on sound biological science and input from the public.

**Table 6. Project costs and staffing.**

#	PROJECT TITLE	FIRST YEAR COST	RECURRING ANNUAL COST	STAFF (FTEs)
1	Surveys and Monitoring	30,000	20,000	Biologist
2	GIS Database	20,000	10,000	Forestry Technician
3	Exotic Plant Control	10,000	10,000	Biologist
4	Forest and Old Field Management	40,000	50,000	Forest Technician
5	Impoundment Management	30,000	30,000	Biologist
6	Water Quantity and Quality	5,000	5,000	Assistant Refuge Manager
7	Land Acquisition, Easements, and Gaps/Corridors	5,000	5,000	Assistant Refuge Manager

#	PROJECT TITLE	FIRST YEAR COST	RECURRING ANNUAL COST	STAFF (FTEs)
8	Hunting and Fishing	20,000	20,000	Assistant Refuge Manager
9	Outreach, Education, and Interpretation	50,000	50,000	Park Ranger
10	Maintenance and Operations	150,000	150,000	Maintenance Workers

According to predictions based on the Refuge Operating Needs System (RONS) database, the refuge staff will need to increase from a total of 5 in Fiscal Year 2007, to a total of 10 by year 2016 (Figure 13). This increase in staff will also necessitate an increase in base funding above standard yearly increases that allow only for inflation.

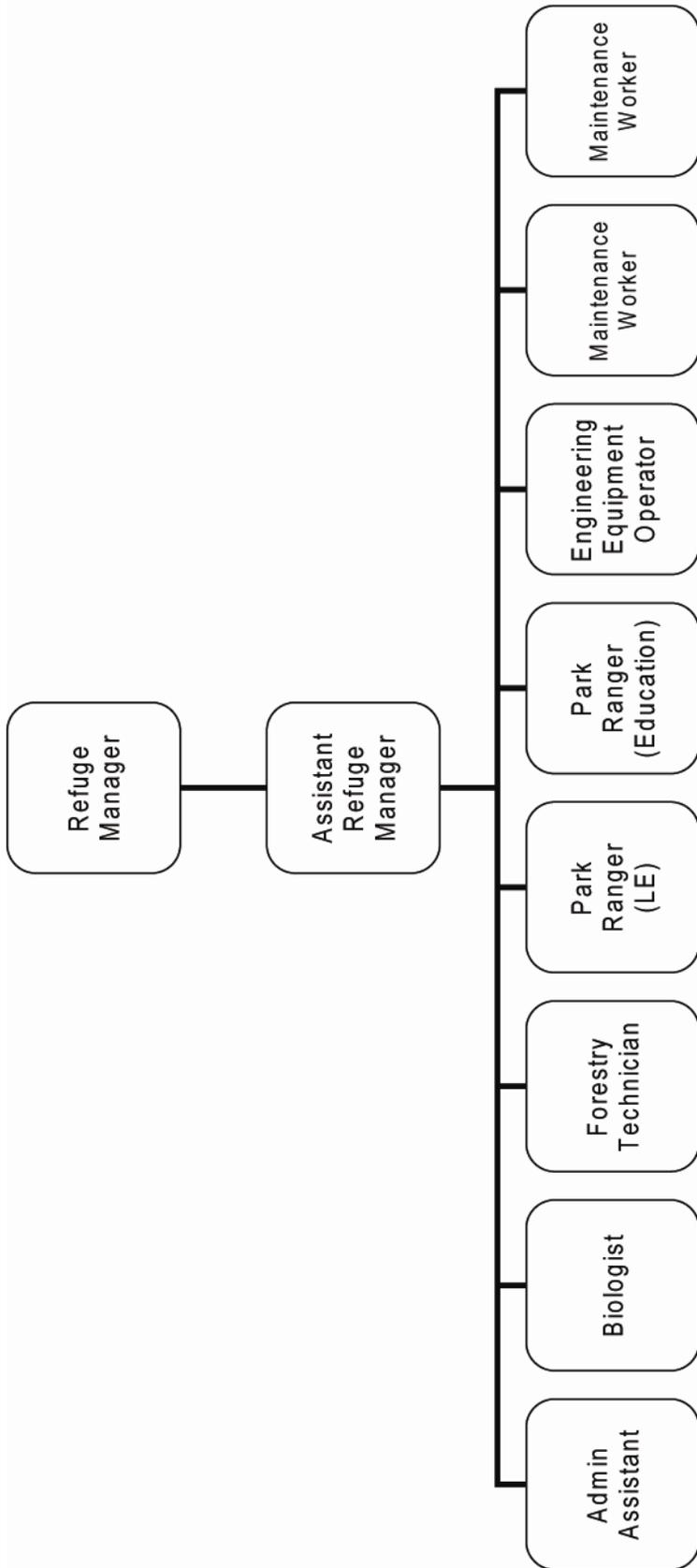
### **PARTNERSHIPS AND VOLUNTEER OPPORTUNITIES**

A key element of this Comprehensive Conservation Plan is to establish partnerships with local volunteers, landowners, private organizations, and State and Federal natural resource agencies. In the immediate vicinity of the refuge, opportunities exist to increase partnerships with the Friends of the Pee Dee NWR, volunteers, University of North Carolina at Charlotte, University of North Carolina at Greensboro, Audubon, Uwharrie National Forest, Ansonville Historical Society, and Anson and Richmond counties. At regional and State levels, partnerships may be established or enhanced with organizations such as NCWRC, North Carolina Department of Forestry, North Carolina Natural Heritage Program, North Carolina Department of Cultural Resources, Catawba Indian Nation, North Carolina Division of Water Resources, North Carolina Cooperative Extension Service, North Carolina State Parks, Gaddy's Goose Pond, Whitetails Unlimited, Progress Energy, Quail Unlimited, USDA Natural Resources Conservation Service, National Wild Turkey Federation, U.S. Geological Survey, and Ducks Unlimited.

### **STEP-DOWN MANAGEMENT PLANS**

While the comprehensive conservation plan is a strategic plan that guides the future direction of the Refuge, a step-down management plan provides specific guidance on activities, such as habitat, fire, and visitor services management. These plans (Table 7) are also developed in accordance with the National Environmental Policy Act, which requires the identification and evaluation of alternatives and public review and involvement prior to their implementation.

Figure 13. Proposed organizational chart, Pee Dee National Wildlife Refuge.



**Table 7. Pee Dee NWR step-down management plans related to the goals and objectives of the comprehensive conservation plan.**

<b>Step-down Plan</b>	<b>Completion Date</b>
Habitat Management Plan	2009
Integrated Exotic Plant Management Plan	2011
Wildlife Inventory Plan	2011
Endangered Species Monitoring Plan	2011
Fire Management Plan (Update)	2009
Law Enforcement Plan	2011
Visitor Services Plan	2008
Forest Management Plan	2011
Archaeological Resource Protection Plan	2011
Impoundment Management Plan	2011
Water Quality Improvement Plan	2011

## **MONITORING AND ADAPTIVE MANAGEMENT**

Adaptive management is a flexible approach to long-term management of biotic resources that is directed over time by the results of ongoing monitoring activities and other information. More specifically, adaptive management is a process by which projects are implemented within a framework of scientifically driven experiments to test the predictions and assumptions outlined within a plan.

To apply adaptive management, specific survey, inventory, and monitoring protocols will be adopted for the refuge. The habitat management strategies will be systematically evaluated to determine management effects on wildlife populations. This information will be used to refine approaches and determine how effectively the objectives are being accomplished. Evaluations will include ecosystem team and other appropriate partner participation. If monitoring and evaluation indicate undesirable effects for target and non-target species and/or communities, then alterations to the management projects will be made. Subsequently, the refuge's Comprehensive Conservation Plan will be revised. Specific monitoring and evaluation activities will be described in the step-down management plans.

## **PLAN REVIEW AND REVISION**

This Comprehensive Conservation Plan will be reviewed annually in development of the refuge's annual work plans and budget. It will also be reviewed to determine the need for revision. A revision will occur if and when conditions change or substantial new information becomes available, such as a change in ecological conditions or a major refuge expansion. The final plan will be augmented by detailed step-down management plans to address the completion of specific strategies in support of the Refuge's goals and objectives. Revisions to the Comprehensive Conservation Plan and the step-down management plans will be subject to public review and NEPA compliance.



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## SECTION B. ENVIRONMENTAL ASSESSMENT

# *I. Background*

### INTRODUCTION

The U.S. Fish and Wildlife Service (Service) has prepared this Environmental Assessment for Pee Dee National Wildlife Refuge in compliance with the National Environmental Policy Act of 1969 and the National Wildlife Refuge System Improvement Act of 1997. The National Wildlife Refuge System Improvement Act requires the development of comprehensive conservation plans (CCPs) for all refuges. Following a public review and comment period on the Draft CCP (Section A), a final decision will be made by the Service that will guide the refuge's management actions and decisions over the next 15 years; provide greater public understanding about the refuge and its management activities; and incorporate information and suggestions from the public and refuge partners.

The Draft CCP proposes a management direction, which is described in detail through a set of goals, objectives, and strategies. It also addresses the refuge's current management issues, provides long-term management direction and guidance for the refuge, and satisfies the legislative mandates of the National Wildlife Refuge System Improvement Act of 1997. While the plan provides general management direction, subsequent step-down plans will provide more detailed management direction and actions.

The environmental assessment determines and evaluates a range of reasonable management alternatives. The intent is to support informed decision-making regarding future management of the refuge. Each alternative presented in this environmental assessment was generated with the potential to be fully developed into a final comprehensive conservation plan. The predicted biological, physical, social, and economic impacts of implementing each alternative are analyzed in this environmental assessment. This analysis assists the Service in determining if the alternatives represent no significant impacts, thus requiring the preparation of a Finding of No Significant Impact; or if the alternatives represent significant impacts, thus requiring more detailed analysis through an Environmental Impact Statement and a Record of Decision. Following public review and comment, the Service will select an alternative to be fully developed for this refuge.

This plan is needed to address current management issues, to provide long-term management direction for the refuge, and to satisfy the legislative mandates of the National Wildlife Refuge System Improvement Act of 1997, which requires the preparation of a comprehensive conservation plan for all national wildlife refuges. There is no current plan that identifies priorities and ensures consistent and integrated management of the refuge, thus necessitating the need for this plan.

The Service identified the refuge's issues, concerns, and needs through discussions with the public, agency managers, conservation partners, and others. In particular, the Service's planning team identified a range of alternatives, evaluated the possible consequences of implementing each, and selected Alternative C as the proposed management action. In the opinion of the Service, Alternative C is the best approach to guide the refuge's future direction and best serves the refuge's purposes, vision, and goals.

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## **PURPOSE AND NEED FOR ACTION**

The purpose of developing the CCP is to ensure that Pee Dee National Wildlife Refuge:

- serves as an inviolate sanctuary for migratory birds;
- protects natural resources;
- manages, restores, and conserves wildlife and habitat resources;
- conserves and restores the diversity, structure, and function of refuge habitats;
- manages the impoundments to support multiple species, including waterfowl, wading birds, shorebirds, marsh birds, other birds, amphibians, and fish;
- maintains the Green Tree Reservoir to support wood ducks and other native species;
- conserves endangered, threatened, and imperiled species;
- controls and eliminates exotic, invasive, and nuisance species;
- contributes to water quality;
- supports migrating and overwintering waterfowl, shorebirds, and landbirds;
- supports priority breeding landbirds;
- maintains and protects herpetological diversity and populations;
- supports native fish and other native aquatic species;
- provides high quality opportunities for the enjoyment of appropriate and compatible wildlife-oriented recreation;
- promotes awareness and appreciation of natural resources;
- promotes support for refuge management activities;
- enhances volunteer programs and the Friends group;
- coordinates with a wide variety of governmental and nongovernmental partners;
- protects and preserves archaeological and historical resources;
- provides sufficient staff, volunteers, facilities, and equipment to support refuge management activities, vision, and goals; and
- provides for appropriate and compatible scientific research.

This environmental assessment addresses the need to adopt a 15-year management plan for Pee Dee National Wildlife Refuge that provides guidance for future refuge management and that meets the requirements of the National Wildlife Refuge System Improvement Act.

## **DECISION FRAMEWORK**

Based on the assessment described in this document, the Service will select an alternative to implement the Comprehensive Conservation Plan for Pee Dee National Wildlife Refuge. The finalized CCP will include a Finding of No Significant Impact (FONSI), which is a statement explaining why the selected alternative will not have a significant effect on the quality of the human environment. This determination is based on an evaluation of the mission of the Service and the Refuge System; the purposes for which the refuge was established and its vision and goals; and other legal mandates. Assuming that no significant impact is found, implementation of the plan will begin after the FONSI is signed, and the plan will be monitored annually and revised when necessary.

## **PLANNING STUDY AREA**

Pee Dee National Wildlife Refuge covers a total of 8,443 acres and is located in south-central North Carolina, approximately 70 miles east of Charlotte in Anson and Richmond counties (see Figure 1). The refuge is owned in fee title by the U.S. Fish and Wildlife Service. Most of the refuge is comprised

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of forested wetlands that border Brown Creek and the Pee Dee River, mixed pine hardwoods, upland pine forests, impoundments, and croplands. The refuge includes over 2,895 acres of bottomland hardwood forest, representing the largest contiguous tract of this rare habitat in North Carolina. This environmental assessment will identify management on refuge lands, as well as for those lands proposed for management or acquisition by the Service.

## **AUTHORITY, LEGAL COMPLIANCE, AND COMPATIBILITY**

The Service has developed this plan in compliance with the National Wildlife Refuge System Improvement Act of 1997 and Part 602 (National Wildlife Refuge System Planning) of the Fish and Wildlife Service Manual. The actions described within this plan also meet the requirements of the National Environmental Policy Act of 1969. The refuge staff achieved compliance with this Act through the involvement of the public and the incorporation of an environmental assessment in this document, with a description of the alternatives considered and an analysis of the environmental consequences of the alternatives (Chapters III and IV in this section). When fully implemented, the plan will strive to achieve the purposes, vision, and goals of Pee Dee National Wildlife Refuge.

The National Wildlife Refuge System includes federal lands and waters managed primarily to provide habitat for a diversity of fish, wildlife, and plants. National wildlife refuges are established under many different authorities and funding sources for a variety of purposes. The purposes for these refuges are established by specific legislation, through presidential orders, or in special agreements. Additional authorities delegated by Congress, federal regulations, executive orders, and several management plans guide the operation of a refuge. Appendix C lists the key laws, orders, and regulations that provide a framework for the proposed action.

The plan's overriding consideration is to carry out the purposes for which the refuge was established. The laws that established the refuge and provided the funds for acquisition state the purposes. Fish and wildlife management is the first priority in refuge management, and the Service allows and encourages public use (wildlife-dependent recreation) as long as it is compatible with, or does not detract from, the refuge's mission and purposes.

### **COMPATIBILITY**

The National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997, states that national wildlife refuges must be protected from incompatible or harmful human activities to ensure that Americans can enjoy Refuge System lands and waters. Before activities or uses are allowed on a national wildlife refuge, the uses must be found to be appropriate and compatible. A compatible use is defined as one that "... will not materially interfere with or detract from the fulfillment of the mission of the Refuge System or the purposes of the refuge." In addition, "wildlife-dependent recreational uses may be authorized on a refuge when they are compatible and not inconsistent with public safety." Appropriate use forms and compatibility determinations were prepared for boating; deer and feral hog hunting; turkey hunting; small game hunting; fishing; wildlife observation and photography; environmental education and interpretation; bicycling and jogging; horseback riding; timber harvest; and cooperative farming. Please refer to Appendix E for the findings of appropriate use and Appendix F for the compatibility determinations for those public uses approved for the refuge.

An interim compatibility determination is a document that assesses the compatibility of an activity during the period of time the Service first acquires a parcel of land to the time a formal, long-term management plan for that parcel is prepared and adopted. If additional properties are acquired for the refuge, interim compatibility determinations would provide for interim use of the properties until

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they are added to the refuge's management plans, at which time formal compatibility determinations would be prepared or the use(s) would be incorporated into existing compatibility determinations.

## **PUBLIC INVOLVEMENT AND THE PLANNING PROCESS**

In accordance with Service guidelines and National Environmental Policy Act recommendations, public involvement has been a crucial factor throughout the development of the Draft Comprehensive Conservation Plan for Pee Dee National Wildlife Refuge. This plan has been written with input and assistance from interested citizens; conservation organizations; and local, state, and federal agencies. The participation of these stakeholders and their ideas has been of great value in setting the management direction for Pee Dee National Wildlife Refuge.

Preplanning activities began in 2006. A wildlife and habitat management review was conducted at the refuge in July 2006. This was later followed by a visitor services review conducted in August 2006. Preplanning continued with information gathering and the identification of data gaps. A Notice of Intent to prepare a CCP for the refuge was published in the *Federal Register* on November 7, 2006. The refuge then held a public scoping meeting on January 25, 2007. Attendees included 21 members of the public, one North Carolina Wildlife Resources Commission (NCWRC) representative, three Service personnel, and one Service contractor. In addition to the comments that were collected at the public scoping meeting, other comments were received through e-mail, regular mail, and fax. On March 20, 2007, an intergovernmental scoping meeting was held at the refuge to identify the key issues facing the refuge. Attendees included representatives from the NCWRC, North Carolina Natural Heritage Program, North Carolina Department of Cultural Resources, and Anson County, as well as Service staff from the refuge, Carolina Sandhills National Wildlife Refuge, and one Service contractor. Staffs from the Catawba Indian Nation and the U.S. Department of Agriculture's Natural Resources Conservation Service were unable to attend the meeting, but submitted comments via other means. The priority issues were identified later on the same day by Service staff, in collaboration with NCWRC representatives.

A wide range of issues, concerns, and opportunities were identified and addressed during the planning process. All public and advisory team comments were considered; however, some issues that are important to the public are beyond the scope of the Service's authority and cannot be addressed within this planning process. The planning team did consider all issues that were raised throughout this planning process, and has developed a plan that attempts to balance the refuge's management priorities based on best management practices, best available information, and the competing opinions regarding important issues.

A complete summary of these issues and concerns is provided in Appendix D, Public Involvement. For more detailed information about the planning process and the identification of issues, please refer to Chapter III, Plan Development, in the Draft Comprehensive Conservation Plan (Section A).

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## *II. Affected Environment*

For a description of the affected environment, please refer to Chapter II, Refuge Overview, in the Draft Comprehensive Conservation Plan (Section A).



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## *III. Description of Alternatives*

### **FORMULATION OF ALTERNATIVES**

Alternatives are different approaches or combinations of management objectives and strategies designed to achieve the refuge's purposes, vision, and goals identified in the CCP; the goals and mission of the National Wildlife Refuge System; and the mission of the Fish and Wildlife Service. Alternatives are formulated to address the priority issues, concerns, and problems identified by the Service and the public during public scoping.

The three alternatives identified and evaluated represent different approaches to provide permanent protection, restoration, and management of the refuge's fish, wildlife, plants, habitats, and other resources, as well as to provide for high quality opportunities for appropriate and compatible wildlife-dependent recreation. Refuge staff assessed the biological conditions and analyzed external factors affecting the refuge. This information contributed to the development of refuge goals and, in turn, helped to formulate the alternatives. As a result, each alternative represents different sets of objectives for reaching refuge goals. Each alternative was evaluated based on how much progress it would make towards achieving the purposes, vision, and goals of the refuge and how it would address the priority issues related to wildlife and habitat management, resource protection, visitor services, and refuge administration. Please refer to Chapter III, Plan Development, in the Draft CCP (Section A) for summaries of the priority issues.

### **MANAGEMENT COMMON TO ALL ALTERNATIVES**

Several elements of refuge management are common to all of the alternatives. All management activities that could impact natural resources, including subsurface mineral reservations, utility lines and easements, soil, water, air, contaminants, and archaeological and historical resources would be managed to comply with all applicable laws, regulations, and policies. All alternatives are subject to all applicable future permit requirements. Individual projects may require additional consultation with the Service's Regional Archaeologist and the State of North Carolina Historic Preservation Office. Additional consultation, surveys, and clearance may be required where project development would be conducted on the refuge or when activities would affect properties eligible for the National Historic Register.

### **DESCRIPTION OF ALTERNATIVES**

Serving as a basis for each alternative, goals were developed to help achieve the refuge's purposes and vision and the mission of the Refuge System. Each alternative represents a different set of objectives. Objectives are desired conditions or outcomes that are grouped into sets and, for this planning effort, consolidated under three alternatives. These alternatives represent different management approaches for managing the refuge over a 15-year timeframe. Three alternatives were developed and analyzed, including the no action and proposed action alternatives. Alternative A continues current management similar to recent activities and levels on the refuge. Alternative B focuses refuge management actions on the needs of trust resources (e.g., migratory birds, federally listed species) as well as other priority (e.g., state-listed) species. Alternative C, the proposed action, focuses refuge management actions on maintaining and enhancing wildlife and habitat diversity.

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The three alternatives are described below.

#### *ALTERNATIVE A: CURRENT MANAGEMENT (NO ACTION)*

This is the “status quo” alternative. Under this alternative, no new actions would be taken. The refuge would continue its management activities and programs at levels similar to those that have been taken during the recent past, as summarized below.

##### **Wildlife and Habitat Management**

Regarding endangered, threatened, and imperiled species, the refuge would maintain foraging habitat and potential future nest trees to support bald eagles. Impoundments would be managed and surveyed for multiple species, including state-listed wading birds such as the little blue heron. Old field areas would be maintained to provide habitat for loggerhead shrikes. In addition, approximately (~) 1,000 acres of upland forest would continue to be managed to potentially support red-cockaded woodpeckers. Bat surveys would continue to document the presence of Rafinesque's big-eared bats. Management for listed stream fish and freshwater mussels would be limited to a 2005 baseline survey. There would be no active management for state-listed plant species, and management for Schweinitz's sunflower would be limited to a 2003 baseline survey.

For migratory birds, in addition to regular surveys, the refuge would maintain approximately 150 acres in flooded crop impoundments and moist soil units, using a management approach for multiple species, including waterfowl, wading birds, and shorebirds. Approximately 135 acres of a green tree reservoir (GTR) would be managed for waterfowl. In addition, ~1,000 acres of uplands would continue to be managed for passerines (subject to breeding bird surveys). Unharvested crops would provide additional forage for migratory birds under the cooperative farming program, and field borders would continue to be planted with seed-producing species.

Control of exotic, invasive, and nuisance species would include the use of approved herbicide on croplands, and impoundments would be drained once a year to control exotic plant species. Feral hogs would be controlled under the deer hunt program, but there would be no active management of coyotes or feral and free-roaming animals.

Habitat management would include forest stand monitoring (following a 2006 GIS timber inventory). Upland forest habitat management would include timber stand improvement of approximately 1,820 acres of mixed pine hardwoods and 1,736 acres of pine forest through prescribed burning and selective thinning. Flooded crop impoundments (~100 acres) would be managed through water manipulation and planted with corn. Approximately 37 acres of moist soil units would be maintained through periodic flooding, disking, mowing, and burning. Green tree reservoir habitat (135 acres) would be maintained through water manipulation and be allowed to dry on a three-year rotation. Management of 2,895 acres of bottomland hardwoods would be limited to periodic timber inventories. Approximately 732 of grasslands, old fields, and rights-of-way would be maintained through burning, mowing, haying, and disking. Croplands (~1,161 acres) would continue to be planted in corn, wheat, and soybeans under the cooperative farming program, with 20% of crops left standing after harvest to benefit wildlife. Refuge-approved fertilizers and herbicides would be used to improve crop production.

Management of other wildlife species would include occasional stocking and surveys of sport fish. A baseline herpetological survey is planned for 2007.

Water resources would be managed at levels similar to past levels. Water levels in the impoundments and GTR would be managed for multiple species. Minimum flow requirements for the Pee Dee River would continue to be provided to Progress Energy as part of the re-licensing process. There would be no active management for water quality.

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## **Resource Protection**

Resource protection would include the continued demarcation of the refuge boundary following the 2007 survey. In addition, small private properties within the refuge's approved acquisition boundary would continue to be assessed for their biological value and considered for purchase. There would be no management regarding habitat gaps and wildlife corridors. Approximately 1,306 acres would continue to be protected in easements. Following extensive previous surveys, protection of archaeological and historical resources would be limited to occasional law enforcement patrols.

## **Visitor Services**

Visitor services would continue at levels similar to past management activities. The visitation in 2006 was estimated at 35,000, although this number is considered to be lower than actual numbers. Turkey quota hunts (five days per year) would continue. Waterfowl hunting would not be permitted. About 7,000 acres would continue to be open to two seasonal deer hunts (i.e., 42-day archery and 13-day firearm). Small game hunts for mourning dove, raccoon/ opossum, gray squirrel, quail, and rabbit totaling 93 days would continue. Seasonal fishing activities would continue with management limited to periodic sportfish surveys and stocking of refuge ponds. The refuge would continue to annually conduct 28 educational programs. The refuge would continue to maintain three information kiosks; the visitor contact station at the refuge's administrative offices; one observation blind; 3.5 miles of trails; a 2.7-mile scenic wildlife drive; and ~25 miles of gravel roads. Horseback riding opportunities on vehicular roads with a special use permit would continue to be provided. All-terrain vehicle (ATV) use would be limited to persons with disabilities. Local outreach would continue to occur with six news releases annually to promote special events and 12 refuge presentations per year to civic groups. The membership of the Friends of the Pee Dee National Wildlife Refuge and volunteer numbers would likely remain at current levels and programs. Control of trash and litter would continue to be moderately effective.

## **Refuge Administration**

Refuge administration would continue similar to past management with five full-time employees (FTEs): 1 Wildlife Refuge Manager, 1 Assistant Refuge Manager (slated for elimination), 1 Administrative Office Assistant, 1 Engineering Equipment Operator, and 1 Law Enforcement (LE) Park Ranger. Refuge offices would continue to be housed at the administrative office that also includes the visitor contact station and the adjacent Friends Building. The refuge would continue to rely on existing utilities, and repairs to equipment and facilities would be made according to funding allocations. The refuge would attempt to maintain its refuge boundary signs and signs supporting visitor services. Regular intergovernmental coordination efforts would include working with the Greater Uwharries Conservation Partnership.

## **ALTERNATIVE B**

Alternative B places refuge management emphasis on the protection of trust resources (migratory birds, threatened and endangered species) as well as several state-listed species.

## **Wildlife and Habitat Management**

Under this alternative, management for endangered, threatened, and imperiled species would be increased. The refuge would maintain foraging habitat and minimize disturbance to potential nesting sites for bald eagles. Management of freshwater marshes and impoundments for multiple species would continue, including little blue herons. To further support little blue herons, the refuge would allow additional acres of foraging habitat to remain flooded throughout the year. Suitable undisturbed habitat for little blue heron rookery sites would be provided. For loggerhead shrikes, the refuge would increase surveys to four times per year. Shrubs and trees that are preferred by loggerhead shrikes for nesting and larders would be planted, and some agricultural areas would be allowed to revert to old fields. The refuge would enhance habitats suitable for the development of red-cockaded woodpecker clusters and consider opportunities for reintroduction. Management for Rafinesque's big-eared bats would include

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implementing annual surveys to document their presence. Management of listed stream fish and freshwater mussels would increase and include acquiring small upstream tracts of available private lands within the refuge acquisition boundary to protect the watershed. Furthermore, the refuge would work to implement five-year surveys and develop a water quality monitoring program. For state-listed plant species and Schweinitz's sunflowers, the refuge would work with partners to document their presence or absence and adjust habitat management as necessary. The Service would work with partners to establish Schweinitz's sunflower populations on the refuge.

Management for migratory birds would increase under this alternative. Surveys and monitoring frequencies would increase, as would regular law enforcement patrols. The refuge would increase the acreage of flooded crop impoundments and moist soil units, using a management approach for multiple species, including waterfowl, wading birds, and shorebirds. For wading birds, nest surveys would be conducted, spring and fall survey would be implemented, and additional areas would be allowed to remain flooded to increase habitat. Seasonal closures would be implemented to limit disturbance. Approximately 135 acres of a green tree reservoir (GTR) would be managed for waterfowl. In addition, ~1,000 acres of uplands would be restored for passerines (subject to breeding bird surveys). Sweetgum in hardwood bottom forests would be thinned to favor mast-producing species. Bird presence, abundance, distribution and responses to management activities would be monitored. Population and habitat objectives would be established to determine the refuge's contribution regional and national bird conservation plans. The extent of cowbird nest parasitism on the refuge would be evaluated and appropriate control measures developed. Unharvested crops would provide additional forage for migratory birds under the cooperative farming program, and field borders would continue to be planted with seed-producing species.

Control of exotic, invasive, and nuisance species would include the use of approved herbicides on croplands. The effects of exotic aquatic plants on migratory birds would be researched, and the impoundments would be drained once a year to control exotic plant species. Upland exotic plant control efforts would focus on high priority habitats for listed species and migratory birds. The refuge would consider a specific feral hog hunt or alternative population control measures, including trapping. For coyotes, it would coordinate with the state to evaluate potential adverse impacts and control where necessary to migratory birds and listed species. The refuge would work with partners to control feral and free-roaming animals and minimize their effects on trust species.

Under Alternative B, habitat management would focus on improving conditions for migratory birds as well as endangered, threatened and imperiled species. The refuge would monitor trust species presence, abundance, distribution and responses to management activities. Upland forest management projects would be scheduling around critical seasons for identified species. The refuge would restore and maintain key habitats for migratory birds and listed species. Working with partners, the refuge would develop a comprehensive flora and fauna list for the refuge and update its Geographic Information System (GIS) forest inventory data every 10 years. There would be a reduction in the acreage of flooded crop impoundments, as some of these would be converted to moist soil units. The refuge would implement moist soil management strategies to enhance wetland habitat conditions and evaluate the potential for the creation of additional impoundments to support priority species. In the GTR, the refuge would monitor listed species presence, abundance, distribution and responses to management activities. Public use impacts to trust species would be minimized (including seasonal closures of key areas). The refuge would consider conversion of GTR areas to natural bottomland hardwood to benefit migratory birds as well as potential listed species. Sweetgum would be thinned in hardwood bottom forests to favor mast-producing species and increase the canebrake understory. In old fields, grasslands, and rights-of-way, the refuge would schedule maintenance disturbances such as prescribed fire, disking, and mowing to minimize impacts to migratory birds and listed species that utilize or are adjacent to these habitats. In addition, the

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refuge would provide for optimal responses of native vegetation and invertebrates for that are utilized by trust species. Some croplands would be converted back to old fields consisting of native vegetation.

Management of other wildlife species would include occasional stocking and surveys of sport fish. Management practices on refuge habitats would be conducted in such a manner as to minimize adverse impacts to herpetological species.

Management of water resources would be increased under this alternative. In addition to managing water levels in the impoundments and GTR for multiple species, the refuge would work with the partners to determine and ensure adequate water levels to support migratory bird listed species' objectives of the refuge and consider additional water-supply options, including subsurface pumping. Minimum flow requirements for the Pee Dee River would continue to be provided to Progress Energy as part of the re-licensing process. The refuge would work with the partners to ensure adequate water quality to support migratory bird and listed species' objectives of the refuge.

### **Resource Protection**

Resource protection management would be increased and the refuge would evaluate the biological value of small, non-refuge properties within the acquisition boundary, specifically with respect to their value to trust resources. The refuge would locate and evaluate important gaps and corridors and work with the partners to protect these important habitats and connections serving threatened and endangered species and migratory birds. For conservation easements, the refuge would locate and develop a GIS database. It would evaluate the contribution that these areas provide to migratory birds and listed species and ensure that these sites adhere to easement conditions and management objectives. With respect to archaeological and historical resources, the refuge would develop an outreach plan to increase awareness of their importance on the refuge.

### **Visitor Services**

Visitor services would decrease compared to current management activities. The refuge would place emphasis of messages to focus on migratory birds and listed species and add directional and entrance signs. An informational video would be developed. Under this alternative, various hunting programs currently available would be altered. The refuge would collaborate with the state and other partners to conduct surveys and research to determine game species population levels and their effects on trust resources and would adjust the harvest of game species as needed. The refuge would also work with the partners to evaluate the potential effects of hunting on trust resources, and would alter these activities accordingly. The refuge would remain off-limits to waterfowl hunting. Seasonal fishing activities would be decreased with the seasonal closure of additional areas to reduce disturbance to waterfowl. Wildlife viewing and photography opportunities would be slightly diminished as additional areas would be closed to limit disturbance to migratory birds and listed species. The refuge would develop onsite and offsite curriculum-based educational programs with messages focused on trust resources. Horseback riding opportunities on vehicular roads with a special use permit would continue to be provided (as long as no adverse effects were determined on trust species) and ATV use would be limited to persons with disabilities. Local outreach would continue at present levels with messages focused on the conservation of listed species and migratory birds. In addition, the refuge would work to increase Friends group membership and the volunteer base and focus their efforts and activities to benefit these trust resources. Trash and litter control efforts would be stepped-up and focused on the protection of migratory birds and listed species.

### **Refuge Administration**

Refuge administration efforts would increase under Alternative B. Refuge infrastructure maintenance would focus on items needed for migratory birds and listed species management activities. Under this alternative, staff levels would increase to a total of 10 FTEs. The following additional staff would be added to the existing positions: 1 Assistant Refuge Manager, 1 Wildlife Biologist, 1 Forestry

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Technician, 2 Maintenance Workers, and 1 Park Ranger (education/outreach and volunteer coordination). Regular intergovernmental coordination efforts would be expanded (e.g. to collaborate with the state to determine the effects of coyotes and feral animals on trust species, and work with partners to determine and ensure adequate water resources and protect important habitats and connections to serve these priority species).

### *ALTERNATIVE C: PROPOSED ACTION*

Alternative C focuses refuge management on native wildlife and habitat diversity and maintaining the biological integrity of the refuge.

#### **Wildlife and Habitat Management**

Under this alternative, wildlife and habitat diversity management activities would be increased. The refuge would maintain foraging habitat and minimize disturbance to potential nesting sites for bald eagles. Management of freshwater marshes and impoundments for multiple species would continue, including little blue herons. The refuge would allow additional acres of foraging habitat to remain flooded throughout the year to further support little blue herons. Undisturbed habitat would be made available as potential little blue heron rookery sites. The refuge would increase bird surveys to four times per year for loggerhead shrikes. Open grasslands and old fields would be managed for shrubs and trees that are preferred by loggerhead shrikes for nesting and as larders. For red-cockaded woodpeckers, the refuge would monitor their presence or absence and coordinate with partners to monitor the proximity of active clusters near the refuge. Upon establish of active clusters on the refuge, management would be adapted as necessary. Management for Rafinesque's big-eared bats would include implementing annual surveys to document their presence. Management of listed stream fish and freshwater mussels would increase. The refuge would work with landowners and other partners to protect upstream watershed areas and implement five-year surveys. A water quality monitoring program would be developed. For state-listed plant species and Schweinitz's sunflowers, the refuge would work with partners to document their presence or absence and adjust habitat management as necessary. The Service would work with partners to establish Schweinitz's sunflower populations on the refuge.

Migratory bird management efforts would be expanded under this alternative. The refuge would increase regular patrols and enforcement, and intensively manage and monitor impoundments for waterfowl, shorebirds, and wading birds. Some of the cornfield impoundments would be converted to moist soil units with native vegetation. The refuge would increase the acreage of seasonally flooded impoundments. During the fall and spring migrations, water levels would be manipulated to support shorebird use. The number of survey days would be increased to cover the spring and fall migrations. Management of wading birds would include minimizing public use impacts (including seasonal closures of key areas) and increasing the number of survey days to cover spring and fall migrations. The refuge would allow additional acres of foraging habitat to remain flooded throughout the year to further support wading birds. Under this alternative, the refuge would restore and maintain upland habitats. In hardwood bottom forests, sweetgum would be thinned to favor mast-producing species. Some native grassland in the early successional growth stages would be maintained. The refuge would monitor bird presence, abundance, distribution and responses to management activities. It would work to develop population and habitat objectives to determine the refuge's contribution regional and national bird conservation plans.

The refuge would survey and monitor wetlands and aquatic areas to identify and locate invasive hot spots. Where feasible, exotic aquatic plants would be eliminated to maintain and enhance the biological integrity of the refuge. The refuge would work with partners to limit reintroduction from nearby lands. For upland exotic plant control, the refuge would survey and monitor to identify and locate new infestations. It would conduct initial attack with an emphasis on elimination. The refuge would control the spread of existing invasive, exotic and nuisance plants to reduce adverse impacts

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to refuge habitats. To control feral hogs, the refuge would consider a specific feral hog hunt or alternative population control measures, including trapping. For coyotes, the refuge would coordinate with the state to evaluate and control where necessary. The refuge would coordinate with partners to control feral and free-roaming animals to minimize adverse impacts.

Under Alternative C, habitat management would focus on increasing the biological diversity on the refuge and improving its biological integrity. The refuge would implement a monitoring program to measure and record habitat conditions and effects of management treatments. It would work with partners to develop comprehensive flora and fauna lists and implement a comprehensive GIS database. The refuge would restore and maintain habitats to enhance wildlife and habitat diversity and update its GIS inventory data every 10 years for mixed hardwoods, pine uplands, and bottomland hardwoods. It would manage pine-dominated community types to promote understory plant species diversity, and implement a monitoring program to measure and record habitat conditions and the effects of management treatments. The refuge would manage water levels in flooded crop impoundments and implement moist soil management strategies to provide quality habitat for a variety of native plants and wildlife species. The refuge would evaluate the potential for the creation of additional impoundments to support wildlife and habitat diversity. Some flooded crop impoundments would be converted to moist soil units. The refuge would inventory and monitor flora and fauna of the GTR. It would manage water levels and work to ensure future water supplies in the GTR to support enhanced wildlife and habitat diversity. For bottomland hardwoods, the refuge would thin sweetgum to favor mast-producing species and increase the canebrake understory and tree diversity. The refuge would schedule maintenance disturbances such as prescribed fire, disking, and mowing in old fields, grasslands, and rights-of-way to provide for optimal response of native pioneer vegetation and invertebrates. Additional acreage of open fields would be converted to native warm season grasses. Croplands would continue to be managed at current levels.

Management of other wildlife species would include working with partners to survey fish and herpetological species present on the refuge, the habitats used by them, and their health and current population sizes. The refuge would conduct management practices on refuge habitats in such a manner as to minimize adverse impacts to native fish, amphibians, and reptiles.

Management of water resources would be increased under this alternative. In addition to managing water levels in the impoundments and GTR for multiple species, the refuge would work with partners to determine and ensure adequate water levels to support its wildlife and habitat diversity objectives and consider additional water supply options, including subsurface pumping. Minimum flow requirements for the Pee Dee River would continue to be provided to Progress Energy as part of the re-licensing process. The refuge would work with partners to ensure adequate water quality to support the biological diversity and integrity objectives of the refuge.

### **Resource Protection**

Under Alternative C, resource protection management would be increased and the refuge would evaluate the biological value of small, non-refuge properties within the acquisition boundary, specifically with respect to their habitat and wildlife diversity value. The refuge would locate and evaluate important gaps and corridors and work with partners to protect these important habitats and connections to protect and improve biodiversity. For conservation easements, the refuge would locate and develop a GIS database. It would evaluate the contribution of these areas as wildlife habitats and ensure that these sites adhere to easement conditions and management objectives. With respect to archaeological and historical resources, the refuge would develop an outreach plan to increase awareness of their importance on the refuge.

### **Visitor Services**

Visitor services would be increased. The refuge would place emphasis on messages that focus on wildlife and habitat diversity, and add directional and entrance signs. A public informational video

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would be developed. The refuge would ensure that there are no adverse impacts to wildlife and habitat diversity from turkey hunting. Management to improve biodiversity would benefit turkey populations. The refuge would work to expand turkey hunt areas to include refuge lands in Richmond County. The refuge would work with the state and other partners to evaluate the status, trends, and health of its deer herd. It would increase the total number of hunting days to reduce deer numbers to protect wildlife and habitat diversity. The refuge would implement a quail population monitoring program to determine the number of hunting days and appropriate bag limit. For fishing opportunities, the refuge would work to increase boat access to the Pee Dee River and consider additional stocking of fish in refuge ponds. Wildlife viewing and photography opportunities would increase and the refuge would install three additional photoblinds and evaluate the potential for additional birding trails. The refuge would develop onsite and offsite curriculum-based educational programs with messages focused on the role and importance of the refuge in the landscape. It would train staff, volunteers, and teachers to conduct educational programs and build an onsite environmental education center (a separate environmental assessment or environmental impact statement would be conducted to assess the potential impacts of the construction and operation of the proposed facility on the refuge and nearby environments). The refuge would add interpretive signs to trails to emphasize biodiversity and expand trails in the vicinity of the environmental education center. Horseback riding opportunities and ATV use would be managed at current levels. Local outreach efforts would focus on wildlife and habitat diversity and increase awareness of the refuge and the Refuge System. The refuge would train the Friends group members and volunteers to assist with outreach activities. The refuge would work to increase Friends group membership and the volunteer base and focus their efforts and activities to benefit wildlife and habitat diversity. Trash and litter control efforts would be stepped up and focused to maintain and improve biodiversity. The refuge would increase the number of litter cleanups through coordination with local service groups and schools, and ensure that the refuge is included in area cleanup projects.

### **Refuge Administration**

Refuge administration efforts would increase under Alternative C. The refuge's infrastructure maintenance would include items needed for wildlife and habitat diversity management activities. Under this alternative, staff levels would increase to a total of 10 FTEs. The following additional staff would be added to the existing positions: 1 Assistant Refuge Manager, 1 Wildlife Biologist, 1 Forestry Technician, 2 Maintenance Workers, and 1 Park Ranger (education/outreach and volunteer coordination). Regular intergovernmental coordination efforts would increase. The refuge would coordinate with the state to determine the effects of coyotes and feral animals on biodiversity. The refuge would work with partners to determine and ensure adequate water resources and protect important habitats and connections. In addition, the refuge would work with Anson and Richmond County planners to define and protect important conservation areas.

### **COMPARISON OF ALTERNATIVES**

Table 8 compares each of the three alternatives by management issues for Pee Dee National Wildlife Refuge.

**Table 8. Comparison of alternatives by management issues for Pee Dee National Wildlife Refuge.**

<i>KEY TOPICS</i>	<b>Alternative A (No Action)</b>	<b>Alternative B</b>	<b>Alternative C (Proposed Action)</b>
<b>WILDLIFE AND HABITAT MANAGEMENT</b>			
<b>ENDANGERED, THREATENED &amp; IMPERILED SPECIES</b>			
Bald Eagle	Prescribed fire and timber management (1,000 ac/yr). No nests known to exist.	Expand Alternative A. Minimize disturbance of nest sites if nesting were to occur.	Expand Alternative A. Minimize disturbance of nest sites if nesting were to occur.
Little Blue Heron	Maintain water levels in impoundments to accommodate wading bird foraging habitat. Provide suitable habitat for rookery sites. Annual Christmas Bird Count (CBC).	Expand Alternative A. Allow additional acres of forage habitat to remain flooded throughout the year. Provide suitable habitat for rookery sites. Limit disturbance around rookery.	Expand Alternative A. Allow additional acres of forage habitat to remain flooded throughout the year. Provide suitable habitat for rookery sites. Limit disturbance around rookery.
Loggerhead Shrike	Christmas Bird Count, currently maintain old field areas in early successional growth with both shrubby vegetation and grassland.	Expand Alternative A. Increase bird surveys to four times per year. Plant shrubs and trees preferred for nesting and as larders. Allow some agricultural areas to revert to old fields.	Expand Alternative A. Increase bird surveys to four times per year. Manage open grasslands and old fields for shrubs and trees preferred for nesting and as larders.
Red-cockaded Woodpecker	Prescribed fire and timber management (1,000 ac/yr). No active clusters known to exist. CBC.	Expand Alternative A. Enhance habitats suitable for the development of clusters. Maintain a frequent fire interval. Monitor status and trends. Consider opportunities for reintroduction.	Expand Alternative A. Monitor presence or absence. Coordinate with partners to monitor the proximity of active clusters. With the presence of active clusters on the refuge adapt management as necessary.

<b>KEY TOPICS</b>	<b>Alternative A (No Action)</b>	<b>Alternative B</b>	<b>Alternative C (Proposed Action)</b>
Rafinesque's Big-eared Bat	Baseline bat survey performed in 2007 with future surveys planned.	Expand Alternative A. Implement annual bat surveys.	Expand Alternative A. Implement annual bat surveys.
Stream Fish	Baseline survey completed in 2005. No till agriculture to limit siltation and other runoff.	Expand Alternative A. Implement five-year surveys. Develop a water quality monitoring program.	Expand Alternative A. Work with landowners and other partners to protect upstream watershed areas. Implement five-year surveys. Develop water quality monitoring program.
Diadromous Fish	Baseline survey completed in 2005. No till agriculture to limit siltation and other runoff.	Expand Alternative A. Implement five-year surveys. Develop a water quality monitoring program.	Expand Alternative A. Work with landowners and other partners to protect upstream watershed areas. Implement five-year surveys. Develop water quality monitoring program.
Freshwater Mussels	Baseline invertebrate survey performed in 2005.	Expand Alternative A. Implement five-year surveys. Develop a water quality monitoring program.	Expand Alternative A. Work with landowners and other partners to protect upstream watershed areas. Implement five-year surveys. Develop water quality monitoring program.
Schweinitz's Sunflower	Baseline survey performed in 2003; species not documented on the refuge.	Expand Alternative A. Work with partners to document presence or absence and adjust habitat management as necessary. Work with partners to establish populations on the refuge.	Expand Alternative A. Document presence or absence and adjust habitat management as necessary. Establish populations on the refuge.

<b>KEY TOPICS</b>	<b>Alternative A (No Action)</b>	<b>Alternative B</b>	<b>Alternative C (Proposed Action)</b>
State-listed Plants	No active management.	Expand Alternative A. Work with partners to document presence or absence and adjust habitat management as necessary.	Expand Alternative A. Document presence or absence and adjust habitat management as necessary.
<b>MIGRATORY BIRDS</b>			
Waterfowl	Manage impoundments 78 ac/yr, moist soil units (78 ac/yr), GTR (135 ac/yr). Monitor 50 wood duck nest boxes. Survey every 2 weeks, Nov-Mar. Waterfowl sanctuary closed Nov 25 – Mar 15 to public use. LE patrol area along Pee Dee River closed to hunting. Allow additional acres of forage habitat to remain flooded throughout the year. Increasing acreage of seasonally flooded impoundments.	Expand Alternative A. Increase regular patrol and enforcement. Intensively manage and monitor impoundments for waterfowl. Allow additional acres of forage habitat to remain flooded throughout the year. Increasing acreage of seasonally flooded impoundments.	Expand Alternative A. Increase regular patrol and enforcement. Intensively manage and monitor impoundments for waterfowl. Convert some of the cornfield impoundments to moist soil units with native vegetation. Increasing acreage of seasonally flooded impoundments.

<b>KEY TOPICS</b>	<b>Alternative A (No Action)</b>	<b>Alternative B</b>	<b>Alternative C (Proposed Action)</b>
Shorebirds	Manage moist soil units (78 ac/yr). Survey: CBC late Dec. or early Jan.	Expand Alternative A. During fall and spring migration manipulate water levels to support shorebird use. Minimize public use impacts to shorebirds (including extending seasonal closures of key areas). Intensively manage and monitor (increase number of survey days to cover spring and fall migration) impoundments for migratory birds.	Expand Alternative A. During fall and spring migration manipulate water levels to support shorebird use. Intensively manage and monitor impoundments for shorebirds. Increase number of survey days to cover spring and fall migration.
Wading Birds	Manage moist soil units (78 ac/yr); allow additional acres of forage habitat to remain flooded throughout the year. Survey: CBC	Expand Alternative A. Conduct nesting surveys. Increase number of survey days to cover spring and fall migration. Minimize public use impacts to wading birds (including seasonal closures of key areas). Allow additional acres of forage habitat to remain flooded throughout the year.	Expand Alternative A. Intensively manage and monitor impoundments for wading birds. Minimize public use impacts to wading birds (including seasonal closures of key areas). Increase number of survey days to cover spring and fall migration. Allow additional acres of forage habitat to remain flooded throughout the year.

<b>KEY TOPICS</b>	<b>Alternative A (No Action)</b>	<b>Alternative B</b>	<b>Alternative C (Proposed Action)</b>
Land Birds	Prescribed fire and timber management (1,000 ac/yr). Maintain field borders. Plant seed-producing species. Maintain old field areas in early successional growth. Allow GTR to remain on a three year cycle. Survey: CBC	Expand Alternative A. Restore and maintain upland habitats. Thin sweetgum in hardwood bottom forests to favor mast-producing species. Monitor bird presence, abundance, distribution and responses to management activities. Develop population and habitat objectives to determine the refuge's contribution regional and national bird conservation plans. Evaluate level of cowbird nest parasitism and develop appropriate control measures.	Expand Alternative A. Restore and maintain upland habitats. Thin sweetgum in hardwood bottom forests to favor mast-producing species. Maintain some native grassland in the early successional growth. Monitor bird presence, abundance, distribution and responses to management activities. Develop population and habitat objectives to determine the refuge's contribution regional and national bird conservation plans.
<b>EXOTIC, INVASIVE &amp; NUISANCE SPECIES</b>			
Control of Exotic Aquatic Plants	Drain impoundments once/yr.	Expand Alternative A. Work with partners to research and evaluate the effects of exotic aquatic plants on migratory birds and listed species.	Expand Alternative A. Survey and monitor to identify, locate invasive hot spots. Control and eliminate, where feasible, exotic aquatic plants to maintain and enhance the biological integrity of the refuge. Work with partners to limit reintroduction from nearby lands.

<b>KEY TOPICS</b>	<b>Alternative A (No Action)</b>	<b>Alternative B</b>	<b>Alternative C (Proposed Action)</b>
Control of Exotic Terrestrial Plants	All farm fields (1,100 ac) use RoundUp.	Expand Alternative A. Focus exotic plant control efforts on high priority habitats for migratory birds and listed species.	Expand Alternative A. Survey and monitor to identify and locate new infestations of exotic upland plants. Conduct initial attack with an emphasis on elimination. Control spread of existing invasive, exotic and nuisance plants to reduce adverse impacts to refuge habitats.
Control of Feral Hogs	Control through managed deer hunt.	Expand Alternative A. Consider a specific feral hog hunt or alternative population control measures, including trapping.	Same as Alternative A. Consider a specific feral hog hunt or alternative population control measures, including trapping.
Control of Coyotes	No active management.	Expand Alternative A. Coordinate with the state to evaluate and control where necessary if adverse impacts are determined.	Expand Alternative A. Coordinate with the state to evaluate and control where necessary.
Control of Feral and Free-roaming Animals	No active management.	Expand Alternative A. Coordinate with the partners to control feral and free-roaming animals to minimize adverse impacts.	Expand Alternative A. Coordinate with the partners to control feral and free-roaming animals to minimize adverse impacts.

<b>KEY TOPICS</b>	<b>Alternative A (No Action)</b>	<b>Alternative B</b>	<b>Alternative C (Proposed Action)</b>
<b>WILDLIFE &amp; HABITAT DIVERSITY</b>			
Mixed Pine Hardwood	1,820 acres. Timber-stand improvement through thinning and prescribed low intensity burning in areas where limited hardwood damage would occur. Monitor forest stand inventory. Baseline GIS timber inventory completed in 2006.	Expand Alternative A. Restore and maintain ~1,820 acres of mixed pine hardwood. Monitor migratory bird and listed species presence, abundance, distribution and responses to management activities. Coordinate forest management project scheduling around critical seasons for identified species. Restore and maintain key habitat for identified species. Work with partners to develop comprehensive flora and fauna list for refuge. Update forest inventory data (GIS) every 10 years.	Expand Alternative A. Restore and maintain ~1,820 acres of mixed pine hardwood. Work with partners to develop comprehensive flora and fauna list for refuge. Manage pine dominated community types to promote understory plant species diversity. Implement monitoring program to measure and record habitat conditions and effects of management treatments. Update forest inventory data (GIS) every 10 years.
Upland Pine Forest	1,736 acres. Timber-stand improvement through thinning and prescribed burning to control mid-story hardwood. Monitor forest stand inventory. Baseline GIS timber inventory completed in 2006.	Expand Alternative A. Monitor migratory bird and listed species presence, abundance, distribution and responses to management activities. Coordinate forest management project scheduling around critical seasons for identified species. Restore and maintain key habitat for identified species. Update forest inventory data (GIS) every 10 years.	Expand Alternative A. Implement monitoring program to measure and record habitat conditions and effects of management treatments. Work with partners to develop comprehensive flora and fauna list for refuge. Implement comprehensive set of GIS databases. Restore and maintain these habitats to enhance wildlife and habitat diversity. Update forest inventory data (GIS) every 10 years.

<b>KEY TOPICS</b>	<b>Alternative A (No Action)</b>	<b>Alternative B</b>	<b>Alternative C (Proposed Action)</b>
Flooded Crop Impoundments	Maintain 100 acres through water manipulation (flood from Nov – Mar) and plant corn. Ditched are not mowed during bird breeding season.	Decrease Alternative A. Implement monitoring program to measure and record habitat conditions and effects of management treatments. Manage water levels in impoundments and implement moist soil management strategies to provide quality habitat for a variety of native plants and wildlife species. Replace some flooded crop impoundments with moist soil units.	Decrease Alternative A. Implement monitoring program to measure and record habitat conditions and effects of management treatments. Manage water levels in impoundments and implement moist soil management strategies to provide quality habitat for a variety of native plants and wildlife species. Replace some flooded crop impoundments with moist soil units.
Moist Soil Units	Manage 37 acres through periodic flooding, disking, mowing, and burning.	Expand Alternative A. Implement moist soil management strategies to enhance wetland habitat conditions. Evaluate the potential for the creation of additional impoundments to support listed species and migratory birds.	Expand Alternative A. Evaluate the potential for the creation of additional impoundments to support wildlife and habitat diversity. Increase moist soil unit acreage. Implement moist soil management strategies to enhance wetland habitat conditions.

<b>KEY TOPICS</b>	<b>Alternative A (No Action)</b>	<b>Alternative B</b>	<b>Alternative C (Proposed Action)</b>
Green Tree Reservoir	Maintain 135 acres through water manipulation (flood Nov – Mar), allow to remain dry on a three-year rotation. Baseline GIS timber inventory completed in 2006. Wood duck boxes are provided in GTR.	Expand Alternative A. Monitor migratory bird and listed species presence, abundance, distribution and responses to management activities. Minimize public use impacts to listed species and migratory birds (including seasonal closures of key areas). Consider conversion of GTR to natural bottomland hardwood to benefit certain listed species.	Expand Alternative A. Inventory and monitor flora and fauna of GTR impoundment. Manage water levels in the GTR to support a variety of native plant and wildlife species. Ensure sufficient water levels in the GTR to support enhanced wildlife and habitat diversity.
Bottomland Hardwoods	2,895 acres. Baseline GIS timber inventory completed in 2006. Maintain contiguous hardwood bottom habitat.	Expand Alternative A. Thin sweetgum in hardwood bottom forests to favor mast-producing species. Thin stands to increase crown size and increase canebrake understory.	Expand Alternative A. Thin sweetgum in hardwood bottom forests to favor mast-producing species. Thin stands to increase crown size and increase canebrake understory.
Grasslands/Old fields/Rights-of-Way	Prescribed burning, mowing, haying, and disking of 732 acres. Maintain field borders. Maintaining native warm season grass fields.	Expand Alternative A. Reintroduce native warm season grasses. Schedule maintenance disturbances such as prescribed fire and disking and mowing to minimize disturbance to trust species that utilize or are adjacent to these habitats. Provide for optimal response of native vegetation and invertebrates listed species and migratory birds.	Expand Alternative A. Schedule maintenance disturbances such as prescribed fire and disking and mowing to provide for optimal response of native pioneer vegetation and invertebrates. Convert additional acreage of open fields to native warm season grass.

<b>KEY TOPICS</b>	<b>Alternative A (No Action)</b>	<b>Alternative B</b>	<b>Alternative C (Proposed Action)</b>
Croplands	Approximately 1,161 acres planted in corn, soybeans and wheat under the Cooperative Farming Program. 20% of crops left for wildlife. Field borders (15 ft wide) left unplanted, fallow, or seeded by refuge staff with annuals as wildlife food. Use Roundup herbicide and fertilizers.	Decrease Alternative A. Convert some croplands back to old fields consisting of native vegetation.	Same as Alternative A.
Native Warmwater Fish	Survey ponds and stock with channel catfish as needed for public use. Fish samples were collected in 2005 for mercury analysis.	Expand Alternative A. Target fish stocking consistent with migratory bird and endangered, threatened and imperiled species' needs.	Expand Alternative A. Work with the partners to survey fish species present on the refuge, habitats used by them, health and current population sizes. Conduct management practices on refuge habitats in such a manner as to minimize adverse impacts to native fish.
Herpetological Species (e.g. frogs, toads, snakes, and lizards)	Herp survey scheduled for 2007.	Expand Alternative A. Survey and develop management measures as appropriate to target priority herpetological species. Evaluate the effects of migratory bird management efforts on herpetological species and adapt management as necessary.	Expand Alternative A. Work with partners to survey herpetological species present on the refuge, habitats used by them, health and current population sizes. Conduct management practices on refuge habitats in such a manner as to minimize adverse impacts to herpetological species.

<b>KEY TOPICS</b>	<b>Alternative A (No Action)</b>	<b>Alternative B</b>	<b>Alternative C (Proposed Action)</b>
<b>WATER QUALITY &amp; QUANTITY</b>			
Water Quantity	Monitor and manage water levels in impoundments and GTR. Provide minimum flow requirements for the Pee Dee River to Progress Energy during FERC re-licensing meetings for two Pee Dee River dams.	Expand Alternative A. Work with the partners to determine and ensure adequate water levels to support migratory bird and listed species' objectives of the refuge. Consider additional options, including subsurface pumping.	Expand Alternative A. Work with the partners to determine and ensure adequate water levels to support wildlife and habitat objectives of the refuge. Consider additional options, including subsurface pumping to maintain needed water levels.
Water Quality	No active management.	Expand Alternative A. Work with the partners to ensure adequate water quality to support listed species and migratory bird objectives of the refuge.	Expand Alternative A. Work with the partners to determine and ensure adequate water quality that supports the wildlife and habitat objectives of the refuge.
<b>RESOURCE PROTECTION</b>			
<b>ACQUISITION BOUNDARY</b>			
Refuge Boundary	Refuge boundary was surveyed in 2007.	Same as Alternative A. Maintain boundary signs.	Same as Alternative A. Maintain boundary signs.
Land Acquisition	Consider purchase of properties within the acquisition boundary from willing sellers as these become available.	Change Alternative A. Focus potential future land acquisition on properties within the acquisition boundary from willing sellers based on the value they could provide to trust species.	Change Alternative A. Focus land acquisition on properties within the acquisition boundary from willing sellers based on enhancing wildlife and habitat diversity.

<b>KEY TOPICS</b>	<b>Alternative A (No Action)</b>	<b>Alternative B</b>	<b>Alternative C (Proposed Action)</b>
<b>CONSERVATION FOCUS AREAS &amp; EASEMENTS</b>			
Gaps/Corridors	No active management.	Expand Alternative A. Locate and evaluate important gaps and corridors. Work with the partners to protect important habitats and connections serving migratory birds and listed species.	Expand Alternative A. Locate and evaluate important gaps and corridors. Work with the partners to protect important habitats and wildlife corridors.
Easements	1,306 acres protected in easement.	Expand Alternative A. Locate and develop GIS database for these properties. Evaluate the contribution that these areas provide to listed species and migratory birds. Ensure that these sites adhere to easement conditions and management objectives.	Expand Alternative A. Locate and develop GIS database for these properties. Evaluate the contribution that these areas provide to wildlife and habitat diversity. Ensure that these sites adhere to easement conditions and management objectives.
<b>CULTURAL RESOURCES</b>			
Archaeological and Historical Resources	Extensive archeological surveys conducted on refuge. Occasional law enforcement patrols.	Same as Alternative A.	Expand Alternative A. Develop outreach plan to increase awareness of the archeological and historical resources on the refuge.

<b>KEY TOPICS</b>	<b>Alternative A (No Action)</b>	<b>Alternative B</b>	<b>Alternative C (Proposed Action)</b>
<b>VISITOR SERVICES</b>			
<b>VISITOR ORIENTATION</b>			
Providing Information to the Public	Maintain 3 kiosks, visitor contact station and website. Provide brochures and maps.	Same as Alternative A. Place emphasis of messages to focus on listed species and migratory birds. Add directional and entrance signs. Develop informational video.	Expand Alternative A. Place emphasis of messages to focus on wildlife and habitat diversity. Add directional and entrance signs. Develop informational video.
<b>HUNTING &amp; FISHING</b>			
Turkey Hunting Opportunities	Manage quota hunts. Five days per year. 100 permits issued	Change Alternative A. Work with partners to evaluate the population status on the refuge and the effect of turkeys on trust resources. Adjust turkey hunting accordingly.	Expand Alternative A. Ensure there are no adverse impacts to wildlife and habitat diversity. Management to improve biodiversity would benefit turkey populations. Expand turkey hunt areas to include refuge lands in Richmond County.
Waterfowl Hunting	No waterfowl hunting is allowed on the refuge. This includes the waters of the Pee Dee River from the confluence of Pressley Creek to the confluence of Brown Creek.	Same as Alternative A.	Same as Alternative A.

<b>KEY TOPICS</b>	<b>Alternative A (No Action)</b>	<b>Alternative B</b>	<b>Alternative C (Proposed Action)</b>
Deer Hunting Opportunities	<p>Manage quota hunt.  Firearm: 13 days per year.  1,250 of permits issued.  Archery: 42 days per year.  1,100 hunters. Approximately 20% of the refuge is off-limits to deer hunting during the migratory bird season.  Participate in Southeastern Cooperative Wildlife Disease Study.</p>	<p>Change Alternative A.  Work with partners to evaluate the population status on the refuge and the effect of deer on trust resources.  Adjust deer hunting accordingly.</p>	<p>Expand Alternative A. Work with the state to evaluate status, trends and herd health. Increase total number of hunting days to reduce deer numbers to protect wildlife and habitat diversity.</p>
Small Game Hunting Opportunities	<p>Mourning Dove: ~10 days annually, approximately 400 hunters.  Raccoon/Opossum: ~40 days, approximately 500 hunters.  Gray Squirrel: ~20 days, approximately 500 hunters.  Quail: 9 days, approximately 500 hunters. Two quail limit per hunter.  Rabbit: ~14 days, approximately 500 hunters.  No small game hunting permitted in waterfowl sanctuary area from Nov. 25–March 15.  Note: small game hunting is permitted in Anson County only.</p>	<p>Change Alternative A.  Work with partners to evaluate the population status on the refuge and the effects of small game on trust species. Adjust hunting of these species (opossum, quail, rabbit, raccoon and squirrel) accordingly.</p>	<p>Expand Alternative A. Implement quail population monitoring to determine number of hunting days and bag limit.</p>

<b>KEY TOPICS</b>	<b>Alternative A (No Action)</b>	<b>Alternative B</b>	<b>Alternative C (Proposed Action)</b>
Fishing Opportunities	Five ponds and several creek/river sites open 7 months per year (closed Oct 15 – Mar 15), two ponds open year-round throughout the refuge. Annual Youth Fishing Day held.	Decrease Alternative A. Limit access to additional waterfowl areas to reduce disturbance.	Expand Alternative A. Increase boat access to the Pee Dee River and consider additional stocking of fish in refuge ponds.
<b>WILDLIFE OBSERVATION &amp; PHOTOGRAPHY</b>			
Wildlife Viewing and Photography Opportunities	Maintain 2.75 mile wildlife drive, three hiking trails (3.5 miles total), ~25 miles of public gravel roads. Not all areas are open year-round. One observation/photography blind at Sullivan Pond.	Decrease Alternative A. Limit access to additional waterfowl areas to reduce disturbance.	Expand Alternative A. Install three additional photoblinds and evaluate potential for additional birding trails. Increase public boat access to the Pee Dee River.
<b>ENVIRONMENTAL EDUCATION &amp; INTERPRETATION</b>			
Environmental Education Opportunities and Interpretive Programs	Conduct 28 programs annually on station, 8 offsite.	Expand Alternative A. Develop onsite and offsite curriculum-based educational programs with messages focused on migratory birds and listed species. Train staff, volunteers and teachers to conduct education programs.	Expand Alternative A. Develop onsite and offsite curriculum-based educational programs with messages focused on the role and importance of the refuge in the landscape. Train staff, volunteers and teachers to conduct education programs. Build an onsite environmental education center (potential impacts associated with this planned facility would be evaluated under a separate EA or EIS).

<b>KEY TOPICS</b>	<b>Alternative A (No Action)</b>	<b>Alternative B</b>	<b>Alternative C (Proposed Action)</b>
Number of Interpretive Trails	Three interpretive trails.	Expand Alternative A. Add interpretive signs to trails to emphasize migratory birds and listed species.	Expand Alternative A. Add interpretive signs to trails to emphasize biodiversity. Expand trails in the vicinity of the environmental education center (see above).
<b>OTHER RECREATIONAL USES</b>			
Horseback Riding Opportunities	Permitted on roads open to vehicles by SUP only.	Decrease Alternative A. Limit areas open to horseback riding or eliminate this activity if it is determined to have negative effects on refuge trust species.	Same as Alternative A.
ATV Use	ATV use permitted for hunters with disabilities. SUP required.	Same as Alternative A.	Same as Alternative A.
<b>OUTREACH</b>			
Local Residents	At least six news releases annually to promote special events. Present approximately 12 refuge programs to civic groups annually. Provide refuge information booths at local events.	Expand Alternative A. Focus outreach efforts on migratory birds and listed species.	Expand Alternative A. Focus outreach efforts on wildlife and habitat diversity. Increase awareness of the refuge and the Refuge System. Train refuge Friends group members/volunteers to assist with outreach efforts.

<b>KEY TOPICS</b>	<b>Alternative A (No Action)</b>	<b>Alternative B</b>	<b>Alternative C (Proposed Action)</b>
<b>FRIENDS GROUP &amp; VOLUNTEERS</b>			
Friends of PDNWR	100 Friends members.	Expand Alternative A. Focus Friends group's efforts and activities to benefit trust species. Support increases to the number of Friends members and level of activities. Increase number of active volunteers and focus projects to benefit migratory birds and listed species.	Expand Alternative A. Focus Friends group's efforts and activities to benefit wildlife and habitat diversity. Support increases to the number of Friends members and level of activities.
Volunteers	30 volunteers / 2,500 hours annually	Expand Alternative A. Increase number of active volunteers and focus projects to benefit migratory birds and listed species.	Expand Alternative A. Increase number of active volunteers and focus projects to benefit wildlife and habitat diversity.
<b>LITTER</b>			
Control of Trash and Litter	Signs and trash cans maintained by volunteers and staff. LE patrol of public use areas.	Expand Alternative A. Focus and schedule trash and litter control efforts to benefit trust species. Increase number of clean-ups through coordination with area service groups and schools. Ensure that refuge is included in area clean-up projects.	Expand Alternative A. Focus and schedule trash and litter control efforts to benefit wildlife and habitat diversity. Increase number of clean-ups through coordination with area service groups and schools. Ensure that refuge is included in area clean-up projects.

<b>KEY TOPICS</b>	<b>Alternative A (No Action)</b>	<b>Alternative B</b>	<b>Alternative C (Proposed Action)</b>
<b>REFUGE ADMINISTRATION</b>			
<b>REFUGE MANAGEMENT</b>			
<p>Administrative Facilities, Utilities, Equipment, and Signs</p>	<p>Repairs to refuge equipment and facilities are made as funding is allocated. Facility maintenance projects and improvement that will cost more than the refuge annual maintenance allocation are input into the SAMMS database for consideration of funding under Deferred Maintenance by the Regional and Washington offices.</p> <p>Administrative office, shop, Friends building, fire cache, 2 dozers, 1 grader, 3 farm tractors, 1 backhoe, 3 trucks, and 5 entrance signs. 2 portable water pumps.</p>	<p>Change Alternative A. Equipment and facility repairs will include items needed for migratory bird management activities. SAMMS project descriptions will be reviewed to ensure migratory bird and listed species management priorities of the refuge are considered.</p>	<p>Change Alternative A. Equipment and facility repairs will include items needed for habitat management activities to enhance Wildlife and Habitat Diversity. SAMMS project descriptions will be reviewed to ensure wildlife and habitat management priorities of the refuge are considered.</p>

<b>KEY TOPICS</b>	<b>Alternative A (No Action)</b>	<b>Alternative B</b>	<b>Alternative C (Proposed Action)</b>
Staffing	<p>5 total FTEs (one of which is targeted for elimination)</p> <p>Wildlife Refuge Manager Assistant Wildlife Refuge Manager, targeted for elimination Admin Office Assist Engineering Equip Operator Park Ranger (LE)</p> <p>Total Staff = 5 FTE</p> <p>Total Recurring Cost = \$ 350,000</p>	<p>Expand Alternative A. In addition to current staff: Assistant Wildlife Refuge Manager Biologist Forestry Technician 2 Maintenance Workers Park Ranger (education/outreach and volunteer coordination)</p> <p>Total Staff = 10 FTE</p> <p>Total Recurring Cost = \$ 800,000</p>	<p>Expand Alternative A. In addition to current staff: Assistant Wildlife Refuge Manager Biologist Forestry Technician 2 Maintenance Workers Park Ranger (education/outreach and volunteer coordination)</p> <p>Total Staff = 10 FTE</p> <p>Total Recurring Cost = \$ 800,000</p>

<b>KEY TOPICS</b>	<b>Alternative A (No Action)</b>	<b>Alternative B</b>	<b>Alternative C (Proposed Action)</b>
<b>INTERGOVERNMENTAL COORDINATION</b>			
Intergovernmental Coordination	Work with Greater Uwharries Conservation Partnership.	Expand Alternative A. Coordinate with the state to determine the effects of coyote and feral animals on endangered, threatened and imperiled species. Work with the partners to determine and ensure adequate water levels, quality and quantity to support endangered, threatened and imperiled species objectives of the refuge. Work with the partners to protect the important habitats and connections serving endangered, threatened and imperiled species. Work with partners to integrate PDNWR in NCDENR Green Infrastructure Plan.	Expand Alternative A. Coordinate with the state to determine the effects of coyote and feral animals on biodiversity. Work with the partners to determine and ensure adequate water levels, quality and quantity to support wildlife and habitat diversity objectives of the refuge. Work with the partners to protect the important habitats and connections serving wildlife and habitat diversity. Work with Anson and Richmond County planners to define and protect important conservation areas. Work with partners to integrate PDNWR in NCDENR Green Infrastructure Plan.

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## *IV. Environmental Consequences*

### **OVERVIEW**

This chapter analyzes and discusses the potential environmental effects or consequences that can be reasonably expected by the implementation of each of the three alternatives described in Chapter III of this environmental assessment. Specific environmental and social impacts of implementing each alternative are discussed in Table 8 under four broad management categories: wildlife and habitat management, resource protection, visitor services, and refuge administration. Outlined are the anticipated impacts over the 15-year life of the CCP that could result from the implementation of the actions described in alternatives A, B, and C. Alternatives B and C are compared to Alternative A, the No Action alternative.

### **EFFECTS COMMON TO ALL ALTERNATIVES**

A few potential effects will be the similar under each alternative. These are summarized under six categories: environmental justice, climate change, other management, cultural resources, Refuge Revenue Sharing Act payments, and other effects.

#### *ENVIRONMENTAL JUSTICE*

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," was signed by President Clinton on February 11, 1994, to focus federal attention on the environmental and human health conditions of minority and low-income populations, with the goal of achieving environmental protection for all communities. The order directed federal agencies to develop environmental justice strategies to aid in identifying and addressing disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations. The order is also intended to promote nondiscrimination in federal programs substantially affecting human health and the environment, and to provide minority and low-income communities with access to public information and opportunities for participation in matters relating to human health or the environment.

None of the management alternatives described in this environmental assessment will disproportionately place any adverse environmental, economic, social, or health impacts on minority and low-income populations. Implementation of any action alternative that includes public use and environmental education is anticipated to provide a benefit to all residents residing in the surrounding communities.

#### *CLIMATE CHANGE*

The U.S. Department of the Interior issued an order in January 2001 requiring federal agencies with land management responsibilities under its direction to consider the potential impacts of climate change as part of their long-range planning endeavors.

The increase of carbon within the earth's atmosphere has been linked to the gradual rise in surface temperatures commonly referred to as global warming. In relation to comprehensive planning for national wildlife refuges, carbon sequestration constitutes the primary climate-related impact to be considered in planning. The U.S. Department of Energy's *Carbon Sequestration Research and*

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*Development* (U.S. Department of Energy 1999) defines carbon sequestration as “... the capture and secure storage of carbon that would otherwise be emitted to or remain in the atmosphere.”

Natural areas play an essential part in carbon sequestration. Terrestrial biomes of all sorts—grasslands, forests, wetlands, tundra, perpetual ice, and desert—are effective both in preventing carbon emissions and in acting as a biological “scrubber” of atmospheric carbon dioxide (U.S. Department of Energy 2007). The conclusions of the Department of Energy’s 1999 report noted that ecosystem protection is important to carbon sequestration and may reduce or prevent the loss of carbon currently stored in the terrestrial biosphere.

Preserving natural habitat for wildlife is the heart of any long-range plan for national wildlife refuges such as Pee Dee NWR. The habitats on Pee Dee NWR will continue to play a role in carbon sequestration, particularly its bottomland hardwoods (Hupp and Noe 2006). All the alternatives proposed in this environmental assessment would preserve or restore land and water, and would thus enhance carbon sequestration. This, in turn, contributes positively to efforts to mitigate human-induced global climate changes.

The impacts of climate change on Pee Dee NWR during the first 15 years of implementation are likely to include an increased risk of vegetation shifts (Morse et al. 1993; Shugart et al. 2003); drought (Dai et al. 2004); the spread of nonnative species (Mooney and Hobbs 2000); and tropical cyclones or hurricanes (Webster et al. 2005).

Changes in temperature, rainfall, wind patterns, and other factors that affect the distribution of plant communities are affected by climate and will respond accordingly. Vegetation communities are predicted to shift with conifer-dominated forests being replaced by those consisting mostly of hardwood species (Shugart et al. 2003). Changes in evapotranspiration and a predicted increase in pine beetles will favor several oak species, while the pine forests are expected to move northward. Although the refuge will not be able to prevent the shift of habitats, the various management techniques outlined in the CCP will help protect the vegetation communities found on the refuge and minimize loss of biological diversity.

Droughts will affect the refuge in two major ways: by reducing water quantity and increasing the risk of wildfires. Improved coordination with partners will help to maintain adequate water levels and safeguard this valuable resource on the refuge. A comprehensive prescribed burning plan will minimize the frequency and intensity of wildfires during periods of drought.

Tropical cyclones negatively affect Pee Dee NWR through flooding and tree damage. Flooding can damage refuge infrastructure and affect habitat by removing vegetation and increasing stream sedimentation. The proposed increase of impoundments may help reduce the intensity of flooding on the refuge by serving as temporary stormwater retention areas. Nesting birds, including listed species may be adversely affected by high winds and tree-falls. Potential nest sites of listed species (e.g., bald eagles) can be checked after storms to assess damage and potentially rescue fledglings.

Global warming is predicted to increase the number and abundance of exotic species (Walther et al. 2002). Warmer winters and a longer growing season will allow more exotic species to colonize areas that were too cold for them in the past. Many of these nonnative plants and animals will compete for space with native species while others will prey on native wildlife, causing ecological harm. The CCP details several strategies to mitigate the effects of nonnative species and protect the native plants and wildlife of the refuge.

## *OTHER MANAGEMENT*

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All management activities that could affect the refuge's natural resources, including subsurface mineral reservations, utility lines and easements, soils, water, and air would be managed to comply with all laws and regulations. In particular, any existing and future oil and gas exploration, extraction, and transport operations on the refuge would be managed identically under each of the alternatives. Thus, the impacts would be the same. Under each of the three alternatives, the Service would work to minimize the impacts of any such activities.

### *CULTURAL RESOURCES*

The U.S. Fish and Wildlife Service is responsible for managing archaeological and historical resources found on refuge lands. Since cultural resource surveys on the refuge have been limited, additional surveys would be conducted prior to any new construction or excavation on refuge lands in order to fully satisfy provisions of the National Environmental Policy Act of 1969 and all applicable cultural resource laws and policies. Potentially negative impacts from construction of trails or facilities would require review by the Service's Regional Archaeologist and consultation with the North Carolina State Historic Preservation Office. Determining whether a particular management action has the potential to affect cultural resources is an ongoing process that would occur during the detailed planning stages of every project. Service acquisition or management of land with known or potential archaeological or historical sites provides three major types of protection for these resources: protection from private development (e.g., into single-family homes); protection from damage by federal activities; and protection from vandalism or theft. The Service's policy is to preserve these resources in the public trust, avoiding impacts whenever possible. Minimal or no negative impacts are anticipated for any particular cultural resources on the refuge under any of the alternatives. As a whole, positive impacts are expected to the cultural resources due to management and protection of these resources under all of the alternatives.

All three alternatives afford additional land protection and low levels of development, thereby producing little negative effect on the refuge's cultural and historic resources. Potentially negative effects could include logging, construction of new trails or facilities, and development of water impoundments. In most cases, these management actions would require review by the Service's Regional Archaeologist in consultation with the State of North Carolina Historic Preservation Office, as mandated by Section 106 of the National Historic Preservation Act. Therefore, the determination of whether a particular action within an alternative has the potential to affect cultural resources is an ongoing process that would occur during the planning stages of every project.

### *REFUGE REVENUE SHARING ACT PAYMENTS*

The Service provides Anson and Richmond counties with Refuge Revenue Sharing Act payments in lieu of property tax income. Annual Refuge Revenue Sharing Act payments to Anson and Richmond counties would continue at similar rates under each alternative. If lands are acquired and added to the refuge, the payments would increase accordingly.

### *OTHER EFFECTS*

Each of the alternatives would have similar positive effects or minimal to negligible effects on the soils; water quality and quantity; noise; transportation; human health and safety; children; hazardous materials; waste management; aesthetics and visual resources; and utilities and public services.

### **SUMMARY OF EFFECTS BY ALTERNATIVE**

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The following section describes the environmental consequences of implementing each refuge management alternative. Table 9 summarizes and addresses the likely outcomes for the specific issues and is organized by broad issue categories.

Each of the alternatives is anticipated to result in net positive environmental benefits. Impacts anticipated under the implementation of each alternative are summarized for soils; air quality; hydrology and water quality; and biological resources.

*ALTERNATIVE A: CURRENT MANAGEMENT (NO ACTION)*

Implementation of Alternative A is anticipated to result in net positive environmental benefits.

The management activities outlined under Alternative A are anticipated to have net neutral to positive impacts on soils.

The management activities outlined under Alternative A would help to improve air quality. Minor, short-term negative air quality impacts could be experienced during controlled burns or wildfires. However, these impacts are offset by the positive impacts of the resultant higher quality native habitats.

The management activities outlined under Alternative A are anticipated to have net neutral impacts on hydrology and water quality.

The management activities outlined under Alternative A are anticipated to have net positive impacts to biological resources. Habitat management activities would result in high quality habitats supporting native wildlife and habitat diversity.

*ALTERNATIVE B*

Implementation of Alternative B is anticipated to result in net positive environmental benefits.

The management activities outlined under Alternative B are anticipated to have net neutral to positive impacts on soils. Restoring and managing habitats would have a positive impact on soils. Expanding impounded wetlands would have minor negative impacts on soils and soil formation processes.

The management activities outlined under Alternative B would help to improve air quality. Minor, short-term negative air quality impacts could be experienced during controlled burns or wildfires. However, these impacts are offset by the positive impacts of the resultant higher quality native habitats.

The management activities outlined under Alternative B are anticipated to have net positive impacts to water quality and hydrology. Positive hydrology and water quality impacts would result from the acquisition, protection, and management of additional lands.

The management activities outlined under Alternative B are anticipated to have net positive impacts to biological resources. Habitat management activities would result in high quality habitats supporting increased numbers of migratory birds and native wildlife and wildlife diversity.

*ALTERNATIVE C: PROPOSED ACTION*

Implementation of Alternative C is anticipated to result in net positive environmental benefits.

The management activities outlined under Alternative C are anticipated to have net positive impacts on soils and soil formation processes. The positive effects of restoring upland areas and more

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intensively managing habitats would offset the moderately negative effects of creating additional impounded wetlands.

The management activities outlined under Alternative C would help to improve air quality. Minor, short-term negative air quality impacts could be experienced during controlled burns or wildfires. However, these impacts are offset by the positive impacts of the resultant higher quality native habitats.

The management activities outlined under Alternative C are anticipated to have net positive impacts to hydrology and water quality. Positive hydrology and water quality impacts would result from the acquisition, protection, and management of additional lands.

The management activities outlined under Alternative C are anticipated to have net positive impacts to biological resources. Habitat management activities would result in high quality habitats supporting native wildlife and wildlife diversity.

### **COMPARISON OF EFFECTS FROM IMPLEMENTING ALTERNATIVES**

While the three alternatives share similarities, their differences result in varying types and levels of impacts. None of the proposed management activities would lead to a violation of federal, state, or local laws imposed for the protection of the environment. Alternative A does not propose any change in the refuge's present management direction. As such, Alternative A serves as the baseline for comparing the other alternatives. Without funding and staffing to support needed programs and to provide protection for the resources, Alternative A provides the least support for long-term productivity and sustainability of the refuge. Alternative C provides the most benefits to the refuge, the natural resources supported by the refuge, and the local community, supporting long-term productivity and sustainability of the refuge. Alternative C was selected as the proposed action based on the analysis in the environmental assessment and its ability to best serve the purposes, vision, and goals of the refuge.

Adaptive management is a key component of each alternative. As such, the actions outlined would not establish a precedent for future actions with significant effects, nor represent a decision in principle about future considerations. Refuge management activities are constantly adapted as new research, data, and information become available.

Table 9 summarizes and compares the environmental consequences for each of the three alternatives under four categories: wildlife and habitat management, resource protection, visitor services, and refuge administration.

**Table 9. Summary of environmental consequences by alternative, Pee Dee National Wildlife Refuge.**

<b>KEY Topics</b>	<b>Alternative A (No Action)</b>	<b>Alternative B</b>	<b>Alternative C (Proposed Action)</b>
<b>WILDLIFE AND HABITAT MANAGEMENT</b>			
<b>ENDANGERED, THREATENED AND IMPERILED SPECIES</b>			
Bald Eagle	Neutral No change in eagle habitat to support stable populations.	Positive Decreased wildlife and habitat disturbance.	Positive Decreased wildlife and habitat disturbance.
Little Blue Heron	Positive Active management to maintain suitable foraging habitat and increasing potential rookery areas.	Positive Active management to increase suitable foraging habitat availability and increasing potential rookery areas.	Positive Active management to increase suitable foraging habitat availability and increasing potential rookery areas.
Loggerhead Shrike	Neutral Obtaining information. Maintaining foraging and nesting habitat.	Positive Increasing information. Increasing foraging and nesting habitat.	Positive Increasing information. Increasing foraging and nesting habitat.
Red-cockaded Woodpecker	Neutral Maintaining upland forest habitat. No active clusters known to exist.	Neutral to Positive Active management to support natural recruitment or reintroduction. Increased information.	Neutral to Positive Active management to support natural recruitment or reintroduction. Increased information.
Rafinesque's Big-eared Bat	Neutral No active management.	Neutral to Positive Increased information.	Neutral to Positive Increased information.
Stream Fish	Neutral Maintaining water quality.	Positive Improving water quality. Increased information.	Positive Improving water quality. Increased information.
Diadromous Fish	Neutral Maintaining water quality.	Positive Improving water quality. Increased information.	Positive Improving water quality. Increased information.

<b>KEY Topics</b>	<b>Alternative A (No Action)</b>	<b>Alternative B</b>	<b>Alternative C (Proposed Action)</b>
Freshwater Mussels	Neutral Maintaining water quality.	Positive Improving water quality. Increased information.	Positive Improving water quality. Increased information.
Schweinitz's Sunflower	Neutral Potential suitable relocation sites identified.	Positive Increased information. Establishing populations on the refuge.	Positive Increased information. Establishing populations on the refuge.
State-listed Plants	Neutral No active management.	Positive Improving water quality. Increased information.	Positive Improving water quality. Increased information.
<b>MIGRATORY BIRDS</b>			
Waterfowl	Positive Increasing available habitat to support increasing populations.	Positive Increased available habitat would support increasing waterfowl populations. Increased information and decreased disturbance.	Positive Active management of increased available habitat would support increasing waterfowl populations. Increased information and decreased disturbance.
Shorebirds	Neutral Management of impoundments maintains variable habitat acres for shorebirds.	Positive Active management of impoundments to support increasing populations of shorebirds. Decreased disturbance.	Positive Active management of impoundments to support increasing populations of shorebirds. Decreased disturbance and increased information.
Wading Birds	Positive Increased habitat available supporting increased populations.	Positive Increased information. Decreased disturbance. Increased habitat available supporting increased populations.	Positive Active management to support increasing populations of wading birds. Decreased disturbance.

<b>KEY Topics</b>	<b>Alternative A (No Action)</b>	<b>Alternative B</b>	<b>Alternative C (Proposed Action)</b>
Land Birds	Neutral to positive Increasing available for some land bird species.	Positive Increase in suitable habitat and active management should support increasing populations. Increased information.	Positive Increase in suitable habitat and active management should support increasing populations. Increased information.
<b>EXOTIC, INVASIVE AND NUISANCE SPECIES</b>			
Control of Exotic Aquatic Plants	Neutral Current management results in stable populations of exotic aquatic plants.	Positive Increased information. Increased coordination with partners and active management should result in decreased exotic aquatic plant populations benefiting migratory birds and listed species.	Positive Increased information. Active management should result in decreased exotic aquatic plant populations benefiting wildlife and habitat diversity.
Control of Exotic Terrestrial Plants	Neutral to Positive Maintaining or decreasing terrestrial plants.	Positive Active management should control terrestrial exotic plants and benefit trust species.	Positive Increased information. Active management should eliminate or control exotic plants resulting in an increase in wildlife and habitat diversity.
Control of Feral Hogs	Neutral Incidental control helps reduce negative impacts of feral hogs.	Positive Feral hog control would help reduce negative impacts to rare, threatened, and endangered species.	Neutral to Positive Increased information. Feral hog control would help reduce negative impacts to wildlife and habitat diversity.
Control of Coyotes	Neutral to Negative Without active management increasing coyote populations could negatively affect refuge species and habitats.	Neutral to Positive Increased information. Coyote control would help reduce negative impacts to rare, threatened, and endangered species.	Neutral to Positive Increased information. Coyote control would help reduce negative impacts to wildlife and habitat diversity.

<b>KEY Topics</b>	<b>Alternative A (No Action)</b>	<b>Alternative B</b>	<b>Alternative C (Proposed Action)</b>
Control of Feral and Free-roaming Animals	Negative Without active management increasing feral and free-roaming animal populations could negatively affect refuge species and habitats.	Positive Concerted control of harmful feral and free-roaming animals would help increase populations of migratory birds and protect listed species.	Positive Concerted control of harmful feral and free-roaming animals would help increase wildlife and habitat diversity.
<b>WILDLIFE AND HABITAT MANAGEMENT</b>			
Mixed Pine Hardwood	Neutral to positive Maintaining habitat, increased information.	Positive Increased information. Habitat management efforts to improve conditions for listed species and migratory birds will increase mixed pine hardwood habitat quality.	Positive Increased information. Habitat management efforts to improve biodiversity will increase mixed pine hardwood quality.
Upland Pine Forest	Neutral to positive Maintaining habitat, increased information.	Positive Increased information. Active management to support trust species would result in improved upland pine forest quality.	Positive Increased information. Active management to support an increase in wildlife and habitat diversity would result in improved upland pine forest quality.
Flooded Crop Impoundments	Neutral Current management would maintain impoundments at stable levels.	Neutral Management for migratory birds and listed species would maintain impoundments at stable levels.	Negative Increased information. Management for biodiversity species would reduce the amount of impoundment acreage.
Moist Soil Units	Neutral Current management would maintain moist soil units at stable levels.	Positive Management for listed species and migratory birds would increase quality and quantity of moist soil units.	Positive Management for increased biodiversity would increase quality and quantity of moist soil units.

<b>KEY Topics</b>	<b>Alternative A (No Action)</b>	<b>Alternative B</b>	<b>Alternative C (Proposed Action)</b>
Green Tree Reservoir	Neutral Current management would maintain present GTR acreage.	Positive Management for migratory birds would increase the quality of the GTR.	Positive Management for increased biodiversity would increase the quality of the GTR.
Bottomland Hardwoods	Neutral Current management would maintain present bottomland hardwood acreage.	Positive Management for migratory birds and listed species would increase the quality of the bottomland hardwoods.	Positive Management for increased biodiversity would increase the quality of the bottomland hardwoods.
Grasslands/Old fields/Rights-of-Way	Neutral Current management would maintain present acreage.	Positive Management for trust species would increase the quality of these areas.	Positive Management for increased biodiversity would increase the quality of these areas.
Croplands	Neutral Current management would maintain present cropland acreage.	Negative Management for migratory birds and listed species would decrease cropland acreage.	Negative Management for increased biodiversity would decrease cropland acreage.
Native Warmwater Fish	Neutral Current management would maintain native warmwater fish populations at stable levels.	Positive Management for listed species and migratory birds would increase populations of native warmwater fish.	Positive Increased information. Minimizing negative impacts of management practices to support increasing wildlife and habitat diversity.
Herpetological Species (e.g., frogs, toads, snakes, and lizards)	Neutral Current management would maintain stable populations.	Positive Increased information. Minimizing negative impacts of migratory bird and listed species management practices to support increasing herpetological populations.	Positive Management for increasing biodiversity would increase herpetological species.

<b>KEY Topics</b>	<b>Alternative A (No Action)</b>	<b>Alternative B</b>	<b>Alternative C (Proposed Action)</b>
<b>WATER QUANTITY AND QUALITY</b>			
Water Quantity	Neutral to Positive Increased information. Active management to maintain optimal water quantities in impoundments. Minimum flow on Pee Dee River required under FERC licensing.	Positive Increased cooperation with partners. Increased information. Active management to maintain optimal water quantities. Secure adequate water supplies to support increasing populations of trust species.	Positive Increased cooperation with partners. Increased information. Active management to maintain optimal water quantities. Secure adequate water supplies to support increasing wildlife and habitat diversity.
Water Quality	Neutral No active management.	Positive Management activities (moist soil units) for migratory birds and listed species would have beneficial impacts to water quality.	Positive Management activities (moist soil units) for increased biodiversity would have beneficial impacts to water quality.
<b>RESOURCE PROTECTION</b>			
<b>ACQUISITION BOUNDARY</b>			
Refuge Boundary	Positive Increased information.	Positive Increased information.	Positive Increased information.
Land Acquisition	Positive Increase in acreage.	Positive Additional lands acquired within the acquisition boundary would benefit trust species.	Positive New lands acquired would benefit biodiversity.
<b>CONSERVATION FOCUS AREAS AND EASEMENTS</b>			
Gaps/Corridors	Neutral	Positive Increased information. Protecting gaps/corridors would benefit migratory birds and listed species.	Positive Increased information. Increasing gaps/corridors would benefit biodiversity and biological integrity of refuge.

<b>KEY Topics</b>	<b>Alternative A (No Action)</b>	<b>Alternative B</b>	<b>Alternative C (Proposed Action)</b>
Easements	Negative Insufficient management oversight.	Positive Increased information and protection.	Positive Increased information and protection.
<b>CULTURAL RESOURCES</b>			
Archaeological and Historical Resources	Neutral to Positive Increased information and some protection offered.	Neutral to Positive Increased information and some protection offered.	Positive Increased information. Increased protection of archaeological and historical resources.
<b>VISITOR SERVICES</b>			
<b>VISITOR ORIENTATION</b>			
Providing Information to the Public	Positive Information available to visitors.		Positive Visitors will gain increasing awareness and understanding of wildlife and habitat diversity.
<b>HUNTING AND FISHING</b>			
Turkey Hunting Opportunities	Neutral	Neutral to Positive Increased information.	Positive Increased turkey populations and hunting opportunities.
Waterfowl Hunting	Negative No opportunities for waterfowl hunting on refuge.	Negative No opportunities for waterfowl hunting on refuge.	Negative No opportunities for waterfowl hunting on refuge.
Deer Hunting Opportunities	Neutral Adequate deer hunting opportunities exist on refuge.	Neutral to Positive Increased information.	Neutral to Positive Although increased deer hunting days exist, they would not occur during periods optimal for hunting.
Small Game Hunting Opportunities	Neutral Adequate small game hunting opportunities exist on refuge.	Neutral to Positive Increased information.	Positive Increased information.

<b>KEY Topics</b>	<b>Alternative A (No Action)</b>	<b>Alternative B</b>	<b>Alternative C (Proposed Action)</b>
<b>WILDLIFE OBSERVATION AND PHOTOGRAPHY</b>			
Fishing Opportunities	Positive Current fishing opportunities exist on refuge.	Negative Fishing opportunities would decrease on the refuge.	Positive Fishing opportunities would increase on the refuge
<b>ENVIRONMENTAL EDUCATION AND INTERPRETATION</b>			
Wildlife Viewing and Photography Opportunities	Positive Current wildlife viewing and photography opportunities exist.	Negative Reduced wildlife viewing and photography opportunities.	Positive Increased wildlife viewing and photography opportunities.
Environmental Education Opportunities and Interpretive Programs	Neutral Current environmental education and interpretation opportunities would be maintained.	Positive Increased environmental education and interpretation opportunities.	Positive Increased environmental education and interpretation opportunities.
Number of Interpretive Trails	Neutral Current interpretive trail would be maintained.	Neutral to Positive Number of interpretive trails might be increased.	Positive Number of interpretive trails might be increased.
<b>OTHER RECREATIONAL USES</b>			
Horseback Riding Opportunities	Positive Horseback opportunities exist on refuge.	Neutral to Positive Horseback opportunities exist on refuge.	Positive Horseback opportunities exist on refuge.
ATV Use	Negative Regular ATV activities do not exist on the refuge.	Negative Regular ATV activities do not exist on the refuge.	Negative Regular ATV activities do not exist on the refuge.
<b>OUTREACH</b>			
Local Residents	Positive	Positive Local outreach would increase.	Positive Local outreach would increase.

<b>KEY Topics</b>	<b>Alternative A (No Action)</b>	<b>Alternative B</b>	<b>Alternative C (Proposed Action)</b>
<b>FRIENDS GROUP AND VOLUNTEERS</b>			
Friends of PDNWR	Neutral to Positive Friends of PDNWR membership and activity level would remain stable or increase.	Positive Friends of PDNWR membership and activity level would increase.	Positive Friends of PDNWR membership and activity level would increase.
Volunteers	Neutral to Positive Volunteer activity level and number of projects would remain stable or increase.	Positive Volunteer activity level and number of projects would increase.	Positive Volunteer activity level and number of projects would increase.
<b>LITTER</b>			
Control of Trash and Litter	Negative Litter cleanup and control would be maintained at current levels.	Positive Litter cleanup and control would increase.	Positive Litter cleanup and control would increase.
<b>REFUGE ADMINISTRATION</b>			
<b>REFUGE MANAGEMENT</b>			
Administrative Facilities, Utilities, Equipment, and Signs	Neutral to Negative Additional facilities, utilities, equipment, and signs are needed.	Positive Increased facilities, utilities, equipment, and signs.	Positive Increased facilities, utilities, equipment, and signs.
Staffing	Neutral to Negative No change in the levels of biological support and wildlife and habitat protection.	Positive Increased staff in all refuge programs to meet refuge goals and objectives. Enhanced information and habitat management.	Positive Increased staff in all refuge programs to meet refuge goals and objectives. Enhanced information and habitat management.

<b>KEY Topics</b>	<b>Alternative A (No Action)</b>	<b>Alternative B</b>	<b>Alternative C (Proposed Action)</b>
<b>INTERGOVERNMENTAL COORDINATION</b>			
Intergovernmental Coordination	Neutral	Positive Increased level of intergovernmental coordination.	Positive Increased level of intergovernmental coordination.

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## UNAVOIDABLE IMPACTS AND MINIMIZATION MEASURES

Under Alternative A, No Action alternative, there are numerous unavoidable impacts, including law enforcement that is not adequate for protecting existing and increasing visitor use; continued degradation of the biological functions of native plant communities and wildlife habitat due to the invasion of exotic, invasive, and nuisance species; and a continued decrease in biodiversity. Over time, if these issues are not addressed, they will continue to negatively impact refuge resources.

Alternative C, the Proposed Action, also has some unavoidable impacts. These impacts are expected to be minor and/or short-term in duration. However, the refuge will attempt to minimize these impacts whenever possible. The following sections describe the measures the refuge will employ to minimize the potential impacts that would result from implementation of the Proposed Action.

### *WATER QUALITY FROM SOIL DISTURBANCE AND USE OF HERBICIDES*

Soil disturbance and siltation due to water management activities; road and levee maintenance; trails and photo-blinds; and cooperative farming programs are expected to be minor and of short duration. To further reduce potential impacts, best management practices will be used to minimize the erosion of soils into water bodies.

Foot traffic on new and extended foot trails is expected to have a negligible impact on soil erosion. To minimize the impacts from public use, the refuge will include informational signs that request trail users to remain on the trails in order to avoid causing potential erosion problems and impacts to adjacent habitats.

Long-term herbicide use for exotic plant and agricultural weed control could result in a slight decrease in water quality in areas prone to exotic plant infestation and near cooperative farming lands. Through the proper application of herbicides, however, this is expected to have a minor impact on the environment, with the benefit of reducing or eliminating exotic plant infestations and by increasing crop production (a percentage of which is made available to benefit wildlife).

### *WILDLIFE DISTURBANCE*

Disturbance to wildlife is an unavoidable consequence of any public use program, regardless of the activity involved. While some activities such as wildlife observation may be less disturbing than others, all of the public use activities proposed under the Proposed Action will be planned to avoid unacceptable levels of impact.

The 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. Providing access for fishing opportunities allows the use of a renewable natural resource without adversely impacting other resources. Hunting will also be managed with restrictions that ensure minimal impacts on 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 to minimize the impacts.

### *VEGETATION DISTURBANCE*

Negative impacts could result from the creation, extension, and maintenance of trails that require the clearing of non-sensitive vegetation along their lengths. This is expected to be a minor short-term impact.

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Increased visitor use may increase the potential for the introduction of new exotic species into areas (e.g., when visitors do not comply with boating regulations at the proposed boat ramp and other access points or with requests to stay on trails). The refuge will minimize these impacts by enforcing the regulations for access to the refuge's water bodies and by installing informational signs that request users to stay on the trails. Further, through environmental education and interpretive programs, the refuge and its partners will be able to increase awareness and understanding of the impacts of exotic, invasive, and nuisance species, which will help minimize their introduction, spread, and impacts.

### *USER GROUP CONFLICTS*

As public use increases, unanticipated conflicts between different user groups could occur. If this should happen, the refuge will adjust its 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, high quality, appropriate, and compatible wildlife-dependent recreational opportunities.

### *EFFECTS ON ADJACENT LANDOWNERS*

Implementation of the Proposed Action is not expected to negatively affect the owners of private lands adjacent to the refuge. Positive impacts that would be expected include higher property values, less intrusion of invasive exotic plants, and increased opportunities for viewing more diverse wildlife.

However, some negative impacts that may occur include a higher frequency of trespass onto adjacent private lands and noise associated with increased traffic. To minimize these potential impacts, the refuge will provide informational signs that clearly mark refuge boundaries; maintain the refuge's existing parking facilities; use law enforcement; and provide increased educational efforts at the visitor contact station.

### *LAND OWNERSHIP AND SITE DEVELOPMENT*

Land acquisition efforts by the Service could lead to changes in land use and recreational use patterns. Most of the non-Service-owned lands within the refuge's approved acquisition boundary are currently undeveloped, and these lands are already privately held and managed. If additional lands are acquired, they would be maintained in a natural state, managed for native wildlife populations, and opened to wildlife-compatible public uses, where feasible.

Potential development of the refuge's buildings, trails, and other improvements could lead to minor short-term 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 the requirements of Section 404 of the Clean Water Act; the National Historic Preservation Act; Executive Order 11988, Floodplain Management; and other applicable regulatory requirements.

### **CUMULATIVE IMPACTS**

A cumulative impact is defined as an impact on the natural or human environment, which results from the incremental impact of the Proposed Action when added to other past, present, and reasonably foreseeable future actions, regardless of which agency (federal or nonfederal) or person undertakes such other actions (40 Code of Federal Regulations, 1508.7).

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Cumulative impacts are the overall, net effects on a resource that arise from multiple actions. Impacts can “accumulate” spatially, when different actions affect different areas of the same resource. They can also accumulate over the course of time, from actions in the past, the present, and the future. Occasionally, different actions counterbalance one another, partially canceling out each other’s effect on a resource. But more typically, multiple effects add up, with each additional action contributing an incremental impact on the resource. In addition, sometimes the overall effect is greater than merely the sum of the individual effects, such as when one more reduction in a population crosses a threshold of reproductive sustainability and threatens to extinguish the population.

A thorough analysis of impacts always considers their cumulative aspects, because actions do not take place in a vacuum: there are virtually always some other actions that have affected that resource in some way in the past, or are affecting it in the present, or will affect it in the reasonably foreseeable future. So any assessment of a specific action’s effects must in fact be made with consideration of what else has happened to that resource, what else is happening, or what else will likely happen to it.

The refuge is not aware of any past, present or future planned actions that would result in a significant cumulative impact when added to the refuge’s proposed actions, as outlined in the Proposed Action. Building additional impoundments, hunting, fishing, increased visitation, and prescribed burning would have negligible cumulative impacts.

Construction of new impoundments would not have any substantial cumulative effects. Additional impoundments would help improve water quality in Brown Creek and the Pee Dee River due to their sediment retention capacity. Water flow, quantity, and hydrology of refuge waterways and ponds would not be significantly impaired by increased impoundment acreage.

Deer hunting would not have any long-term or far-reaching effects on the regional deer population since the home ranges of deer limit them primarily to the refuge. Hunting seasons would not coincide with breeding and nesting seasons of migratory birds, so cumulative effects caused by hunting-induced disturbance would be minimal. There would be minimal negative effects to other wildlife, including listed species. Conflicts between hunters and other consumptive and non-consumptive users are not expected to occur. Experience has proven that time and space zoning (e.g., separate use areas and use periods) is an effective tool in eliminating conflicts between user groups. Expanding the turkey hunt to include the Richmond County portion of the refuge is unlikely to incur any negative cumulative impacts for the same reasons outlined above.

Fishing would not cause any cumulative effects. State catch limits and periodic stocking would ensure that fish stocks on the refuge would not be depleted. Fishing would be limited to certain areas to minimize any associated wildlife disturbance effects.

The cumulative impacts of increased visitation would be minimal. Although nonconsumptive users can impact wildlife through disturbance, the seasonal closure of vulnerable areas (e.g. where wildlife are foraging or nesting) and use of natural “screens” (vegetation barriers) would minimize these adverse effects.

The cumulative effects of prescribed burning would be minimal. The use of relatively small, prescribed burns timed with favorable winds would maintain air pollution at acceptable levels. These managed burns would reduce fuel loads and help prevent or manage catastrophic wild fires that would have the potential to cause serious air quality problems.

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## **DIRECT AND INDIRECT EFFECTS OR IMPACTS**

Direct effects are caused by an action and occur at the same time as the action. Indirect effects are caused by an action but are manifested later in time or further removed in distance, but still reasonably foreseeable.

The actions proposed for implementation under the Proposed Action include minor facility development; wildlife and population management; resource protection; public use; and administrative programs. These actions would result in both direct and indirect effects. The various programs proposed in this plan would likely lead to increased public use, a direct effect; and it, in turn, would lead to potential indirect effects such as increased littering, noise, and vehicular traffic.

Other indirect effects that may result from implementing the Proposed Action include minor impacts from siltation expanding the water control structures, as well as expanding or creating new foot trails and providing greater visitor access through construction of a boat ramp.

None of the direct or indirect effects are anticipated to be significant.

## **SHORT-TERM USES VERSUS LONG-TERM PRODUCTIVITY**

The habitat protection and management actions outlined under the Proposed Action are dedicated to maintaining the long-term productivity of refuge habitats. The benefits of this plan for long-term productivity far outweigh any impacts from short-term actions, such as the creation of new trails. While these activities could cause short-term negative impacts, the educational values and associated public support gained from the improved visitor experience would produce long-term benefits for the refuge's entire ecosystem.

The key to protecting and ensuring the refuge's long-term productivity is to find the threshold where public uses do not degrade or interfere with the refuge's natural resources. The activities outlined under the Proposed Action have been carefully conceived to ensure that the threshold is not passed. Therefore, implementing the Proposed Action would lead to long-term benefits for wildlife protection and land conservation that far outweigh any short-term impacts.



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# V. Consultation and Coordination

## INTRODUCTION

The comprehensive planning process for Pee Dee National Wildlife Refuge involved a wide variety of participants, including federal, state, and local governments; universities and other researchers; private nonprofit groups; and the Friends of the Pee Dee National Wildlife Refuge, as well as local residents, local businesses, concerned citizens from all over the country, 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 other parties.

## CORE CCP PLANNING TEAM

The Core CCP Planning Team included representatives from the refuge and the North Carolina Wildlife Resources Commission, as well as the Dynamac Corporation, a Service contractor. The team met as a whole to review all issues, determine the priority issues, and identify potential solutions or approaches. A subset of the Core Planning Team, consisting of the refuge staff and the Service contractor, developed the Draft CCP/EA, based on the information and direction provided by the Core Planning Team.

### **Pee Dee National Wildlife Refuge, U.S. Fish and Wildlife Service**

- Jeffrey Bricken, Refuge Manager
- Greg Walmsley, Assistant Refuge Manager

### **North Carolina Wildlife Resources Commission**

- Ken Knight, Supervising Wildlife Biologist
- Jonathan Shaw, Wildlife Biologist

### **Dynamac Corporation (Contractor)**

- Oliver van den Ende, Environmental Scientist/Ecologist

## WILDLIFE AND HABITAT MANAGEMENT REVIEW TEAM

The Wildlife and Habitat Management Review Team included a core group of Service staff with invited participants and was organized by staff at the refuge and the Service's Southeast Regional Office. The invited participants included local and regional experts, researchers, and individuals with intimate knowledge of and experience regarding the resources of the refuge. These participants included representatives from the North Carolina Wildlife Resources Commission, North Carolina Forest Service, Ducks Unlimited, and Gaddy's Goose Pond. The wildlife and habitat management review was conducted in July 2006.

### **U.S. Fish and Wildlife Service**

- Jeffrey Bricken, Refuge Manager, Pee Dee NWR, Wadesboro, North Carolina
- Pete Campbell, Fish and Wildlife Biologist, Raleigh Ecological Services Sub-office, Southern Pines, North Carolina
- Don Cockman, Deputy Refuge Manager, Carolina Sandhills NWR, McBee, South Carolina

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- Stephen Earsom, Regional Ecologist, Raleigh Ecological Services Office, Raleigh, North Carolina
  - Greg Walmsley, Assistant Refuge Manager, Pee Dee NWR, Wadesboro, North Carolina

#### **North Carolina Wildlife Resources Commission**

- Joe Fuller, Migratory Bird Coordinator, NCWRC, Edenton, North Carolina
- Mark Johns, Wildlife Biologist/North Carolina Partners in Flight Coordinator, Cary, North Carolina
- Ken Knight, Supervising Wildlife Biologist, NCWRC, Albemarle, North Carolina
- Jeff Marcus, Piedmont Faunal Diversity Biologist, NCWRC, Aberdeen, North Carolina
- Terry Sharpe, Wildlife Biologist, NCWRC, Hoffman, North Carolina
- Jonathan Shaw, Wildlife Biologist, NCWRC, Albemarle, North Carolina

#### **North Carolina Forest Service**

- Carl Griffin, Regional Forester, NCFS, Wadesboro, North Carolina
- Tim Mc Fayden, Assistant Regional Forester, NCFS, Lilesville, North Carolina

#### **Other Invited Experts**

- Collin Smith, Regional Biologist, Ducks Unlimited, Greenville, North Carolina
- Buck Wheless, Manager, Gaddy's Goose Pond, Ansonville, North Carolina

#### **VISITOR SERVICES REVIEW TEAM**

The Visitor Services Review Team consisted of Service staff from Pee Dee NWR, the Southeast Regional Office, and other refuges. The review team met with the Refuge Manager, Jeffrey Bricken, and Assistant Refuge Manager, Greg Walmsley. The public use review for the refuge was conducted in August 2006.

- Garry Tucker, U.S. Fish and Wildlife Service, Division of Visitor Services and Outreach, Southeast Regional Office, Atlanta, Georgia
- Diane Barth, U.S. Fish and Wildlife Service, Southeast Louisiana Refuges Complex, Lacombe, Louisiana
- Ray Paterra, Cape Romain NWR

#### **WILDERNESS REVIEW TEAM**

The Wilderness Review Team consisted of staff from the Pee Dee NWR. The wilderness review was completed in June 2007.

- Jeffrey Bricken, Refuge Manager, Pee Dee NWR
- Greg Walmsley, Assistant Refuge Manager, Pee Dee NWR

#### **INTERGOVERNMENTAL COORDINATION PLANNING TEAM**

The participants of the Intergovernmental Coordination Planning Team included local, state, and federal governmental field staff representatives involved with the resources at the local and regional levels, including representatives from U.S. Fish and Wildlife Service. An intergovernmental scoping meeting was held in March 2006.

#### **U.S. Fish and Wildlife Service**

- Allyne Askins, Refuge Manager, Carolina Sandhills NWR, McBee, South Carolina
- Jeffrey Bricken, Refuge Manager, Pee Dee NWR, Wadesboro, North Carolina

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- Pete Campbell, Wildlife Biologist, Sandhills Ecological Services Sub-office, Southern Pines, North Carolina
  - John Stanton, Supervisory Wildlife Biologist, Columbia Migratory Bird Field Office, Columbia, North Carolina
  - Greg Walmsley, Assistant Refuge Manager, Pee Dee NWR, Wadesboro, North Carolina
  - Oliver van den Ende, Environmental Scientist, Dynamac Corporation (Service contractor), Cape Canaveral, Florida

**U.S. Department of Agriculture Natural Resources Conservation Service (mailed comments)**

- Stephanie Goglia, District Conservationist, Wadesboro, North Carolina

**Native American Tribes (mailed comments)**

- Dr. Wenonah Haire, Tribal Historic Preservation Officer, Catawba Indian Nation, Rock Hill, South Carolina

**North Carolina Wildlife Resources Commission**

- Ken Knight, Supervising Wildlife Biologist, NCWRC, Albemarle, North Carolina
- Jonathan Shaw, Wildlife Biologist, NCWRC, Albemarle, North Carolina

**North Carolina Department of Cultural Resources**

- John Mintz, Archaeologist, NCD.C.R, Raleigh, North Carolina

**North Carolina Natural Heritage Program**

- Michael Shafale, Community Ecologist, Raleigh, North Carolina

**Anson County**

- Andy Lucas, County Manager, Wadesboro, North Carolina

In addition, a variety of other governmental representatives were kept informed throughout the planning process, including the U.S. Department of Transportation's Eastern Federal Lands Highway Division; the Office of Conservation and Community Affairs, North Carolina Department of Environment and Natural Resources; U.S. Forest Service; U.S. Geological Survey; North Carolina Division of Forest Resources; Yadkin-Pee Dee River Basin Water Supply Planning; and the Anson County Agricultural Office.



## Appendix A. Glossary

- 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 a management plan. Analysis of results helps 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 (Service Manual 052 FW 1. 12B). The System's focus is on indigenous species, biotic communities, and ecological processes. Also referred to as biodiversity.
- 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:** 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).
- Concern:** See Issue
- Cover Type:** The present vegetation of an area.

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<b>Cultural Resource Inventory:</b>	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).
<b>Cultural Resource Overview:</b>	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 office's background or literature search described in Section VIII of the Cultural Resource Management Handbook (Service Manual 614 FW 1.7).
<b>Cultural Resources:</b>	The remains of sites, structures, or objects used by people in the past.
<b>Designated Wilderness Area:</b>	An area designated by the U.S. Congress to be managed as part of the National Wilderness Preservation System (Draft Service Manual 610 FW 1.5).
<b>Disturbance:</b>	Substantial alteration of habitat structure or composition. May be natural (e.g., fire) or human-caused events (e.g., aircraft overflight).
<b>Ecosystem:</b>	A dynamic and interrelating complex of plant and animal communities and their associated non-living environment.
<b>Ecosystem Management:</b>	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.
<b>Endangered Species (Federal):</b>	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.
<b>Endangered Species (State):</b>	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.

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<b>Environmental Assessment (EA):</b>	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).
<b>Environmental Impact Statement (EIS):</b>	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).
<b>Finding of No Significant Impact (FONSI):</b>	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).
<b>Goal:</b>	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).
<b>Habitat:</b>	Suite of existing environmental conditions required by an organism for survival and reproduction. The place where an organism typically lives.
<b>Habitat Restoration:</b>	Management emphasis designed to move ecosystems to desired conditions and processes, and/or to healthy ecosystems.
<b>Habitat Type:</b>	See Vegetation Type.
<b>Improvement Act:</b>	The National Wildlife Refuge System Improvement Act of 1997.
<b>Informed Consent:</b>	The grudging willingness of opponents to “go along” with a course of action that they actually oppose (Bleiker).
<b>Issue:</b>	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)].
<b>Management Alternative:</b>	See Alternative
<b>Management Concern:</b>	See Issue
<b>Management Opportunity:</b>	See Issue

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<b>Migration:</b>	The seasonal movement from one area to another and back.
<b>Mission Statement:</b>	Succinct statement of the unit's purpose and reason for being.
<b>Monitoring:</b>	The process of collecting information to track changes of selected parameters over time.
<b>National Environmental Policy Act of 1969 (NEPA):</b>	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).
<b>National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57):</b>	Under the Refuge Improvement Act, the 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 Refuge System (i.e., hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation).
<b>National Wildlife Refuge System Mission:</b>	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.
<b>National Wildlife Refuge System:</b>	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; game ranges; wildlife management areas; or waterfowl production areas.
<b>National Wildlife Refuge:</b>	A designated area of land, water, or an interest in land or water within the Refuge System.
<b>Native Species:</b>	Species that normally live and thrive in a particular ecosystem.
<b>Noxious Weed:</b>	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 (P.L. 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 United States and to the public health.

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<b>Objective:</b>	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).
<b>Plant Association:</b>	A classification of plant communities based on the similarity in dominants of all layers of vascular species in a climax community.
<b>Plant Community:</b>	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.
<b>Preferred Alternative:</b>	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.
<b>Prescribed Fire:</b>	The application of fire to wildland fuels to achieve identified land use objectives (Service Manual 621 FW 1.7). May occur from natural ignition or intentional ignition.
<b>Priority Species:</b>	Fish and wildlife species that 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.
<b>Public Involvement Plan:</b>	Broad long-term guidance for involving the public in the comprehensive conservation planning process.
<b>Public Involvement:</b>	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.
<b>Public:</b>	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.

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<b>Purposes of the Refuge:</b>	“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).
<b>Recommended Wilderness:</b>	Areas studied and found suitable for wilderness designation by both the Director of the Fish and Wildlife Service and the Secretary of the Department of the Interior, 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).
<b>Record of Decision (ROD):</b>	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).
<b>Refuge Goal:</b>	See Goal
<b>Refuge Purposes:</b>	See Purposes of the Refuge
<b>Residuum</b>	Residue, often used in reference to soil origins.
<b>Siltation</b>	The deposition or accumulation of silt.
<b>Songbirds:</b> (Also Passerines)	A category of birds that is medium to small, perching landbirds. Most are territorial singers and migratory.
<b>Step-down Management Plan:</b>	A plan that provides specific guidance on management subjects (e.g., habitat, public use, fire, and 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).
<b>Strategy:</b>	A specific action, tool, technique, or combination of actions, tools, and techniques used to meet unit objectives (Service Manual 602 FW 1.6 U).
<b>Study Area:</b>	The area reviewed in detail for wildlife, habitat, and public use potential. For purposes of this CCP, the study area includes the lands within the currently approved refuge boundary and potential refuge expansion areas.
<b>Threatened Species (Federal):</b>	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.

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<b>Threatened Species (State):</b>	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.
<b>Tiering:</b>	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).
<b>U.S. Fish and Wildlife Service Mission:</b>	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.
<b>Unit Objective:</b>	See Objective
<b>Vegetation Type, Habitat Type, Forest Cover Type:</b>	A land classification system based upon the concept of distinct plant associations.
<b>Vision Statement:</b>	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).
<b>Wilderness Study Areas:</b>	<p>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:</p> <ul style="list-style-type: none"> <li>▪ Generally appears to have been affected primarily by the forces of nature, with the imprint of man’s work substantially unnoticeable;</li> <li>▪ Has outstanding opportunities for solitude or a primitive and unconfined type of recreation; and</li> <li>▪ 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).</li> </ul>
<b>Wilderness:</b>	See Designated Wilderness
<b>Wildfire:</b>	A free-burning fire requiring a suppression response; all fire other than prescribed fire that occurs on wildlands (Service Manual 621 FW 1.7).
<b>Wildland Fire:</b>	Every wildland fire is either a wildfire or a prescribed fire (Service Manual 621 FW 1.3)

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## ACRONYMS AND ABBREVIATIONS

ac	acres
BCC	Birds of Conservation Concern
BMP	Best Management Practice
BRT	Biological Review Team
CCP	Comprehensive Conservation Plan
CFR	Code of Federal Regulations
cfs	cubic feet per second
DOI	Department of the Interior
DU	Ducks Unlimited
EA	Environmental Assessment
EE	environmental education
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FR	Federal Register
ft	feet
FTE	full-time equivalent
FWS	U.S. Fish and Wildlife Service (also: Service)
FY	Fiscal Year
GIS	Global Information System
ha	hectares
in	inches
m	meters
NCWAP	North Carolina's Wildlife Action Plan
NCWRC	North Carolina Wildlife Resources Commission
NEPA	National Environmental Policy Act
NRHP	National Register of Historic Places
NWR	National Wildlife Refuge
NWRS	National Wildlife Refuge System
PDNWR	Pee Dee National Wildlife Refuge
PFT	Permanent Full Time
PUNA	Public Use Natural Area
RM	Refuge Manual
RNA	Research Natural Area
ROD	Record of Decision
RONs	Refuge Operating Needs System
RRP	Refuge Roads Program
SCONC	State Climate Office of North Carolina
SSPDE	Savannah-Santee- Pee Dee Ecosystem
TFT	Temporary Full Time
USC	United States Code

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## Appendix C. 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 United 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.
Anadromous Fish Conservation Act of 1965, as amended	Authorizes the Secretaries of Interior and Commerce to enter into cooperative agreements with states and other non-federal interests for conservation, development, and enhancement of anadromous fish and contribute up to 50 percent as the federal share of the cost of carrying out such agreements. Reclamation construction programs for water resource projects needed solely for such fish are also authorized.
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.

STATUE	DESCRIPTION
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 “air quality and related values” of land under their control. These values include fish, wildlife, and their habitats.
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.
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 threatened and endangered 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 U.S. 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.

STATUE	DESCRIPTION
Food Security Act of 1985, as amended (Farm Bill)	The Act contains several provisions that contribute to wetland conservation. The Swampbuster provisions state that farmers who convert wetlands for the purpose of planting after enactment of the law are ineligible for most farmer program subsidies. It also established the Wetland Reserve Program to restore and protect wetlands through easements and restoration of the functions and values of wetlands on such easement areas.
Farmland Protection Policy Act of 1981, as amended	The purpose of this law is to minimize the extent to which federal programs contribute to the unnecessary conversion of farmland to nonagricultural uses. Federal programs include construction projects and the management of federal lands.
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.
Federal-Aid Highways Act of 1968	Established requirements for approval of federal highways through national 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.

STATUE	DESCRIPTION
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.
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 System 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.
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.

STATUE	DESCRIPTION
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 plants taken in violation of domestic or foreign laws. It regulates the introduction to America of foreign species.
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.
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 United States 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.

STATUE	DESCRIPTION
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.
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 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 national 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 a refuge provided such use is compatible with the major purposes(s) for which the refuge was established.

STATUE	DESCRIPTION
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 Refuge System lands, identifies the Secretary of the Interior as responsible for managing and protecting the Refuge 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 grant 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, the United States, and Mexico. The North American Wetlands Conservation Council was 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).
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 of fees for public uses.

STATUE	DESCRIPTION
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 non-game species. The funding formula is no more than 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 Departments of 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 United States. It requires the Secretary of each military department to use trained professionals to manage the wildlife and fishery resource under his jurisdiction, and requires that federal and state fish and wildlife agencies be given priority in management of fish and wildlife activities on military reservations.
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.

STATUE	DESCRIPTION
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.
Wild and Scenic Rivers Act of 1968, as amended	This Act selects certain rivers of the nation possessing remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values; preserves them in a free-flowing condition; and protects their local environments.
Wilderness Act of 1964, as amended	This Act directs the Secretary of the Interior to review every roadless area of 5,000 acres 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) program within the Departments 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 EOs and other actions in connection with 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 comprehensive conservation planning is the National Vegetation Classification System (NVCS), which is the adopted standard for vegetation mapping. Using NVCS 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.

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# *Appendix D. Public Involvement*

## **SUMMARY OF PUBLIC SCOPING COMMENTS**

A public scoping meeting was held on January 25, 2007, to solicit comments from the public regarding the development of comprehensive conservation plan (CCP) for Pee Dee National Wildlife Refuge. The meeting provided information about the refuge's current management and the comprehensive conservation planning process. The meeting was well attended.

Comment forms were made available at the scoping meeting and at the refuge headquarters. In addition, periodic refuge planning updates were posted on the Pee Dee NWR website to provide the public with the progress of the plan and upcoming milestones. Individuals could also sign to be on a mailing list and obtain information via regular mail.

The public comments received are summarized below. Most comments were supportive of the refuge and its management actions. These comments were used by the planning team to help guide development of the goals, objectives, and strategies found in the comprehensive conservation plan.

- Wildlife and Habitat Management (including the need for pine stand thinning; continue quail management; need for feral hog and coyote control; continue cooperative farming; prohibiting the use of moist soil management and water manipulation practices; implementing a biological assessment and inventory all flora and fauna; and assess nonlethal wildlife management techniques).
- Resource Protection (including acquiring additional lands for the refuge).
- Visitor Services (including need to continue current hunting programs; banning all hunting from the refuge; and evaluate all public use activities and regulate as necessary).
- Refuge Administration (including increasing the refuge staff).



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# Appendix E. Appropriate Use Determinations

## PEE DEE 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.

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**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. Further, 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.

## FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name:     Pee Dee National Wildlife Refuge    

Use:     Boating    

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** \_\_\_ **No** **X**

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: \_\_\_\_\_ Date: \_\_\_\_\_

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: \_\_\_\_\_ Date: \_\_\_\_\_

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

## FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name:     Pee Dee National Wildlife Refuge    

Use:     Camping and Picnicking    

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 \_\_\_ No X**

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: \_\_\_\_\_ Date: \_\_\_\_\_

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: \_\_\_\_\_ Date: \_\_\_\_\_

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

## FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name:     Pee Dee National Wildlife Refuge    

Use:     Rock, Fossil and Artifact Collecting and Metal Detector 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: \_\_\_\_\_ Date: \_\_\_\_\_

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: \_\_\_\_\_ Date: \_\_\_\_\_

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

## FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name:     Pee Dee National Wildlife Refuge    

Use:     Horseback Riding, 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: \_\_\_\_\_ Date: \_\_\_\_\_

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: \_\_\_\_\_ Date: \_\_\_\_\_

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

## FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name:     Pee Dee National Wildlife Refuge    

Use:     Off-road Vehicles    

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** \_\_\_ **No** **X**

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: \_\_\_\_\_ Date: \_\_\_\_\_

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: \_\_\_\_\_ Date: \_\_\_\_\_

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

## FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name:     Pee Dee National Wildlife Refuge    

Use:     Sunbathing, Swimming and Waterskiing    

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 \_\_\_ No X**

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: \_\_\_\_\_ Date: \_\_\_\_\_

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: \_\_\_\_\_ Date: \_\_\_\_\_

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

## FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name:     Pee Dee National Wildlife Refuge    

Use:     Timber Harvest    

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: \_\_\_\_\_ Date: \_\_\_\_\_

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: \_\_\_\_\_ Date: \_\_\_\_\_

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

## FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name:     Pee Dee National Wildlife Refuge    

Use:     Cooperative Farming    

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: \_\_\_\_\_ Date: \_\_\_\_\_

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: \_\_\_\_\_ Date: \_\_\_\_\_

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

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# Appendix F. Compatibility Determinations

## PEE DEE NATIONAL WILDLIFE REFUGE COMPATIBILITY DETERMINATIONS

**Introduction:** The Fish and Wildlife Service reviewed several uses for compatibility during the comprehensive conservation planning process for Pee Dee National Wildlife Refuge. The descriptions and anticipated impacts of each of these uses are addressed separately. However, the Uses through Public Review and Comment sections and the Approval of Compatibility Determinations section apply to each use. If one of these uses is considered outside of the Comprehensive Conservation Plan for Pee Dee National Wildlife Refuge, then those sections become part of that compatibility determination.

**Uses:** The following uses were evaluated and found to be compatible with the mission of the National Wildlife Refuge System and the purposes of the refuge: (1) boating; (2) deer and feral hog hunting; (3) turkey hunting; (4) small game hunting; (5) fishing; (6) wildlife observation and photography; (7) environmental education and interpretation; (8) bicycling and jogging; (9) horseback riding; (10) timber harvest; and (11) cooperative farming.

**Refuge Name:** Pee Dee National Wildlife Refuge

**Date Established:** 1963

**Establishing and Acquisition Authority:** Migratory Bird Conservation Act

**Refuge Purpose:** "...for use as an inviolate sanctuary, or for any other management purposes, for migratory birds." 16 USC §715d (Migratory Bird Conservation Act)

### **National Wildlife Refuge System Mission:**

The mission of the National Wildlife 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.*

### **Public Review and Comment:**

Pee Dee National Wildlife Refuge's compatibility determinations are being made available for public review and comment in conjunction with the public comment period for the refuge's Draft Comprehensive Conservation Plan and Environmental Assessment (Draft CCP/EA). Public comments on these compatibility determinations are invited and are due by the deadline stated on the cover of the Draft CCP/EA.

The methods being used to solicit public review and comment include a Notice of Availability for public review of the Draft CCP/EA published in the *Federal Register*; notices posted at the refuge headquarters; news releases sent to area newspapers; public service announcements sent to local radio stations; and copies of the Draft CCP/EA distributed to adjacent landowners, the general public, and local, state, and federal agencies. In addition, the Friends of the Pee Dee National Wildlife Refuge is assisting in the outreach effort.

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**Description of Use:** *Boating*

Boating is not one of the Refuge System's six priority public uses, but the Code of Federal Regulations (CFR) allows refuge managers to authorize the use of boats in national wildlife refuges. A portion of Pee Dee NWR can only be accessed or viewed via the navigable waters of the Pee Dee River. Therefore, boating is an important facilitator of several priority public uses on the refuge. There is no public boat landing on the refuge. Motorized and nonmotorized boating are analyzed in this compatibility determination.

**Availability of Resources:** Operation and maintenance funds to support boating would be taken from the refuge's annual budget, which would need to be increased to sustain the program. Additional funds of approximately \$5000 would primarily be needed for current law enforcement officers to ensure that the boating public adheres to refuge rules and regulations.

**Anticipated Impacts of the Use:** Boating has been shown to alter distribution, reduce use of particular habitats by birds, alter feeding behavior, and cause premature departure from areas. Impacts of boating can occur even at low densities, given the ability of powerboats to cover extensive areas in a short amount of time, the noise they produce, and their speed (Sterling and Dzubin 1967; Bergman 1973; Speight 1973; Skagen 1980; Korschgen et al. 1985; Kahl 1991; Bauer et al. 1992; Dahlgren and Korschgen 1992). Wildlife responds differently to boats based on their size, speed, the amount of noise they make, and how close the crafts get to wildlife. Boats increase the access of visitors to areas not open to most other visitors, thus having a greater potential to cause wildlife disturbance if not managed properly. The speed and manner in which a boat approaches wildlife can influence wildlife responses. Rapid movement directly toward wildlife frightens them, while movement away from or at an oblique angle to the animal is less disturbing (Knight and Cole 1995). Dahlgren and Korschgen (1992) categorized the following human activities in order of decreasing disturbance to waterfowl:

1. Rapid over-water movement and loud noise (e.g., power-boating, water skiing, and aircraft);
2. Over-water movement with little noise (e.g., sailing, wind surfing, rowing, and canoeing);
3. Little over-water movement or noise (e.g., wading and swimming); and
4. Activities along shorelines (e.g., fishing, birdwatching, hiking, and traffic).

Hume (1976, as cited by Dahlgren and Korschgen 1992) observed a similar differential response of waterfowl to human activities. Common goldeneyes often flew when people on the shore approached within 100 or 200 meters, but settled elsewhere on the water. A single sailing dingy was sufficient to cause more than 60 common goldeneyes to take flight and for most to leave the vicinity within a few minutes. Remaining birds then flew up each time the boat approached to within 300 to 400 meters and generally left the area within an hour. The appearance of a powerboat caused instantaneous flight by most birds. If the boat traversed the length of the reservoir, all remaining birds left within minutes. Hume reported that waterfowl abundance decreased over time as a result of the increased frequency of boating. In Germany, Bauer et al. (1992) concluded that boating pressure on wintering waterfowl had reached such a high level that it was necessary to establish larger sanctuaries and stop water sports and angling from October to March. Likewise, on numerous occasions, Thornburg (1973) observed boaters causing mass flights of diving ducks on the Mississippi River. He believed that increased boating could pose a serious threat to the continued use of the area by great numbers of migratory waterfowl. Thornburg (1973) concluded that eventually restrictions on boating activity may be necessary and that establishing a sanctuary should be considered. Rodgers and Schwikert (2002) compared flushing distance of three species of birds in response to a slow versus fast approach using the same outboard-powered boat. A fast approach resulted in significantly larger flush distances for brown pelicans, anhingas, and great egrets. They concluded that water bird staging areas along migratory corridors and frequently used foraging sites of resident birds merit protection from human activity. In another study, Rodgers and Smith (1997)

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recommended that the establishment of 150-meter buffer zones around colonial bird rookeries would help minimize disturbance. Increasing the predictability of boating patterns to help wildlife habituate to non-threatening human disturbance can also be accomplished by establishing well marked routes of travel. Boating impacts on wildlife can be classified based on the form of boating activity (Korschgen and Dahlgren 1992; Knight and Cole 1995), the season of use (Burger 1995), and species tolerance to the activity (Jahn and Hunt 1964). For example, motorboat activity likely has more disturbances on wildlife than nonmotorized boat travel because motorboats produce a combination of movement and noise (Knight and Cole 1995). Even canoes can cause disturbance based on the ability to access shallower areas of the marsh (Speight 1973). However, compared to motorboats and airboats, canoe travel appears to have the least disturbance (Jahn and Hunt 1964).

If waterfowl populations begin declining or other wildlife impacts occur, additional actions could be taken, such as implementing additional closed areas or adding other boat restrictions.

**Determination:**

- Use is Not Compatible
- Use is Compatible, with the Listed Stipulations

**Stipulations Necessary to Ensure Compatibility:** To ensure compatibility of boating activities on the refuge, several stipulations are necessary since boating could adversely impact waterfowl and resident wildlife if guidelines are not in place to ensure operation to minimize such impacts. All of the provisions of 50 CFR §27.31 and 27.32 will be imposed as well. Included in this section is the requirement that “No operator or person in charge of any boat shall operate or knowingly permit any other person to operate a boat in a reckless manner, or in a manner so as to endanger or be likely to endanger any person, property or wildlife.” Boaters will utilize only areas open to the public and not venture into closed areas. We do not provide areas for boat landing and access to the refuge lands from the river. Boaters are not allowed to tie off to shoreline vegetation or pull onto refuge lands to access trails. Gas-powered motors are prohibited, and boaters must comply with all applicable state boating laws.

**Justification:** The National Wildlife Refuge System Improvement Act of 1997 (P.L. 105-57) identifies six legitimate and appropriate uses of wildlife refuges; environmental education, interpretation, hunting, fishing, wildlife observation and wildlife photography. These priority public uses are dependent upon healthy wildlife populations. Where these uses are determined to be compatible, they are to receive enhanced consideration over other uses in planning and management. Use of motorized boats is to be used as a means to facilitate the priority public uses identified above. These activities will not materially interfere with or detract from the mission of the National Wildlife Refuge System or the purposes for which the refuge was established.

**NEPA Compliance for Refuge Use Description:**

- Categorical Exclusion without Environmental Action Statement
- Categorical Exclusion and Environmental Action Statement
- Environmental Assessment and Finding of No Significant Impact
- Environmental Impact Statement and Record of Decision

**Mandatory 10-Year Re-evaluation Date:**

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**Description of Use:** *Deer and Feral Hog Hunting*

Hunting has been identified as a priority wildlife-dependent activity under the National Wildlife Refuge System Improvement Act. With the implementation of the CCP, the Service will take the steps necessary (e.g., develop needed regulations and publish the appropriate Federal Register notice) to open the refuge to upland hunting for deer and feral hogs in a portion of the refuge's upland habitat in cooperation with the state. This will provide additional opportunities for a priority recreational activity and help to reduce the feral hog population on the refuge. Implementing the upland hunt will first require preparing a hunt plan; posting an appropriate notice in the *Federal Register*; and establishing regulations in Title 50, Code of Federal Regulations. Upland hunting for white-tailed deer and feral hogs will be limited to approximately 7,000 acres of the refuge's over 8,443 acres. A quota will be established for the number of hunters. The remainder of the refuge will remain closed to upland hunting to minimize conflicts with other priority uses. The deer and feral hog hunt will be conducted in cooperation with the North Carolina Wildlife Resources Commission (NCWRC).

**Availability of Resources:** The details for administering the program have not been determined. It is assumed that a quota permit will be charged for the hunting opportunity to cover the costs of managing the program. Funds would be needed annually to mow, grade, and fix roads and parking areas open to hunter access; maintain signs; and print leaflets. The selection process for permits will likely be processed through the existing state system. Management of the program has a biological, administrative, maintenance, and law enforcement component. Partnering with the state will help provide the needed components.

**Anticipated Impacts of the Use:** Anticipated impacts were identified and evaluated based on best professional judgment and published scientific papers. Many of the impacts associated with upland hunting are similar to those considered for other public use activities, such as waterfowl hunting and wildlife viewing and photography, with the exception of direct mortality to game species, short-term changes in the distribution and abundance of game species, and unrestricted travel through the hunt area. Direct mortality can impact isolated, resident game species populations by reducing breeding populations to a point where the isolated population can no longer be sustained. This can result in localized extirpation of isolated populations. The hunt would be conducted in upland habitats; therefore, minimal disturbance to migratory birds is anticipated. Use of lead shot could be allowed for deer and feral hogs, but considering the separation between the upland hunt and wetland habitat, the ingestion of lead shot by migratory birds should be minimal. The walk-in hunters would use existing fire breaks and roads for access. No soil compaction or vegetation disturbance is expected. Parking would occur in sites already designated as such. Hunting would not occur within 1,500 feet of any active eagle nest, if these were to become established on the refuge.

Cumulative effects of deer hunting are expected to be minimal. Almost all of the deer harvested would be from the Pee Dee NWR population. The hunt will be managed to ensure that the long-term size of the herd remains stable.

The refuge does not have an active hog removal program. Although feral hogs are not known to be on the refuge, they occur on neighboring lands and it is reasonable to assume that they will begin invading the refuge within the near future. The primary intentions of feral hog hunts would be to increase pressure on any new population and assist in the population control of this unwanted species. Feral hogs are exotic species which are documented to have serious negative effects on native wildlife and habitats. The cumulative effects of a feral hog hunt would be positive with long term benefits to native plants and animals of the refuge.

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**Determination:**

- Use is Not Compatible  
 Use is Compatible, with the Listed Stipulations

**Stipulations Necessary to Ensure Compatibility:** Several stipulations will be necessary to ensure compatibility of this use. Additional stipulations may be added, as the program is developed with the state. Known stipulations are listed. The hunt will be conducted in accordance with state regulations and seasons.

- The methods of hunting to be considered include archery, muzzleloaders, and modern firearms as prescribed by the North Carolina Wildlife Resources Commission.
- Other than white-tailed deer and feral hogs, only turkey and small game (see Turkey and Small Game Hunting compatibility determinations) will be hunted in the designated areas.
- Quota hunt permits will be issued.
- Hunting densities no greater than one quota hunter per 28 acres will be allowed.
- The number of deer permitted to be taken will be based on annual population estimates.
- Check stations will be used to collect hunt data and to monitor the quality of the hunt.
- Vehicle access will be limited to open roadways.
- Climbing spikes and permanent stands will not be permitted.
- Off-road vehicles or ATVs will not be permitted, except by special use permit for hunters with disabilities.
- If required, liberal bag limits or extended seasons may be established for feral hogs as part of a wider effort to eliminate this nonnative species.
- No flagging or trail marking will be permitted.
- Waterfowl sanctuaries will be closed to all deer or feral hog hunting from November 25 through March 15.

Upland hunting would have little impact on other visitor activities. A closed area for hunters will be established to provide at a safe buffer distance around designated public use facilities.

**Justification:** Hunting is a priority wildlife-dependent use under the National Wildlife Refuge System Improvement Act. Upland hunting, as described, was determined to be compatible, in view of the potential impacts that hunting can have on the Service's ability to achieve purposes and goals of the refuge, because (1) hunter densities and use levels will be relatively low during days the refuge is open to hunting; (2) sufficient restrictions have been established to ensure that an adequate amount of high-quality habitat would be available to accommodate the needs of deer and other wildlife using the refuge; (3) sufficient opportunities are available for other priority wildlife-dependent recreation during the upland hunt season; (4) deer hunting would maintain deer levels at optimal levels; and (5) removal of feral hogs would benefit the refuge as they are a destructive, exotic species.

**NEPA Compliance for Refuge Use Description:**

- Categorical Exclusion without Environmental Action Statement  
 Categorical Exclusion and Environmental Action Statement  
 Environmental Assessment and Finding of No Significant Impact  
 Environmental Impact Statement and Record of Decision

**Mandatory 10-Year Re-evaluation Date:**

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**Description of Use:** *Turkey Hunting*

Hunting has been identified as a priority wildlife-dependent activity under the National Wildlife Refuge System Improvement Act. With the implementation of the CCP, the Service would take the steps necessary to open additional areas of the refuge to upland hunting for turkey. Turkey hunting would be expanded to include the portion of the refuge's upland habitat located in Richmond County. Implementing the turkey, quail, and dove hunts will first require updating the hunt plan; posting an appropriate notice in the *Federal Register*; and establishing regulations in Title 50, Code of Federal Regulations. Upland hunting areas for turkey will be defined in a hunting step-down plan. A quota will be established for the number of hunters. The remainder of the refuge will remain closed to upland hunting to minimize conflicts with other priority uses. Turkey hunts will continue to be conducted in cooperation with the NCWRC.

**Availability of Resources:** The details for administering the program have not been determined. It is assumed that a quota permit will be charged for the hunting opportunity to cover the costs of managing the program. Funds would be needed annually to mow, grade, and fix roads and parking areas open to hunter access; maintain signs; and print leaflets. The selection process for permits will likely be processed through the existing state system. Management of the program has a biological, administrative, maintenance, and law enforcement component. Partnering with the state will help provide the needed components.

**Anticipated Impacts of the Use:** Anticipated impacts were identified and evaluated based on best professional judgment and published scientific papers. Many of the impacts associated with upland hunting are similar to those considered for other public use activities, such as waterfowl hunting and wildlife viewing and photography, with the exception of direct mortality to turkey, short-term changes in the distribution and abundance of turkeys, and unrestricted travel through the hunt area. Direct mortality can impact isolated, resident game species populations by reducing breeding populations to a point where the isolated population can no longer be sustained. This can result in localized extirpation of isolated populations. The hunt would be conducted in upland habitats; therefore, minimal disturbance to migratory birds is anticipated. Use of lead shot could be allowed for turkey, but considering the separation between the upland hunt and wetland habitat, the ingestion of lead shot by migratory birds should be minimal. The walk-in hunters would use existing fire breaks and roads for access. No soil compaction or vegetation disturbance is expected. Parking would occur in sites already designated as such. Hunting would not occur within 1,500 feet of any active eagle nest (if these were to become established on the refuge).

The cumulative effects of turkey hunting are expected to be minimal. Almost all of the game harvested would be from the Pee Dee NWR population. The hunt will be managed to ensure that the long-term size of these game birds remains stable.

**Determination:**

Use is Not Compatible  
 Use is Compatible, with the Listed Stipulations

**Stipulations Necessary to Ensure Compatibility:** Several stipulations will be necessary to ensure compatibility of this use. Additional stipulations may be added, as the program is developed with the state. Known stipulations are listed. The hunt will be conducted in accordance with state regulations and seasons.

- The methods of hunting to be considered include archery, muzzle-loading shotguns and modern shotguns, as prescribed by the NC Wildlife Resources Commission.

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- Other than turkey, white-tailed deer, feral hogs, and small game will be hunted in the designated areas.
  - Quota hunt permits will be issued.
  - Hunting densities no greater than one quota hunter per 100 acres will be allowed.
  - The number of turkey permitted to be taken will be based on annual population estimates.
  - Check stations will be used to collect hunt data and to monitor the quality of the hunt.
  - Vehicle access will be limited to open roadways.
  - Climbing spikes and permanent stands will not be permitted.
  - Off-road vehicles or ATVs will not be permitted, except by special use permit for hunters with disabilities.
  - No flagging or trail marking will be permitted.

Upland hunting would have little impact on other visitor activities. A closed area for hunters will be established to provide at a safe buffer distance around designated public use facilities.

**Justification:** Hunting is a priority wildlife-dependent use under the National Wildlife Refuge System Improvement Act. Upland turkey hunting, as described, was determined to be compatible, in view of the potential impacts that hunting can have on the Service’s ability to achieve purposes and goals of the refuge, because: (1) hunter densities and use levels will be relatively low during days the refuge is open to hunting, (2) sufficient restrictions have been established to ensure that an adequate amount of high-quality habitat would be available to accommodate the needs of game birds and other wildlife using the refuge, and (3) sufficient opportunities are available for other priority wildlife-dependent recreation during the upland hunt season.

**NEPA Compliance for Refuge Use Description:**

- Categorical Exclusion without Environmental Action Statement
- Categorical Exclusion and Environmental Action Statement
- Environmental Assessment and Finding of No Significant Impact
- Environmental Impact Statement and Record of Decision

**Mandatory 10-Year Re-evaluation Date:**

**Description of Use:** *Small Game Hunting*

Hunting has been identified as a priority wildlife-dependent activity under the National Wildlife Refuge System Improvement Act. With the implementation of the CCP, the Service would continue small game hunting to include mourning dove, raccoon/ opossum, gray squirrel (no fox squirrels), quail, and rabbit. Small game hunting will be designated in the specific areas of the refuge’s over 8,443 acres. The remainder of the refuge will remain closed to upland hunting to minimize conflicts with other priority uses. Small game hunts will continue to be conducted in cooperation with the NCWRC.

**Availability of Resources:** The details for administering the program have not been determined. It is assumed that a quota permit will be charged for the hunting opportunity to cover the costs of managing the program. Funds would be needed annually to mow, grade, and fix roads and parking areas open to hunter access; maintain signs; and print leaflets. The selection process for permits will likely be processed through the existing state system. Management of the program has a biological, administrative, maintenance, and law enforcement component. Partnering with the state will help provide the needed components.

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**Anticipated Impacts of the Use:** Anticipated impacts were identified and evaluated based on best professional judgment and published scientific papers. Many of the impacts associated with upland hunting are similar to those considered for other public use activities, such as waterfowl hunting and wildlife viewing and photography, with the exception of direct mortality to small game species, short-term changes in the distribution and abundance of these species, and unrestricted travel through the hunt area. Direct mortality can impact isolated, resident game species populations by reducing breeding populations to a point where the isolated population can no longer be sustained. This can result in localized extirpation of isolated populations. The hunt would be conducted in upland habitats; therefore, minimal disturbance to migratory birds is anticipated. Use of lead shot could be allowed for small game, but considering the separation between the upland hunt and wetland habitat, the ingestion of lead shot by migratory birds should be minimal. The walk-in hunters would use existing fire breaks and roads for access. No soil compaction or vegetation disturbance is expected. Parking would occur in sites already designated as such. Hunting would not occur within 1,500 feet of any active eagle nest (if these were to become established on the refuge).

The cumulative effects of small game hunting are expected to be minimal. Almost all of the game harvested would be from the Pee Dee NWR population. The hunt will be managed to ensure that the long-term size of these game species remains stable.

**Determination:**

Use is Not Compatible  
 Use is Compatible, with the Listed Stipulations

**Stipulations Necessary to Ensure Compatibility:** Several stipulations will be necessary to ensure compatibility of this use. Additional stipulations may be added, as the program is developed with the state. Known stipulations are listed. The hunt will be conducted in accordance with state regulations and seasons.

- The methods of hunting to be considered include primitive weapons, archery, and shotguns in accordance with state law.
- Other than small game, turkey, white-tailed deer and feral hogs will be hunted in the designated areas.
- Quota hunt permits would be issued as needed.
- Hunting densities no greater than one hunting party per 100 acres will be allowed.
- The number of game permitted to be taken will be based on annual population estimates.
- Check stations will be used to collect hunt data and to monitor the quality of the hunt.
- Vehicle access and parking will be limited and confined to existing fire lanes and unimproved roads.
- Climbing spikes and permanent stands will not be permitted.
- Off-road vehicles or ATVs will not be permitted.
- No flagging or trail marking will be permitted.

Upland hunting would have little impact on other visitor activities. A closed area for hunters will be established to provide at a safe buffer distance around all public use facilities.

**Justification:** Hunting is a priority wildlife-dependent use under the National Wildlife Refuge System Improvement Act. Upland small game hunting, as described, was determined to be compatible, in view of the potential impacts that hunting can have on the Service's ability to achieve purposes and goals of the refuge, because (1) hunter densities and use levels will be relatively low during days the refuge is open to hunting; (2) sufficient restrictions have been established to ensure that an adequate amount of high-quality habitat would be available to accommodate the needs of game birds and other

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wildlife using the refuge; and (3) sufficient opportunities are available for other priority wildlife-dependent recreation during the upland hunt season.

**NEPA Compliance for Refuge Use Description:**

- Categorical Exclusion without Environmental Action Statement
- Categorical Exclusion and Environmental Action Statement
- Environmental Assessment and Finding of No Significant Impact
- Environmental Impact Statement and Record of Decision

**Mandatory 10-Year Re-evaluation Date:**

**Description of Use:** *Fishing*

Fishing has been identified as a priority wildlife-dependent activity under the National Wildlife Refuge System Improvement Act and is a traditional use at the refuge. While most anglers fish from the bank on Pee Dee NWR, a substantial number use boats for fishing access. Therefore, future fishing activities would be supported by boating; and boating impacts are also considered in this review. Fishing is permitted on approximately 300 acres of the refuge's 8,443 acres. Fishing areas include Andrews Pond, Ross Pond, Sullivan Pond, Arrowhead Lake, Brown Creek, and the Pee Dee River. Fishing is allowed in accordance with state regulations. Additionally, the refuge has implemented refuge specific fishing regulations which can be update annually in Title 50 Code of Federal Regulations. The listed items are a summary of refuge-specific fishing regulations.

- Fishing is allowed seven days a week from one-hour before sunrise until one-hour after sunset.
- All public use on the refuge is prohibited during refuge firearms deer hunts. See Public Use Brochure or inquire at refuge headquarters for hunt dates.
- Boats ramps are provided at Andrews Pond, Beaver Ponds, and Arrowhead Lake. All other lakes are open to boats, but boats must be hand loaded and unloaded.
- Gasoline-powered boat motors may not be used. Boats are subject to all federal and state laws governing their use.
- Possession or use of trotlines, set hooks, gigs, jug lines, limblines, snagging devices, nets, seines, fish traps or other special devices is prohibited.
- No littering, fishing areas will be closed if litter is not picked up.
- Taking or attempting to take frogs and turtles is prohibited.
- Swimming is prohibited.
- All other sport fishing regulations will be in accordance with North Carolina State law.

**Availability of Resources:** Operation and maintenance funds to support fishing are taken from the refuge's annual budget, which is adequate to sustain the program at the current level. Funds are needed annually to mow, grade, and fix roads, parking lots, paint, repair, and replace signs; and develop and print brochures. Staff would be needed to spend up to two months a year managing the fishing program. Funding for the improvements (i.e. boat ramp) outlined in the CCP is not currently available but some of those costs could be off-sets by grants from cooperating 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 ecological extinction of certain fish species and precedes all other human disturbance (Jackson et al. 2001). In recent history, overfishing in North Carolina has led to the decline of certain

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species. But, today the state monitors fish populations and has sets seasons, slot and size limits, and total bag limits for most sports fish, making the likelihood of overfishing depleting fish stocks minimal. The closed areas of the refuge also serve to recharge local waters. Collectively, the state fishing regulations should minimize the likelihood of fish stocks declining on the refuge. Since fishing is facilitated by boating on much of the refuge, boat impacts are an important component of this use (see the compatibility determination on Boating for details on impacts).

Under Service policy, fishing tournaments cannot originate within the refuge, but, because the quality of fishing is better within the refuge, tournament fishermen originating from a tournament outside the refuge travel into refuge waters. Tournaments have become big businesses and can substantially increase the level of fishing activity in the refuge. This can have negative impacts on other sport fishermen, wildlife, and habitat.

**Determination:**

- Use is Not Compatible  
 Use is Compatible, with the Listed Stipulations

**Stipulations Necessary to Ensure Compatibility:** Fishing is allowed on the refuge in accordance with state regulations. In addition the refuge has the listed sports fishing regulations, which are paraphrased.

- Fishing is allowed only during daylight hours.
- Gas-powered boat motors may not be used on refuge waters.
- Airboats, personal watercraft, or hovercraft are not allowed.
- Special off-limit areas may seasonally be designated to limit disturbance to migratory birds.

Boating impacts to wildlife include noise and speed, as well as from increased access to more parts of the refuge (i.e., boats can disturb more birds than bank fishing). Certain areas of the Pee Dee River will likely be closed seasonally to reduce disturbance to migratory birds. Monitoring will help the Service to determine the effectiveness of refuge management actions in maintaining migratory birds, endangered species, and other wildlife populations on the refuge. It is anticipated that refuge sanctuary areas and seasonally closed areas of the navigable waters will be adequate to sustain migratory bird and endangered species populations and adequate stocks of fish, and provide for a high quality fishing experience which has little impact on other visitors. If wildlife populations suffer as a result of fishing activities, the quality of fishing declines, or other wildlife impacts occur, additional motor boat restrictions may be implemented. The refuge will modify or eliminate any use with unacceptable impacts.

**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 and supporting activities (e.g., boating) can have on the Service's ability to achieve purposes and goals of the refuge, because: (1) fishing densities and use levels are relatively low during most days; (2) an adequate amount of high-quality feeding and resting habitat would be available to accommodate the needs of waterfowl, migratory birds and other resident birds using the refuge; and (3) sufficient opportunities are available for other priority wildlife-dependent recreation.

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**NEPA Compliance for Refuge Use Description:**

- Categorical Exclusion without Environmental Action Statement  
 Categorical Exclusion and Environmental Action Statement  
 Environmental Assessment and Finding of No Significant Impact  
 Environmental Impact Statement and Record of Decision

**Mandatory 15-Year Re-evaluation Date:****Description of Use:** *Wildlife Observation and Photography*

Wildlife observation and photography are considered simultaneously in this compatibility determination. Wildlife observation and photography have been identified in the National Wildlife Refuge System Improvement Act of 1997 as priority wildlife-dependent recreational uses provided they are compatible with the purposes of the refuge. This compatibility determination applies only to personal photography. Commercial photography or videography, if allowed, would be covered under the Commercial Services compatibility determination and would require a special use permit by the refuge with specific restrictions. Wildlife observation and photography may occur during daylight hours throughout all open areas of the refuge. Wildlife viewing and photography improvements have been made along hiking trails and at other locations to provide exposure to different refuge habitat types and diverse flora and fauna. In addition, numerous refuge dikes and trails are open year-round or seasonally to provide different wetland or upland habitats for wildlife viewing. Approved forms of access for wildlife viewing and photography include driving licensed vehicles, hiking, and motorized and nonmotorized boats.

**Availability of Resources:** Operation and maintenance funds to support wildlife viewing and photography are taken from the refuge's annual budget, which is adequate to sustain the program at the current level. Funds are needed annually to mow, grade, and repair roads open to the public; fix, repair, and replace trails; paint, repair, and replace signs; and develop and print brochures. Funding is not currently available to fully support all the planned wildlife observation and photography improvements (i.e., additional trails) identified in the CCP. Funds for part or all of the proposed projects could come from cooperating partners.

**Anticipated Impacts of the Use:** This section critically and objectively evaluates 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 levels of use.

*Short-term Impacts:* Wildlife observation trails have a greater potential for disturbing wildlife species. Among wetland habitats, approaches can reduce time spent foraging and can cause water birds 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 a 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-powered lenses to get much closer to their subject than other

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activities would require (Morton 1995). Some visitors may use boats to facilitate this activity, and boating impacts are listed in the Boating compatibility determination.

*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 and monitored. For example, during the fall migration and over-wintering seasons, wildlife observation, photography, environmental education, interpretation, and waterfowl hunting 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 public use may not be at a level to cause this shift, but anticipated increases relative to the expansion of the population and growth of visitor opportunities could result in seasonal shifts in migratory bird use of the refuge's wetland habitats.

**Determination:**

- Use is Not Compatible  
 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. However, as use increases, wildlife impacts are more likely to occur. Evaluation of the sites and programs will be conducted annually to assess if objectives are being met, if habitat impacts are minimized, and if wildlife populations are not being adversely affected. If evidence of unacceptable impacts begins to appear, it will be necessary to change the activity or the program, move the activity or program, or eliminate the program. Stipulations that may be employed include those listed as follows:

- Establish buffer zones that minimize disturbance around sensitive areas and establishing additional no-entry zones.
- Manage to provide vegetation which effectively conceals visitors and provides cover for birds, to help minimize impacts of people in busy areas such as pond dikes.
- Reduce impacts from wildlife viewing and photography by providing observation blinds.
- Re-route, modify, or eliminate activities which demonstrate direct wildlife impacts.
- Educate visitors that their actions can have negative impacts on wildlife.
- Maintain well-marked trails where predictable human use lessens wildlife impacts.

**Justification:** Wildlife observation and photography are priority public uses of the National Wildlife Refuge System. Providing high 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 level 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  
 Environmental Assessment and Finding of No Significant Impact  
 Environmental Impact Statement and Record of Decision

**Mandatory 15-Year Re-evaluation Date:**

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**Description of Use:** *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 or teacher-led environmental education programs; offsite 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 have been 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. The CCP identifies the construction of a 10,000-square foot (929 m<sup>2</sup>) education building and nearby trails that feature wetlands such as the bottomland hardwoods and moist soil units. This facility would serve as the centerpiece of the refuge's environmental education and interpretation program. These programs will explore various habitats of the refuge (i.e., wetlands, scrub, and pine flatwoods), leading to a better understanding of the value of these habitats to fish and wildlife resources, the human influence on the ecosystem, and the importance of these resources to society. In addition to the new proposed environmental education center, the CCP calls for minor changes, such as adding new signs, revising brochures, and developing new interpretive panels and kiosks.

**Availability of Resources:** Annual refuge operation and maintenance funds support the Visitor Service program and activities. The development of proposed facilities is contingent upon successfully locating a funding source. Funding for improvements (new education and interpretation facility) identified in the CCP will typically come from the Service's new construction accounts, grants or endowments, and refuge budget increases. Refuge staff, interns, volunteers, and Friends of the Pee Dee NWR provide the staffing for these uses.

**Anticipated Impacts of the Use:** Environmental education primarily occurs at the Friends building and surrounding areas. The construction of the proposed environmental education center would require the conversion of a grassy area to impervious surfaces required for the building and associated parking lot. In addition, it would increase disturbance in several new sites along planned trails, however, impacts would be considered discrete, as visitors would be required to stay on marked trails and these areas could be seasonally closed to limit disturbance to migratory birds. Vegetation trampling, altering structure and species composition, and temporal wildlife impacts to species would be at a minimal level. This unavoidable impact associated with running the environmental educational and interpretation program is acceptable.

**Determination:**

Use is Not Compatible  
 Use is Compatible, with the Listed Stipulations

**Stipulations Necessary to Ensure Compatibility:** While anticipated impacts are anticipated to be minimal, stipulations are required to ensure that wildlife resources are adequately protected. The environmental education program activities and the proposed environmental education center location would avoid sensitive sites and sensitive wildlife populations. Built into all curriculums will be a section on wildlife etiquette. Environmental education programs and activities will be held at or near established facilities where impacts may be minimized. Evaluations of sites and programs should 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, wildlife disturbances are unavoidable, but through interpretive material (e.g., brochures, signs, and kiosk panels) proper

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wildlife etiquette will be stressed. Education is critical for making visitors aware that their actions can have 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. 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 represent two priority wildlife-dependent recreational activities listed under the National Wildlife Refuge System Improvement Act. The nearest Service environmental education and interpretation center in North Carolina is five hours away. 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. Resources required to run the programs is minimal and is built into the refuge operation and maintenance budget. Identified improvements will not be developed until adequate staff and budget are available to develop and operate them. As long as stipulations to insure compatibility are followed, the programs should remain compatible with the purposes of the refuge. At such time that the monitoring program identifies unacceptable wildlife impacts are occurring, the refuge will modify the activity to minimize or eliminate the impacts. Both programs allow the education of the public of the missions of the Service and Refuge System and refuge purposes. They highlight the areas which are most in line with the refuge's management philosophy proposed under the CCP. Considering the minimal anticipated impacts through implementation of the environmental education and interpretation programs and the benefits that should arise through public education, participation, and involvement, the program is deemed compatible.

**NEPA Compliance for Refuge Use Description:**

- Categorical Exclusion without Environmental Action Statement
- Categorical Exclusion and Environmental Action Statement
- Environmental Assessment and Finding of No Significant Impact
- Environmental Impact Statement and Record of Decision

**Mandatory 15-Year Re-evaluation Date:**

**Description of Use:** *Bicycling and Jogging*

While not one of the six priority wildlife-dependent recreational uses listed in the National Wildlife Refuge System Improvement Act, bicycling and jogging are modes of transportation currently used to facilitate wildlife observation. This compatibility determination provides additional guidance on this specific use. As proposed, bike riding and jogging would occur only on designated roads and trails. These uses occur all year.

**Availability of Resources:** Operation and maintenance funds to support wildlife viewing are taken from the refuge's annual budget, which is adequate to sustain the program at the current level. Funds are needed annually to mow, grade, and fix roads open to the public; fix, repair, and replace boardwalks and trails; paint, repair, and replace signs; and develop and print brochures. Additional funds are not anticipated for these uses as they will use existing infrastructure and require minimal oversight.

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**Anticipated Impacts of the Use:** A critical and objective evaluate 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 the potential to have impacts, the focus is to minimize impacts. This is based on the impacts at the existing and projected level of use. Bicycling may be an appropriate form of transportation to view wildlife and has been approved in specific locations. However, bicycle riding takes several forms. For example, mountain biking, according to the International Mountain Bicycling Association (IMBA) is the sport of riding bicycles off paved roads. It requires endurance and bike handling skills and is performed on dirt roads, fire breaks, access roads, and public trails. According to the IMBA, the sport is broken down into several categories: cross country, downhill, street, dirt jumping, and free riding. Although wildlife viewing may be an incidental aspect of the mountain biking activity, it is not considered the main purpose or intent. Mountain bikers and ATV riders may enjoy the outdoor setting found at the refuge, but the activity may conflict with other wildlife-dependent recreation activities, may disturb migratory birds, and is not specifically aimed at viewing wildlife. Therefore, mountain biking, along with other similar sport activities, such as ATV use, is not permitted except for people with disabilities. Other forms of bike riding may be appropriate. The intent of some bike riders is wildlife viewing and several bicycle trails are planned in the CCP. Bicycle riders are not permitted to ride on refuge hiking trails. This activity disturbs other trail users and will be eliminated from hiking trails.

*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. As a result, marsh birds in open areas flee from joggers and bike riders (Laskowski 1999). 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 season wildlife observation, photography, environmental education, interpretation, and waterfowl hunting are all occurring simultaneously and are at the highest levels of the year. Techniques to limit disturbance must be evaluated, and 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 wetland habitat. Bicycling would add to the level of disturbance, especially in wetland habitats and strategies need to be implemented to limit wildlife impacts.

**Determination:**

Use is Not Compatible  
 Use is Compatible, with the Listed Stipulations

**Stipulations Necessary to Ensure Compatibility:** All forms of wildlife observation should have minimal wildlife and habitat impacts. However, bicycling and jogging can cause wildlife impacts in open wetland areas, can increase wildlife impacts, and can disrupt other individuals viewing wildlife. Bicycles will not be permitted on established hiking trails and will be limited to paved roads and gravel

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roads. Evaluation of 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 or the program, move the activity or program or eliminate the program. Stipulations that might be employed include those listed.

- Establish buffer zones and no entry zones that minimize disturbance around sensitive areas.
- Manage to provide vegetation which effectively conceals visitors and provides cover for wildlife, to help minimize impacts of people in busy areas such as pond dikes.
- Reduce impacts from wildlife viewing and photography by providing observation blinds.
- Re-route, modify, or eliminate biking activities which demonstrate direct wildlife and habitat impacts.
- Educate bike riders and joggers that their actions can have negative impacts on wildlife.
- Post signs where this use is allowed and contained (gravel and paved roads).

**Justification:** Bicycling to observe wildlife facilitates priority public uses of the National Wildlife Refuge System. Providing opportunities for these activities contributes toward fulfilling provisions of the National Wildlife Refuge System Improvement Act. Wildlife observation from bicycles in areas where there are few impacts to wildlife would provide an appropriate mode of transportation for promoting increased awareness, understanding, and support of refuge resources and programs. The stipulations outlined above should minimize potential impacts relative to wildlife/human interactions. At the current level of visitation, bicycling and jogging does not seem to 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
- Environmental Assessment and Finding of No Significant Impact
- Environmental Impact Statement and Record of Decision

**Mandatory 10-year Re-evaluation Date:**

**Description of Use:** *Horseback Riding*

While not one of the six priority public uses, horseback riding is often associated with them. Horseback riding would be a self-initiated activity on the refuge, with no amenities provided specifically for this activity. Participants of this activity would be responsible for all aspects of their visit and use of the refuge. This is a popular activity, which has historically occurred on refuge lands.

**Availability of Resources:** No additional administrative costs are associated with this activity. The only new infrastructure needed to implement this use would be signs demarking the trails. There would be no additional maintenance or monitoring costs associated with this activity.

**Anticipated Impacts of the Use:** Although horseback riding may cause disturbance to wildlife and interfere with other public uses, these impacts are not expected in the specially designated areas where this activity will be permitted to occur (all gravel and paved roads open to public vehicle traffic). Disturbance to migratory birds will be minimal, as certain areas will be seasonally closed to all public use, including horseback riding. In some areas, horses have been determined

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to introduce exotic plants via their droppings; however, this has not been documented on Pee Dee NWR. By restricting the use to roads, trampling of native vegetation will be minimized.

**Determination:**

- Use is Not Compatible
- Use is Compatible, with the Listed Stipulations

**Stipulations Necessary to Ensure Compatibility:** Horseback riding would be permitted on public use roads and would require a special use permit (SUP). The SUP process will allow the refuge to educate the users on specific rules related to horseback riding on the refuge (e.g., no off-road riding). It will also provide the refuge with the number of users. Horseback riding would be permitted year-round during daylight hours only. Areas closed to the general public for management or safety purposes would be closed to horseback riding as well. If negative impacts associated with this use are determined, additional restrictions would be placed on this activity or it would be discontinued.

**Justification:** Horseback riding supports wildlife observation by providing an alternative mode of travel on public use roads.

**NEPA Compliance for Refuge Use Decision:**

- Categorical Exclusion without Environmental Action Statement
- Categorical Exclusion and Environmental Action Statement
- Environmental Assessment and Finding of No Significant Impact
- Environmental Impact Statement and Record of Decision

**Mandatory 10-year Re-evaluation Date:**

**Description of Use:** *Timber Harvest*

Select trees will be harvested and/or salvaged as part of habitat restoration projects on the refuge. Typically, these operations will involve commercial logging that will be implemented to imitate natural events, such as fires and hurricanes that once influenced and maintained representative habitats within Pee Dee NWR. In addition, forest areas that have been damaged by fires and hurricanes may be salvaged in order to promote natural regeneration of the forests. Commercial logging and salvage operations are not recognized as wildlife-dependent priority uses by the National Wildlife Refuge System Improvement Act. However, the establishing authorities for the refuge recognized that “timber management” would be required to maintain some of the forests representative of refuge habitats. Therefore, this activity is an important use for the Pee Dee NWR. These timber harvest operations would occur primarily in the upland pine and mixed pine/hardwood forests, approximately 3,600 acres. Timber harvest could also be implemented in mixed pine hardwoods and to remove sweetgum from select areas of the bottomland hardwood. These operations would be scheduled during times of the year when they would least impact trust species or public use activities.

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**Availability of Resources:** The annual costs are estimated as follows:

- Preparation of Habitat Management Plans/Programs: \$1000
- Pre/Post Treatment Surveys/Assessments: \$1000
- Permit Administration: \$1000
- Road Repairs/Maintenance: \$5000

These funds are anticipated to come from annual budget increases and grants.

**Anticipated Impacts of the Use:** The operation of heavy equipment would damage or destroy ground vegetation. These areas would be allowed to grow back following the harvest. Soil compaction by harvesting machinery could occur in some areas, but the extent is expected to be minimal through the use of low ground pressure equipment. The potential exists for heavy machinery to damage or destroy potential listed plant species. To prevent this, surveys would be performed of all proposed treatment areas, and high-risk zones would be flagged as "off-limits" to tree harvesting machines. Heavy equipment and vehicles would temporarily add emissions to the air. Minor wildlife disturbance would also occur along the roads used to haul timber from the refuge. The probability of catastrophic wildfires and pine beetle infestations on the refuge would be reduced in the treated areas. Ground cover and understory plant densities would go up, increasing forage and cover for many wildlife species.

**Determination:**

- Use is Not Compatible  
 Use is Compatible, with the Listed Stipulations

**Stipulations Necessary to Ensure Compatibility:** Timber sales will not be conducted for economic benefits. Instead, the operation will be merely a tool to implement critical habitat restoration programs for the refuge. Therefore, these timber sales will be consistent with approved forest management plans and programs that outline the habitat restoration needs for the refuge. A maximum of 1000 acres of pine forests would be available for commercial timber sales annually. Timber sales would be conducted under special use permit, contract or a combination of the two to specify low ground pressure equipment, favorable weather conditions and other details to minimize impacts and maximize benefits.

**Justification:** The refuge's establishing legislation directed that a timber management program be conducted on the refuge and stated, through the Secretary's report of 1974, that "commercial timbering for the sake of revenue will not be considered as an objective of management". Timber management will be used primarily to imitate natural influences, especially fire that used to shape and maintain the natural biological diversity of Pee Dee NWR. Moreover, these sales will also provide economic benefits. All timber management practices performed will be for the primary purpose of achieving restoration and other habitat and wildlife management objectives. It will be to the benefit of the government to accomplish forested habitat restoration goals via commercial timber harvest as opposed to paying a contractor to remove the timber where possible. Whether the harvest is a goods-for-services setup or a timber sale contract, the resulting resources are utilized where feasible. This management tool is consistent with Pee Dee NWR's goals and objectives. Refuge timber harvests are only conducted for fire fuel management, treatment and prevention of insect outbreaks, or for habitat restoration and wildlife management purposes. Timber harvest will contribute to the achievement of the purposes and mission of Pee Dee NWR and the National Wildlife Refuge System. The harvest of forest products for the restoration of forest habitats on Pee Dee NWR will not materially interfere with or detract from the mission of the National Wildlife Refuge System or the purposes for which the refuge was established.

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**NEPA Compliance for Refuge Use Decision:**

- Categorical Exclusion without Environmental Action Statement  
 Categorical Exclusion and Environmental Action Statement  
 Environmental Assessment and Finding of No Significant Impact  
 Environmental Impact Statement and Record of Decision

**Mandatory 10-year Re-evaluation Date:****Description of Use:** *Cooperative Farming*

**Description of Use:** Cooperative farming is not one of the six priority wildlife dependent public uses of the National Wildlife Refuge System but is an existing economic activity that supports the refuge's migratory bird management trust responsibility. Through cooperative farming agreements, the refuge maintains 1,161 acres annually planted with agricultural crops to provide food and resting habitat for wintering migratory waterfowl, as well as other wildlife. This acreage occurs throughout the refuge lands bordering bottomland hardwood forests and near impoundments. The cooperative farmers grow corn, soybeans, and wheat leaving 20 percent of the crop standing in the fields. Cooperative farming would be permitted through the cooperative farming agreement process. Agreements would cover a one year time period. Farming agreements would be prepared and monitored by the refuge. Farmers would be limited to using herbicides and insecticides approved through the pesticide use proposal procedures. Cooperators would supply the refuge with annual pesticide use summary. Cooperative farming is the most cost effective means available for producing winter forage for migrating and wintering waterfowl and providing roosting and resting habitat under current resource levels.

**Availability of Resources:** Administration of the cooperative farming program will require several days work by one or more staff members. Estimated time needed to complete various tasks is as follows:

- Prepare Cooperative Farming Agreement – 4 staff days
- Prepare Pesticide Use Proposals – 1 staff day
- Prepare Region 4 Intra-Service Section 7 Biological Evaluation – 1 staff day
- Prepare Pesticide Use Report – 1 staff day
- Meet with Cooperative Farmers – 3 staff days
- Monitor farming activities through the growing season – 5 staff days
- Conduct various administrative tasks – 2 staff days
- Road maintenance – 10 staff days

**Total: 27 staff days.** Additional future funds are not anticipated to provide management oversight for this use, as cooperative farming is expected to remain at current levels under the proposed action.

**Anticipated Impacts of the Use:**

*Short-term Impacts:* Cooperative farming is a critical program that the refuge uses to meet its migratory waterfowl management responsibility for which it was established. Farming provides a steady, reliable winter food source for wintering migratory waterfowl, as well as other wildlife. Farming also sets back succession and controls brushy invasion of open field habitat. The program is the most cost effective means of providing supplemental food for waterfowl and other wildlife. Possible negative impacts of greatest concern are those associated with the use of pesticides in

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farming operations. Pesticide use in crop production could have a variety of direct or indirect effects on wild plants and animals, if used outside the guidelines prescribed by pesticide manufacturers. During application care must be taken to place the product only on target areas. Pesticides are applied when wind conditions do not facilitate drift to nontarget plants or animals. Pesticides are applied in quantities and under weather conditions that do not promote runoff. To prevent pesticide runoff from entering surface waters, no farming is done within 50 feet of standing water. Virtually all unintended plant impacts are short-term. Processes are in place to assist the refuge to limit possible adverse effects from the use of farm pesticides. Before each proposed pesticide is used in the program it must go through the Pesticide Use Proposal review process. The refuge must also consult with its local Ecological Services Office through the Intra-Service Section 7 Biological Evaluation process to determine if a proposed pesticide use has potential impacts to threatened and/or endangered species. Field preparation and planting can cause both beneficial as well as negative short-term wildlife impacts. Spring disking alters the wildlife use pattern by temporarily displacing small fauna until vegetative cover regenerates.

*Long-term Impacts:* The long-term impact of the cooperative farming program is that it provides a cost-effective way for the refuge to provide steady, reliable food and habitat for wintering migratory waterfowl. Cooperative farming maintains large open field habitat. If food and habitat are not available yearly or are available sporadically, then migratory waterfowl use can occur only sporadically. No measure exists to indicate that cooperative farming promotes or causes soil erosion. These refuge river bottoms have been farmed since long before the refuge was established in 1963. The refuge has maintained farming activities since its establishment and the land's productivity has not declined. The refuge is subjected to spring flooding, but rather than erode the refuge's bottomlands these floods continue to build up the soils as the river drops its silt load once it comes out of its banks. Evidence of this soil accumulation process is regularly seen on flooded refuge roads which accumulate silt during flood events.

*Cumulative Impacts:* Farming benefits waterfowl as well as other wildlife species and supports hunting, wildlife observation, wildlife photography, environmental education and interpretation. This activity does not significantly impact any other refuge activity.

**Determination:**

- Use is Not Compatible  
 Use is Compatible, with the Listed Stipulations

**Stipulations Necessary to Ensure Compatibility:** That policy and guidance is followed and that practice is conducted according to this station's Cropland Management Plan and any subsequent decisions developed through the comprehensive planning process. An annual cooperative farming agreement is developed and signed by the cooperative farmer and the refuge manager or his representative. Annual evaluation and ongoing monitoring of the cooperative farming program will be done to ensure conditions within the cooperative agreement are being complied with and overall condition of the area is not being degraded. Stipulations within the agreement only allow application of approved chemicals. Also, the program should be modified to fulfill new refuge goals developed in the upcoming Comprehensive Conservation Planning process. Staff must monitor the program to ensure farmers are adhering to their farming agreements, including the following:

- To reduce erosion, soil loss and ground disturbance, eliminate spring disking activities through the use of no till farming procedures.
- To reduce nutrient loading in refuge streams, implement crop rotations with corn and soybeans. This rotation enhances nitrogen fixation prior to corn planting and greatly reduces the use of commercial fertilizers on refuge lands.

- 
- Implement wildlife buffers along the edges of cooperative farm fields to provide food, cover and enhanced habitat diversity along the field borders.

**Justification:** The cooperative farming program is a critical component of management for migratory waterfowl and benefits other wildlife, and, thus, fulfills all of the refuge purposes noted above. It also helps meet national waterfowl management objectives. Farming by means of a cooperative farmer where a share of the crop is left for wildlife consumption is the most economical way to produce the grain foods to feed the wildlife species using the refuge. Options to utilize contracted farmers or refuge employees to conduct this program are not available due to budget constraints. The cooperative farming program provides supplemental foods for migrating and wintering waterfowl as well as other migratory bird species and native wildlife at minimal cost to the government.

**NEPA Compliance for Refuge Use Decision:**

- Categorical Exclusion without Environmental Action Statement  
 Categorical Exclusion and Environmental Action Statement  
 Environmental Assessment and Finding of No Significant Impact  
 Environmental Impact Statement and Record of Decision

**Mandatory 1-year Re-evaluation Date:**

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### **Approval of Compatibility Determinations**

The signature of approval is for all compatibility determinations considered within the Comprehensive Conservation Plan for Pee Dee 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: \_\_\_\_\_  
(Signature/Date)

Regional Compatibility  
Coordinator: \_\_\_\_\_  
(Signature/Date)

Refuge Supervisor: \_\_\_\_\_  
(Signature/Date)

Regional Chief, National  
Wildlife Refuge System,  
Southeast Region: \_\_\_\_\_  
(Signature/Date)



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# Appendix G. Intra-Service Section 7 Biological Evaluation

## INTRA-SERVICE SECTION 7 BIOLOGICAL EVALUATION FORM

**Originating Person:** Jeffrey Bricken  
**Telephone Number:** 704-694-4424  
**E-Mail:** jeffrey\_bricken@fws.gov  
**Date:** August 10, 2007

**PROJECT NAME:** Pee Dee NWR 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
- Refuges/Wildlife

**II. State/Agency:** North Carolina

**III. Station Name:** Pee Dee National Wildlife Refuge

**IV. Description of Proposed Action**

See attached: Draft Comprehensive Conservation Plan and Environmental Assessment for Pee Dee National Wildlife Refuge, Anson and Richmond Counties, North Carolina.

**V. Pertinent Species and Habitat:**

**Red-cockaded woodpecker**

The Pee Dee NWR has approximately 3,200 acres of pine and pine-hardwood forests. This is a sufficient number of forested acreage that could support 13 red-cockaded woodpecker clusters if the forests are intensively managed to meet the USFWS red-cockaded woodpecker recovery guidelines. However, at its peak, the Pee Dee NWR red-cockaded woodpecker population consisted of only three groups. Degradation of pine habitat, due to a lack of hardwood management, and intense cavity competition by other woodpecker species, caused the eventual abandonment of these sites. No active red-cockaded woodpecker clusters are known to exist on private lands surrounding the refuge. The nearest viable red-cockaded woodpecker population is in the North Carolina Sandhills, over 70 miles to the east of Pee Dee NWR.

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In 1998, only one male red-cockaded woodpecker remained on the refuge. The following year an attempt was made to pair the remaining male with a female translocated from Carolina Sandhills NWR. The attempt failed when the female abandoned the cluster site. The male was last seen in 2001. Since that time, no red-cockaded woodpeckers have been observed on the refuge.

The U.S. Fish and Wildlife Service's 1998 report entitled, *Strategies and Guideline for the Recovery and Management of the Red-cockaded Woodpecker and its Habitats on National Wildlife Refuges* cited a refuge population goal of 10 clusters. Since that time, biologists have evaluated this population goal and concluded that it would not be realistic to attempt to establish a viable population of red-cockaded woodpeckers on Pee Dee NWR. This decision was based on two factors: the great distance to the nearest stable red-cockaded woodpecker population, causing the Pee Dee NWR to become a population "sink"; and the length of time it will take to restore the upland pine stands to a condition that will meet the recovery habitat criteria provided in the 2003 revised red-cockaded woodpecker recovery plan. Refuge staff will continue to manage upland pine and mixed pine stands to meet the species recovery guidelines and to provide habitat for transient birds. Management will include timber thinning as well as the application of prescribed fire to reduce hardwood midstory and promote herbaceous ground cover. If a red-cockaded woodpecker does colonize one of the existing cluster sites, refuge staff will ensure that the cluster core has suitable cavity habitat in place. Otherwise, no cavity habitat management is planned.

### **Schweinitz's sunflower**

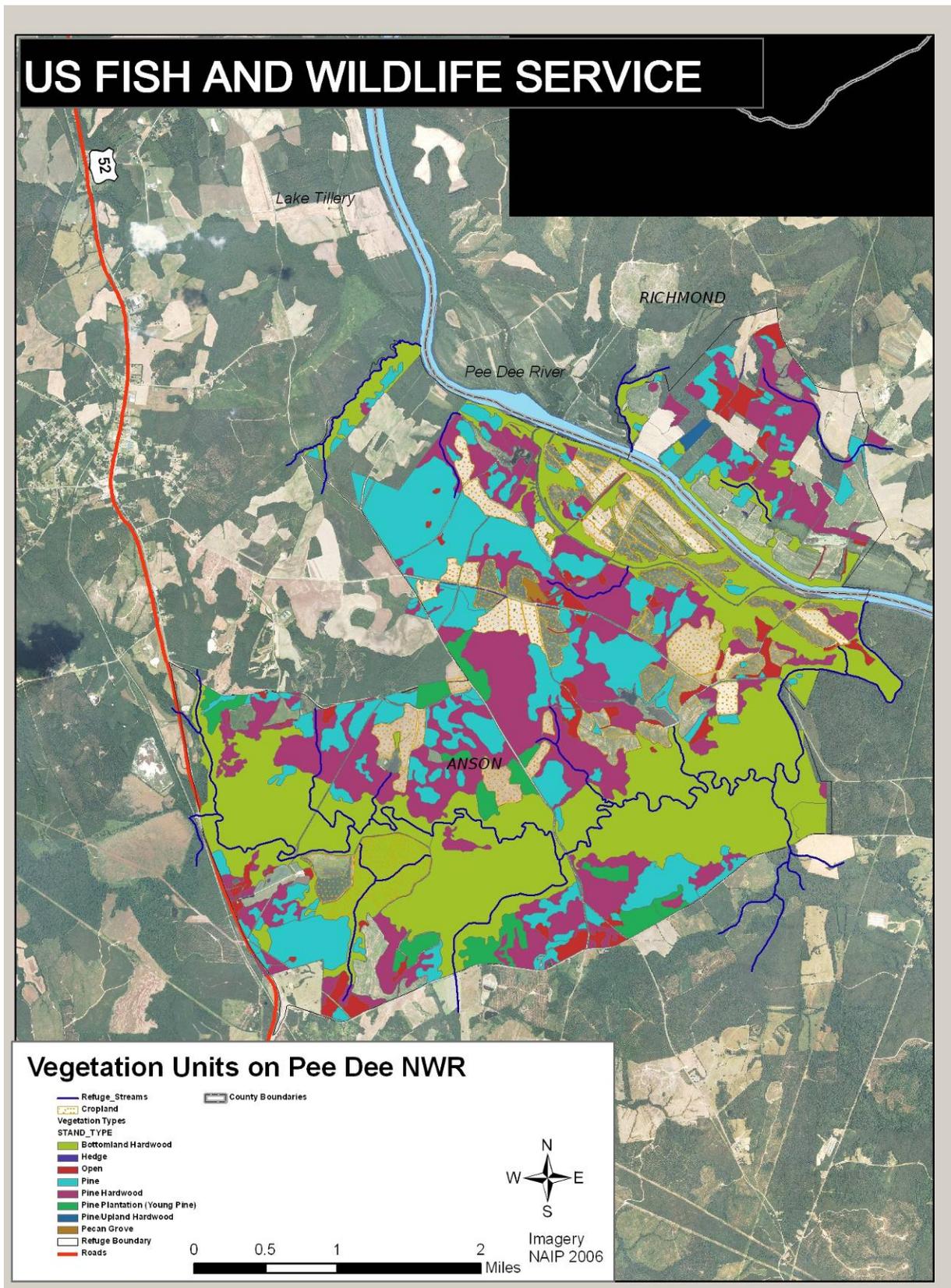
Generally speaking, areas currently supporting or with the potential to support Piedmont Longleaf Pine forests, Shortleaf Pine Oak forests, or Dry Oak Hickory forests over mafic geology (and mafic-derived soils) have the potential to support viable populations of Schweinitz's sunflower. The species is likely to persist in canopy gaps within these larger community types - as may occur in association with hardpans, diabase sills, bluffs, glades, or monadnocks - openings which vary in size and composition, but can be created through mechanical clearing and maintained through use of prescribed fire.

In a rangewide status survey of the species, Pee Dee NWR is identified as one of three sites recommended for establishing protected populations of Schweinitz's sunflower at a landscape level (Bates, 2003). The refuge currently contains remnant natural community types that are associated with and known to support this species, namely Piedmont longleaf pine and diabase bluffs. Pee Dee NWR also contains Iredell soils, mafic in nature and geologically, Triassic basin, both associated with "Piedmont prairies."

**No candidate species occur on the refuge.**

**A. Include species/habitat occurrence map:**

Section 7 Refuge vegetation map. Potential RCW habitat includes areas with older stands of pine, while Schweinitz's sunflowers could grow in certain "open" areas.



Complete the following table:

SPECIES/CRITICAL HABITAT	STATUS <sup>1</sup>
Red-cockaded woodpecker ( <i>Picoides borealis</i> )	Endangered (E)
Schweinitz's sunflower ( <i>Helianthus schweinitzii</i> )	Endangered (E)

<sup>1</sup>STATUS: E=endangered, T=threatened, PE=proposed endangered, PT=proposed threatened, CH=critical habitat, PCH=proposed critical habitat, C=candidate species, S/A=Similar Appearance

**VI. Location (attach map):**

- A. Ecoregion Number and Name:** Southeastern mixed forests (NA0413)
- B. County and State:** Anson and Richmond Counties, North Carolina  
**Section, township, and range (or latitude and longitude):**  
**Distance (miles) and direction to nearest town:**
- E. Species/habitat occurrence:**

**VII. Determination of Effects:**

**Explanation of effects of the action on species and critical habitats in item V. B:**

SPECIES/ CRITICAL HABITAT	IMPACTS TO SPECIES/CRITICAL HABITAT
Red-cockaded woodpecker ( <i>Picoides borealis</i> )	No critical habitat has been designated for this species. Currently, there are no active sites on the refuge. Management of the upland pine stands will be conducted in accordance with criteria listed in the Service's red-cockaded woodpecker recovery plan. Resulting habitat improvements will have a <b>positive effect</b> on red-cockaded woodpeckers.
Schweinitz's sunflower ( <i>Helianthus schweinitzii</i> )	Establish and manage one or more viable populations of Schweinitz's sunflower on appropriate sites using guidance from the current species Recovery Plan and species experts.

**B. Explanation of actions to be implemented to reduce adverse effects:**

SPECIES/ CRITICAL HABITAT	ACTIONS TO MITIGATE/MINIMIZE IMPACTS
Red-cockaded woodpecker	If red-cockaded woodpeckers re-establish themselves on the refuge, the thinning of pine stands and elimination of midstory hardwood by chemical and mechanical means will be limited to the time period outside of this species breeding season (April to July).
Schweinitz's sunflower	Annually monitor established populations to measure success of relocation and management regimes and to determine population status and potential contribution toward the species' recovery goal.

**VIII. Effect Determination and Response Requested:**

SPECIES/CRITICAL HABITAT	DETERMINATION <sup>1</sup>			REQUESTED
	NE	NA	AA	
Red-cockaded woodpecker		X		Concurrence
Schweinitz's sunflower		X		Concurrence
				Concurrence

<sup>1</sup>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".

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**Signature** (originating station)

**Date**

**Title**

**IX. Reviewing Ecological Services Office Evaluation:**

A. Concurrence \_\_\_\_\_ Nonconcurrency \_\_\_\_\_

B. Formal consultation required \_\_\_\_\_

C. Conference required \_\_\_\_\_

D. Informal conference required \_\_\_\_\_

E. Remarks (attach additional pages as needed):

**Signature**

**Date**

**Title**

**Office**

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## *Appendix H. 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:

- generally appears to have been influenced primarily by the forces of nature, with the imprint of man's work substantially unnoticeable;
- has outstanding opportunities for solitude or primitive and unconfined types of recreation;
- has at least 5,000 contiguous roadless acres or is of sufficient size to make practicable its preservation and use in an unimpeded condition; or is a roadless island, regardless of size;
- 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
- may contain ecological, geological, or other features of scientific, educational, scenic, or historic value.

The lands within Pee Dee National Wildlife Refuge were reviewed for their suitability in meeting the criteria for wilderness, as defined by the Wilderness Act of 1964.

The refuge's wilderness review was performed by the refuge staff in June 2007. No areas within the refuge were found to be suitable for designation as wilderness. The refuge's management boundary totals 8,443 acres across Anson and Richmond counties, North Carolina. Human disturbances are evident throughout and around the refuge in the form of roadways and adjacent agricultural areas and development.



# Appendix I. Refuge Biota

## LISTED WILDLIFE (POTENTIALLY) OCCURRING ON THE REFUGE

Common Name	Scientific Name	Status	
		NCWRC	USFWS
<i>FRESHWATER MUSSELS</i>			
Alewife Floater	<i>Anodonta implicata</i>	T	-
Brook Floater	<i>Alasmodonta varicosa</i>	E	SC
Carolina Creekshell	<i>Villosa vaughaniana</i>	E	SC
Carolina Fatmucket	<i>Lampsilis radiata conspicua</i>	T	-
Carolina Heelsplitter	<i>Lasmigona decorata</i>	E	E
Creeper	<i>Strophitus undulatus</i>	T	-
Eastern Pondmussel	<i>Ligumia nasuta</i>	T	-
Notched Rainbow	<i>Villosa constricta</i>	SC	-
Roanoke Slabshell	<i>Elliptio roanokensis</i>	T	
Yellow Lampmussel	<i>Lampsilis cariosa</i>	E	SC
<i>FISH</i>			
Carolina Darter	<i>Etheostoma collis</i>	SC	SC
<i>MAMMALS</i>			
Rafinesque's Big-eared Bat	<i>Corynorhinus rafinesquii rafinesquii</i>	T	SC
<i>BIRDS</i>			
Bald Eagle	<i>Haliaeetus leucocephalus</i>	T	*
Little Blue Heron	<i>Egretta caerulea</i>	SC	-
Loggerhead Shrike	<i>Lanius ludovicianus ludovicianus</i>	SC	-
Red-cockaded Woodpecker	<i>Picoides borealis</i>	E	E

Key: E=endangered, SC= species of concern, T=threatened, \* Delisted July 2007

## LISTED PLANTS POTENTIALLY FOUND ON THE REFUGE

Common Name	Scientific Name	Status	
		NCWRC	USFWS
Bog oatgrass	<i>Danthonia epilis</i>	SC	SC
Bog spicebush	<i>Lindera subcoriacea</i>	SC	SC
Dwarf aster	<i>Eurybia mirabilis</i>	SC	SC
Flatrock panic grass	<i>Panicum lithophilum</i>	SC	SC
Georgia lead-plant	<i>Amorpha georgiana</i> var. <i>georgiana</i>	SC	SC
Pickering's dawnflower	<i>Stylisma pickeringii</i> var. <i>pickeringii</i>	SC	SC
Roughleaf yellow-eyed grass	<i>Xyris scabrifolia</i>	SC	SC
Sandhills bog lily	<i>Lilium pyrophilum</i>	SC	SC
Sandhills milk-vetch	<i>Astragalus michauxii</i>	SC	SC
Schweinitz's sunflower	<i>Helianthus schweinitzii</i>	E	E
Small-leaved meadow-rue	<i>Thalictrum macrostylum</i>	SC	SC
Spring-flowering goldenrod	<i>Solidago verna</i>	SC	SC

Key: E=endangered, SC= species of concern, T=threatened

**BIRDS**

Seasonal abundance and breeding status of birds on the refuge during spring (SP), summer (SU), fall (F) and winter (W). Key: A=abundant, C=common, U=uncommon, O=occasional, R=rare; PB=possible breeding, √=documented breeding, X=accidental, N=nonnative

Common Name	Scientific Name	Breeding on Refuge	SP	SU	F	W
Acadian Flycatcher	<i>Empidonax virescens</i>	√	C	C	C	
American Bittern	<i>Botaurus lentiginosus</i>					R
American Black Duck	<i>Anas rubripes</i>		C		C	C
American Coot	<i>Fulica americana</i>		C		C	C
American Crow	<i>Corvus brachyrhynchos</i>	√	A	A	A	A
American Goldfinch	<i>Carduelis tristis</i>	√	C	C	C	C
American Kestrel	<i>Falco sparverius</i>		U	U	U	U
American Pipit	<i>Anthus rubescens</i>		U		U	C
American Redstart	<i>Setophaga ruticilla</i>	PB	U	U	U	
American Robin	<i>Turdus migratorius</i>	√	C	C	C	C
American Tree Sparrow	<i>Spizella arborea</i>					X
American Wigeon	<i>Anas americana</i>		U		U	C
American Woodcock	<i>Scolopax minor</i>	PB	C	O	C	C
Anhinga	<i>Anhinga anhinga</i>		O	O		
Bachman's Sparrow	<i>Aimophila aestivalis</i>					X
Bald Eagle	<i>Haliaeetus leucocephalus</i>		U	O	O	U
Baltimore Oriole	<i>Icterus galbula</i>		O	R	O	
Bank Swallow	<i>Riparia riparia</i>		R		R	
Barn Owl	<i>Tyto alba</i>		R	R	R	R
Barn Swallow	<i>Hirundo rustica</i>	√	C	C	C	
Barred Owl	<i>Strix varia</i>	√	C	C	C	C
Belted Kingfisher	<i>Ceryle alcyon</i>	√	C	C	C	C
Black Tern	<i>Chlidonias niger</i>		R		R	
Black Vulture	<i>Coragyps atratus</i>	PB	C	C	C	C
Black-and-white Warbler	<i>Mniotilta varia</i>	√	C	C	C	
Black-billed Cuckoo	<i>Coccyzus erythrophthalmus</i>		R		R	
Blackburnian Warbler	<i>Dendroica fusca</i>		A			
Blackpoll Warbler	<i>Dendroica striata</i>		O		O	
Black-throated Blue Warbler	<i>Dendroica caerulescens</i>		U		U	
Black-throated Green Warbler	<i>Dendroica virens</i>		O			
Blue Grosbeak	<i>Guiraca caerulea</i>	√	C	C	C	
Blue Jay	<i>Cyanocitta cristata</i>	√	C	C	C	C
Blue-gray Gnatcatcher	<i>Polioptila caerulea</i>	√	C	C	C	
Blue-headed Vireo	<i>Vireo solitarius</i>	PB	U	O	U	O
Blue-winged Teal	<i>Anas discors</i>		C		C	O
Blue-winged Warbler	<i>Vermivora pinus</i>		R			
Bobolink	<i>Dolichonyx oryzivorus</i>		O		O	
Bonaparte's Gull	<i>Larus philadelphia</i>					O
Brant	<i>Branta bernicla</i>		X			X
Broad-winged Hawk	<i>Buteo platypterus</i>		O	R	O	
Brown Creeper	<i>Certhia americana</i>		U		U	U
Brown Thrasher	<i>Toxostoma rufum</i>	√	C	C	C	U
Brown-headed Cowbird	<i>Molothrus ater</i>	√	C	C	C	A
Brown-headed Nuthatch	<i>Sitta pusilla</i>	√	C	C	C	C
Bufflehead	<i>Bucephala albeola</i>					U

Common Name	Scientific Name	Breeding on Refuge	SP	SU	F	W
Canada Goose	<i>Branta canadensis</i>		O		C	C
Canada Goose (resident)	<i>Branta canadensis</i>	√	C	C	C	C
Canada Warbler	<i>Wilsonia canadensis</i>		U		U	
Canvasback	<i>Aythya valisineria</i>					R
Carolina Chickadee	<i>Poecile carolinensis</i>	√	C	C	C	C
Carolina Wren	<i>Thryothorus ludovicianus</i>	√	C	C	C	C
Cattle Egret (N)	<i>Bubulcus ibis</i>		U	U		
Cedar Waxwing	<i>Bombycilla cedrorum</i>		U		U	C
Chestnut-sided Warbler	<i>Dendroica pensylvanica</i>		R			
Chimney Swift	<i>Chaetura pelagica</i>	√	C	C	C	
Chipping Sparrow	<i>Spizella passerina</i>	√	C	C	C	C
Chuck-will's-widow	<i>Caprimulgus carolinensis</i>	√	C	C		
Cliff Swallow	<i>Petrochelidon pyrrhonota</i>	√	U	U		
Common Goldeneye	<i>Bucephala clangula</i>					R
Common Grackle	<i>Quiscalus quiscula</i>		C	C	C	A
Common Nighthawk	<i>Chordeiles minor</i>	√	U	U	U	
Common Yellowthroat	<i>Geothlypis trichas</i>	√	C	C	C	R
Cooper's Hawk	<i>Accipiter cooperii</i>	PB	U	O	U	U
Dark-eyed Junco	<i>Junco hyemalis</i>		A		A	A
Double-crested Cormorant	<i>Phalacrocorax auritus</i>		U		U	U
Downy Woodpecker	<i>Picoides pubescens</i>	√	C	C	C	C
Eastern Bluebird	<i>Sialia sialis</i>	√	C	C	C	C
Eastern Kingbird	<i>Tyrannus tyrannus</i>	√	C	C	U	
Eastern Meadowlark	<i>Sturnella magna</i>	√	C	C	C	C
Eastern Phoebe	<i>Sayornis phoebe</i>	√	C	C	C	U
Eastern Screech-Owl	<i>Otus asio</i>	√	U	U	U	U
Eastern Towhee	<i>Pipilo erythrophthalmus</i>	√	C	C	C	C
Eastern Wood-Pewee	<i>Contopus virens</i>	√	C	C	C	
European Starling (N)	<i>Sturnus vulgaris</i>	√	A	A	A	A
Evening Grosbeak	<i>Coccothraustes vespertinus</i>		R		R	R
Field Sparrow	<i>Spizella pusilla</i>	√	C	C	C	C
Fish Crow	<i>Corvus ossifragus</i>	√	U	U	U	
Fox Sparrow	<i>Passerella iliaca</i>		U		U	U
Glossy Ibis	<i>Plegadis falcinellus</i>			X		
Golden Eagle	<i>Aquila chrysaetos</i>		X			X
Golden-crowned Kinglet	<i>Regulus satrapa</i>		C		C	C
Golden-winged Warbler	<i>Vermivora chrysoptera</i>		R			
Grasshopper Sparrow	<i>Ammodramus savannarum</i>		O	O	O	R
Gray Catbird	<i>Dumetella carolinensis</i>	√	C	C	C	R
Gray-cheeked Thrush	<i>Catharus minimus</i>				U	
Great Blue Heron	<i>Ardea herodias</i>	PB	C	C	C	C
Great Crested Flycatcher	<i>Myiarchus crinitus</i>	√	C	C	U	
Great Egret	<i>Ardea alba</i>			U	U	
Great Horned Owl	<i>Bubo virginianus</i>	√	C	C	C	C
Greater Scaup	<i>Aythya marila</i>					X
Greater White-fronted Goose	<i>Anser albifrons</i>					X
Green Heron	<i>Butorides virescens</i>	√	C	C	C	
Green-winged Teal	<i>Anas crecca</i>		C		U	C
Hairy Woodpecker	<i>Picoides villosus</i>	√	U	U	U	U
Henslow's Sparrow	<i>Ammodramus henslowii</i>					X

Common Name	Scientific Name	Breeding on Refuge	SP	SU	F	W
Hermit Thrush	<i>Catharus guttatus</i>		U		U	C
Hooded Merganser	<i>Lophodytes cucullatus</i>		C		C	C
Hooded Warbler	<i>Wilsonia citrina</i>	√	C	C	C	
Horned Lark	<i>Eremophila alpestris</i>		O		O	O
House Finch	<i>Carpodacus mexicanus</i>	√	C	C	C	C
House Sparrow (N)	<i>Passer domesticus</i>	√	C	C	C	C
House Wren	<i>Troglodytes aedon</i>	√	U		U	U
Indigo Bunting	<i>Passerina cyanea</i>	√	C	C	C	
Kentucky Warbler	<i>Oporornis formosus</i>	√	U	U	U	
Killdeer	<i>Charadrius vociferus</i>	√	C	U	C	C
Lark Sparrow	<i>Chondestes grammacus</i>					X
Least Bittern	<i>Ixobrychus exilis</i>			R		
Least Sandpiper	<i>Calidris minutilla</i>		O	O	O	
LeConte's sparrow	<i>Ammodramus leconteii</i>					X
Lesser Scaup	<i>Aythya affinis</i>		R		R	O
Lesser Yellowlegs	<i>Tringa flavipes</i>			U		U
Lincoln's Sparrow	<i>Melospiza lincolnii</i>				O	
Little Blue Heron	<i>Egretta caerulea</i>			O	O	
Loggerhead Shrike	<i>Lanius ludovicianus</i>	√	U	U	U	U
Louisiana Waterthrush	<i>Seiurus motacilla</i>	√	U	U	U	
Magnolia Warbler	<i>Dendroica magnolia</i>		R		O	
Mallard	<i>Anas platyrhynchos</i>		O		C	A
Mallard (resident)	<i>Anas platyrhynchos</i>	√	A	C	A	A
Marsh Wren	<i>Cistothorus palustris</i>		U		U	
Merlin	<i>Falco columbarius</i>					X
Mississippi Kite	<i>Ictinia mississippiensis</i>		R			
Mourning Dove	<i>Zenaida macroura</i>	√	A	A	A	A
Northern Bobwhite	<i>Colinus virginianus</i>	√	C	C	C	C
Northern Cardinal	<i>Cardinalis cardinalis</i>	√	C	C	C	C
Northern Flicker	<i>Colaptes auratus</i>	√	C	C	C	C
Northern Harrier	<i>Circus cyaneus</i>		C		C	C
Northern Mockingbird	<i>Mimus polyglottos</i>	√	C	C	C	C
Northern Parula	<i>Parula americana</i>	√	C	C	C	
Northern Pintail	<i>Anas acuta</i>		C		O	C
Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>	√	U	U		
Northern Shoveler	<i>Anas clypeata</i>		C		U	C
Northern Waterthrush	<i>Seiurus noveboracensis</i>		O		O	
Orchard Oriole	<i>Icterus spurius</i>	√	C	C	U	
Osprey	<i>Pandion haliaetus</i>		U	C	U	
Ovenbird	<i>Seiurus aurocapillus</i>	√	C	C	C	
Palm Warbler	<i>Dendroica palmarum</i>		O		U	R
Peregrine Falcon	<i>Falco peregrinus</i>				X	X
Pied-billed Grebe	<i>Podilymbus podiceps</i>		C	U	C	C
Pileated Woodpecker	<i>Dryocopus pileatus</i>	√	C	C	C	C
Pine Siskin	<i>Carduelis pinus</i>		R		R	R
Pine Warbler	<i>Dendroica pinus</i>	√	C	C	C	C
Prairie Warbler	<i>Dendroica discolor</i>	√	C	C	C	
Prothonotary Warbler	<i>Protonotaria citrea</i>	√	C	C	C	
Purple Finch	<i>Carpodacus purpureus</i>		R		R	R
Purple Gallinule	<i>Porphyryla martinica</i>		X	X		

Common Name	Scientific Name	Breeding on Refuge	SP	SU	F	W
Purple Martin	<i>Progne subis</i>	√	C	C		
Red-bellied Woodpecker	<i>Melanerpes carolinus</i>	v	C	C	C	C
Red-breasted Merganser	<i>Mergus serrator</i>					R
Red-breasted Nuthatch	<i>Sitta canadensis</i>		O		O	O
Red-cockaded Woodpecker	<i>Picoides borealis</i>		X	X	X	X
Red-eyed Vireo	<i>Vireo olivaceus</i>	√	C	C	C	
Redhead	<i>Aythya americana</i>					R
Red-headed Woodpecker	<i>Melanerpes erythrocephalus</i>	√	C		C	C
Red-shouldered Hawk	<i>Buteo lineatus</i>	√	C	C	C	C
Red-tailed Hawk	<i>Buteo jamaicensis</i>	√	C	C	C	C
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	√	C	C	C	A
Ring-billed Gull	<i>Larus delawarensis</i>		U		U	C
Ring-necked Duck	<i>Aythya collaris</i>		C		C	A
Rock Pigeon (N)	<i>Columba livia</i>	√	U	U	U	U
Rose-breasted Grosbeak	<i>Pheucticus ludovicianus</i>		U		U	
Ruby-crowned Kinglet	<i>Regulus calendula</i>		C		C	C
Ruby-throated Hummingbird	<i>Archilochus colubris</i>	√	C	C	C	
Ruddy Duck	<i>Oxyura jamaicensis</i>				O	O
Rusty Blackbird	<i>Euphagus carolinus</i>		O		O	O
Sandhill Crane	<i>Grus canadensis</i>		X			X
Savannah Sparrow	<i>Passerculus sandwichensis</i>		C		C	C
Scarlet Tanager	<i>Piranga olivacea</i>		U		U	
Sedge Wren	<i>Cistothorus platensis</i>				R	R
Sharp-shinned Hawk	<i>Accipiter striatus</i>		U	U	U	
Smith's Longspur	<i>Calcarius pictus</i>					X
Snow Goose	<i>Chen caerulescens</i>		R		R	R
Solitary Sandpiper	<i>Tringa solitaria</i>			C		O
Song Sparrow	<i>Melospiza melodia</i>		C		C	U
Sora	<i>Porzana carolina</i>				R	
Spotted Sandpiper	<i>Actitis macularia</i>			C		O
Summer Tanager	<i>Piranga rubra</i>	√	C	C	U	
Swainson's Thrush	<i>Catharus ustulatus</i>		U		U	
Swainson's Warbler	<i>Limnothlypis swainsonii</i>		R			
Swamp Sparrow	<i>Melospiza georgiana</i>		C		C	C
Tree Swallow	<i>Tachycineta bicolor</i>			U		U
Tricolored Heron	<i>Egretta tricolor</i>			X		
Tufted Titmouse	<i>Parus bicolor</i>	√	C	C	C	C
Tundra Swan	<i>Cygnus columbianus</i>		U		U	U
Turkey Vulture	<i>Cathartes aura</i>	PB	C	C	C	C
Upland Sandpiper	<i>Bartramia longicauda</i>				R	
Vesper Sparrow	<i>Poocetes gramineus</i>		O		O	O
Whip-poor-will	<i>Caprimulgus vociferus</i>	√	C	C		
White Ibis	<i>Eudocimus albus</i>			X		
White-breasted Nuthatch	<i>Sitta carolinensis</i>	√	C	C	C	C
White-crowned Sparrow	<i>Zonotrichia leucophrys</i>		O		O	O
White-eyed Vireo	<i>Vireo griseus</i>	√	C	C	C	
White-throated Sparrow	<i>Zonotrichia albicollis</i>		C		C	A
Wild Turkey	<i>Meleagris gallopavo</i>	√	C	C	C	C
Wilson's Snipe	<i>Gallinago delicata</i>		U		C	C

Common Name	Scientific Name	Breeding on Refuge	SP	SU	F	W
Winter Wren	<i>Troglodytes troglodytes</i>		O		O	U
Wood Duck	<i>Aix sponsa</i>	√	C	U	C	C
Wood Stork	<i>Mycteria americana</i>			X		
Wood Thrush	<i>Hylocichla mustelina</i>	√	C	C	U	
Worm-eating Warbler	<i>Helmitheros vermivorus</i>	PB	U	U	U	
Yellow Warbler	<i>Dendroica petechia</i>	PB	U	U	U	
Yellow-bellied Flycatcher	<i>Empidonax flaviventris</i>				R	
Yellow-bellied Sapsucker	<i>Sphyrapicus varius</i>		C		C	C
Yellow-billed Cuckoo	<i>Coccyzus americanus</i>	√	C	C	C	
Yellow-breasted Chat	<i>Icteria virens</i>	√	C	C	O	
Yellow-rumped Warbler	<i>Dendroica coronata</i>		A		A	A
Yellow-throated Vireo	<i>Vireo flavifrons</i>	√	U	U	U	
Yellow-throated Warbler	<i>Dendroica dominica</i>	√	C	C	U	
Veery	<i>Catharus fuscescens</i>		O		O	

## OTHER WILDLIFE

Common Name	Scientific Name
<i>Fish</i>	
Longnose Gar	<i>Lepisosteus osseus</i>
American Eel	<i>Anguilla rostrata</i>
Gizzard Shad	<i>Dorosoma cepedianum</i>
Redfin Pickerel	<i>Esox americanus</i>
Common Carp (nonnative)	<i>Cyprinus carpio</i>
Golden Shiner	<i>Notemigonus crysoleucas</i>
Whitefin Shiner	<i>Cyprinella nivea</i>
Comely Shiner (nonnative)	<i>Notropis amoenus</i>
Coastal Shiner	<i>Notropis petersoni</i>
Sandbar Shiner	<i>Notropis szepticus</i>
Creek Chubsucker	<i>Erimyzon oblongus</i>
Spotted Sucker	<i>Minytrema melanops</i>
Shorthead Redhorse	<i>Moxostoma macrolepidotum</i>
Smallmouth Buffalo (nonnative)	<i>Ictiobus bubalus</i>
Blue Catfish (nonnative)	<i>Ictalurus furcatus</i>
Channel Catfish (nonnative)	<i>Ictalurus punctatus</i>
White Catfish	<i>Ameiurus catus</i>
Yellow Bullhead	<i>Ameiurus natalis</i>
Flat Bullhead	<i>Ameiurus playcephalus</i>
Flathead Catfish (nonnative)	<i>Pylodictis olivaris</i>
Eastern Mosquitofish	<i>Gambusia holbrooki</i>
Pirate Perch	<i>Aphredoderus saynus</i>
Bluespotted Sunfish	<i>Enneacanthus gloriosus</i>
Flier	<i>Centrarchus macropterus</i>
Redbreast Sunfish	<i>Lepomis auritus</i>
Green Sunfish (nonnative)	<i>Lepomis cyanellus</i>
Pumpkinseed	<i>Lepomis gibbosus</i>
Warmouth	<i>Lepomis gulosus</i>
Bluegill	<i>Lepomis macrochirus</i>
Redear Sunfish	<i>Lepomis microlophus</i>

<b>Common Name</b>	<b>Scientific Name</b>
Largemouth Bass	<i>Micropterus salmoides</i>
Black Crappie	<i>Pomoxis nigromaculatus</i>
Tessellated Darter	<i>Etheostoma olmstedii</i>
Carolina Darter	<i>Etheostoma collis</i>
Yellow Perch (nonnative)	<i>Perca flavescens</i>
<i>Newts and Salamanders</i>	
Eastern Newt	<i>Notophthalmus viridescens</i>
Spotted Salamander	<i>Ambystoma maculatum</i>
Marbled Salamander	<i>Ambystoma opacum</i>
Northern Dusky Salamander	<i>Desmognathus fuscus</i>
Two-lined Salamander	<i>Eurycea bislineata</i>
Three-lined Salamander	<i>Eurycea guttolineata</i>
Slimy salamander	<i>Plethodon glutinosus</i>
Mud Salamander	<i>Pseudotriton montanus</i>
Red Salamander	<i>Pseudotriton ruber</i>
<i>Toads</i>	
Eastern Spadefoot Toad	<i>Scaphiopus holbrooki</i>
American Toad	<i>Bufo americanus</i>
Oak Toad	<i>Bufo quercicus</i>
Fowler's Toad	<i>Bufo woodhousei</i>
<i>Frogs</i>	
Northern Cricket Frog	<i>Acris crepitans</i>
Gray Treefrog	<i>Hyla chrysoscelis</i>
Spring Peeper	<i>Hyla crucifer</i>
Upland Chorus Frog	<i>Pseudacris triseriata</i>
Bullfrog	<i>Rana catesbeiana</i>
Green Frog	<i>Rana clamitans</i>
Pickereel Frog	<i>Rana palustris</i>
Southern Leopard Frog	<i>Rana sphenoccephala</i>
Eastern Narrowmouth Toad	<i>Gastrophryne carolinensis</i>
<i>Turtles</i>	
Snapping Turtle	<i>Chelydra serpentina</i>
Eastern Mud Turtle	<i>Kinosternon subrubrum</i>
Eastern Musk Turtle	<i>Stenotherus odoratus</i>
River Cooter	<i>Chrysemys concinna</i>
Eastern Painted Turtle	<i>Chrysemys picta</i>
Spotted Turtle	<i>Clemmys guttata</i>
Eastern Box Turtle	<i>Terrapene Carolina</i>
<i>Lizards</i>	
Eastern Fence Lizard	<i>Sceloporus undulatus</i>
Five-lined Skink	<i>Eumeces fasciatus</i>
Southeastern Five-lined Skink	<i>Eumeces inexpectatus</i>
Broadheaded Skink	<i>Eumeces laticeps</i>
Ground Skink	<i>Scincella lateralis</i>
Six-lined Racerunner	<i>Cnemidophorus sexlineatus</i>
Green Anole	<i>Anolis carolinensis</i>
<i>Snakes</i>	
Scarlet Snake	<i>Cemophora coccinea</i>
Black Racer	<i>Coluber constrictor</i>
Corn Snake	<i>Elaphe guttata</i>
Rat Snake	<i>Elaphe obsoleta</i>
Eastern Hognose Snake	<i>Heterodon platirhinos</i>

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<b>Common Name</b>	<b>Scientific Name</b>
Eastern Kingsnake	<i>Lampropeltis getula</i>
Redbelly Water Snake	<i>Nerodia erythrogaster</i>
Rough Green Snake	<i>Opheodrys aestivus</i>
Brown Snake	<i>Storeria dekayi</i>
Eastern Ribbon Snake	<i>Thamnophis sauritus</i>
Eastern Garter Snake	<i>Thamnophis sirtalis</i>
Smooth Earth Snake	<i>Virginia valeriae</i>
Copperhead	<i>Agkistrodon contortrix</i>
<i>Mammals</i>	
Opossum	<i>Didelphis marsupialis</i>
Short-tailed Shrew	<i>Blarina brevicauda</i>
Eastern Mole	<i>Scalopus aquaticus</i>
Little Brown Myotis	<i>Myotis lucifugus</i>
Silver-haired Bat	<i>Lasionycteris noctivagans</i>
Eastern Pipstrel	<i>Pipistrellus subflavus</i>
Big Brown Bat	<i>Eptesicus fuscus</i>
Raccoon	<i>Procyon lotor</i>
Long-tailed Weasel	<i>Mustela frenata</i>
Mink	<i>Mustela vison</i>
River Otter	<i>Lutra canadensis</i>
Striped Skunk	<i>Mephitis mephitis</i>
Red Fox	<i>Vulpes fulva</i>
Gray Fox	<i>Urocyon cinereoargenteus</i>
Coyote	<i>Canis latrans</i>
Bobcat	<i>Lynx rufus</i>
Eastern Chipmunk	<i>Tamias striatus</i>
Eastern Gray Squirrel	<i>Sciurus carolinensis</i>
Fox Squirrel	<i>Sciurus niger</i>
Southern Flying Squirrel	<i>Glaucomys volans</i>
Beaver	<i>Castor canadensis</i>
White-footed Mouse	<i>Peromyscus leucopus</i>
Hispid Cotton Rat	<i>Sigmodon hispidus</i>
Muskrat	<i>Ondatra zibethicus</i>
Norway Rat (nonnative)	<i>Rattus norvegicus</i>
Black Rat (nonnative)	<i>Rattus rattus</i>
House Mouse (nonnative)	<i>Mus musculus</i>
Eastern Cottontail Rabbit	<i>Sylvilagus floridanus</i>
White-tailed Deer	<i>Odocoileus virginianus</i>

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## *Appendix J. List of Preparers*

**Jeffrey Bricken**, Refuge Manager, Pee Dee National Wildlife Refuge

**Greg Walmsley**, Assistant Refuge Manager, Pee Dee National Wildlife Refuge

**Oliver van den Ende**, Contractor, Dynamac Corporation