Alligator River National Wildlife Refuge

Comprehensive Conservation Plan

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

August 2008

Submitted by: Michael R. Bryant *Date:* 3/12/2007

Michael R. Bryant , Refuge Manager
Alligator River NWR

Concur: Michael R. Bryant *Date:* 3/12/2007

Michael R. Bryant, Project Leader
North Carolina Coastal Plain NWR Complex

Concur: *Date:* 6/4/2007

Pete Jerome, Refuge Supervisor
Southeast Region

Concur: *Date:* 6-6-07

Jon Andrew, Regional Chief
Southeast Region

Approved by: *Date:* 6-8-07

Sam Hamilton, Regional Director
Southeast Region

COMPREHENSIVE CONSERVATION PLAN

ALLIGATOR RIVER NATIONAL WILDLIFE REFUGE

Dare and Hyde Counties, North Carolina

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

Southeast Region
Atlanta, Georgia

August 2008

TABLE OF CONTENTS

COMPREHENSIVE CONSERVATION PLAN

EXECUTIVE SUMMARY 1

I. BACKGROUND 1

- Introduction 1
- Purpose and Need for the Plan 1
- U.S. Fish and Wildlife Service 2
- National Wildlife Refuge System 2
- Legal Policy Context 3
- National Conservation Plans and Initiatives 3
- Relationship to State Partners 4

II. REFUGE OVERVIEW 5

- Introduction 5
- Refuge History and Purposes 5
  - History 5
  - Purposes 5
- Special Designations 7
- Ecosystem Context 7
- Regional Conservation Plans and Initiatives 9
- Ecological Threats and Problems 10
  - Habitat Loss and Fragmentation 10
  - Alterations to Hydrology 11
  - Siltation of Aquatic Ecosystems 11
  - Conservation Priorities 13
  - Challenges 14
- Physical Resources 14
  - Climate 15
  - Geology and Topography 16
  - Minerals 16
  - Soils 16
  - Hydrology 19
  - Water Quality 20
  - Air Quality 20
  - Visual Resources 22
- Biological Resources 22
  - Habitat 22
  - Wildlife 30
- Cultural Resources 35
- Socioeconomic Environment 35
  - Introduction 35
  - History 36
  - Land Use 38
  - Demographics 41
  - Employment 41
  - Forestry 43
  - Outdoor Recreation in the Area 43
  - Outdoor Recreation Economics 44

Tourism 45
Transportation 45
Cultural Environment 46
Refuge Administration and Management 46
Land Protection and Conservation 46
Visitor Services 46
Personnel, Operations, and Maintenance 51
Refuge Infrastructure 52

III. PLAN DEVELOPMENT 55

Public Involvement and the Planning Process 55
Summary of Issues, Concerns, and Opportunities 56
Hydrology 56
Fish and Wildlife Populations 57
Habitat Management 59
Visitor Services 60
Resource Protection 61
Wilderness Review 61

IV. MANAGEMENT DIRECTION 63

Introduction 63
Vision 64
Goals 64
Wildlife and Fish Populations 64
Habitat Management 65
Public Use/Outreach 65
Resource Protection 65
Objectives and Strategies 65
Fish and Wildlife Populations 65
Habitat Management 69
Visitor Services 74
Resource Protection 79
Refuge Administration 84

V. PLAN IMPLEMENTATION 87

Introduction 87
Proposed Projects 87
Refuge Administration 91
Funding and Personnel 91
Volunteers 95
Partnership Opportunities 95
Step-down Management Plans 95
Monitoring and Adaptive Management 96
Plan Review and Revision 97

APPENDICES

APPENDIX I. GLOSSARY 99

APPENDIX II. REFERENCES AND LITERATURE CITED.....107

APPENDIX III. RELEVANT LEGAL MANDATES 113

APPENDIX IV. PUBLIC INVOLVEMENT.....121

Summary of Public Scoping Meetings.....121
Draft Plan Comments and Service Responses 128

APPENDIX V. DECISIONS AND APPROVALS 159

Intra-Service Section 7 Biological Evaluation 159
COMPATIBILITY DETERMINATION 162

APPENDIX VI. REFUGE BIOTA.....175

APPENDIX VII. PRIORITY BIRD SPECIES AND THEIR HABITATS 201

APPENDIX VIII. BUDGET REQUESTS.....203

APPENDIX IX. WILDERNESS REVIEW 229

APPENDIX X. CONSULTATION AND COORDINATION.....237

APPENDIX XI. FINDING OF NO SIGNIFICANT IMPACT 241

LIST OF FIGURES

Figure 1. Location of Alligator River National Wildlife Refuge in Dare and Hyde Counties, North Carolina. 6
Figure 2. Alligator River National Wildlife Refuge in the South Atlantic Coastal Plain Physiographic Area. 8
Figure 3. Soils of the Alligator River National Wildlife Refuge. 17
Figure 4. Vegetative habitat types of the Alligator River National Wildlife Refuge. 23
Figure 5. Current boundary of the Alligator River National Wildlife Refuge. 47
Figure 6. Current visitor facilities at Alligator River National Wildlife Refuge. 48
Figure 7. Proposed visitor facilities for Alligator River National Wildlife Refuge. 92

LIST OF TABLES

Table 1. The Nature Conservancy ranking of vegetative communities of Alligator River National Wildlife Refuge. 9
Table 2. Threatened and endangered animal species of the Coastal Plain of North Carolina. 12
Table 3. Characteristics of soils of Alligator River National Wildlife Refuge. 19
Table 4. Classifications of water bodies around the Alligator River National Wildlife Refuge. 21
Table 5. Acreage by habitat or land use under fee title ownership at Alligator River National Wildlife Refuge. 24
Table 6. Texture of soil and marine origin sediments and estimated crop yields for soils on the Alligator River National Wildlife Refuge. 27
Table 7. Dare County agricultural statistics from the 2002 USDA Census of Agriculture. 39
Table 8. Commodity production in Dare County in 1997 and 2002. 39
Table 9. Hyde County agricultural statistics from the 2002 USDA Census of Agriculture. 40
Table 10. Commodity production in Hyde County in 2002 and 1997, from the 2002 and 1997 USDA Census of Agriculture. 40
Table 11. Economic and population data for northeastern North Carolina counties. 42
Table 12. Acquisition history of the Alligator River National Wildlife Refuge. 46
Table 13. Staff of the Alligator River and Pea Island National Wildlife Refuges, 2005. 51
Table 14. Projects supporting Wildlife Strategies. 87
Table 15. Projects supporting Habitat Strategies. 88
Table 16. Projects supporting Public Use Strategies. 89
Table 17. Projects supporting Resource Protection Strategies. 90
Table 18. Projects supporting Refuge Administration Strategies. 91
Table 19. Proposed staffing plan for Alligator River National Wildlife Refuge. 93

Executive Summary

The U.S. Fish and Wildlife Service prepared this Comprehensive Conservation Plan to guide the management of Alligator River National Wildlife Refuge in Dare and Hyde Counties, North Carolina. The plan outlines programs and corresponding resource needs for the next 15 years, as mandated by the National Wildlife Refuge System Improvement Act of 1997.

Before the Service began planning, it conducted a biological review of the refuge's wildlife and habitat management program and conducted public scoping meetings to solicit public opinions on the issues the plan should address. The biological review team was composed of biologists from federal and state agencies and nongovernmental organizations that have an interest in the refuge. The refuge staff held the public scoping meetings at four locations on four evenings. The staff also held a second-round public meeting to solicit public reaction to the proposed alternatives.

The Service developed and analyzed three alternatives. Alternative 1 was a proposal to maintain the current management. The refuge currently manages its moist soil units very intensively by managing water levels and vegetation to create optimum habitat for migrating waterfowl, shorebirds, wading birds, and aquatic organisms. It also manages the marshes and pine forests with prescribed fire. The staff surveys waterfowl, shorebirds, and wading birds on a routine basis. The refuge allows the six priority public use activities: hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation. The staff conducts extensive environmental education and interpretation programs with the assistance of 10,000 hours of volunteer service every year. The staff of Alligator River National Wildlife Refuge also manages Pea Island National Wildlife Refuge. A staff of 16.7 of the 23 full-time equivalent positions manages the Alligator River Refuge. The staff manages the refuge from a General Services Administration-rented building in Manteo, 10 miles east of the refuge.

Alternative 2 proposed moderate program increases. Under this alternative, the refuge would continue to manage its moist soil units very intensively by managing water levels and vegetation to create optimum habitat for migrating waterfowl, shorebirds, wading birds, and aquatic organisms. It also would manage the marshes and pine forests with prescribed fire. The staff would inventory and monitor fire-dependent habitats to document their conditions and assess the effectiveness of management. The staff would survey waterfowl, shorebirds, and wading birds on a routine basis. The staff would also document the presence of wildlife species as they are found, and document the density of invertebrates in moist soil units. The refuge would allow the six priority public use activities: hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation. The staff would conduct extensive environmental education and interpretation programs with the assistance of 12,000 hours of volunteer service every year. The staff would conduct programs on the refuge and in the newly constructed visitor center. The staff of Alligator River National Wildlife Refuge would continue to manage the Alligator River and Pea Island national wildlife refuges. A staff of 26.75 of the 39 full-time equivalent positions would manage the Alligator River Refuge. The staff would manage the refuge from a Service-owned building in Manteo, 10 miles east of the refuge.

Alternative 3 proposed substantial program increases. Under this alternative, the refuge would continue to manage its moist soil units very intensively by managing water levels and vegetation to create optimum habitat for migrating waterfowl, shorebirds, wading birds, and aquatic organisms. It also would manage marshes and pine forests with prescribed fire and deciduous forests with thinning. The staff would inventory and monitor all habitats to document their conditions and assess the effectiveness of management. The staff would survey all wildlife species on a routine basis. The staff would also document presence of wildlife species as they are found and document the density of invertebrates in moist soil units. The refuge would allow the six priority public use activities: hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation. The staff would conduct extensive environmental education and interpretation programs with the assistance of 15,000 hours of volunteer service every year. The staff would conduct programs on the refuge and in the newly constructed visitor center. The staff of Alligator River National Wildlife Refuge would continue to manage the Alligator River and Pea Island national wildlife refuges. A staff of 37.45 of the 58 full-time equivalent positions would manage the Alligator River Refuge. The staff would manage the refuge from a Service-owned building in Manteo, 10 miles east of the refuge.

The Service selected Alternative 2 as the preferred alternative, which is reflected in this Comprehensive Conservation Plan. It advances the refuge program considerably, and is more realistic than Alternative 3 in terms of expected staffing levels to conduct the proposed program.

I. Background

INTRODUCTION

The U.S. Fish and Wildlife Service (Service) developed this Comprehensive Conservation Plan to provide a foundation for the management and use of Alligator River National Wildlife Refuge in Dare and Hyde Counties, North Carolina. The plan will serve as a guide for the refuge's management actions and direction over the next 15 years. Fish and wildlife conservation will receive first priority in refuge management, and 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 Service 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. Compliance with this Act was achieved through the involvement of the public and the development of an environmental assessment, which described the alternatives considered and an analysis of the environmental consequences of the alternatives. The environmental assessment was incorporated as Section B of the Draft Comprehensive Conservation Plan for Alligator River National Wildlife Refuge.

The plan was prepared by a planning team composed of representatives from the refuge and various Service programs, including the divisions of Planning, Refuges, Fisheries, Ecological Services, Realty, and Migratory Birds. In developing this plan, the planning team and refuge staff incorporated the input of state agencies, nongovernmental organizations, local citizens, and the general public through a series of stakeholder and public scoping meetings. This public involvement and the planning process itself are described in Chapter III, Plan Development.

The plan represents the Service's preferred alternative and is being put forward after considering two other alternatives, as described in the environmental assessment and summarized in the Executive Summary. The preferred alternative is the Service's recommended course of action for the management of the refuge and is detailed in this comprehensive conservation plan.

PURPOSE AND NEED FOR THE PLAN

The purpose of this comprehensive conservation plan is to identify the role that Alligator River National Wildlife Refuge will play in support of the mission of the National Wildlife Refuge System, and to provide long-term guidance to the refuge's management programs and activities for the next 15 years.

The plan is needed to:

- provide a clear statement of direction for the management of the refuge;
- provide refuge neighbors, visitors, and local, state, and federal and government officials with an understanding of the Fish and Wildlife Service's management actions on and around the refuge;
- ensure that the Service's management actions, including land protection and recreational and educational programs, are consistent with the mandates of the National Wildlife Refuge System Improvement Act of 1997;

- ensure that the management of the refuge is consistent with federal and state plans; and
- provide a basis for the development of budget requests for the refuge's operational, maintenance, and capital improvement needs.

Perhaps the greatest need of the Service is to communicate with the public and include public participation in its efforts to carry out the mission of the National Wildlife Refuge System. Many agencies, organizations, institutions, businesses, and private citizens have developed relationships with the Service to advance the goals of the Refuge System. This plan supports the Partners in Flight Initiative; South Atlantic Coastal Plain Migratory Bird Conservation Plan; North American Waterfowl Management Plan; Western Hemisphere Shorebird Reserve Network; and National Wetlands Priority Conservation Plan.

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. In addition, the Service administers a national network of lands and waters for the management and protection of these resources.

As part of its mission, the Service manages more than 540 national wildlife refuges covering a total of more than 93 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, lie in Alaska. The remaining 16 million acres are spread across the other 49 states and several 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.*

The National Wildlife Refuge System Improvement Act of 1997 established, for the first time, a clear mission of wildlife conservation for the national wildlife refuges. The Act states that the Service will manage each refuge 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
- recognize that wildlife-dependent recreational activities including hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, are legitimate and priority public uses.

Following passage of the Act in 1997, the Service immediately began efforts to carry out the direction of the new legislation, including the preparation of comprehensive conservation plans for all refuges. The development of these plans is now ongoing nationally. Consistent with the Act, the Service is preparing all refuge comprehensive conservation plans in conjunction with public involvement, and is requiring each refuge to complete its own plan within a 15-year schedule.

Approximately 39.5 million people visited the country's national wildlife refuges in 2003, mostly to observe wildlife in their natural habitats. As this visitation continues to grow, the refuges generate substantial economic benefits to the local communities that surround the refuges. Economists have reported that national wildlife refuge visitors contribute more than $809 million annually in sales and $315 million in employment income to local economies (U.S. Fish and Wildlife Service 2003). In addition, the National Survey of Fishing, Hunting, and Wildlife Associated Recreation reports that nearly 40 percent of the country's adults spent $108 billion on wildlife-related recreational pursuits in 2001 (U.S. Fish and Wildlife Service 2001).

Volunteerism continues to be a major contributor to the successes of the Refuge System. In 1998, volunteers contributed more than 1.5 million person-hours on the refuges nationwide, a service valued at more than $20.6 million.

The wildlife and habitat vision for national wildlife refuges stresses the following principles:

- Wildlife comes first.
- Ecosystems, biodiversity, and wilderness are vital concepts in refuge management.
- Refuges must be healthy.
- Growth of refuges must be strategic.
- The National Wildlife Refuge System serves as a model for habitat management with broad participation from others.

LEGAL POLICY CONTEXT

A variety of international treaties, federal laws and regulations, Department and Service policies, and presidential executive orders guides the administration of Alligator River National Wildlife Refuge. The documents and acts listed in Appendix III describe the refuge's establishing authority, the National Wildlife Refuge Administration Act of 1966, and the National Wildlife Refuge System Improvement Act of 1997 (the legal and policy guidance for the operation of national wildlife refuges).

NATIONAL CONSERVATION PLANS AND INITIATIVES

Along with the Service's legal mandates and initiatives, other planning activities directly influence the development of the comprehensive conservation plan. Various groups and agencies develop and coordinate planning initiatives involving federal, state, and local agencies; local communities; nongovernmental organizations; and private individuals to help restore habitats for fish and wildlife on and off public lands.

The Service is initiating cooperative partnerships in an effort to reduce the declining trend in biological diversity. Biological planning for species groups targeted in this plan reflects the North American Waterfowl Management Plan. The North American Waterfowl Management Plan of 1986 brings together international teams of biologists from private and governmental organizations from Canada and the United States. The partnerships, called joint ventures, are working to restore waterfowl and other migratory bird populations to the levels of the early 1970s by protecting about 6 million acres of priority wetland habitats ranging from the Gulf of Mexico to the Canadian Arctic.

The United States Shorebird Conservation Plan and Waterbirds for the Americas outline approaches to conserving those species groups. Restoration of migratory songbird populations is a high priority of the Partners in Flight Plan. It also provides strategies for conserving and managing wintering, breeding, and migration habitat for mid-continental wood duck and colonial bird populations.

The Partners in Flight Plan emphasizes landbird species as a priority for conservation. Habitat loss, population trends, and the vulnerability of species and habitats to threats are all factors used in the priority ranking of species. Further, biologists have identified focal species for each habitat type from which they will determine population and habitat objectives and conservation actions. This list of focal species, objectives, and conservation actions will aid migratory bird management on the refuge.

The Southeast Waterbird Plan emphasizes waterbird species as a priority for conservation. Habitat loss, population trends, and the vulnerability of species and habitats to threats are all factors used in the priority ranking of species. Further, biologists have identified focal species for each habitat type from which they will determine population and habitat objectives and conservation actions. This list of focal species, objectives, and conservation actions will aid migratory bird management on the refuge.

The Farm Bill programs administered by the U.S. Department of Agriculture provide cost-share funding and technical assistance to private landowners to install and manage conservation practices on working farms and forests and restore cropland to natural habitats. The programs provide opportunities for landowners in the vicinity of national wildlife refuges to manage their land better as wildlife habitat or protect it with easements.

RELATIONSHIP TO STATE PARTNERS

A provision of the National Wildlife Refuge System Improvement Act of 1997, and subsequent agency policy, is that the Service shall ensure timely and effective cooperation and collaboration with other federal agencies and state fish and wildlife agencies during the course of acquiring and managing refuges. This cooperation is essential in providing a foundation for the protection and sustainability of fish and wildlife throughout the United States.

The North Carolina Wildlife Resources Commission is a state-partnering agency with the Service. The Commission is charged with enforcement responsibilities for migratory birds and endangered species, as well as managing the state's natural resources. It also manages approximately 1.8 million acres of game lands in North Carolina.

The Commission coordinates the state's wildlife conservation program and provides public recreation opportunities, including an extensive hunting and fishing program, on several game lands and from several boat ramps located in Dare County. The Commission's participation and contribution throughout this comprehensive conservation planning process has been valuable. It is continuing its work with the Service to provide ongoing opportunities for an open dialogue with the public to improve the condition of fish and wildlife populations on the coastal plain of North Carolina. Not only has the Commission participated in biological reviews, stakeholder meetings, and field reviews as part of the comprehensive planning process, it is also an active partner in the coordination, planning, and execution of various wildlife and habitat surveys. The Commission also assists the refuge staff in providing special wildlife observation opportunities. A key part of the comprehensive planning process is the integration of common mission objectives between the Service and the Commission, where appropriate.

II. Refuge Overview

INTRODUCTION

Alligator River National Wildlife Refuge is located in mainland Dare and Hyde Counties, North Carolina. The refuge is named for the Alligator River, which constitutes the refuge's western boundary. The Albemarle Sound forms the refuge's northern boundary; Croatan and Pamlico Sounds, the eastern boundary; and Hyde County, the southern boundary. The majority of the refuge lies in Dare County. The village of Manns Harbor (2000 population 1,182) lies at the eastern edge of the refuge, and the village of Engelhard (2000 population 1,561) lies just beyond the refuge's southeastern corner (Figure 1). The refuge covers approximately 152,260 acres and lies at the eastern end of a broad, flat, and swampy peninsula in northeastern North Carolina.

REFUGE HISTORY AND PURPOSES

HISTORY

The Fish and Wildlife Service established Alligator River National Wildlife Refuge in March 1984 on an 118,000-acre area that was donated by the Prudential Life Insurance Company.

There were no inhabitants within the refuge area until the late 1700s or early 1800s, when settlers established a community called Beechlands near Milltail Creek. In 1885, three lumbermen from Buffalo, New York, purchased 168,000 acres on the Dare County mainland to set up a timber industry and camp at Buffalo City, near Milltail Creek. The land changed owners several times over the years and the West Virginia Pulp and Paper Company eventually obtained it. In 1974, McLean Industries bought the land for a large farming experiment called First Colony Farms. The Prudential Life Insurance Company formed a partnership with McLean Industries to form the Prulean Corporation. In 1984, Prudential Life Insurance Company obtained all the Prulean Corporation land, as well as some of the First Colony Farms land.

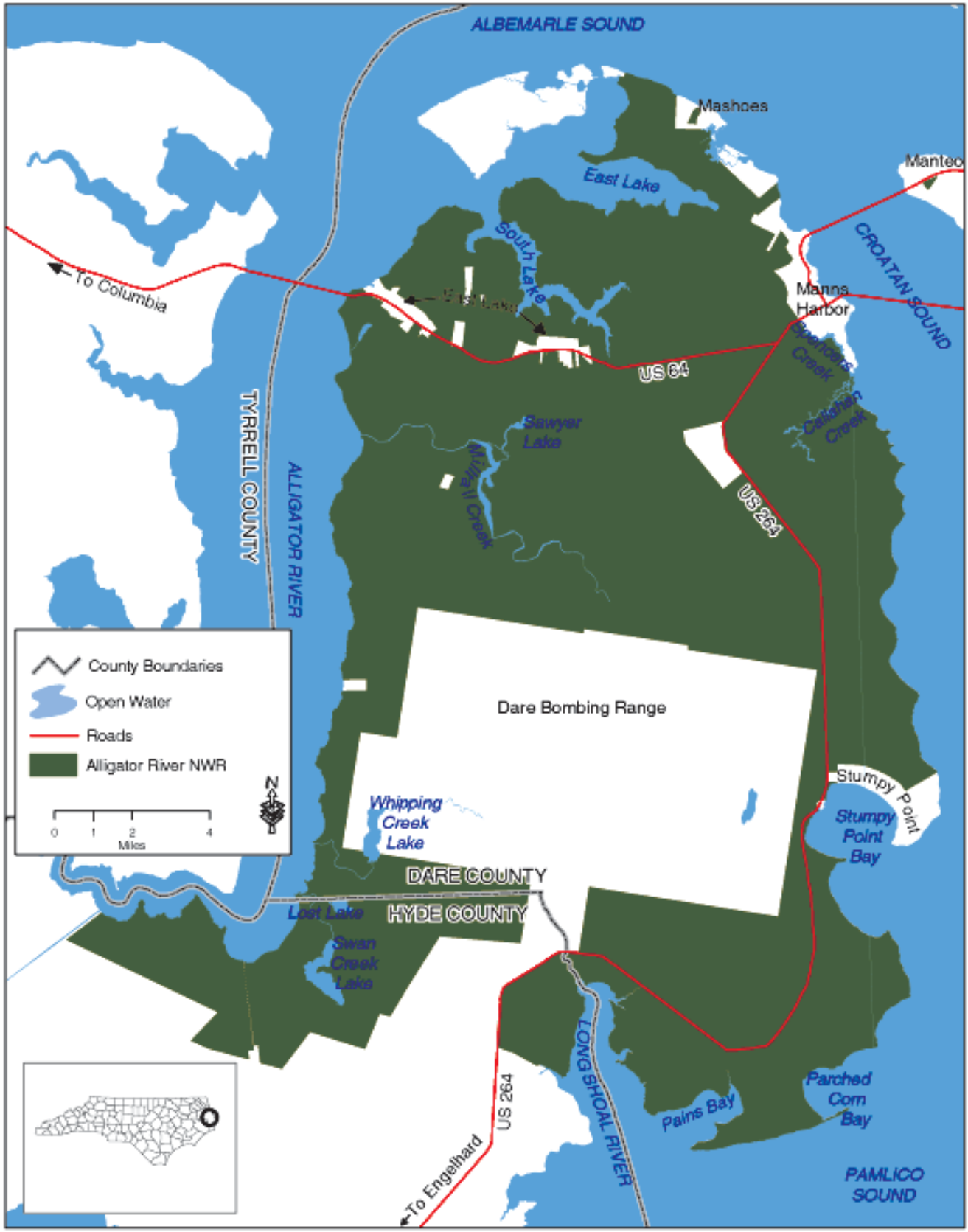
Today, the refuge surrounds the 46,000-acre Dare County Bombing Range, used by the Navy and Air Force for target practice with inert ordnance. The Air Force constructed the bombing range in 1965 on land leased from West Virginia Pulp and Paper Company and then First Colony Farms. In 1978, First Colony Farms transferred the land to the Air Force. Within the range, the North Carolina Wildlife Resources Commission manages 41,200 acres as a game land.

PURPOSES

The purpose of Alligator River National Wildlife Refuge is to protect and conserve migratory birds and other wildlife resources through the protection of wetlands, in accordance with the following:

> *...for the development, advancement, management, conservation, and protection of fish and wildlife resources...* 16 U.S.C. Sec 742f(a)4 (Fish and Wildlife Act of 1956).
>
> *...for the benefit of the United States Fish and Wildlife Service, in performing its activities and services...* 16 U.S.C. Sec. 742f(b)1 (Fish and Wildlife Act of 1956).

Figure 1. Location of Alligator River National Wildlife Refuge in Dare and Hyde Counties, North Carolina.



...suitable for (1) incidental take of fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species… 16 U.S.C., Sec. 460k-1 (Refuge Recreation Act of 1952).

*...the Secretary…may accept and use…real…property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors…*16 U.S.C., Sec. 460k-2; 16 U.S.C., Sec. 460k-460k-4 (Refuge Recreation Act of 1952).

*...conservation, management, and restoration of fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans 1*6 U.S.C., Sec. 668dd(a)(2) (National Wildlife Refuge System Administration Act of 1966).

*…for the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions…*16 U.S.C., Sec. 3901 (b) 100 Stat. 1583 (Emergency Wetland Resources Act of 1986).

SPECIAL DESIGNATIONS

The North Carolina Natural Heritage Program has designated most of the refuge, with the exception of cropland, moist soil areas, and the maintenance shop area, as a Significant Natural Heritage Area. The Nature Conservancy ranks certain vegetative communities as imperiled or rare (Table 1).

The North Carolina Division of Water Quality has designated several water bodies in the vicinity of Alligator River National Wildlife Refuge as outstanding resource waters or high quality waters (Table 4).

ECOSYSTEM CONTEXT

Alligator River National Wildlife Refuge lies within a physiographic area known as the South Atlantic Coastal Plain (Figure 2). The South Atlantic Coastal Plain was once a 25 million-hectare (62 million-acre) complex of forested wetlands and uplands, dunes, and marshes that extended from Florida to North Carolina. Historically, the extent and duration of seasonal flooding along the ecosystem's rivers has fluctuated annually, recharging the South Atlantic Coastal Plain's aquatic systems and creating a rich diversity of dynamic habitats that supported a vast array of fish and wildlife resources.

The refuge is one of the ten national wildlife refuges in eastern North Carolina. Those ten national wildlife refuges—Alligator River, Pea Island, Cedar Island, Currituck, Great Dismal Swamp, Mackay Island, Mattamuskeet, Roanoke River, Pocosin Lakes, and Swanquarter in North Carolina, and the Back Bay National Wildlife Refuge in Virginia—are all located in the watersheds of the Roanoke, Tar, Neuse, and Cape Fear Rivers. These four watersheds are designated as Ecosystem Unit # 34, the Roanoke–Tar–Neuse–Cape Fear Ecosystem, by the U.S. Fish and Wildlife Service.

Figure 2. Alligator River National Wildlife Refuge in the South Atlantic Coastal Plain Physiographic Area.

Table 1. The Nature Conservancy ranking of vegetative communities of Alligator River National Wildlife Refuge.

Vegetative Community	State Rank	Global Rank
Nonriverine Wet Hardwood Forest	S1	G1
Peatland Atlantic White Cedar Forest	S2	G2
Nonriverine Swamp Forest	S2, S3	G2, G3
Low Pocosin	S2	G3

S1 = Critically imperiled in North Carolina because of extreme rarity or otherwise very vulnerable to extirpation in the state.
S2 = Imperiled in North Carolina because of rarity or otherwise very vulnerable to extirpation in the state.
S3 = Rare or uncommon in North Carolina.
G1 = Critically imperiled globally because of extreme rarity or otherwise very vulnerable to extinction throughout its range.
G2 = Imperiled globally because of rarity or otherwise very vulnerable to extinction throughout its range.
G3 = Either very rare and local throughout its range, or found locally in a restricted area.

REGIONAL CONSERVATION PLANS AND INITIATIVES

Along with the Service's legal mandates and initiatives, other planning activities directly influence the development of the comprehensive conservation plan. Various groups and agencies develop and coordinate planning initiatives involving regional, state, and local agencies; local communities; nongovernmental organizations; and private citizens to help restore habitats for fish and wildlife on and off public lands.

The Service is initiating cooperative partnerships in an effort to reduce the declining trend in biological diversity. Biological planning for species groups targeted in this plan reflect the North American Waterfowl Management Plan, which includes the Atlantic Coast Joint Venture, the joint venture between the North Carolina Wildlife Resources Commission and the Fish and Wildlife Service, the Partners in Flight Plan, and the South Atlantic Migratory Bird Initiative.

The Atlantic Coast Joint Venture focuses its work on the middle and upper Atlantic coast. Within the Atlantic Coast Joint Venture is the joint venture formed between the North Carolina Wildlife Resources Commission, Fish and Wildlife Service, and private conservation organizations.

The South Atlantic Coastal Plain serves as a primary migration habitat for migratory land birds returning from Central and South America. It also provides wintering, breeding, and migration habitat for midcontinental wood duck and colonial bird populations. Restoration of migratory songbird populations is a high priority of the Partners in Flight Plan for the South Atlantic Physiographic Region.

The Partners in Flight Plan emphasizes land bird species as a priority for conservation. Habitat loss, population trends, and the vulnerability of species and habitats to threats are all factors used in the priority ranking of species. Further, biologists from local offices of the Service, the North Carolina Wildlife Resources Commission, and conservation organizations such as Audubon Society and The Nature Conservancy have identified focal species for each habitat type from which they will determine population and habitat objectives and conservation actions. This list of focal species, objectives, and conservation actions will aid migratory bird management on the refuge.

The Farm Bill programs administered by the U.S. Department of Agriculture each have state-level plans and priority ranking systems in which the Service has input. The Service also uses these programs to assist private landowners in the vicinity of national wildlife refuges to manage habitat for wildlife or protect their land with easements.

The North Carolina Wildlife Resources Commission has its own comprehensive wildlife conservation strategy, known as the North Carolina Wildlife Action Plan, to help direct the state's allocation of funds from the federally funded State Working Grants Program. The Service has provided input to the development and execution of the strategy. The plan addresses resident as well as migratory species.

ECOLOGICAL THREATS AND PROBLEMS

HABITAT LOSS AND FRAGMENTATION

The South Atlantic Coastal Plain has changed markedly over the last 100 years as civilization spread throughout the area. Scientists have estimated that land conversion has cleared 40 percent of the natural vegetation. The greatest changes to the landscape have been in the form of land clearing for urban development and agriculture (Hunter et al. 2001).

Although these changes have allowed people to settle and earn a living in the area, they have had a tremendous negative effect on the biological diversity, biological integrity, and environmental health of the South Atlantic Coastal Plain. The changes have reduced vast areas of forests, pocosins, marshes, and coastal dunes to fragments ranging in size from very small tracts of limited functional value to a few large areas that have maintained many of the original functions and values of forested habitat. Severe fragmentation has resulted in a substantial decline in biological diversity and integrity. Species endemic to the South Atlantic Coastal Plain that have become extinct, endangered, or threatened include the extinct Carolina parakeet and passenger pigeon; endangered red wolf and red-cockaded woodpecker; and threatened bald eagle, piping plover, and sea turtle. The Bachman's sparrow, black rail, and Rafinesque's big-eared bat are federal species of concern. Table 2 provides a complete list of the threatened and endangered animals in North Carolina.

Breeding bird surveys show continuing declines in species and species populations. The avian species most adversely affected by fragmentation include those that are area-sensitive (dependent on large continuous blocks of hardwood forest); those that depend on forest interiors; those that depend on special habitat requirements such as mature forests or a particular food source; and those that depend on good water quality. Habitat loss has also affected species dependent on coastal marshes, exposed sandy areas on beaches and sandbars, and dune ecosystems.

More than 300 species of breeding migratory land birds occupy the region. Some of the inland species, including the Swainson's warbler, prothonotary warbler, swallow-tailed kite, wood thrush, and cerulean warbler, have declined substantially and need the benefits of large forested blocks to recover and sustain their existence. On the Lower Coastal Plain, land birds such as the seaside sparrow, saltmarsh sharp-tailed sparrow, and Nelson's sharp-tailed sparrow depend on declining marsh habitat. Secretive marshbirds like the black rail and yellow rail require brackish marsh. The piping plover, red knot, least tern, black skimmer, and American oystercatcher are shorebirds that nest on the decreasing acreage of unvegetated sand along beaches and among coastal dunes.

Fragmentation of bottomland hardwood forests in the interior areas of the coastal plain has left many of the remaining forested tracts surrounded by agricultural lands. Intensive agriculture has removed most of the forested corridors along sloughs that formerly connected the forest patches. The loss of connectivity between the remaining forested tracts hinders the movement of wildlife between tracts and reduces the functional values of many remaining smaller forest tracts. The lost connections also result in a loss of gene flow. Restoring the connections to allow gene flow and reestablish travel corridors is particularly important for some wide-ranging species such as the black bear.

Habitat loss on the Lower Coastal Plain is more permanent than in the interior. Conversion of marshes for commercial development is irreversible. Conversion of pocosins and nonriverine hardwood forests for agriculture results in the oxidation of organic soils on which those plant communities evolved.

ALTERATIONS TO HYDROLOGY

In addition to the loss of vast acreages of wetlands, substantial alterations have occurred in the hydrology of the South Atlantic Coastal Plain. The changes are a result of channel dredging for navigation and access to the marshes; drainage ditches; degradation of aquatic systems from excessive sedimentation, contaminants, and urban development; managed stream flows from flood control and hydroelectric power generation reservoirs; river channel modifications; flood control levees; and deforestation.

The region's natural hydrology is directly responsible for the connectedness of wetlands and indirectly responsible for the complexity and diversity of habitats through its effects on topography and soils. Natural resource managers recognize the importance of dynamic hydrology to wetlands and waterfowl-habitat relationships (Fredrickson and Heitmeyer 1988).

Instead of natural hydrology, large-scale, man-made hydrological alterations have changed the spatial and temporal patterns of flooding throughout the entire South Atlantic Coastal Plain. In addition, these alterations have modified both the extent and duration of annual seasonal as well as daily flooding. The alteration of the annual flooding regime has had a tremendous effect on the interior forested wetlands and their associated wetland-dependent species. Changes in daily flooding regimes by drainage ditches and closing inlets through coastal barrier islands accelerates erosion on ditch banks and throughout marshes and decreases the exposure of intertidal areas that would be available with normal lunar tidal cycles. According to Mitsch and Gosselink (1993), restoration of wetland functions is especially difficult because wetlands depend on a dynamic interface of hydrologic regimes to maintain water, vegetation, and animal complexes and processes.

The dredging of navigation channels also generates a spoil material that must be disposed. The material is not always compatible for placement on the closest potential site, such as beaches where the material must be a suitable substrate for invertebrate populations and shorebird and turtle nesting.

SILTATION OF AQUATIC ECOSYSTEMS

Deforestation and hydrologic alteration have degraded aquatic systems, including lakes, rivers, sloughs and bayous. Clearing of bottomland hardwood forests has led to an accelerated accumulation of sediments and contaminants in aquatic systems. Sediment now fills many water bodies, greatly reducing their surface area and depth. Concurrently, the non-point source runoff of excess nutrients and contaminants is threatening the area's remaining aquatic resources. The Service lists six species of aquatic organisms as threatened and twelve species as endangered in North Carolina (Table 2).

Table 2. Threatened and endangered animal species of the Coastal Plain of North Carolina.

Status	Common Name	Scientific Name
Endangered	Manatee, West Indian**	*Trichechus manatus*
Endangered	Sea Turtle, Hawksbill**	*Eretmochelys imbricata*
Endangered	Sea Turtle, Kemp's Ridley**	*Lepidochelys kempii*
Endangered	Sea Turtle, Leatherback**	*Dermochelys coriacea*
Endangered	Stork, Wood	*Mycteria americana*
Endangered	Sturgeon, Shortnose	*Acipenser brevirostrum*
Endangered	Tern, Roseate**	*Sterna dougallii*
Endangered	Whale, Finback	*Balaenoptera physalus*
Endangered	Whale, Humpback	*Megaptera novaeangliae*
Endangered	Whale, Right	*Balaena glacialis*
Endangered	Whale, Sea	*Balaenoptera borealis*
Endangered	Whale, Sperm	*Physeter catodon*
Endangered	Wolf, Red*	*Canis rufus*
Endangered	Woodpecker, Red-cockaded*	*Picoides borealis*
Threatened***	Alligator, American*	*Alligator mississippiensis*
Threatened	Eagle, Bald*	*Haliaeetus leucocephalus*
Threatened	Plover, Piping**	*Charadrius melodus*
Threatened	Sea Turtle, Green	*Chelonia mydas*
Threatened	Sea Turtle, Loggerhead**	*Caretta caretta*
Threatened	Silverside, Waccamaw	*Menidia extensa*

** Presence documented on Alligator River National Wildlife Refuge*
*** Other species listed in Dare County, North Carolina*
**** Listed by Similarity of Appearance*

Hydrologic alterations have basically eliminated the geomorphologic processes that created sandbars, oxbow lakes, sloughs, and river meander scars. Consequently, the protection, conservation, and restoration of aquatic resources are of added importance in light of the alterations associated with navigation and flood control.

PROLIFERATION OF INVASIVE AQUATIC PLANTS

Compounding the problems faced by aquatic systems is the growing threat from invasive aquatic vegetation. Static water levels caused by the lack of annual flooding and reduced water depths resulting from excessive sedimentation have created conditions favorable for the establishment and proliferation of several species of invasive aquatic plants. Additionally, the introduction of exotic (nonnative) vegetation capable of aggressive growth is further threatening the viability of aquatic systems. These invasive aquatic plants threaten the natural aquatic vegetation important to aquatic systems, and choke waterways to a degree that often prevents recreational use. Common reed (*Phragmites australis*) is the most dominant of these plants on the Outer Banks and the refuge, and has a negative impact on the marshes in the area.

CONSERVATION PRIORITIES

The declines in the area of the South Atlantic Coastal Plain's bottomland hardwood forests and their associated fish and wildlife resources have prompted the Service to designate this forest type as an area of special concern. These areas are of particular concern as habitat for neotropical migratory land birds that only breed in the interior of large forested areas. They also provide habitat for fish-eating raptors that require forested habitat close to water. The forests protect the aquatic habitat for interjurisdictional fish and other aquatic organisms. Much of the development has been for crop production and these areas have potential for restoration, as crop prices do not justify the maintenance of intensive drainage systems required to maintain production. Many government habitat restoration programs focus on bottomland forests.

In the Lower Coastal Plain, the loss of marshes, pocosins, and nonriverine hardwood forest habitat has not been as great in acreage or percentage of habitat lost, but there was originally much less of these habitat types. Although wetland protection legislation regulates development in marshes, the public desires to live and recreate in these areas and developers continue to destroy these areas. Pocosins and nonriverine hardwood forests have been logged, cleared, and drained for crop production. The fish and wildlife species associated with these habitats are in much greater jeopardy than those associated with bottomland hardwood forests. The potential for restoring these habitats is lower than it is for bottomland forests, since the habitat loss is due to the conversion of land to residential, commercial, and agricultural developments. Conservationists must mitigate habitat loss by intensive management of the habitat that remains with prescribed fire and water management.

A collaborative effort involving private, state, and federal conservation partners is now underway to implement a variety of tools to restore the functions and values of wetlands in the South Atlantic Coastal Plain. The goal is to prioritize and manage wetlands to most effectively maintain and possibly restore the biological diversity in the South Atlantic Coastal Plain. Through cooperative efforts, apportioning resources, and the focusing of available programs, conservationists can improve the South Atlantic Coastal Plain's biological diversity.

Conservationists have initiated several coordinated efforts to set priorities and establish focus areas to overcome the impacts of hydrologic changes and forest fragmentation. Conservation organizations and agencies established a cooperative private-state-federal partnership, known as the North American Waterfowl Management Plan, Atlantic Coast Joint Venture in 1988 to help provide sufficient wintering waterfowl habitat throughout the Atlantic Coastal Plain.

The initial Atlantic Coast Joint Venture effort for waterfowl has expanded to also establish breeding bird objectives for shorebirds and neotropical migratory birds. Partners in Flight has developed bird conservation plans to focus a number of private, state, and federal restoration programs into specific areas in an effort to provide maximum program benefits for neotropical migratory birds.

One of the biggest challenges to the management and restoration efforts underway in the South Atlantic Coastal Plain, and one that affects refuges in particular, is the need to meet long-term management objectives that address comprehensive ecosystem needs. These needs include those of wintering migratory waterfowl, neotropical migratory birds, shorebirds, large mammals, and other wide-ranging species. Often, management for one species or species group conflicts with the management objectives for another species or species group. The tendency is to pursue short-term priorities that frequently change as scientific knowledge expands and interests in special resources shift. Biologists must exercise caution to prevent the start-up of management and restoration actions that are difficult to reverse and fail to meet the long-term, comprehensive management needs of the ecosystem or a specific area within the ecosystem. An example might be a tendency to totally manage Alligator River National Wildlife Refuge in an effort to provide habitat for many species of waterfowl that require a managed herbaceous wetland. Such an approach may overlook the critical habitat needs of neotropical migratory land birds that prefer a shrubby habitat.

Active management of wetlands, moist soil areas, and croplands on both public and private land is necessary to meet the habitat goals of the Atlantic Coast Joint Venture (Reinecke and Baxter 1996). The management (i.e., vegetation manipulation and hydrology restoration) compensates for the spatial and temporal habitat changes that deforestation and hydrologic alterations have caused throughout the South Atlantic Coastal Plain. Appropriately managed, Alligator River National Wildlife Refuge will make a substantial contribution to meeting the objectives of the Atlantic Coast Joint Venture. Setting habitat and species objectives from the perspective of the South Atlantic Coastal Plain is advantageous because it looks at the big picture and enables managers to plan and provide habitat for a diversity of species throughout their range.

CHALLENGES

In order for Alligator River National Wildlife Refuge to meet its multiple objectives of national, regional, and local scope—ranging from moist soil unit and marsh management to providing for public use—the U.S. Fish and Wildlife Service must fund and staff it above current levels. Securing adequate funding and personnel and then successfully addressing historical habitat alterations and hydrological functions are the refuge's biggest challenges. In the interim, as the needed funding and personnel become available, the refuge must concentrate on its highest priorities without committing irreversible actions that would preclude future implementation of the desired management programs.

PHYSICAL RESOURCES

The habitat at Alligator River National Wildlife Refuge has resulted largely from wetland community development following the Wisconsin Ice Age about 15,000 years ago. The lower sea level during this time period resulted in large, fast-flowing river systems cutting through the coastal plain terrace. As ice caps began melting, the sea level rose; and it is believed that the river flows slowed, depositing organic

and silt sediments in the areas between streams. As the shallow water areas developed, aquatic vegetation invaded, thereby increasing organic deposition. With a warming trend at the end of the Ice Age, boreal forests began to be gradually replaced with swamps, bogs, marshes, and pocosin habitats. Logging and land clearing activities over the last 300 years have greatly altered all habitat types.

CLIMATE

Because the flow of air over North Carolina is predominantly from west to east, the continental influence is much greater than the ocean or marine influence. Therefore, the refuge experiences a fairly large variation in temperature from winter to summer.

The Gulf Stream current flows only a short distance off the North Carolina coast. One might think this "river" of warm water would have a profound effect on the climate, which is true to a degree. Temperatures on the coast are typically warmer in winter months and cooler during summer months than mainland Dare County due to the temperature of the surrounding waters.

Lows sometimes reform along the coast as "Cape Hatteras lows" and then move north along the coast. Winter's low-pressure storms are usually more intense because of the large north-to-south contrasts. Winter storms bring prolonged periods of steady rain and are responsible for most of the winter precipitation. The forms of precipitation in spring begin to change from these steady rains to occasional thunderstorms. The Gulf of Mexico's warm, moist air produces warm, humid weather throughout the summer. Rainfall comes from occasional thunderstorms. Autumn, North Carolina's driest season, is to many people the most pleasant with its many clear, warm days and cool nights with little rain. This weather usually lasts until November. The winter is cool and has brief occasional cold spells. Snowfall is not common.

The average annual precipitation is 56.99 inches. Rainfall is evenly distributed throughout the year: the average monthly rainfall ranges from 3.43 inches in April to 5.98 inches in August. The average seasonal snowfall is about 1.9 inches. The record snowfall was 8.2 inches at Hatteras in December 1989. Twelve inches of snow fell on the Outer Banks on January 23, 2003. Twenty-five inches is the record at Elizabeth City, North Carolina.

Of the total annual precipitation, about 27 inches usually falls in May through September. The growing season for most crops falls within this period. Thunderstorms occur on about 43 days each year. Every few years, a hurricane or tropical storm crosses the county, bringing one to three days of intensive rainfall.

The average relative humidity in midafternoon is about 65 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines on 55 percent of the winter days. The prevailing wind is from the southwest. Average wind speed is highest, 13 miles per hour, in spring.

The average daily maximum temperature at the Cape Hatteras weather station from 1971–2000 was 69.9 degrees Fahrenheit, and the average daily minimum is 55.6 degrees.

In January the average temperature is 46.1 degrees, the average daily maximum is 53.6 degrees, and the average daily minimum is 38.63 degrees. The lowest temperature on record, which occurred at Cape Hatteras on January 21, 1985, is 6 degrees. In July the average temperature is 79.2 degrees, the average daily maximum is 85.4 degrees, and the average daily minimum is 72.9 degrees. The highest recorded temperature, which occurred on July 10, 1992, is 96 degrees. The average last freezing temperature in spring is March 16. The average first freezing temperature in the fall is December 7. The average growing season is 265 days.

GEOLOGY AND TOPOGRAPHY

Alligator River National Wildlife Refuge is the product of wetland community development following the Wisconsin Ice Age 15,000 years ago. Prior to this Ice Age, the level of the Atlantic Ocean in the Southeast was higher than it is presently. During the Wisconsin Ice Age, the sea level dropped to its current level and exposed large areas of the continental shelf. As a result, fast-flowing rivers cut through the coastal plain terrace to the Atlantic Ocean. During the next several thousand years, as the ice receded, the sea levels gradually rose. During this period, it is believed the river flows were slowed and organic sediment loads were deposited in the interstream areas as flowing systems shifted to slow-moving streams (Daniel 1981). Aquatic plants began to grow in these shallow bodies of water, adding to the accumulation of sediment and aquatic debris. Simultaneous with this buildup of organic sediments, a climatic warming trend accompanied the end of the Ice Age (Whitehead 1972). This warming trend helped to eliminate the cooler climate boreal forests and replace them with swamps, bogs, marshes, and pocosin habitats.

The refuge lies in the Pamlico Terrace, an extensive, low, flat plain lying east of the Suffolk Scarp, a prehistoric Atlantic Ocean shoreline. The terrace slopes from 10 to 16 foot elevations at the base of the scarp gently eastward to 1 to 2 feet at the end of the land peninsulas. The Suffolk Scarp separates the Pamlico Terrace of the main estuarine region from the higher Inland Coastal Plain around the westernmost segment of the Albemarle Sound system.

Streams in this area have relatively small sediment loading. Suspended sediments are mixed with organic sediments from swamp forests and marshes. This mixture of sediments produces the dominant bottom sediment of the area's sounds. This sediment contains up to 15% organic matter (Griese et al. 1979) and is deposited within the standing waters of the estuaries.

Brown to black, organic-rich muds predominate in the surrounding sounds, but grade laterally into a thin apron of fine sand in the shallow waters around the perimeter of the estuaries. The sand apron usually occurs landward of the main break in the bottom slope at a depth of about 3 feet, and extends to the shoreline. The sediments in front of the marshes generally have little sand. They are characterized by high organic contents and contain peat blocks, logs, and stumps (Copeland et al. 1982).

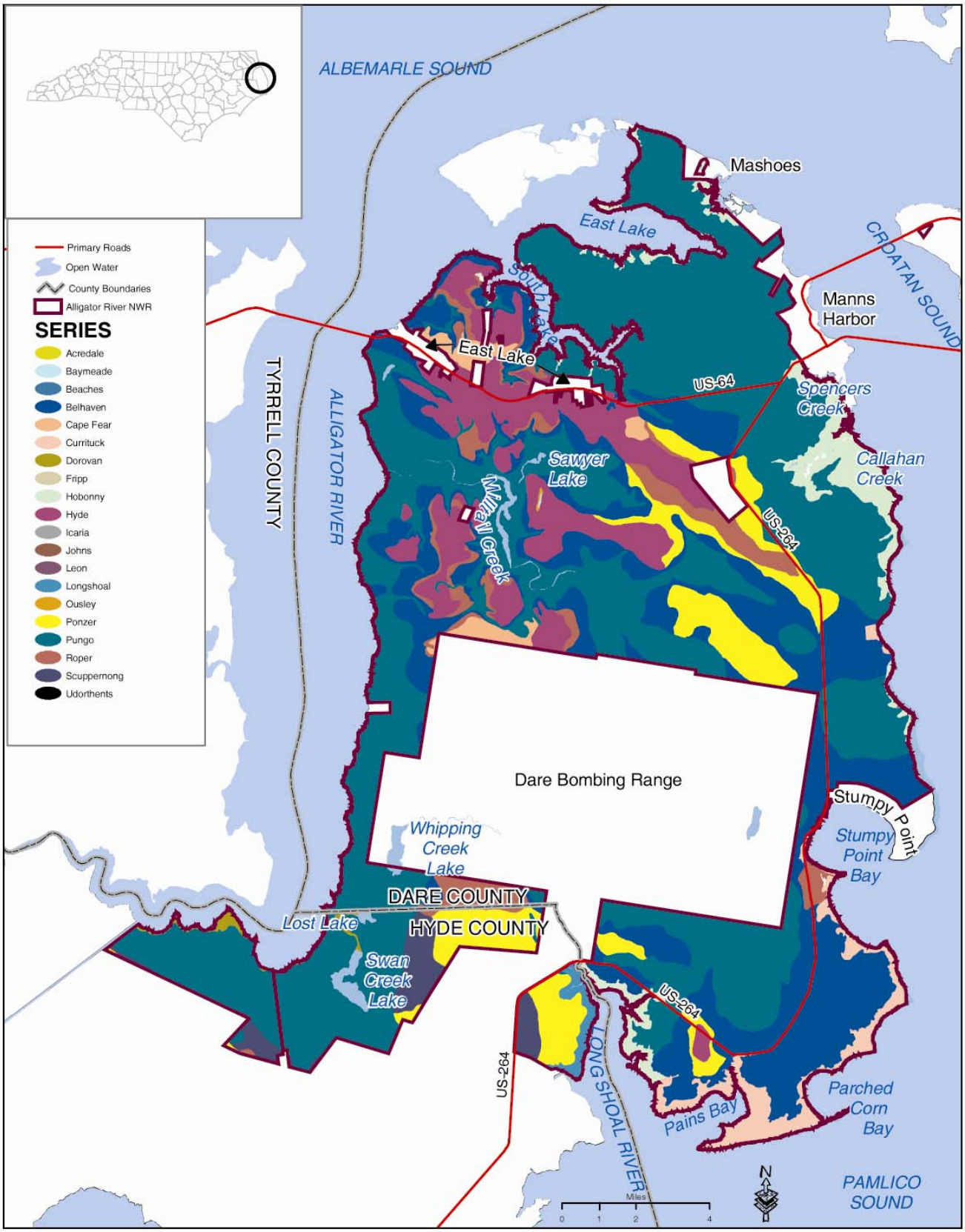
MINERALS

Sand is the only mineral resource occurring in economic quantities. There are several sand pits in the vicinity of the refuge.

SOILS

The soil types identified on the refuge are Pungo muck*, Belhaven muck*, Scuppernong muck*, Ponzer muck*, Dorovan muck*, Hobonny muck*, Pettigrew muck*, Longshoal muck*, Currituck mucky peat*, Hyde loam*, Cape Fear loam*, Udorthents (sands), Acredale fine sand*, Ousley fine sand, and Baymeade fine sand (USDA Soil Conservation Service 1992) (Table 3). Soils with an asterisk are listed as hydric in *Hydric Soils of the United States* (USDA Soil Conservation Service 1985) (Figure 3). Hydric soils are "…soils that in their undrained condition are saturated, flooded or ponded long enough during the growing season to develop anaerobic conditions that favor the growth and regeneration of hydrophytic (water-loving) vegetation" (USDA Soil Conservation Service 1985). These soils have seasonally high water tables within a foot of the surface of the soil.

Figure 3. Soils of the Alligator River National Wildlife Refuge.



Pocosin wetlands are characterized by deep organic soils known as mucks or peats. The depth of organic soil depth over mineral soil, though not evident at the surface, has a tremendous influence on the potential uses of the land. Typically, the deeper the muck surface layer, the shorter the vegetation in the native plant community growing on the soil. The dominant species in the plant communities are dense shrubs tolerant of the wet, acidic soils. Tall trees are unable to establish their deep root systems on the deep organic soils. Wind easily topples trees that do grow on the deep organic soils. Over the years, evolution has selected trees that are shorter. Formation of peat is an ongoing process in areas sufficiently wet to prevent oxidation of organic matter deposited by plants.

Soils with more than 51 inches of muck over mineral soil identified in the refuge are Pungo (62,068 acres, 41% of the land); Hobonny (5,473 acres, 3.6%); Dorovan (561 acres, 0.3%); and Longshoal (766 acres, 0.5%). The following soils have surface layers of 16 to 51 inches of muck: Belhaven (48,135 acres, 31.6%); Currituck (3,845 acres, 2.5%); Scuppernong (2,748 acres, 1.8%); and Ponzer (7,065 acres, 4.6%). These eight soils make up 86% of the total land area of the refuge. They are excessively wet, characterized by layers of peat over mineral soil, and are mostly unsuitable for agriculture (Skaggs et al. 1980; Lilly 1981). Forest productivity is lower on these soils, compared to mineral soils with less than 16 inches of organic soil. With appropriate drainage and bedding, productivity can be increased. However, the refuge would not likely engage extensively in such practices on these deep organic soils, owing to the accelerated oxidation of peat and release of nitrogen and mercury—a negative impact on water quality.

Roper soil (5,487 acres, 3.6%) has less than 16 inches of muck over mineral soil. The native vegetation on these soils is typical of that on mineral soils and the productivity of the soils is similar to mineral soils. When drained, these soils are among the most productive agricultural soils in the area. The Natural Resources Conservation Service classifies Roper and Ponzer as prime farmland soils.

Mineral soils make up 14,895 acres (9.7%) of the land area of the refuge. The soil with the largest area is Hyde (13,132 acres mostly in the north-central part of the refuge, 8.6% of land area), followed by Cape Fear (1,661); Udorthents (58); Ousley (19); Acredale (17); and Baymeade (8). Most mineral soils are more productive than organic soils for crops as well as forest trees. Most soils on the refuge are poorly drained and would grow loblolly pine, baldcypress, Atlantic white cedar, or pond pine, and those underlain by clayey subsoil would be good for bottomland hardwoods such as water oak, willow oak, and swamp white oak. The Natural Resources Conservation Service classifies Hyde, Cape Fear, and Baymeade as prime farmland soils.

The Udorthents and the Baymeade and Ousley soils are well drained to droughty and are more suitable for native tree species such as longleaf pine, loblolly pine, and upland oak species such as white oak and red oak. Udorthents are the dredge spoils from the Intracoastal Waterway and are extremely droughty. The volume of peat on the Albemarle peninsula is probably less than half the original amount owing to the effects of drainage, agriculture, and fire (Lilly 1995). There are descriptions of subsidence greater or equal to 3 feet as a consequence of drainage and agriculture (Ruffin 1861; Dolman and Buol 1967; Lilly 1981; Roberts and Cruikshank 1941; Whitehead and Oaks 1979). In general, drainage of organic soils results in the loss of at least one-third of the peat (Farnham and Finney 1965), and sometime much greater (Dolman and Buol 1967; Lilly 1981). Some of the initial loss in volume is due to mechanical shrinkage (Dolman and Buol 1967; Skaggs et al. 1980). In addition, drainage makes pocosins drier, increasing the frequency and severity of fires. Last, drainage causes peat to oxidize rather than accumulate. If subjected to drainage, fire, and tillage over a long enough period of time, all blackland soils will become mineral soils (Lilly 1981).

Table 3. Characteristics of soils of Alligator River National Wildlife Refuge.

Series	Approximate Acreage	Surface Texture	Muck Depth	Water Table Depth	Flooding Frequency
Dorovan	584.8	Muck	90”	0-1’	Frequent
Hobonny	5,761.4	Muck	90”	0-1’	Frequent
Longshoal	823.2	Mucky Peat	72”	0-0.5’	Frequent
Pungo	73,358.1	Muck	65”	0-1’	Rare
Belhaven	31,837.0	Muck	45”	0-1’	Rare
Currituck	3,979.8	Mucky Peat	40”	0-1’	Frequent
Scuppernong	2,784.3	Muck	33”	0-1’	Rare
Ponzer	10,741.0	Muck	30”	0-1’	Rare
Roper	5,715.1	Muck	10”	0-1’	Rare
Hyde	13,425.8	Loam	None	0-1’	Rare
Cape Fear	1,641.2	Loam	None	0-1’	Rare
Udorthents	10.8	Sand	None	>6’	Rare
Acredale	17.0	Silt Loamy	None	0-1’	Rare
Ousley	19.9	Fine Sand	None	1.5-3’	Common
Baymeade	8.4	Fine Sand	None	4-5’	Very Rare
Beaches	0.4	Fine Sand	None	0-1’	Storm Tidal
Fripp	0.4	Fine Sand	None	>6’	Very Rare
Icaria	1.5	Loamy Fine Sand	None	0-1’	Rare
Johns	0.2	Loamy Sand	None	1.5-3’	Very Rare
Leon	0.3	Fine Sand	None	0-1’	Rare
Total Land	150,710.7				
Water	2,306.7				
Total	**153,017.4**				

HYDROLOGY

Groundwater provides the freshwater resources for the area. Studies have shown that the groundwater reservoir consists of two types of aquifers: a water table aquifer that extends from the land surface to the first confining beds of silt and clay, and a confined or semi-confined aquifer beneath and between the silt and clay beds. The water table aquifer ranges in thickness from 10 to 50 feet and averages 15 feet. The water table itself averages three feet above mean sea level.

Maintenance of the fresh groundwater depends on the amount of rainfall. Due to the sandy nature of the soils, rainfall enters the water table aquifer with little or no surface runoff. However, when the ground becomes saturated during periods of intensive rainfall, some runoff occurs in roadside ditches and small intermittent freshwater ponds.

The deeper confined aquifers are as much as 30 feet thick and are below the first confining beds whose thickness ranges from 5 to 20 feet. Exact thicknesses are difficult to determine due to the gradational nature of sediments below the water table aquifer.

The fresh groundwater is best described as a lens-shaped mass floating on top of denser saltwater. The amount of freshwater in this lens varies depending on the amount of recharge and discharge. Between the freshwater and saltwater a zone of brackish water occurs. This zone periodically changes due to flooding, tidal movement, and rainfall.

WATER QUALITY

There are three National Pollution Discharge Elimination System permitted sites that discharge into waters adjacent to the refuge. One is a marine maintenance facility and two are domestic water supply treatment plants.

The state's list of impaired waters includes Roanoke Sound, Croatan Sound, and Pamlico Sound due to fecal coliform. Technical conditions do not exist to develop total maximum daily loads for the water bodies. Total maximum daily loads are required for Spencer Creek, Callaghan Creek, and Stumpy Point Bay, which are also impaired due to fecal coliform.

The state has classified the water bodies and streams according to their water quality and the uses that quality supports. The classifications for the waters surrounding the Alligator River National Wildlife Refuge are listed in Table 4. It should be noted that all comments and evaluations about water quality refer to human health and development potential. Ecologically speaking, the water quality on the refuge is okay.

AIR QUALITY

The area closest to the refuge that an environmental agency monitors is the Virginia Beach-Norfolk, Virginia, metropolitan area. The Environmental Protection Agency monitors carbon monoxide, nitrogen dioxide, ozone, sulfur dioxide and particulates in Norfolk, Virginia Beach, Hampton, Newport News, Suffolk, and Chesapeake. Despite the large population with the industry, traffic, and power plants, the area has exceeded only ozone level standards in 2002. Monitoring has indicated unhealthy levels only twice and unhealthy levels for sensitive groups only thirteen times. The air quality is due to the breezes blowing through the area from the ocean.

Prescribed burning on the refuge has the potential to have an impact on air quality. The State of North Carolina specifies that prescribed fires purposely set to marshes for marsh management practices acceptable to the North Carolina Division of Forestry and the Environmental Management Commission are permissible if not prohibited by ordinances and regulations of governmental entities having jurisdiction. The regulation also includes a disclaimer that addresses certain potential liabilities of burning even though permissible.

Table 4. Classifications of water bodies around the Alligator River National Wildlife Refuge.

Water Body or Stream	Classification	Best Uses
Swan Creek Swan Creek Lake Whipping Creek Whipping Creek Lake Sandy Ridge Gut Sawyer Lake	C– Low Quality Freshwater* Sw – Low Velocity Water ORW – Outstanding Resource Water	Secondary Recreation (Not Swimming)
Billy's Ditch	C– Low Quality Freshwater* Sw – Low Velocity Water	Secondary Recreation (Not Swimming)
Pamlico Sound Croatan Sound Spencer Creek Callaghan Creek Stumpy Point Bay Back Lake Long Shoal River Deep Creek Muddy Creek Clark Creek Pains Bay Parched Corn Bay Sandy Bay	SA – Highest Quality Saltwater HQW – High Quality Water	Commercial Shellfishing and All Other Tidal Saltwater Uses
Albemarle Sound	SB – Moderate Quality Saltwater	Primary Recreation (Including Swimming)
Alligator River Milltail Creek Boat Bay	SC– Low Quality Saltwater* Sw – Low Velocity Water ORW – Outstanding Resource Water	Secondary Recreation (Not Swimming)
East Lake The Frying Pan South Lake Northeast Prong of East Lake Liehue Gut Hooker Gut Deer Creek Deep Bay Broad Creek	SC– Low Quality Saltwater* Sw – Low Velocity Water	Secondary Recreation (Not Swimming)
Tom Mann Creek Gar Gut Davis Pond Spence Creek Poster Gut	SC– Low Quality Saltwater*	Secondary Recreation (Not Swimming)

* These evaluations describe water quality for human consumption and development potential.

VISUAL RESOURCES

Alligator River National Wildlife Refuge offers a great variety of habitats and wildlife species; however, some effort on the part of the observer is often required in order to see and appreciate the offerings. In 2004, Sawyer Lake Road was opened for year-round access to facilitate wildlife and habitat viewing in the south Twiford Farming Unit area. There certainly exists a grand opportunity for visitors to see and experience habitats and wildlife not available in other places, but the "seeing and experiences" are not necessarily easy to do. From the shorelines of Pamlico, Albemarle, and Croatan sounds and the Alligator River, visitors can watch sunrises, sunsets, forest silhouettes, and other scenic vistas. One of the most popular and first sights seen by refuge visitors is the view from the top of the bridge over the Alligator River. For many, this is the first introduction to pocosin habitat.

Numerous trails and roadways, some with interpretive signage; many fishing areas; and opportunities for canoeing and kayaking into dense and unique habitats all make this largely wild refuge a popular spot. The Buffalo City area of the refuge, once a company town, offers historical and biological interpretive opportunities. The Wildlife Drive, beginning at the Creef Cut Trailhead, offers scenic vistas of wildlife management areas and good, close-up examples of the unique "pocosin." Sawyer Lake Road also provides wildlife viewing opportunities.

U.S. Highway 64, as it passes through Alligator River National Wildlife Refuge, is designated a North Carolina Scenic Byway and motorists in the area frequently hope to spot black bear and the far more elusive American alligator, red-cockaded woodpecker, and red wolf. The Charles Kuralt Trail also highlights the refuge.

BIOLOGICAL RESOURCES

HABITAT

Human development activities have affected the refuge's plant communities over time. Some of these activities occurred before the Service established the refuge, and some have occurred since. Most notable today are the road/canal systems, public highways, farmland, and the refuge maintenance/ support facilities. However, the refuge's vast expanse of undisturbed swamp forest and wetlands contain many important wildlife and ecological resources. Because clear-cutting, peat mining, and agricultural conversion have developed much of the Pamlico peninsula, this area remains one of the most remote and diverse swamps in eastern North Carolina. The refuge's principal natural communities include broad expanses of nonriverine swamp forests, pocosins, and freshwater and salt marshes. Its isolation and undisturbed quality add to the value of its rich wildlife habitats. The Alligator River area is part of the northern border of the American alligator's range and remains as a stronghold for the black bear in North Carolina and the mid-Atlantic coast. The refuge also provides habitat for the endangered red-cockaded woodpecker, and bald eagles, and is the site for reintroduction of the red wolf. More recently, prescribed fire has altered plant communities and successional stages on part of the refuge. The plant community descriptions in this document are not intended as complete species lists.

There are twelve habitat types/land uses found on the refuge (Figure 4 and Table 5). Except for the cropland, these cover types, for the most part, are classified as wetlands based upon vegetation, degree of soil saturation, and hydroperiod. All cropland is classified as prior converted wetland.

Figure 4. Vegetative habitat types of the Alligator River National Wildlife Refuge.

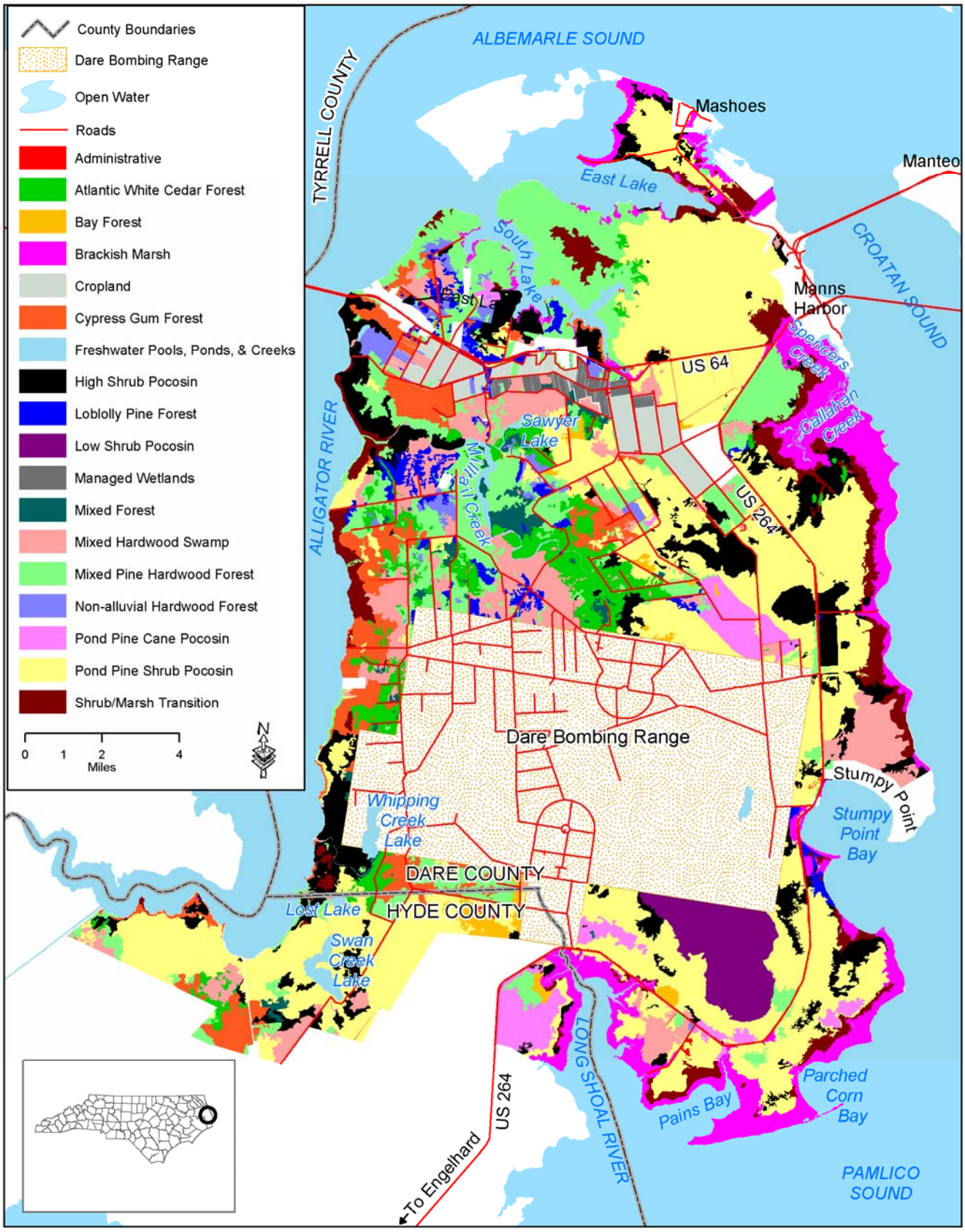


Table 5. Acreage by habitat or land use under fee title ownership at Alligator River National Wildlife Refuge.

Habitat Type	Approximate Acreages
Pond Pine/Shrub Pocosin	50,012.5
Pond Pine/Cane Pocosin	4,260.5
Brackish Marsh	11,889.1
Low Shrub Pocosin	4194.5
Non-Alluvial Hardwood Forest	1,800.0
Mixed Pine/Hardwood Forest*	21,377.4
Atlantic White Cedar Forest	6,700.3
High Shrub Pocosin	14,127.4
Cropland	3,468.5
Managed Wetlands	1,001.2
Cypress-Gum Forest	7,488.0
Freshwater Pools, Ponds, & Creeks	2306.7
Administrative	1,580.5
Bay Forest	1,345.2
Shrub/Marsh Transition	6,960.0
Mixed Hardwood Swamp**	11,503.8
Loblolly Pine Forest	3,001.5
Total Acres	**153,017.4**

* Includes Mixed Forest.
** Cypress nor Black Gum a component of this habitat type.

Freshwater Lakes, Ponds, and Pools

Except for vernal pools, this “open water” habitat type is found in association with the peninsular drainage areas. These areas are Spencer Creek, Callaghan Creek, Long Shoal River, Milltail Creek, Whipping Creek, and Swan Creek. Milltail Creek Lake, Whipping Creek Lake, and Swan Creek Lake are enlarged portions of the creek channels. Laurel Bay Lake drains into Alligator River, Sawyer Lake drains into Milltail Creek, and Lost Lake drains into Swan Creek. Tidal streams such as Peter Mashoes Creek flowing into the Albemarle Sound and Deep Creek flowing into the Pamlico Sound are not typical of the other refuge drainage systems. East Lake and South Lake are estuarine bays off of Albemarle Sound. Numerous man-made canals also dissect the refuge.

These aquatic systems can be best described as low-energy, sluggish systems with flows largely dependent upon wind tides in surrounding water bodies. Stream and lake systems are relatively deep (4–20 feet) and have vertical banks that are sometimes hollow underneath. There is a profound absence of shallow water within these systems. The bottom substrate consists of a liquefied organic muck varying from 2 to 4 feet deep. Water quality is usually poor, with low dissolved oxygen and a pH ranging from 3.5 to 5.5. The water is darkly stained due to tannins from organic soils and vegetation with low turbidity.

Brackish Marsh

The Brackish Marsh community is found along the margins of sounds and estuaries in areas not subjected to regular flooding by salt water. Often referred to as "high marsh," this community is subjected to irregular flooding mostly from wind tides along the Outer Banks. Salinity in the brackish marsh is generally low due to distance from a saltwater source and freshwater inflow, but can be mid-range for brief periods. If a brackish marsh occurs in an area subjected to regular flooding with low salinity water, mineral deposition can result in mud flats. Vegetation in the brackish marsh community is strongly dominated by black needlerush (*Juncus roemerianus*), but patches of saltmeadow grass (*Spartina patens*) and salt grass (*Distichlis spicata*) can be found. In some areas patches of giant cordgrass (*Spartina cynosuroides*) and reed *(Phragmites australis)* occur and can be extensive in a few areas. Sawgrass (*Cladium jamaiciense*) is the dominant species in large tracts of marsh on the north side of the refuge and can be found throughout. One may also find cattails, wax myrtle, bulrush, sedges, and spikerushes. As salinity increases, this community can grade into salt marsh; if salinity decreases, it grades into freshwater marsh. The largest acreage of brackish marsh on the refuge occurs primarily along the eastern boundary adjacent to Croatan Sound. This irregularly flooded marsh is also present along Callaghan and Spencer creeks and is associated with the mouth of almost every creek emptying into East and South lakes.

Freshwater marsh occurs along fringes of rivers and streams, as patches in lakes, and as isolated pockets in disturbed areas. Panic grasses, arrow arum, blue flag, water lily, cattail, and sawgrass are predominant in this marsh type. Also present are duck weed, giant duck weed, water meal, cow-lilly, bladderworts, lotus, duck potato, sweet flag, pickerel weed, mock bishops weed, sedges, rushes, water willow, and marsh pennywort (Noffsinger et al. 1984).

Flood-killed Land

This cover type shares characteristics of marsh. At one time this was forested land, but years of storm tides, wind tides, hurricanes, and other salinity-increasing episodes have gradually killed most of the woody species. In some areas, pumping for agricultural drainage altered hydroperiods to the point that some woody species no longer survive.

Cropland

Description of Croplands. The acquisition of the 10,000-acre Prulean Farms inholding, including approximately 5,100 acres of cropland, in March 1988 gave the refuge even greater habitat diversity. This tract provided a large, functional farming area that has considerable potential for waterfowl management through the creation of moist soil units in agricultural land and cultivated fields with the assistance of cooperative farmers. Furthermore, the purchase and resulting development of waterfowl management units meets a goal established in the North American Waterfowl Management Plan for the Atlantic Flyway. Prulean Farms developed the cropland from forested wetlands by encircling it with dikes and constructing drainage ditches. Five pumps at two stations drain the area. Each pump is capable of removing 250,000 gallons of water per minute from the farm fields. Pumping is required to keep the area dry enough to farm.

Geographic Divisions of Croplands. Cropland at Alligator River National Wildlife Refuge was developed from hardwood swamp and pocosin habitat and does not exhibit readily apparent geographic variation. However, the area is divided into units because of distances between units and for reference purposes.

The Laurel Bay Unit is on the west side of the refuge and consists of approximately 1085 acres of tillable land. The North Twiford Unit lies in the north/central section of the refuge north of Twiford Road and has approximately 684 acres of tillable land. The South Twiford Unit is on the south side of Twiford Road and has about 660 acres of tillable land. The Creef Unit lies on the east side of the agricultural area and has approximately 2044 acres of tillable land. The remaining acreage is in wooded blocks and forested buffer strips that were required as "mitigative" conditions during the land-clearing phase while there was an active permit application.

Soil Types of Croplands. Much of the land area that was cleared and drained for agricultural purposes would have been classified as pocosin even though some areas had undergone succession into hardwood swamp and white cedar swamp. Soils of pocosins vary from dark surfaced mineral soils (usually called ultisols or entisols) to deep organic soils called histosols. Histosols with a high fiber content and extending to depths of 24 inches or greater are called peat. Peat is formed when leaves, sticks, other vegetable matter become submerged in water and decompose slowly. In an unaltered condition, pocosin soils develop over thousands of years and drain poorly. Mineral soils in pocosins, often buried by organic soils, were deposited largely as recent marine sediments and vary from sand to clay. Considerable variation in mineral soils can occur over relatively short distances in pocosins.

Typically, pocosin soils exhibit pH ranges of 3.0 to 4.0. Low pH and poor aeration cause reduction conditions (as opposed to oxidation), resulting in lower availability of nitrogen and phosphorous. As peat depth increases, nutrient availability decreases.

Soil types in the Laurel Bay Unit include Hyde loam, Pungo muck, and Belhaven muck. The North Twiford and South Twiford units have Hyde loam, Roper muck, and Belhaven muck. The Creef Unit has Hyde loam, Roper muck, Belhaven muck, Ponzer muck, and Cape Fear loam. All of these series are considered to be very poorly drained soils; the mucks have an organic surface. Slopes range from 0 to 2 percent.

Of these soil types, Hyde loam and Roper muck are considered prime farmland if properly drained. In the undrained state none are ideally suited for farming because of wetness, the possibility of flooding, and for some types, the presence of woody material such as logs, stumps, and roots in the soil. The texture of the marine sediments that were the origin of the soils and estimated crop yields are in Table 6.

Although percentages have not been determined, visual observation of the Dare County soil survey maps clearly show that Hyde loam and Roper muck are the dominant soil types.

Cropland Management Objectives. The primary purpose of the refuge's agricultural program is to provide food and habitat for wintering waterfowl, including ducks, Canada geese, tundra swans, and many other wildlife species. Agricultural practices provide large, open areas with extensive amounts of food for migratory and resident wildlife. Priority is given to migratory waterfowl, endangered species, neotropical migratory birds, and resident game birds. Small nongame mammals provide a food base for predators. Mammalian game species such as the cottontail rabbit, white-tailed deer, and black bear thrive around the agricultural fields. A pack of red wolves has used this area as the center of its home range since release in 1987.

Table 6. Texture of soil and marine origin sediments and estimated crop yields for soils on the Alligator River National Wildlife Refuge.

Soil Series	Surface Texture	Texture of Marine Sediments Origin	Estimated Corn Yield	Estimated Soybean Yield
Hyde	Loam	Loamy	150	45
Roper	Muck	Loamy	160	45
Cape Fear	Loam	Loamy, Clayey	140	45
Belhaven	Muck	Loamy	125	40
Ponzer	Muck	Loamy	130	40
Pungo	Muck	Loamy, Clayey	100	25

Other objectives include providing research opportunities for wildlife frequently using farmland and demonstrating benefits to wildlife from alternative farming practices. Also, the farming program results in grain availability for trapping and banding activities, reduces soil erosion while maintaining soil fertility, and prevents encroachment of undesirable vegetation. These objectives have been and will continue to be achieved through the refuge's cooperative farmers, because this is the most economical and efficient approach.

Managed Wetlands (Moist Soil Management Units)

To date, approximately 1,900 acres of cropland have been placed under a moist soil management regime. Moist soil management units were located in those areas where farming was most difficult because of woody debris, deep organic soils, wetness, or combinations of these factors.

Water management in the moist soil units is done to promote optimum growth conditions for vegetation adapted to growing in a moist environment that produces good waterfowl food. This entails a slow drawdown from late January through early March. A slow drawdown is necessary to avoid flushing nutrients and coliform bacteria from the farm fields. Each unit is dried out during the spring and early summer so that treatments such as burning, disking, and planting can be done as needed. Approximately 100–150 acres of millet or milo are planted on a rotational basis. Once the treatments are complete, moist soil conditions are maintained during the remainder of the summer. In early fall, the fields in each unit are gradually flooded. A sample water management plan is included in Appendix II. Management activities within these management units hinge upon assistance from cooperative farmers through their lease agreements.

Cypress-Gum Forest

This cover type is found primarily in the western half of the refuge. Although much of this habitat is riparian, there is no readily apparent river levee system associated with these systems. Cypress-gum forests also occur as wet flats in nonalluvial settings. Dominant tree species are bald cypress, black gum, red maple, and red bay. Other tree species may include Carolina water ash and green ash. An occasional loblolly or pond pine may be found scattered throughout. The average canopy height of these trees varies depending upon hydroperiod and past logging practices but can be 100–120 feet. Large trees suitable for denning by many wildlife species, including the black bear, may be found throughout this

forest type. These den trees add a very important component to the overall habitat. Red bay, greenbrier, titi, and fetterbush make up the shrub layer. Very little if any herbaceous vegetation is present.

Atlantic White Cedar Forest

The white cedar forest habitat type usually exists in a landscape mosaic interspersed with pond pine pocosin, cypress-gum, and nonalluvial hardwood communities. The habitat type typically occurs as a relatively even-aged stand, often with a dense canopy and low plant species diversity. White cedar is predominant although black gum is an important coexisting species. An occasional pond pine or bald cypress may be present. Conversely, an occasional white cedar may be found in other habitat types. Average tree height in this area is about 60 feet. The shrub layer in these areas is dominated by sweet gallberry, fetterbush, and greenbrier. Virginia or netted chain-fern is usually the only herbaceous plant present in substantial amounts.

Mixed Pine/Hardwood Forest

Hardwood/mixed pine is found in scattered areas throughout the refuge. Red maple, red bay, and black gum are dominant hardwood trees with an average height of 50 to 60 feet. Pond pine and loblolly pine are the pine species present. Dominant shrubs are fetterbush, bitter gallberry, and sweet bay. Little or no herbaceous vegetation is present (Noffsinger et. al 1984). Cane may be found in some locations.

Nonalluvial (Nonriverine) Hardwood Forest

This habitat type occurs on poorly drained loamy or clayey mineral soils (mostly Hyde loam and Cape Fear loam) found primarily in the flats of the refuge between streams. These areas occur mostly on the margins of peatlands, grading into cypress-gum, Atlantic white cedar, or pond pine pocosin habitat types. Various hardwood trees typical of bottomland hardwoods dominate this forest. Over time, these forests on mineral soils have been most productive from a development perspective, as much of the total acreage has been targeted for residential development, conversion to pine plantation, or conversion to agriculture. A long history of poor logging practices has further degraded this habitat type. However, remaining areas in a more natural state are dominated by a tree canopy of water oak, laurel oak, cherrybark oak, swamp chestnut oak, overcup oak, white oak, black gum, sweetgum, red maple, green ash, and loblolly pine. Tulip poplar, persimmon, shagbark hickory, and serviceberry may also be found. Dominant understory vegetation includes American holly, deciduous holly, blueberry, sweet pepperbush, sweet and bitter gallberry, and fetterbush. The ground layer may have cane, netted and Virginia chain fern, royal fern, ebony spleenwort, and partridgeberry. Common woody vines are greenbrier, grape, poison ivy, Virginia creeper, and cross vine.

Pond Pine/Shrub Pocosin

Pocosin – General. Alligator River National Wildlife Refuge exhibits typical pocosin vegetation, which is a dense growth of shrubs sometimes associated with trees. The most common shrubs are titi, honey cup, fetterbush, bitter gallberry, and sweet gallberry growing with green brier. Shrubs and vines often grow so densely that walking through them is almost impossible. Some shrubs that inhabit the refuge are evergreen, but the two most important deciduous species are titi and honeycup. Dominant trees are usually pond pines with some loblolly bays, red bays, and sweet bays. Because of various factors, trees and shrubs change in height, density and relative species composition from one area to another throughout the refuge. In some areas, shrubs are fairly short (two to three feet) and the only trees are a few scattered pond pines that are crooked and very stunted. These shrub-dominated areas are commonly referred to as short or low pocosin. Short or low pocosin is usually found over deeper peat deposits (McDonald et al. 1983). In other places on the refuge both trees

and shrubs are much taller and denser. Forested areas are sometimes called tall or high pocosin. In this plan, the pocosin community is differentiated as Low Shrub Pocosin, High Shrub Pocosin, Pond Pine/Shrub Pocosin, and Pond Pine/Cane Pocosin.

Very few species are able to adapt to nutrient-poor, acidic, organic soils, and long hydroperiod of pocosin habitat. The diversity present is attributed to the fact that openings in the vegetation remain which permit establishment of such herbaceous species as sphagnum, Virginia chain-fern, sedges, trumpets, red pitcher plant, sundews, cotton grass, beakrush, bladderwort, yellow-eyed grass, hatpins, and broom sedge. These open areas may also have shrubs like lambkill, leatherleaf, and huckleberry that are less common in denser areas (Ash et al. 1983).

Low Shrub Pocosin. The low shrub pocosin community is associated with the deeper organic soils that occur primarily in the southeastern portion of the refuge. The shrub layer is the dominant feature of this community and generally attains a canopy height of two to six feet. Bitter gallberry, fetterbush, titi, and honey cup dominate this shrub layer with Virginia chain-fern being the most abundant herbaceous plant (Noffsinger et al. 1984). Openings may occur and are usually dominated by sedges, pitcher plants, cranberry, and broom sedge. These areas are further characterized by long hydroperiods with widely spaced, stunted pond pines with heights of mature trees ranging from about six to twenty feet. These communities closely approximate a “quaking bog” as the ground actually moves in a vertical plane as you walk across it. False low shrub pocosin can be distinguished from true low shrub pocosin by the presence of tree residue and depth of the peat.

High Shrub Pocosin. The high shrub pocosin community is associated with deep to intermediate organic soils, primarily in a transitional zone between low shrub pocosin and the pond pine pocosin. The shrub layer remains as the dominant feature of this community. However shrubs tend to be taller (ten to fifteen feet) and trees, mostly pond pine, may grow up to thirty to forty feet. Bitter gallberry and fetterbush dominate this shrub layer with Virginia chain-fern being the most abundant herbaceous plant (Noffsinger et al. 1984). Other shrub species may include wax myrtle and salt meadow bush, especially on edges and in areas of disturbance. Red bay and loblolly bay may be found, but are uncommon. Openings are less common than in low shrub pocosin, but may occur with species composition being about the same as the low shrub community. These areas are further characterized by intermediate to long hydroperiods. False high shrub pocosin can be distinguished from true high shrub pocosin by the presence of tree residue and depth of the peat.

Pond Pine/Shrub Pocosin. Pond pine pocosin occurs primarily in the eastern half of the refuge with large areas occurring in-the northeastern and southeastern sections on intermediate depth organic soils. This cover type is very similar to the high shrub pocosin, but contains more pond pine, bays, and red maple. Red bay and loblolly bay also reach heights greater than twenty feet in this cover type. Mature tree heights, including red maple, may vary from about thirty to forty feet. Fetterbush and bitter gallberry are the dominant shrubs with Virginia chain-fern as the dominant herbaceous plant where openings occur. Grasses, sedges and other herbaceous species are rarely present due to the dense shrub understory.

Pond Pine/Cane Pocosin. This cover type is found primarily northeast of the Navy Bombing Range and south of Grouse and Cedar roads on essentially the same types and depths of organic soils. Pond pine is the dominant canopy with only small amounts of red bay, sweetbay, and red maple present. Average height of the overstory trees is forty to sixty feet. The shrub layer is dominated by river cane (*Arundinaria gigantea*) with bitter gallberry (Noffsinger et al. 1984). Differences in the Pond Pine/Cane and Pond Pine/Shrub communities are poorly understood. Past reports suggested that differences are attributable to fire frequency. However, subsequent observations suggest variation is due to factors other than fire frequency. Differences in hydroperiod and soil properties are the most likely explanations for the cane understory domination in some areas and not in others. For example,

the areas with cane may be on organic soils with a higher mineral content, have subtle differences in depth of organic layer, or the physical and chemical properties of material underlying the organic layer may be causative factors for differences in surface plant community composition.

Threatened and Endangered Plants

Although there have been no comprehensive botanical surveys, there are no known federally listed plants on the refuge.

Plant Species

A comprehensive, in-depth botanical survey for plant species on the refuge has not been conducted. However, Appendix VI represents the most comprehensive list available. This botanical list will be revised as new information becomes available.

WILDLIFE

General

Alligator River National Wildlife Refuge and its surrounding waters support many species of resident and migratory fish and wildlife. Of these, 48 species are fish (Allen et al. 1979; Baker and Smith 1965; Hester and Copeland 1975; Johnson et al. 1980); 145 are birds (Potter 1982a); 48 are reptiles and amphibians (Allen et al. 1979; Braswell and Wiley 1982); and 40 are mammals (Clark et al. 1985). The refuge supports wildlife species that are important from both a regional and a national standpoint (Noffsinger et al. 1984). Its large size and dense vegetation makes it a haven for species that avoid man, such as the black bear. Also, the refuge harbors many species adapted to living in forested habitat as opposed to disturbed areas such as field edges. The refuge also lies at or near the northern limit of ranges for several vertebrate species (Noffsinger et al. 1984).

Birds

Alligator River National Wildlife Refuge provides habitat for a wide variety of birds. Because of the refuge's large size and plant community diversity, habitat is provided for forest-dwelling species as well as marsh-dwelling species. This somewhat unique complex of various wetland habitat types results in the presence of some unique avian forms such the Wayne’s black-throated green warbler, a distinct form of prairie warbler, and an unusually dense population of worm-eating warblers (Watts and Paxton 2002). Approximately 250 species of birds visit the refuge regularly, with about 40 to 50 additional species considered accidental visitors.

The area is roughly at midpoint in the Atlantic Flyway and is a much-used and valuable feeding and resting area for numerous species of wintering waterfowl. Tundra swans, coots, and more than 25 species of ducks winter either on the refuge or in its adjacent sounds and rivers. Migratory waterfowl numbers peak during the months of November through February. In addition to waterfowl, large numbers of hawks, owls, and many species of passerine birds may be seen. The avian species composition changes throughout the year since most are migratory.

Waterfowl. Until the addition of the moist soil management units, the refuge did not support large numbers of waterfowl. The wood duck is the most abundant year-round species. The species is most often associated with the numerous ditches, canals, and swamps. The most prevalent wintering species in moist soil units and refuge marshes include pintail, green-winged teal, gadwall, widgeon, mallard, and black duck. Other species wintering or migrating on the refuge and surrounding waters

may include blue-winged teal, ring-necked duck, shoveler, scaup, canvasback, ruddy duck, red head, bufflehead, hooded merganser, and red-breasted merganser. Tundra swan numbers have increased steadily to a peak of about 1,500 birds on average. A few (less than ten) resident Canada geese are seen on the refuge periodically. Neither migratory Canada geese nor snow geese use the refuge.

Breeding Birds. The species that breed on the refuge are characteristic of species that inhabit other coastal plain communities. However, Alligator River National Wildlife Refuge differs noticeably from other coastal plain areas by having more warblers, especially prothonotary and black- throated green warblers, and fewer nuthatches, thrashers, and blue-gray gnatcatchers. The refuge is especially rich in woodpecker species, such as the endangered red-cockaded woodpecker and the large pileated woodpecker. The red-cockaded woodpecker is found in pond pine pocosin. They use pond pine trees for nest cavity trees and the pond pine pocosin forest for foraging habitat. Typically, the red-cockaded woodpecker prefers living trees 60 to 80 years old that are infected with red-heart fungus. The tree must also exude resin around the nest hole; a new cavity tree will be found when it no longer does so. The resin may serve as a defense against predators (Ash et al. 1983). Wading birds such as the great blue heron are common and breeding has been documented in at least two rookeries on and adjacent to the refuge. Bald eagles have also historically nested on the refuge and viable nests remain; nesting does not occur in every nest every year.

Wintering Birds. Based upon results of the Christmas Bird Count since 2001, approximately 110 bird species can be found on the refuge during the winter. The most common winter species are the American robin, yellow-rumped warbler, red-winged blackbird, sparrows, and northern bobwhite. Robins feed heavily on berries of redbay and greenbrier and roost in large concentrations in the Milltail Creek and Whipping Creek areas. Myrtle warblers use low-shrub pocosins, vegetated canal banks, and forest edges. They feed heavily on bayberry and wax myrtle berries. Northern bobwhite and red-winged blackbirds overwinter primarily in the agricultural fields within the refuge. Within the agricultural grassland filter strips, the song sparrow, fox sparrow, swamp sparrow, white-throated sparrow, and savannah sparrow may be observed. Mourning doves and crows winter on the refuge in smaller numbers making use of the farm fields. The American kestrel and the red-tailed hawk prey in the open areas of the refuge, while the northern harrier hunts over the marshes, fields, and low shrub pocosins.

Transient Species. Alligator River National Wildlife Refuge lies in the path of the Atlantic Flyway, a major migration route. The refuge provides resting and foraging areas for many migrant species which winter farther south. Species that migrate through the refuge during the fall include the blue-winged teal; raptors such as the broad-winged hawk and merlin; shorebirds; and a variety of perching birds such as the western kingbird, bank swallow, veery, Swainson's thrush, and warblers (yellow, magnolia, Cape May, black-throated blue, blackpoll, and palm); bobolink; northern oriole; and rose-breasted grosbeak (Noffsinger et al. 1984).

Mammals

Of the 47 species of mammals commonly occurring in the lower coastal plain of North Carolina, 42 occur on the refuge. The most common land mammals are the black bear, opossum, and rodents such as the hispid cotton rat. Semiaquatic furbearers such as the muskrat, nutria, and river otter are common. Numbers of beaver are increasing. The white-tailed deer population has remained relatively constant at low numbers in recent years. However, deer herd health checks at five-year intervals show that the population is slightly higher than the carrying capacity for pocosin habitat. The black bear population is among the highest density populations in the southeast. Numerous sightings of eastern cougar have been reported, but none have been confirmed.

American Black Bear. The refuge has what is believed to be one of the largest concentrations of black bear found in the southeastern United States. A decline in bear numbers in this and other areas seems to have resulted from man's disturbing influence and the destruction of habitat (Hamilton 1978). According to Hamilton and Marchiuto (1977 and 1978), major wetland forest types such as pocosin must be protected to maintain the Coastal Plain bear population.

Hardy (1974) suggested a Dare County bear population of 25 to 35 individuals, of which 13 to 20 were adult males, four to eight were adult females, and five to nine were juveniles. There was very little evidence of reproductive success. The population imbalance probably resulted from selective mortality engendered by excessive hunting.

The U.S. Geological Survey's Cooperative Wildlife Research Unit at Virginia Tech completed a study of the black bear population at Alligator River in 2005. The estimated population is between 180 and 293, with a density on good habitat of three bears per square mile. The normal population on good habitat is one bear per square mile.

High hunting pressure associated with increased access through road construction was the apparent mechanism that reduced bear on and off the refuge. In the 1970s, state legislation made it illegal to hunt black bear in Dare County. The population has increased steadily since. The state legislature re-established a hunting season for Dare County in 1992, but the season was not opened on the refuge due to insufficient population data. A research project, conducted by the University of Tennessee from 1992–1996, resulted in good information on habitat use, food habits, and reproduction. During the same study an attempt to estimate the population size was not successful due to low recapture numbers (Folta 1998; Allen 1998). An effort to estimate the population through genetic analysis of hair samples began during 2003 by Virginia Tech and data collection will continue through 2004.

Limiting factors on black bear on the refuge have been identified as blackgum mast, disturbance, and availability of escape cover. Although blackgum fruit has been identified as limiting, the diet of the black bear varies with the seasons and availability of food. Spring foraging appears to be largely opportunistic with a high occurrence of ants and leaves in the diet. Blueberries and switchcane stems are preferred through the summer. Fall feeding shifts to blackgum, with winter diets consisting mainly of greenbrier, sumac, and gallberry (North Carolina State University 1974).

White-tailed Deer. The white-tailed deer is probably the most sought-after game species on the refuge. Hunters make extensive use of the refuge with its road system to gain access to large blocks of habitat suitable for deer hunting. White-tailed deer are considered to be browsers because they primarily consume woody vegetation. However, white-tailed deer will eat almost any available form of plant life. Because of this adaptability, it is impossible to single out one habitat as greatly superior to others. Interaction of deer and habitat is a combination of food preference and utilization, quantity and quality of food, and availability of cover (Halls 1984; Halls and Ripley 1961). However, best estimates suggest a much lower carrying capacity for pocosin habitat than other habitat types. For example, Monschein (1981) reported the following best estimates: approximately 6 deer per square mile for pocosin habitat; about 18 deer per square mile along pocosin borders; and 35–40 deer per square mile for coastal bottomland hardwoods. Basic differences involve the quantity, quality, and availability of food.
Since establishment of the refuge, periodic abomasal parasite counts, necropsy findings, laboratory tests, and general physical condition indicate that the health of the deer population is fair to good. It was concluded in 1985, 1992, and 1998 by the Southeastern Cooperative Wildlife Study that the Alligator River deer were "…within an optimal stocking density for the nutritional capacity of the habitat. Additional increase in deer numbers should be avoided by removal of deer through management by sport-hunting" (Nettles 1985; Davidson 1992 and 1998).

Furbearers. The Alligator River Refuge provides habitat for fur-bearing species such as bobcat, otter, mink, gray fox, muskrat, nutria, and raccoon. Raccoon, nutria, muskrat, otter and mink make use of the canals and streams that run through the refuge. The gray fox does not penetrate very deeply into the unmodified areas of the refuge, but it does make good use of the edges feeding on small mammals as well as blackberries and other fruits (Ash et al. 1983). Bobcats are common predators on the refuge and are most commonly observed around the farm unit, along the edges of pocosin areas, and in swamp forests. They may be found throughout the refuge because of the presence of the marsh rabbit, the bobcat's main prey (Ash et al. 1983).

In addition to the mammals already mentioned, the refuge supports populations of the gray squirrel, cottontail rabbit, opossum, and several rodent and insectivore species.

Reptiles and Amphibians

Sixty-one species of reptiles and amphibians are reported for the refuge. Reptiles and amphibians are most numerous and diverse around permanent and semi-permanent open water, marshes, creeks, lakes, and canals. They also thrive in disturbed or modified/transitional areas. Some of the species that inhabit the area are the brown, banded, and plain-bellied water snakes; common snapping, red-bellied and eastern painted turtles; the southern leopard frog; and a wide variety of snakes. Three species of venomous snakes have been documented on the refuge. They are the cottonmouth moccasin, canebrake (timber) rattlesnake, and copperhead. The pygmy rattlesnake has been documented in Hyde County; however, even though the refuge extends into Hyde County, none have been documented on the refuge.

American Alligator. The refuge is near the northern extent of the American alligator's natural range in North America. This endangered reptile occurs in refuge marshes, slow-moving streams, and man-made canals. They prefer areas where the water turbidity is low and the water quality is high, with the presence of an adequate food source (McDonald et al. 1983). Milltail Creek Lake, Whipping Creek, and Swan Creek Lake usually provide prime alligator habitat (Noffsinger et al. 1984).

Fish

The fisheries on and surrounding Alligator River Refuge are diverse and productive. The refuge's interior lakes and streams support species characteristic of blackwater or oligohaline systems. Fish that inhabit the refuge include resident species, migratory species, anadromous species, and one catadromous species.

Resident species such as gar, pickerel, white and yellow perch, a variety of sunfish, and catfish inhabit the blackwater streams and lakes of the refuge. They also use the open water of Alligator River and the sounds for spawning, nursery and foraging habitat. These resident species provide a large portion of the diet of migratory and anadromous species, which are important to both sport and commercial fishermen (Noffsinger et al. 1984). Migratory species use the refuge's estuaries as spawning grounds and the surrounding waters as a nursery area. Migratory species that use the refuge include Atlantic croaker, spot, Atlantic menhaden, and the southern and summer flounders.

Anadromous species are those that spawn in the refuge's freshwater streams and estuaries, inhabit these areas as juveniles, mature offshore, and return to these streams to spawn as adults. The Alligator River and Milltail and Whipping creeks are used heavily by these species, which include striped bass, alewife, and blueback herring. The mouth of Alligator River serves as an important wintering area for sexually immature female striped bass. This area is important because the Albemarle Sound population does not make coastal migrations as do other Atlantic coast striped bass populations.

Insect and Disease Pests

The gypsy moth is now well established as far south as northeastern North Carolina. The North Carolina Division of Plant Industry and U.S. Forest Service closely monitor gypsy moth populations. Both agencies use pheromone traps located throughout the Dare County mainland and the barrier islands, including refuge lands. When large-scale outbreaks are detected, they use integrated pest management techniques to suppress but not necessarily eliminate gypsy moths from the area. Although the refuge is within the quarantine area of northeastern North Carolina, there have not been any outbreaks of the gypsy moth requiring treatment other than on Roanoke Island.

Since the mid-1990s, southern pine beetle outbreaks and cutting controlling buffers resulted in the conversion of over 5,000 acres of mostly pond pine habitat to shrub habitat. Without prescribed fire, this acreage will most likely remain as shrub habitat unless pond pine is planted after site preparation. During 2002 and 2003 the spread of southern pine beetle infestations was greatly diminished.

Exotic and Pest Organisms

At the present time little is known about exotic organisms on the refuge. Feral cats and dogs can be found on the refuge, but there is uncertainty as to numbers and extent of impact on wildlife.

Fire ants are an increasing problem, especially in the farm unit. Due to pesticide use restrictions on the refuge, it is not possible to eradicate this species.

The coyote, a carnivorous species native to the grasslands of the midwestern United States, has migrated eastward as wooded habitat was cleared. Coyotes are now present throughout the refuge, but they represent a carnivore that is not native to the refuge or North Carolina.

Alligatorweed (*Alternanthera philoxeroides)* is currently found on the refuge in ditches adjacent to Highway 64, Milltail Road, and Longcurve Road. Common reed (*Phragmities australis)* is found throughout various refuge areas, including disturbed sites and farming units. Efforts have recently begun to control these invasive, noxious plants.

Threatened and Endangered Species

Several federally listed species occur in the area. Among them are the red-cockaded woodpecker, red wolf, bald eagle, and American alligator. All species except for the red-cockaded woodpecker occur throughout the refuge.

The Service first reintroduced the red wolf on the refuge in 1987. Since the initial releases, wolves have reproduced in the wild and may be found throughout the refuge and four surrounding counties. Depending upon circumstances within and between packs, there can be from two to five packs of wolves on the refuge at a given point in time. An estimated 100 wolves now inhabit a 1.7 million acre area in eastern North Carolina.

The red-cockaded woodpecker is federally listed as an endangered species. Known red-cockaded woodpecker clusters occur on the south end in the vicinity of Whipping Creek Road, north of U.S. Highway 264 just east of Stomper Road, and on the Dare County Bombing Range. One inactive cluster with one known cavity tree occurs in the vicinity of the east side of Koehring Road just north of the Pollock Road intersection. The area around Stumpy Point was surveyed by helicopter during 1999 and no evidence of the red-cockaded woodpeckers was found in the areas outside of those described.

The bald eagle is federally listed as a threatened species and is seen infrequently throughout the year. Sighting numbers have been increasing in recent years. Eagle nesting has been documented near the North Twiford Farm Unit and near Swan Creek Lake on the south end of the refuge. Mature bald eagles have been observed adjacent to Stumpy Point Bay and nesting is suspected, but the refuge has not been able to find and confirm a nest. Another possible eagle nest may be under construction at the mouth of Laurel Bay Lake.

The American alligator is listed as threatened by similarity of appearance in North Carolina and is found in aquatic habitat throughout the refuge. The Service has documented nesting in recent years on the refuge, but the current population is not known.

CULTURAL RESOURCES

There have been limited archaeological investigations within the refuge. The wetland environment makes it unlikely that there are many cultural resources on the refuge. The small area of uplands is the most likely site of settlements or encampments. The staff must conduct management activities so as to avoid compromising sensitive sites.

SOCIOECONOMIC ENVIRONMENT

INTRODUCTION

Alligator River National Wildlife Refuge lies within mainland Dare and Hyde Counties, North Carolina. Recently made more accessible to the mainland by bridges and ferries and primarily supported by tourism, coastal Dare and Hyde counties have seen an influx of tourists, visitors, and residents over the last few decades. This considerable population growth and development of the barrier islands has brought substantial economic benefit to a region historically rural and impoverished. As a result, the refuge, with its location along U.S. Highway 64, has seen greater recreational and public use due to this increase in visitors. However, the region's natural resources of land and water have suffered increasing demands, often with negative impact. As one of the few remaining tracts of intact natural land, the refuge and, consequently, its management considerations, have become even more critical.

Alligator River National Wildlife Refuge and Dare and Hyde counties are located in the northeastern part of North Carolina and are bounded by the Albemarle Sound to the north, Tyrrell and Beaufort counties to the west, and the Pamlico Sound to the south.

Dare County. The Alligator River forms the western boundary of Dare County, which is bound to the north by the Albemarle Sound, to the east by the Atlantic Ocean, and to the south by the Hyde County line dividing the Pamlico Sound.

For many decades, Dare County has been in the forefront of economic growth and development in the state of North Carolina, and historically, unemployment has been lower than the state average. Seven million tourists visit the Outer Banks of Dare, Currituck, and Hyde counties every year. The next closest areas of economic growth and social life are Greenville, North Carolina, 100 miles west of the refuge; and Virginia Beach, Virginia, 100 miles north of the refuge.

Despite the growth on the Outer Banks, Dare County is still predominantly rural, with the largest town being Kill Devil Hills (2000 population: 5,897). Like other rural areas throughout the country, outdoor activities are both popular and necessary. Hunting, recreational fishing, and bird watching are popular pastimes and commercial fishing is an important element of the economy. The importance of Alligator River National Wildlife Refuge and its appropriate management is, therefore, easily understood.

Hyde County. Hyde County is in northeastern North Carolina with the Atlantic Ocean and Dare County, North Carolina to the east, Pamlico Sound to the south, Beaufort County, North Carolina to the west, and the Tyrrell County, North Carolina to the north. The area has had little growth since 1900 despite rapid growth in Dare County on the coast to the east and the major highway to the coast passing through the county. Ocracoke Island on the Outer Banks of North Carolina is the only part of the county with a growing population and economy. The lack of growth in mainland Hyde County is due in large part to the poorly drained, deep organic soil that makes development expensive and environmentally hazardous. The county's unemployment and poverty rates are much higher than the state averages, and its high school and college graduation rates are below the state averages. The area is still predominantly rural, and the largest town and county seat is Swan Quarter (2000 population: 300). Like other rural areas throughout the country, outdoor activities are both popular and necessary. Hunting and recreational fishing are popular pastimes. Farming, commercial fishing, and forestry are important elements of the economy.

HISTORY

Dare County. The original residents of the area were Native Americans described as those of the Coastal Algonkian linguistic group at the time of European contact. Northeastern North Carolina was the most southern extent of Coastal Algonkian habitation. One chiefdom was located on the Outer Banks on Hatteras Island (Haag 1958). They lived in permanent villages where they could hunt, fish, shellfish, and farm in close proximity to the village. The Algonkians utilized seasonal villages to follow migrating fish and wildlife populations. They grew corn, beans, sunflower, and squash in small gardens; and hunted deer, bear, alligators, turtles, and a variety of small mammals. Mention of the Algonkians ceased by the mid-eighteenth century (Mathis and Crow 1983).

As early as 1584, English officers spent two months exploring Roanoke Island and its surrounding area. In 1585, Sir Walter Raleigh sent a fleet of seven vessels of men back to the island in an attempt to establish the first English colony in what is now eastern North Carolina. Fort Raleigh was built on Roanoke Island, but the following year the survivors returned to England. In 1587, Raleigh sent an expedition of 117 people that included women and children to give permanence to the colony. Led by John White, these settlers rebuilt the fort. On August 18, 1587, White's granddaughter, Virginia Dare, was born in the colony; she was the first English child born in the New World. Later that year, White sailed back to England for supplies, but Spanish hostilities and England's financial hardships delayed his return for three years. Upon arriving back at Roanoke Island in 1590, he found no trace of the colonists. Many theories have been proposed about the fate of those 117 people—"The Lost Colony"—but the mystery remains unsolved.

The area remained unpopulated for more than a half century after the disappearance of the Lost Colony. Sir John Colleton established the first permanent settlement on Collington Island on the Outer Banks in the winter of 1664–1665. Shipwrecked sailors and settlers from Virginia established the first settlements. These settlers made an effort to grow tobacco, grow grapes for a winery, and raise hogs. The only real profit was from oil extracted from beached whales. Raising livestock on the grasslands of the dunes became an important occupation. The only agriculture was in small gardens (Stick 1958).

In the early 1700s, pirates moved into the area to prey on ships that passed too close to the treacherous shoreline. The most famous of these pirates, Blackbeard, made his headquarters on the Outer Banks. His death in 1718 brought an end to early day piracy. Around 1726, residents built windmills to grind grain on Roanoke Island and the Outer Banks. The residents made a living from farming, fishing, hunting, and beachcombing (U.S. Department of the Interior 1981).

Modern tourists first found the Outer Banks of Dare County at Nags Head in the 1830s when planters from inland counties came to escape the hot humid summer. Cottages and the Nags Head Hotel were home to visitors. The hotel was the scene of nightly dinners and dances, and built a railway for transportation to the beach (Outer Banks Chamber of Commerce 2003).

In the early 1800s, the Atlantic Ocean earned the name "Graveyard of the Atlantic" as numerous vessels sank. During the Civil War, Union forces captured Fort Hatteras and Roanoke Island to secure access to North Carolina by sea. The Union ironclad ship *USS Monitor* sank in a gale off Cape Hatteras on December 30, 1862 (Outer Banks Chamber of Commerce 2003). In 1870, the state assembly established Dare County (named for Virginia Dare) from parts of Hyde, Currituck, and Tyrrell counties. During this time, most opportunities for work were in the U.S. Coast Guard as lighthouse operators or weather station employees. The improvements of inlets and advances in navigation and transportation allowed commercial fishing to become an important part of the economy (Stick 1958).

On December 17, 1903, Wilbur and Orville Wright made the first successful power-driven airplane flight from Kill Devil Hills near Kitty Hawk on the Outer Banks. German submarines filled the waters off the North Carolina coast during World Wars I and II. Since the World War II, tourism replaced hunting and fishing as the principal industry (Outer Banks Chamber of Commerce 2003).

The rivers and sounds were once the major transportation avenues in the area. As the area grew and the railroad arrived, boat traffic declined. In the twentieth century with the popularity of automobiles, the state developed a network of highways connecting the county to all areas of the eastern United States. The state replaced a drawbridge across the Croatan Sound on U.S. Highway 64 at Manns Harbor in 2002 with a high-rise bridge so motorists can bypass downtown Manteo on their way to the Outer Banks. The state is widening U.S. Highway 64 to four lanes that will connect the area to Interstate 95 and the Outer Banks. There are small local airports in Manteo and Frisco; regional airports in Greenville; and an international airport in Norfolk, Virginia. Amtrak provides passenger rail service as far east as Rocky Mount.

Hyde County. The inhabitants of Hyde County at the time of European settlement were also Coastal Algonkians called the Machapungo and Mattamuskeets. By the early 1700s, most of the Indians lived on a reservation in the eastern part of the county. In 1711 the number of Indians was about 30, and by 1761 only 6 remained.

English explorers first arrived in the county in 1585. The early history of the county was dominated by maritime trade and featured the exploits of Edward Teach, also known as Blackbeard the Pirate. The first settlers were castaways from ships.

The North Carolina General Assembly formed Hyde County from Bath County in 1705 and originally named it Wickam County. It named the county Hyde County in 1712 in honor of Edward Hyde, the first governor of North Carolina.

In the 1800s, residents built many plantation homes in the county. The best known is the Octagon House in the eastern part of the county. With its rich soil with an organic topsoil layer, Hyde County has always had a good reputation for agricultural production, especially in corn. People traveled to the county from across the state for corn.

In 1837, the State Literary Board owned Lake Mattamuskeet and ordered the lake drained with a canal to the Pamlico Sound. This decreased the size of the lake from 120,000 to 50,000 acres and its depth from a range of six to nine feet to two to three feet. The state established Mattamuskeet Drainage District in 1910 to drain Lake Mattamuskeet completely with more drainage canals and a pumping plant for crop

production. The cost of maintaining the water levels necessary for production exceeded the profits from the crops. In 1932, the developers abandoned the operation. The large pumping plant built for the project was then converted into a hunting lodge and is now Mattamuskeet Lodge.

In 1934, the lake and the surrounding area became the Mattamuskeet National Wildlife Refuge. The lake attracts large populations of wintering waterfowl and the area is a haven for hunters and birdwatchers.

Agriculture has remained the most important part of the county's economy and lifestyle. The acreage in cropland increased dramatically in the 1970s when soybean prices increased substantially. Much of that land was difficult to drain and maintain water levels necessary for production, and has been abandoned.

In the later part of the twentieth century, conservation agencies and organizations began to purchase areas less suited for agriculture and forestry production due to the deep organic soils. They manage those areas for wildlife habitat, the protection of unique ecological communities, and outdoor recreation. Recreation based on natural and cultural resources is a growing part of the local lifestyle.

LAND USE

Dare County. Logging and farming have never been important sources of income in Dare County due to the deep, sandy soils of the dunes, saturated soils of the marshes on the Outer Banks, and wetlands with deep organic soils on the mainland. The forest and marsh plant communities have always provided hunting opportunities, and the marshes are important nursery areas for fish. The beaches, dunes, wildlife, and fishing opportunities on the Outer Banks are major attractions to tourists for their summer vacations.

There is limited residential construction in the marshes, pocosins, and forested wetlands of the county. The largest development has been on the northern end of the coastal barrier island known as the Outer Banks, from Hatteras Village to Corolla.

Before the Civil War, farmers cultivated up to 5,000 acres of corn and tobacco on mainland Dare County in a settlement known as Beechlands near Milltail Creek. They also grazed cattle on 25,000 acres of marsh. The Dare County Lumber Company harvested enough timber on 168,000 acres of mainland Dare County to set up a settlement called Buffalo City that eventually went bankrupt. Both areas are now part of the Alligator River National Wildlife Refuge.

Today, Dare County is 57 percent forested (142,212 acres) and 3 percent farmland (4,961 acres). From 1997 to 2002, the land in farms decreased slightly percent from 4,961 acres to 4,954 acres; the average size of farms increased 12 percent from 551 acres to 619 acres; the number of full-time farm operators remained the same at 6; the total market value of agricultural products sold increased 10 percent from $836,000 to $916,000; and the average market value of agricultural products sold per farm increased 22 percent from $92,920 to $114,470 (Table 7).

Soybeans are the most important crop in Dare County. Production decreased substantially between 1997 and 2002 (Table 8) (U.S. Department of Agriculture 1997).

Table 7. Dare County agricultural statistics from the 2002 USDA Census of Agriculture.

Number of Farms	8
Acres in Farms	4,954
Average Size of Farms (Acres)	619
Market Value of Land Per Farm	$1,098,170
Market Value of Land Per Acre	$1,268
Market Value of Equipment Per Farm	$110,232
Total Cropland (Acres)	2,094
Market Value of All Products Sold	$916,000
Market Value of Products Sold Per Farm	$114,470
Operators with Farm as Principal Occupation	6
Operators with Anther Occupation as Principal Occupation	2
Land in Soybeans (Acres)	1,623

Table 8. Commodity production in Dare County in 1997 and 2002.

Commodity	2002 Production	1997 Production	2002-1997 Change
Soybeans (acres)	1,623	3,516	Decreased 56%
Wheat (acres)	471	0	N/A

From the 2002 and 1997 USDA Census of Agriculture

Hyde County. Today, Hyde County is 60 percent forested (235,800 acres); 24 percent cropland (95,327 acres); and 11 percent marsh (44,729 acres).

From 1997 to 2002, the land in farms increased 8 percent from 95,327 acres to 103,089 acres; the average size of farms decreased 25 percent from 953 acres to 716 acres; full-time farm operators increased 22 percent from 74 farms to 90 farms; total market value of agricultural products sold decreased slightly from $32,996,000 to $32,868,000; and average market value of agricultural products sold per farm decreased 31 percent from $329,965 to $228,251 (Table 9).

In 2002 corn and soybeans accounted for 31,059 and 30,013 acres of cropland, the largest crops in the county. Cotton and wheat have also been important crops in Hyde County (Table 10) (USDA 2002).

Table 9. Hyde County agricultural statistics from the 2002 USDA Census of Agriculture.

Number of Farms	144
Acres in Farms	103,089
Average Size of Farms (Acres)	716
Market Value of Land Per Farm	$1,264,802
Market Value of Land Per Acre	$1,819
Market Value of Equipment Per Farm	$208,106
Total Cropland (Acres)	91,524
Market Value of All Products Sold	$32,868,000
Market Value of Products Sold Per Farm	$228,251
Market Value of Crops Sold	$32,151,000
Market Value of Livestock Sold	$717,000
Operators with Farm as Principal Occupation	90
Operators with Another Occupation as Principal Occupation	54
Hogs in Inventory	3,300
Hogs Sold	7,160
Beef Cows in Inventory	180
Beef Cows Sold	99
Land in Corn (Acres)	31,059
Land in Soybeans (Acres)	30,013
Land in Cotton (Acres)	22,906
Land in Wheat (Acres)	10,614

Table 10. Commodity production in Hyde County in 2002 and 1997, from the 2002 and 1997 USDA Census of Agriculture.

Commodity	2002 Production	1997 Production	1992-1997 Change
Corn (acres)	31,059	31,990	Decreased 3%
Soybeans (acres)	30,013	36,381	Decreased 17%
Cotton (acres)	22,906	4,212	Increased 444%
Wheat (acres)	10,614	18,989	Decreased 44%
Hog Inventory	3,300	9,890	Decreased 67%
Hogs Sold	7,160	25,059	Decreased 71%
Cattle Inventory	180	427	Decreased 58%
Cattle Sold	99	142	Decreased 30%

DEMOGRAPHICS

Dare County. Dare County is primarily rural with a total estimated population of 29,967 in 2000 (Table 11) (U.S. Census Bureau 2000). The county population increased 32 percent between 1990 and 2000. Kill Devil Hills is the largest town with a population of 5,897.

The population is 94.7 percent White, 2.7 percent Black, 2.2 percent Hispanic, 0.4 percent Asian, and 0.3 percent Native American (U.S. Census Bureau 2000). In 2000, the median family income was $35,258, about the same as the state average of $35,320. The poverty rate was 8.1 percent, well below the state average of 12.6 percent (U.S. Census Bureau 2000). The average unemployment rate in 2004 was 5.1 percent, slightly below the State of North Carolina's unemployment rate of 5.5 percent (North Carolina Employment Security Commission 2004).

The percentage of high school graduates in the population older than 25 years old is 60 percent; the percentage of college graduates is 16 percent. The state averages are 56 percent for high school and 14 percent for college (U.S. Census Bureau 2000). The home ownership rate is 74.5 percent, above the state average rate of 69.4 percent. There are 2.34 persons per household in Dare County, slightly below the state average of 2.49.

Hyde County. Hyde County is primarily rural with a total estimated population of 5,826 in 2000 (Table 11) (U.S. Census Bureau 2000). The county population increased 7.7 percent between 1990 and 2000 (U.S Census Bureau 2000). Swan Quarter, the county seat, is the largest town but the population is widely dispersed throughout the unincorporated areas of the county.

The population is 62.7 percent White, 35.1 percent Black, 2.2 percent Hispanic, 0.3 percent Native American, and 0.4 percent Asian (U.S. Census Bureau 2000). In 2000 the mean family income was $23,568, substantially below the state average of $35,320. The poverty rate was 24.8 percent, well above the state average of 12.6 percent (U.S. Census Bureau 2000). The average unemployment rate in 2004 was 7.2 percent, well above the State of North Carolina's unemployment rate of 5.5 percent (North Carolina Employment Security Commission 2004).

EMPLOYMENT

Dare County. The hotel and food service and retail trade industries are the largest employers in Dare County, employing 3,028 and 3,022 of 12,543 employees with an annual payroll of $281.6 million in 2000 (U.S. Department of Commerce, County Business Patterns 2000). This is due in large part to the tourist industry on the Outer Banks (North Carolina Department of Economic Security Commission 1999).

In 2000, the sectors employing the largest numbers of persons were in decreasing order as follows: hotel and food service, retail trade, construction, real estate, wholesale trade, professional services, administrative support, health care, manufacturing, and finance (U.S. Department of Commerce, County Business Patterns, 2000).

Hyde County. Lodging and food service and retail trade are the largest employers in Hyde County, employing 277 and 223 of the county's 1,044 employees with an annual payroll of $22.4 million in 2000 (U.S. Department of Commerce, County Business Patterns 2000). This is due in large part to the tourists attracted to the Outer Banks of Hyde County (North Carolina Economic Security Commission, 2002).

Table 11. Economic and population data for northeastern North Carolina counties.

County	Average Income[1]	Poverty Rate (%)[1]	Average 2004 Unemployment Rate (%)[2]	2000 Population[1]	Population Trend[1]
N. Carolina	$35,320	12.6	5.5	8 million	+21% since 1990
Counties in the Vicinity of the Alligator River National Wildlife Refuge					
Dare	$35,258	8.1	5.1	29,967	+32% since 1990
Hyde	$23,568	24.8	7.2	5,826	-37% since 1900
Other Northeastern North Carolina Counties					
Beaufort	$28,614	17.4	6.9	44,958	+6% since 1990
Bertie	$22,816	12.6	8.2	19,773	Same as 1990
Camden	$35,423	12.2	3.8	6,885	+16% since 1990
Carteret	$34,348	11.8	4.7	59,383	+13% since 1990
Chowan	$27,900	18.7	4.9	14,526	+7% since 1990
Craven	$33,214	13.8	4.9	91,436	+12% since 1990
Currituck	$36,287	10.8	2.8	18,190	+32% since 1990
Gates	$30,087	15.4	4.2	10,516	Same as 1900
Halifax	$24,471	23.6	8.1	57,370	Same as 1950
Hertford	$23,724	23.1	8.0	22,601	Same as 1960
Martin	$26,058	20.1	7.1	25,593	Same as 1940
Northampton	$24,218	23.1	7.3	22,086	Same as 1980
Pamlico	$28,629	16.8	4.7	12,934	+14% since 1990
Pasquotank	$29,305	19.0	4.7	34,897	+11% since 1990
Perquimens	$26,489	19.5	4.8	11,368	Same as 1920
Tyrrell	$21,616	25.7	7.8	4,149	-17% since 1900
Washington	$27,726	20.5	7.3	13,723	Same as 1960

[1] *U.S. Census Bureau, 2000 Census of the United States*
[2] *North Carolina Economic Security Commission, December, 2004*

In 2000, the sectors employing the largest numbers of persons were in decreasing order as follows: lodging and food service, retail trade, agriculture, manufacturing, construction, wholesale trade, health care, finance, forestry and fishing, real estate, administrative and support services, and recreation (U.S. Census Bureau, Economic Census 2000).

FORESTRY

Dare County. Timber was a source of wealth for Dare County before the Civil War. However, the Service now manages much of the forestland primarily for wildlife habitat and timber is a secondary product of the land.

Today, Dare County is approximately 57 percent forested, with 142,212 acres of timberland. In contrast, 60 percent of North Carolina is forested. Forty-nine percent of the county's forest is in loblolly pine and 45 percent is oak-gum-cypress (USDA Forest Service 1991).

Hyde County. Timber has always been a source of wealth for Hyde County. However, much of the timber was cleared in order to cultivate the land for corn, soybeans, and other crops.

Today, Hyde County is approximately 60 percent forested, with 235,800 acres of forestland. In contrast, 60 percent of North Carolina is forested. Fifty-two percent of the county's forest is in pine, 32 percent is in oak-gum-cypress, 11 percent is in oak-hickory, and 5 percent is in oak-pine (USDA Forest Service 2002).

In 2000, private landowners were the largest forest landowners with 55 percent of the count's forestland. The federal government owned 28 percent, forest industry owned 15 percent, and the state government owned 2 percent (USDA Forest Service 2002).

OUTDOOR RECREATION IN THE AREA

Fish and wildlife resources have had a profound effect on recreation in the area. Dare and Hyde counties have always had an abundance of fish and game, due to their diversity of lands and waters. Early in the twentieth century, sportsmen established clubs to protect game and wildlife. Later, as part of a comprehensive wildlife management program, the Service established Alligator River National Wildlife Refuge to preserve and restore habitat for native wildlife and migratory birds. The Fish and Wildlife Service also manages the Pocosin Lakes and Mattamuskeet national wildlife refuges, and the North Carolina Wildlife Resources Commission manages the Dare County Bombing Range as a game land to provide hunting opportunities in the area.

Recreation in the area is also based on the water in the ocean, sounds, rivers, and lakes. Swimming in the ocean and sunbathing on the beach are the anchors of recreation on the Outer Banks. Boat ramps provide access to the river and sound. Numerous outfitters provide boats and guided tours. The North Carolina Coastal Plain Paddle Trails Guide lists trails through the Pea Island and Alligator River national wildlife refuges (North Carolina Division of Parks and Recreation 2001). Many vendors sell and rent canoes, kayaks, sailboats, surfboards, and sailboards. There are numerous opportunities to fish in the surf, from piers, in small boats in the sounds and streams, and from large boats in the ocean.

A variety of agencies and organizations provide environmental education and interpretation opportunities: the Fish and Wildlife Service at Pea Island National Wildlife Refuge; the National Park Service at Cape Hatteras National Seashore; the State of North Carolina at Jockey's Ridge State Park and the State Aquarium; the town of Manteo at Roanoke Island Festival Park; and The Nature Conservancy at Nags Head Woods.

Many of the festivals in the area are focused on natural resources, including Wings over Water throughout the county and Wildfest in Manteo. At least one fishing tournament is held every month from May to November. The Nature Conservancy at Nags Head Woods holds week-long ecocamps throughout the summer.

OUTDOOR RECREATION ECONOMICS

Fish and wildlife are the focus of the refuge, but they are also important to the local economy. First, a considerable commercial fishery is present in area streams, lakes, and sounds. Striped bass, red drum, flounder, speckled trout, and gray trout are the major species harvested. Secondly, hunting and fishing are economically important to local businesses, both directly as the local population spends money and indirectly as an attraction that draws sportsmen from outside the county.

Unfortunately, a general lack of regard for the preservation of fish and wildlife resources, combined with channel dredging and wetland clearing and draining, has led to the loss of valuable fishery spawning grounds and the loss of habitat for many wildlife species. In the attempt to protect and restore some of these resources, the Alligator River Refuge serves an important role, not only by providing habitat for a diversity of plant and wildlife species, but also as a place where people can go to enjoy these resources, either through observation, photography, education, or interpretation; or more directly through fishing.

There have been no studies performed on Alligator River Refuge or any other refuges in North Carolina on which to estimate the economic impact of outdoor recreation. The Service has surveyed all wildlife-dependent recreation participants in North Carolina. There has been a study of visitors to the interpretive facilities of a nongovernmental organization in northeastern North Carolina. There are also numerous studies of ecotourists and birdwatchers on national wildlife refuges and other areas throughout the United States.

The Fish and Wildlife Service surveyed participants in wildlife-dependent recreation in North Carolina in 2001. The survey documented an average expenditure of $69 per day by anglers, $74 per day for hunters, and $199 per day for wildlife observers and photographers (U.S. Fish and Wildlife Service 2001).

The Partnership for the Sounds sponsored a study of the economic impact of its facilities. The study demonstrated that the average visitor spent $108 per visit, with a range of $64 to $333 per day (Vogelsang 2001). A similar study of visitors at the Chincoteague National Wildlife Refuge in Virginia also showed a range of expenditures from $62 to $101 per day (U.S. Environmental Protection Agency 1997).

A study commissioned by the State of New Jersey demonstrated that the average visitor to the shorebird migration spent $130 per day (New Jersey Department of Environmental Protection 2000). Birdwatchers on eight national wildlife refuges in New Jersey reported a range of expenditures from $25 to $41 per day (Kerlinger 1994).

Ecotourists on Dauphin Island, Alabama, spent an average of $60 per visitor per day (Kerlinger 1999).

Birdwatchers from the local area in High Island, Texas, reported an average expenditure of $46 per day, and nonresidents reported $693 per trip (Eubanks et al. 1993). The average visitor to the Great Texas Coastal Birding Trail spent $78 per day (Eubanks and Stoll 1999).

Studies at the Santa Ana National Wildlife Refuge in south Texas demonstrated a range of expenditures from $88 to $145 per day on nature-based tourist activities. The Laguna Atascosa National Wildlife Refuge in south Texas reported a range of $83 to $117 per day (U.S. Environmental Protection Agency 1997).

Birdwatchers to the Salton Sea National Wildlife Refuge in California spent an average of $57 per day (National Audubon Society 1998).

With improved facilities and staffing, Alligator River Refuge can continue to serve as an important commodity in the economic life of the community. Ecotourism, fishing, wildlife observation and photography, and environmental interpretation are increasingly being seen as a desirable industry. As the population increases and the number of places left to enjoy wildlife decreases, the refuge may become even more important to the local community. It can benefit the community directly by providing recreational opportunities for the local population, and indirectly by attracting tourists from outside the county to generate additional dollars to the local economy.

TOURISM

Seven million tourists visit the Outer Banks of Dare, Currituck, and Hyde counties every year. Tourism in the area is based on the outdoor recreation opportunities described above and the cultural attractions in the area. Roanoke Island, on which Manteo is located, was the birthplace of Virginia Dare, the first English child born in America. The state legislature named the county in her honor. The county seat in Manteo has a historic district featuring old homes and limited development along the streams and the sound. Manteo also features Roanoke Island Festival Park with a historic visitor's center and a replica of Queen Elizabeth II; Elizabethan Gardens managed by the National Park Service as a replica of a formal English garden; and Fort Raleigh National Historic Site, the site of the first settlement. Other cultural attractions include the National Park Service's Wright Brothers Memorial, Bodie Island Lighthouse, and Cape Hatteras Lighthouse; the North Carolina Maritime Museum; the Frisco Native American Museum; and the Chicamocomico Lifesaving Station.

Cultural resources are the basis of many events that attract tourists. These include historical workshops, lectures, and programs at the North Carolina Maritime Museum; tours of historic homes and their gardens; readings of books on historical themes; Virginia Dare's Birthday; National Aviation Day and Week at the Wright Brothers Memorial; Freedman's Colony Celebration at Festival Park; and an Antique Fair at Festival Park.

Alligator River National Wildlife Refuge could serve as an additional attraction to tourists visiting the area at least seasonally. If the refuge had more facilities and permanent staffing, tourists might stay longer in the area to enjoy the opportunities provided for wildlife-dependent recreation and interpretation. This could generate more income for the local economy.

TRANSPORTATION

In its early days, residents of the area relied on water transportation. The rivers and streams that crisscross the county served as a means for transportation, trade, and communication between almost every community in the area. Some of the important waterways in the area were the Albemarle, Pamlico, Croatan, and Roanoke sounds and the Alligator River. While today these waterways are no longer necessary for most of the transportation needs within the county, they are still important as sources of income and for recreation.

U.S Highways 64 and 264 run east and west through the refuge and connect population centers in central North Carolina and Interstate 95 to Dare County. U.S. Highways 158 and 168 run north and south through the Outer Banks to the east of the refuge and connect Dare County with population centers in southeastern Virginia. A number of smaller roads connect the various communities in the area.

Visitors can reach Alligator River Refuge via U.S. Highways 64 and 264. The refuge's dike roads are not open to vehicular traffic. The refuge has 100 miles of gravel roads. Travel off the roads by foot or boat will primarily be limited only by a user's willingness to exert the manpower.

CULTURAL ENVIRONMENT

Dare County is a rural county in predominantly rural northeastern North Carolina. Cultural opportunities in the immediate area are limited to the history-based facilities outlined in the Tourism section; theater at local high schools and parks; music at local fairs, festivals, and nightclubs; and art at local fairs, festivals, and 20 small galleries. A summer-long production of "The Lost Colony" is offered annually at the Fort Raleigh National Historic Site, commemorating the first English settlers on Roanoke Island since 1936. Greenville, North Carolina and East Carolina University, located 100 miles west of the refuge, offer the nearest opportunities for large theatrical or musical performances. Norfolk, Virginia, located 100 miles to the north, has the area's largest art museums and venues for the performing arts, with national touring collections and companies.

REFUGE ADMINISTRATION AND MANAGEMENT

LAND PROTECTION AND CONSERVATION

Alligator River National Wildlife Refuge currently covers 153,017.4 acres (Table 12). The refuge's approved acquisition boundary is 239,800 acres (Figure 5).

VISITOR SERVICES

The refuge is an important link to the other natural areas that together make these experiences possible. Carefully selected and managed staff, programs, and facilities will provide the wildlife-dependent environmental education, interpretation, and recreation opportunities that refuge visitors expect. A few commercial businesses have interests in guiding canoeing and kayaking tours and angling adventures.

The refuge's current visitor facilities are shown in Figure 6.

Table 12. Acquisition history of the Alligator River National Wildlife Refuge.

DATE	TRACTS	ACRES	COST	COST ACRE	TOTAL ACREAGE	TOTAL COST
1984	1	114,259.00	$0	$0	114,259.00	$0
1988	2	10,060.03	$3,518,000	$349	124,319.03	$3,518,000
1989	2	13,272.00	$951,000	$72	137,591.03	$4,469,000
1990	1	11,100.00	$0	$0	148,691.03	$4,469,000
1991	2	40.40	$687,167	$17,009	148,731.43	$5,156,167
1993	4	3,429.94	$507,100	$148	152,161.37	$5,663,267
1996	1	34.00	$0	$0	152,195.37	$5,663,267
2002	1	65.44	$31,000	$475	152,260.81	$5,694,267
2003	1	331.88	$347,500	$1,047	152,592.69	$6,041,767
2004	1	324.66	$347,500	$1,070	152,917.35	$6,389,267
2007	1	100	$165,000	$1,650	153,017.35	$6,554,267
Total	**17**	**153,017.35**	**$6,554,267**	**$42.83**		

Figure 5. Current boundary of the Alligator River National Wildlife Refuge.

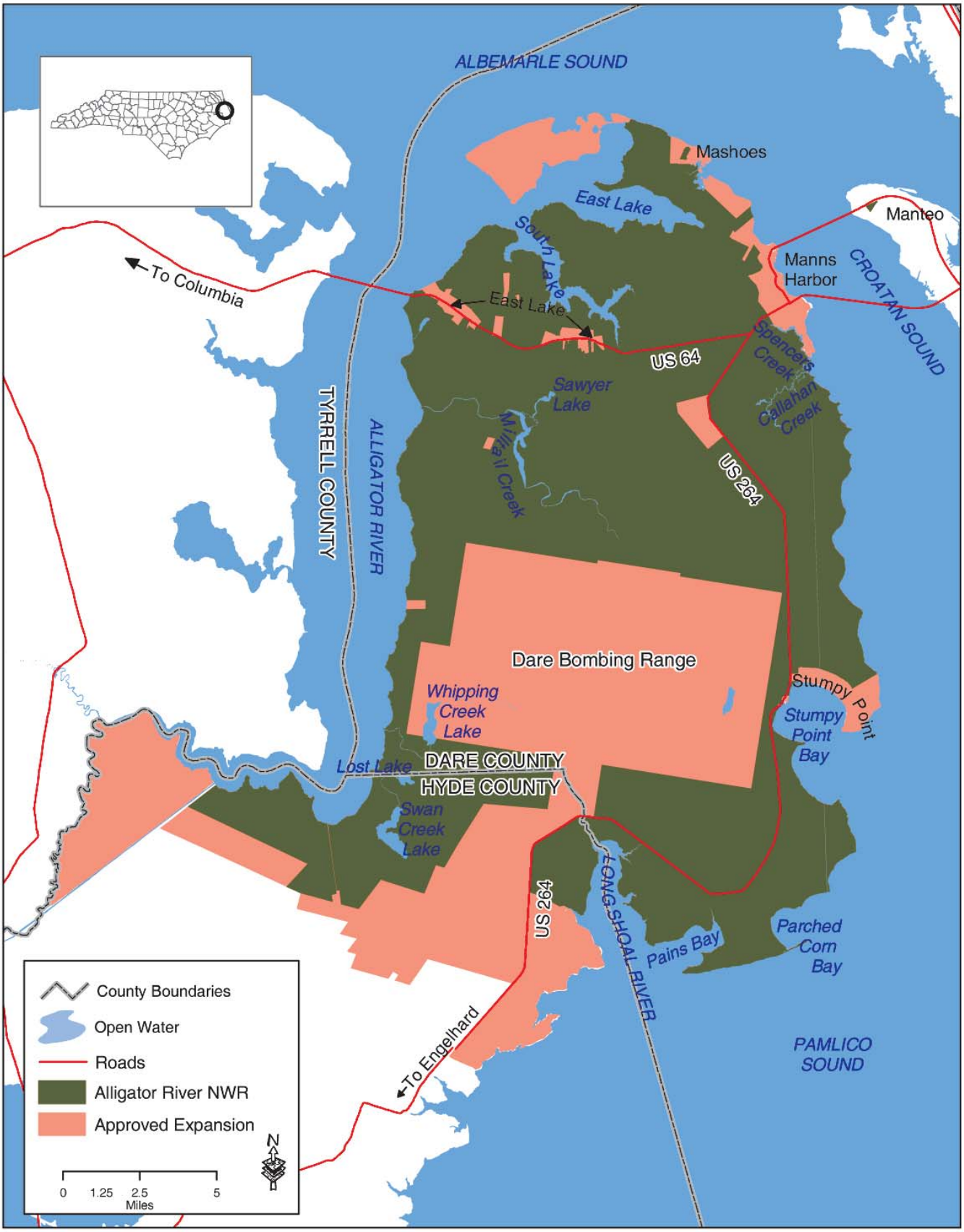
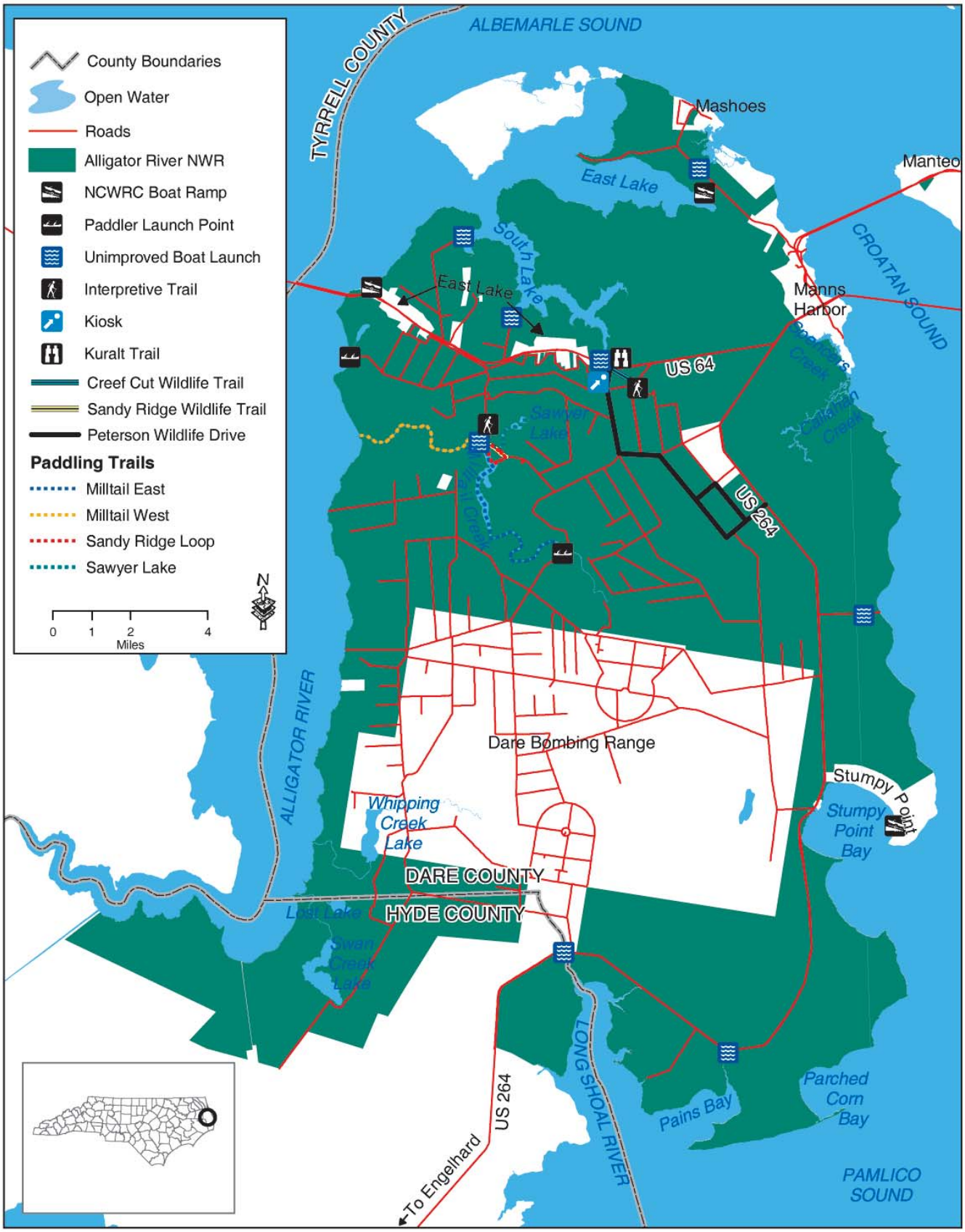


Figure 6. Current visitor facilities at Alligator River National Wildlife Refuge.



Hunting

Hunting is restricted to specific areas, times, and seasons. A refuge hunting permit is required. In general, most species for which there are state seasons and bag limits are designated as game species on the refuge. The refuge's hunting regulations are in keeping with management objectives to ensure the activity continues at a level compatible with the achievement of maintaining optimum populations of hunted species and other species that may be impacted by the hunt. Raccoon hunting is one of the rare night uses of the refuge. For refuge hunts, a state license is required, and all state regulations apply.

Fishing

Alligator River Refuge offers freshwater fishing throughout its navigable waterways. The refuge also provides access to boaters who wish to fish the waters surrounding the refuge. Several small, unimproved boat launching ramps are located within the boundary of the refuge, as well as riverbanks, canal banks, and bridges for land-based fishing activities. The Creef Cut Trail offers a universally accessible fishing platform. On the interior waters of the refuge, bluegill, crappie, blackfish, fliers, yellow perch, and madtom catfish are common. Depending on the salinity of the sound water, both freshwater and saltwater fish may be caught in the sounds. State regulations apply; a state fishing license is required for refuge fishing in most cases.

Environmental Education

The refuge offers guided canoe tours, nature talks and walks, outreach programs in the local school systems, and special seminars and conferences, including the nationally recognized Wings over Water, on a regular and continuing basis. The staff makes many of these program offerings in conjunction with Pea Island National Wildlife Refuge. The staff also makes themselves available to judge science fairs in local schools and provide guidance and encouragement for scout and other environmental education projects.

The refuge currently has no visitor center. The administrative office is located approximately fifteen miles east in Manteo. Several sites on the refuge offer refuge literature and educational panels. A refuge tour tape/compact disc and a Kuralt Trail tape/compact disc are available for purchase and offer educational information about the refuge.

The refuge participates actively in a highly successful intern and work camper program, affording more specific environmental education opportunities to residents and visitors who take advantage of these unique resources. The book store at Pea Island National Wildlife Refuge offers numerous books on the wildlife specific to Alligator River Refuge, and films and tapes on the refuge are available both at Pea Island Refuge and the Manteo office.

Interpretation

Alligator River Refuge offers two interpretive kiosks at roadside facilities easily accessible to the motoring public, as well as pamphlets providing information on the refuge, the red wolf program, and the refuge hunting program. A cassette outlining the unique habitats at Alligator River Refuge is available both in Manteo and at Pea Island Refuge.

Regularly scheduled interpretive programs, including a guided canoe tour of the Milltail Creek area, are available during the warmer months. During the spring and summer months, "wolf howlings" are conducted on a regular basis to enable the public to gain a better understanding and enjoy a unique experience with this endangered mammal, which has successfully been reintroduced into the wild.

Wildlife Observation

The refuge offers two half-mile universally accessible trails: Creef Cut and Sandy Ridge. Boating, canoeing, and kayaking opportunities, a wildlife drive, and limited driving over former logging roads are available for unique wildlife observation opportunities. The black bear population at Alligator River Refuge is one of the largest in the northeast, and many visitors find it quite easy to get a glimpse of a bear in the wild. More fortunate visitors observe a red wolf or an alligator; however, these observations are usually a result of just being in the right place at the right time. While birding is not a major attraction here, there is a wide variety of land birds, raptors, and many species of waterfowl and other migratory birds. There is ample opportunity to view reptiles and small mammals, and more limited opportunity to see the threatened red-cockaded woodpecker, American alligator, and bald eagle. A number of plant species, terrestrial and hydrophytic, as well as the unusual pocosin areas, are also readily observed.

Wildlife Photography

The mammalian population of Alligator River Refuge, together with the walking trails along the waterways and in hardwood swamps and marshes, offer unlimited opportunities for landside wildlife photography. Canoe and kayak trips through the backwaters of the refuge offer waterfront photographic opportunities. But, as is true with wildlife photography in most places, a great deal of patience and perseverance is needed to accomplish professional quality shots.

Universal Access

Alligator River Refuge gives special attention to ensure that visitors with disabilities can visit the refuge for pleasure, education, interpretation, and wildlife observation opportunities. The Creef Cut Trail and Sandy Ridge Trail are level and accessible by wheelchair, and a wheelchair is available at no charge for those who request it. A special access permit is available to hunters with disabilities.

Public Involvement

The refuge offers nearly limitless involvement on either a volunteer or spectator basis for the interested public. It offers special educational opportunities to the scores of local residents and visitors who volunteer for these unique experiences. Waterfowl and black bear surveys and red wolf radio telemetry programs not only provide assistance for the species, but also enable the refuge staff to educate the public on the habits and habitats of these wildlife species. Volunteers and staff share their information with visitors who may otherwise have no interest, concern, or knowledge in protecting or managing those species. The Coastal Wildlife Refuge Society is the nonprofit local organization established to raise funds for continued maintenance of the refuge and its educational programs, and to recruit volunteers for continuation of this process.

The refuge's intern program provides unique experiences for college students and graduates geared towards careers in the environmental sciences. It also provides additional volunteers to maintain the high standards of the refuge. A work camping program, in which volunteers barter a campsite and utilities in exchange for work hours, enables the refuge to take advantage of a wide spectrum of individual experiences and expertises that will enhance the refuge. Each of these programs instills a sense of pride and public stewardship among the volunteers, ensures them of their role in ownership of the land, and heightens their awareness about the critical need for protecting the human/natural interactions.

PERSONNEL, OPERATIONS, AND MAINTENANCE

When the Service created Alligator River National Wildlife Refuge, it combined Alligator River Refuge with Pea Island National Wildlife Refuge to manage the two refuges as a complex. Today, the refuge staff administers the Alligator River and Pea Island Refuges from an office located in Manteo. The refuge's current staff is listed in Table 13.

Table 13. Staff of the Alligator River and Pea Island National Wildlife Refuges, 2005.

Position	Status	Percent of Time on Alligator River
Refuge Manager, GS-0485-14	PFT	40
Deputy Refuge Manager, GS-0485-13	PFT	70
Assistant Refuge Manager, GS-0485-12	PFT	75
Wildlife Biologist, GS-0486-12	PFT	40
Park Ranger (Interpretation), GS-0025-12	PFT	40
Park Ranger (Interpretation), GS-0025-09	PFT	10
Park Ranger (Law Enforcement), GS-0025-09	PFT	70
Administrative Officer, GS-0341-09	PFT	75
Office Assistant, GS-0303-07	PPT	75
Biological Science Technician, GS-0404-07	PFT	50
Forestry Technician, GS-0462-07	PFT	50
Park Ranger (Interpretation), GS-0025-05	TEMP	10
Secretary, GS-0318-05	TERM	75
Biological Science Technician, GS-0404-05	TEMP	50
Student Intern, GS-0499-04,	SCEP	50
Engineering Equipment. Operator Supervisor, WS-5716-09	PFT	75
Engineering Equipment Operator, WG-5716-09	PFT	90
Engineering Equipment Operator, WG-5716-09	PFT	90
Engineering Equipment Operator, WG-5716-08	PFT	90
Automotive Worker, WG-5823-08	PFT	90
Maintenance Worker, WG-4749-06	TERM	30
Fire Management Program		
Fire Management Officer, GS-0460-12	PFT	50
Fire Management Officer (Wildland Urban Interface), GS-0401-11	PFT	40
Prescribed Fire Specialist, GS-0401-07	PFT	40
Forestry Technician, (Fire) GS-0462-08	PFT	80

Position	Status	Percent of Time on Alligator River
Forestry Technician (Fire), GS-0462-06	PFT	80
Forestry Technician, (Fire) GS-0462-04	PFT	80
Engineering Equipment Operator, (Fire) WG-5716-08	PFT	80
Engineering Equipment Operator, (Fire) WG-5716-08	PFT	80
Engineering Equipment Operator, (Fire) WG-5716-08	PFT	80
Red Wolf Program		
Wildlife Biologist, GS-0486-13*	PFT	0
Wildlife Biologist, GS-0486-09*	PFT	0
Wildlife Biologist, GS-0486-11*	PFT	0
Wildlife Biologist, GS-0486-09*	PFT	0
Wildlife Biologist, GS-0486-07*	TERM	0
Bio. Science Tech., GS-0404-07*	PFT	0
Office Assistant, GS-0303-07*	TERM	0

PFT = Permanent Full Time employee
TERM = Term Employee (up to four years)
TEMP = Temporary Employee (not to exceed one year)
SCEP = Student Cooperative Education Program

REFUGE INFRASTRUCTURE

Roads and Trails

The refuge has two established half-mile-long trails: the Creef Cut Trail and the Sandy Ridge Trail. These trails are accessible to visitors with disabilities and feature several overlooks and one wildlife observation platform. Pedestrians can walk, drive, or ride bicycles around 100 miles of gravel roads on the refuge. The trail is part of a series of trails among the eleven refuges and one fish hatchery in eastern North Carolina established in honor of the late Charles Kuralt for the recognition he brought to the National Wildlife Refuge System.

At the south end of Buffalo City Road, a series of four, color-coded paddle trails totaling 15 miles are available for canoes and kayaks.

Communication Systems

The refuge's communications system currently consists of mobile radios with a base station on mainland Dare County. The staff uses cellular phones for communication between the field and office.

Waste Collection and Disposal

Volunteers and temporary staff transfer general trash to dumpsters located at the shop that Dare County empties for a fee. The North Carolina Department of Transportation is responsible for removing trash from the rights-of-way of U.S. Highways 64 and 264. Septic systems treat sanitary waste from the shop and intern quarters. There are portable toilets at the Creef Cut Trail parking lot at the intersection of Milltail Road and U.S. Highway 64 and at the end of Buffalo City Road.

III. Plan Development

PUBLIC INVOLVEMENT AND THE PLANNING PROCESS

In accordance with Service guidelines and National Environmental Policy Act requirements, public involvement was a crucial factor throughout the development of this Comprehensive Conservation Plan for Alligator River National Wildlife Refuge. The plan was written with input and assistance from interested citizens, conservation organizations, and officials of local and state agencies. The participation of these stakeholders and their ideas has been of great value in setting the management direction for the refuge. The Service, as a whole, and the refuge staff, in particular are very grateful to each individual who contributed time, expertise, and ideas to the planning process. The staff remains impressed by the passion and commitment of so many individuals for the lands and waters administered by the refuge.

Representatives from the Fish and Wildlife Service and state wildlife agency personnel attended the initial planning meetings. At these initial meetings, they discussed strategies for completing the plan; identified the staff's issues and concerns; and compiled a mailing list of likely interested government agencies, nongovernmental organizations, businesses, and individual citizens. The Service invited these agencies, organizations, businesses, and citizens to participate in a series of public scoping meetings that were held on February 15, 16, 20, 22, and 23, 2001, in Washington, Plymouth, Columbia, Swan Quarter, and Manns Harbor, North Carolina, respectively. At these public scoping meetings, the audiences were introduced to the refuge and its planning process, and asked to identify their issues and concerns. The Service advertised the meetings in advance by publishing announcements giving their locations, dates, and times in the *Federal Register* and legal notices in local newspapers. The Service also sent press releases to local newspapers and public service announcements to television and radio stations. Service personnel placed 50 posters announcing the meetings in local post offices, local government buildings, and stores.

The Service expanded the planning team's identified issues and concerns to include those generated by the agencies, organizations, businesses, and citizens from the local community. These issues and concerns formed the basis for the development and comparison of the objectives in the different alternatives described in the environmental assessment, which was prepared in conjunction with the Draft Comprehensive Conservation Plan.

The alternatives were subjects of discussion at a second-round public meeting held on April 26, 2005, in Manns Harbor, North Carolina. The planning staff again published announcements giving the location, date, and time for the public meeting as legal notices in local newspapers. The staff also sent press releases to local newspapers and public service announcements to television and radio stations. The staff placed 75 posters announcing the meeting in local post offices, local government buildings, and stores.

At this second-round public meeting, the refuge staff and planning team briefed members of the public on the alternatives. The audience provided feedback on the alternatives and suggested additions to the alternatives that were not mentioned in the previous scoping meetings. The staff considered this input in revising the draft plan and selecting a preferred alternative.

The Draft Comprehensive Conservation Plan and Environmental Assessment for Alligator River National Wildlife Refuge was then completed and released for public review in May of 2006. A news release and flyers were sent on June 5, 2006, announcing the availability of the document for public review and comment, with a deadline for submitting comments by July 14, 2006. In addition, a public open house was held on June 13, 2006, at the Refuge Administrative Office in Manteo, North

Carolina, to solicit comments on the Draft Comprehensive Conservation Plan and Environmental Assessment. The comments were submitted either orally at the meeting or by mail or e-mail.

All comments were considered and evaluated in preparing the final comprehensive conservation plan for Alligator River National Wildlife refuge. Some changes were incorporated into the plan.

A summary of the comments received from the public scoping meetings, as well as the comments received on the Draft Comprehensive Conservation Plan and Environmental Assessment and the Service's responses to them, are provided in Appendix IV, Public Involvement.

SUMMARY OF ISSUES, CONCERNS, AND OPPORTUNITIES

The input of local citizens and public agencies, the team members' knowledge of the area, and the resource needs identified by the refuge staff and biological review team all contributed to the issues and concerns addressed in the plan. The Fish and Wildlife Service assembled a planning team to evaluate the resource needs. The team then developed a list of goals, objectives and strategies to shape the management of the refuge for the next 15 years. The individual members of the planning team, biological review team, and other expert contributors are identified in Appendix X, Consultation and Coordination.

These issues and concerns provided the basis for developing the refuge's alternative management objectives and strategies. These issues played a role in determining the desired future conditions for the refuge and were considered in the preparation of the long-term comprehensive conservation plan. The issues and concerns are described below. They are of local, regional, and national significance and reflect similar issues that were, in part, identified by the public at the scoping meetings.

HYDROLOGY

Drainage Ditches

Previous managers of the land that is now Alligator River Refuge developed a network of ditches to drain the land for agriculture and timber harvest. These ditches and the roads created from the excavated material from the ditches remain on the refuge. The establishment of water control structures and management of water on the refuge is important to the maintenance and restoration of wetland communities. Water management is also the key to successfully managing wildfire threats and prescribed burning.

Global Warming and Sea Level Rise

It is clearly evident from elevation, topographic relief, and proximity to the ocean that impacts on the refuge stemming from global warming will manifest themselves through rising sea level and coastal storms. Much of the outer refuge boundary is at or only slightly above sea level. Rising sea level will result in wetter hydrologic regimes and saltwater intrusion. Saturated marshes, pocosins, and hardwood forests cover the majority of the refuge. Scientists predict that the sea level along the North Carolina coast will rise from two to three feet in the next 100 years due to global warming. This rise in the water levels has initiated change and will continue to change the types of vegetative cover on the refuge. Grass-dominated marsh areas will transition to open water while marsh vegetation will expand into areas currently covered by pocosin and hardwood forests. Bald cypress and swamp black gum are likely to expand into areas currently occupied by hardwood forests. It is conceivable that several hundred acres of forested wetlands will begin transition into brackish coastal marsh during the time span covered by this comprehensive conservation plan. Similarly, considerable

acreages of the marsh fringe will have eroded and become open water. More frequent and more intense coastal storms on the refuge coupled with frequent fuel reduction burns will hasten the transition from forested habitat to marsh habitat.

As the habitats change, the wildlife species that inhabit those habitats will also change. Colonial nesting birds such as herons and egrets that currently utilize tall trees along the river will lose their roost sites as trees die and fall. New candidate roost trees further upslope will be separated from open water by freshwater marshes. Cavity-nesting waterfowl, land birds, and mammals will lose their cavities as the trees they currently use fall, but other trees further upslope will replace them as cavity trees. The freshwater marshes that will expand into the former pocosins and hardwood forests will provide habitat for species of land birds and waterfowl not currently inhabiting the refuge and additional habitat for waterfowl and wading birds currently using the refuge. The marshes will also provide more habitats for groups of species currently on the refuge, including marsh birds and a greater abundance and diversity of aquatic species.

The refuge has a history of working with conservation organizations and other agencies on management issues arising due to the effects of global warming. One of the first land-based workshops focusing on the problems and possible adaptive management strategies was co-sponsored by the refuge in early 2006. Of the management strategies discussed to date, there is an overall consensus that considerably more scientifically valid data are needed to effectively and efficiently implement management actions. Management actions with the highest probability of being implemented include use of flap gates on primary canals to prevent or slow wind tides from pushing salt water further and further into the refuge interior and planting certain tree species that are more tolerant to elevated salinity. For example, mature cypress appears to withstand frequent saltwater intrusion better than pine. If this is indeed the case, the question then becomes, “Are cypress growth rates faster than the rate of habitat change induced by rising sea level?” Alternatively, the question “How far away from the marsh/forest interface should cypress be planted?” could direct another strategy.

Due to the current state of our knowledge with regards to the nature and extent of global warming impacts on the refuge, the focus of this comprehensive conservation plan is to gather the best scientific data possible for future planning. The most immediate action the refuge can take is to incorporate more information on changes brought about as a result of global warming through education and outreach to the public. In addition, the refuge will work cooperatively with other organizations and agencies to develop prudent adaptive management strategies that work in concert with changes brought about due to global warming. These strategies could involve changes in refuge infrastructure features such as the road/canal system. It is the intent of the refuge to develop data bases and management actions to cope with the effects of global warming that will carry through into the next century.

FISH AND WILDLIFE POPULATIONS

The refuge staff and the public at the scoping meetings contributed ideas for the fish and wildlife population issues. In addition, staff of the Fish and Wildlife Service and cooperating agencies and organizations conducted a biological review of Alligator River National Wildlife Refuge in 1999 and 2000 as part of the comprehensive planning process. They identified the objectives and strategies needed to protect the refuge’s wildlife populations and meet the minimum feeding and nesting habitat requirements of waterfowl, shorebirds, and neotropical migratory birds.

Threatened and Endangered Species

Recovery and protection of threatened and endangered plants and animals is an important responsibility delegated to the Service and its national wildlife refuges. Four threatened or endangered species of animals use (or could use) Alligator River National Wildlife Refuge: the bald eagle (federally threatened), red-cockaded woodpecker (federally endangered), red wolf (federally endangered), and American alligator (federally threatened).

Bald eagles use the refuge for foraging. Currently, two bald eagle nests are located within the refuge boundary; however, nesting does not occur in every nest every year. The refuge staff surveys the nests in January in conjunction with waterfowl surveys. The refuge should perform surveys in April and May to document nesting success.

Red-cockaded woodpeckers nest in pines in the southern part of the refuge. Adequate pine habitat does exist on other areas of the refuge. Before Hurricane Isabel in September 2003, there were two active clusters on the refuge, at least one of which was successful every year. The red-cockaded woodpecker nesting areas received extensive damage during Hurricane Isabel. The extent of this damage and potential impacts should be evaluated in the future. The refuge also should survey the habitat for red-cockaded woodpecker and manage the stands to provide optimum habitat. The hurricane has reduced the canopy coverage and may have reduced the canopy enough to have improved the habitat to optimum condition. There is no commercial demand for the species in the forest the woodpeckers inhabit.

The Service introduced red wolves to the refuge in 1987. The first animals were captive-bred animals that were the offspring of the last wild red wolves in existence. The total population on the Albemarle-Pamlico peninsula is approximately 100 adults.

American alligators are listed as threatened due to their similarity of appearance to crocodiles. They do live and reproduce throughout the refuge in small numbers. The exact population is uncertain.

Waterfowl

Management of the refuge's moist soil units and marshes for waterfowl is important for meeting the refuge's purpose. The refuge's waterfowl objectives help guide water management actions on the refuge. In order to meet its waterfowl objectives, the refuge must maintain the moist soil units to meet waterfowl habitat needs and provide sufficient sanctuary areas that provide undisturbed resting and feeding areas for waterfowl.

Shorebirds

Management of refuge's moist soil units for shorebirds is also important for meeting the refuge's purpose. The refuge's shorebird objectives help guide operation and management actions on the refuge. The refuge could manage the moist soil units to meet shorebird habitat needs, especially during the fall and spring migration periods, and provide sufficient sanctuary areas that provide undisturbed resting and feeding areas for shorebirds. Extensive pumping and soil disturbance would be required to create the habitat.

Wading Birds

The refuge should protect heron rookeries and monitor them to document nesting success. Two rookeries are currently on the refuge: one on Whipping Creek Lake and one on Swan Creek Lake. Some canoeing and kayaking use occurs in those areas, but there is no access for surveys.

Neotropical Migratory Birds

Neotropical migratory birds are a species group of special management concern. Providing habitat (i.e., pocosins, hardwood forests, pine forests, brackish marshes, and maritime shrub) for these birds is a refuge objective. Strategic marsh management compatible with the refuge's waterfowl habitat objectives contributes to the maritime shrub needs of neotropical migratory birds. Black-throated green warblers utilize the transition areas between Atlantic white cedar and pond pine stands. The staff must maintain that transition zone.

Data Needs

Wildlife data collection on the refuge has focused on waterfowl and recently black bear. Cooperating federal and state agencies, nongovernmental organizations, and the public have all encouraged the Service to continue that data collection and expand it to include all the wildlife species on the refuge and the effects of refuge management and public use on the diversity and health of the wildlife. Specific needs include aerial surveys for red-cockaded woodpecker cavities and bald eagle nests, and ground-truthing surveys for the red-cockaded woodpecker cavities.

HABITAT MANAGEMENT

The refuge staff and the public at the scoping meetings contributed ideas for the habitat management issues. In addition, staff of the Fish and Wildlife Service and cooperating agencies and organizations conducted a biological review of Alligator River National Wildlife Refuge in 1999 and 2000 as part of the comprehensive conservation planning process. They identified objectives and strategies needed to meet the minimum feeding and nesting habitat requirements of waterfowl, shorebirds, and neotropical migratory birds.

Moist Soil Area Management

The staff manages the refuge's moist soil units for moist soil vegetation and submerged aquatic vegetation for waterfowl habitat, mud flats for shorebird habitat, and grass habitat for marsh birds. Providing quality habitat requires water management using water control structures and pumps; vegetation management with disking; prescribed burning; mowing; and monitoring of water levels, vegetation, and invertebrates.

Marsh Management

The staff manages the refuge marshes for perennial emergent vegetation that provides habitat for waterfowl, marsh birds, wading birds, shorebirds, and neotropical migratory songbirds. The black rail, a marsh bird, is a federal species of concern. The staff must conduct prescribed burning so the secretive marsh birds have escape routes from the fire and so the fires create a mosaic of habitats. Providing quality habitat requires prescribed burning and control of invasive species such as common reed (*Phragmites australis*).

Data Needs

Data collection on the refuge has focused on managed wetlands (moist soil units). Cooperating federal and state agencies, nongovernmental organizations, and the public have all encouraged the Service to continue that data collection and expand it to include all the habitats on the refuge and the effects of refuge management and public use on the diversity and condition of the habitats. The most significant of these needs are aerial surveys for red-cockaded woodpeckers and bald eagles, and ground surveys to monitor red-cockaded woodpecker nesting activity.

VISITOR SERVICES

Alligator River National Wildlife Refuge offers the six priority wildlife-dependent recreational opportunities identified in the National Wildlife Refuge System Improvement Act of 1997. Wildlife observation and photography, along with educational and interpretive programs, attract thousands of visitors annually to the refuge. Fishing is popular in the refuge's ditches, creeks, and lakes. Hunting for deer and small game is permitted on the refuge during state hunting seasons. Hunting for waterfowl is prohibited in farming units, but is allowed on state waters including Milltail Creek and Sawyer Lake. Access to the refuge by motor vehicle, bicycle, boats, and horseback is an important issue in the public use program.

Wildlife Observation and Photography

The refuge's network of roads and paddling trails gives visitors visual access to wildlife in many different habitats throughout the refuge. Especially in peak migration seasons but also throughout the year, the refuge welcomes thousands of avid birdwatchers, photographers, nature lovers, and fortunate passers-by.

Hunting

Currently, hunting for deer, small game, and waterfowl is permitted on the Alligator River Refuge. Hunting and fishing are integral parts of the rural North Carolina culture. It is not surprising that there is considerable state and local interest in providing additional hunting opportunities, especially for the black bear, which is hunted on private lands surrounding the refuge. Any expanded hunting opportunities will be dependent upon providing safe, quality experiences that are compatible with refuge purposes.

Fishing

The refuge attracts several thousand annual visitors for its fishing opportunities, primarily in the drainage ditches but also in lakes and creeks.

Environmental Education and Interpretation

The refuge provides an array of public tours and educational/interpretive programs to educate visitors about the refuge and the diversity and significance of its wildlife and habitat. Due to the limitations of a small staff, the refuge relies heavily on a network of local volunteers, student interns, and work campers for the implementation of this public outreach. Year-round, the refuge staff and a dedicated group of volunteers work to highlight the importance of Alligator River National Wildlife Refuge and the work of the Fish and Wildlife Service.

Nonpriority Public Uses

The refuge owns the majority of the wild lands in Dare County and most of the access to streams that give the public access to the area's bays and sounds. Since its establishment, the refuge has approved special use permits for several traditional noncommercial uses that have minimal impact to refuge resources. The public expressed concern that those uses be permitted in the future. The uses include the gathering of firewood; cutting small-diameter poles for pound nets; cutting big cordgrass to cover duck blinds; gigging frogs; and mooring small commercial fishing boats.

RESOURCE PROTECTION

Cultural Resources

There have been limited archaeological investigations within the refuge. The wetland environment makes it unlikely that there are many cultural resources on the refuge. The small area of uplands is the most likely site of settlements or encampments. The staff must conduct management activities so as to avoid compromising sensitive sites.

Land Acquisition

There are inholdings around the perimeter of the refuge within its approved acquisition boundary. Acquiring these inholdings would secure the Service's ability to protect all refuge resources.

Law Enforcement and Refuge Regulation

The staff enforces applicable laws and regulations through the use of one full-time law enforcement officer who covers both the Alligator River and Pea Island refuges. The officer has obligations for more than 158,000 acres, and this extensive territory limits his ability to perform his functions. His other workload limits the amount of time he can devote to the monitoring of permits and enforcement of the conditions for the permits. During the fall and winter months, it is important to have more of a law enforcement presence on the Alligator River Refuge due to its large number of hunters. During the summer months, it is important to have more of a law enforcement presence on the Pea Island Refuge due to the large number of visitors to the beach and visitor center areas.

Other Resource Protection

Other threats to refuge resources require closer monitoring and management. Pest plants and animals and wildlife disease are all concerns to which the refuge should be paying closer attention.

WILDERNESS REVIEW

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

In summary, in examining the nature of the 46,715 acres selected as wilderness study areas, it was determined that there would be mostly passive management whether the lands were designated as wilderness areas or not. There is little opportunity for recreation because the deep organic soils support very little pedestrian traffic. Therefore, it was decided not to propose the acreage as wilderness. As a result of this decision, the question of whether lands falling within the currently approved acquisition boundary of the refuge would be proposed for wilderness designation is not addressed further as a part of this plan. Any future land acquisition outside the currently approved acquisition boundary would be evaluated independently for possible proposed wilderness designation.

IV. Management Direction

INTRODUCTION

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

Three alternatives for managing the refuge were considered in the Draft Comprehensive Conservation Plan and Environmental Assessment: Alternative 1 (No Action); Alternative 2 (Preferred Alternative); and Alternative 3. Each of those alternatives was described in the Alternatives section of the Draft Environmental Assessment. The Service chose Alternative 2 as the preferred management direction.

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.

This comprehensive conservation plan was derived from Alternative 2, the preferred alternative, of the environmental assessment (Section B of the Draft Comprehensive Conservation Plan for Alligator River National Wildlife Refuge).

Implementing the preferred alternative will result in the Service protecting, maintaining, restoring, and enhancing refuge lands for resident wildlife, waterfowl, migratory nongame birds, and threatened and endangered species. The refuge staff will initiate extensive wildlife and plant census and inventory activities to develop the baseline biological information needed to implement management programs on the refuge.

The refuge will direct all management actions towards achieving the refuge's primary purposes: (1) preserving nesting and migratory habitat for neotropical migratory land birds, and (2) helping to meet the habitat conservation goals of the North American Waterfowl Management Plan. In addition, the staff will manage the refuge to contribute to other national, regional, and state goals for protecting and restoring populations of wildlife.

The Service will implement active habitat management through forest management and moist soil unit management designed to provide a historically diverse complex of habitats that meets the foraging, resting, and breeding requirements for a variety of species.

Under this plan, the refuge will continue to seek acquisition of all willing seller inholdings within the present acquisition boundary. The primary purpose for this acquisition is to provide a system of coastal marshes, pocosins, and forested habitats of sufficient size and carrying capacity to reach regional objectives associated with area-sensitive neotropical birds, anadromous fish, colonial nesting birds, forest-associated waterfowl, and wetland forest landscapes. Lands acquired as part of the refuge will be available for compatible wildlife-dependent recreation and environmental education.

During the 15-year life of this plan, the refuge staff will develop and implement a habitat management plan, designed to maintain the present spatially and specifically diverse mosaic of habitats with little negative effect to wildlife objectives.

The Service will provide opportunities for quality wildlife-dependent recreation activities (e.g., hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation). The refuge will maintain the interior and exterior access roads to provide all-weather vehicular access to a broad segment of the public. The staff will permit hiking to support wildlife-dependent recreation to the extent that these opportunities do not substantially interfere or detract from the achievement of wildlife conservation. They will provide wildlife observation sites and platforms; interpretive trails, boardwalks, and kiosks; and restrooms at specific sites to allow for fully accessible environmental education and interpretation programs. The plan provides for quality fishing and hunting programs, consistent with sound biological principles with sufficient focus on migratory bird needs for resting, loafing, feeding and courting requirements. The Service will permit fishing along the banks of streams and ditches and from boats. The staff will continue to implement an environmental education plan, incorporating an aggressive and proactive promotion of both on- and off-site programs.

VISION

The vision for the refuge is as follows:

Alligator River National Wildlife Refuge's unique wetland habitats will become more critical for many wildlife, fish, and plants as eastern North Carolina is developed. Refuge habitats will be managed, enhanced, and restored for optimal diversity of wildlife, fish, and plants. Healthy and viable populations of threatened and endangered species, and other wildlife, fish, and plants will be managed and conserved.

People will visit this refuge in greater numbers to witness its subtle beauty and to seize the opportunity to explore. Refuge staff and volunteers will assume a greater role in educating the visiting public to ensure that biological integrity is maintained and that people have a safe, pleasant and educational experience. Visitors will be encouraged to participate in compatible, wildlife-dependent recreational activities.

The proposed visitor center will serve as a gateway, not only for adventure into Alligator River Refuge, but also to encourage the many visitors to the Outer Banks to venture inland to other local national wildlife refuges. There will be a growing responsibility to reach out to local and national communities about the refuge's importance as a valuable piece of the puzzle that connects all wildlife habitats together.

Working with others, the refuge's staff and volunteers will adaptively manage the refuge's natural resources and create in this wild place a legacy of fish, wildlife, and plants for future visitors to experience, enjoy, and cherish.

GOALS

WILDLIFE AND FISH POPULATIONS

Inventory, protect, and manage to maintain healthy and viable populations of threatened and endangered species (e.g., red wolf and red-cockaded woodpecker), other priority wildlife (migratory birds and black bear), and fish.

HABITAT MANAGEMENT

Inventory and manage to provide diverse, high quality mid-Atlantic Coastal Plain forested wetlands, marshes, aquatic habitats, and areas intensively managed for wildlife.

PUBLIC USE/OUTREACH

Provide safe, quality wildlife-dependent recreation opportunities for people to learn about and enjoy the wildlife resources and habitats of the refuge and of the National Wildlife Refuge System.

RESOURCE PROTECTION

Limit the adverse impacts of development to refuge resources and allow natural processes to dominate on candidate wilderness areas.

OBJECTIVES AND STRATEGIES

The goals, objectives, and strategies addressed below are the Service's responses to the issues, concerns, and needs expressed by the planning team, the refuge staff, and the public. These goals, objectives, and strategies reflect the Service's commitment to achieve the purposes of the enabling legislation for the establishment of Alligator River National Wildlife Refuge; the mandates of the National Wildlife Refuge System Improvement Act of 1997; the mission of the National Wildlife Refuge System; the North American Waterfowl Management Plan; and the purpose and vision for Alligator River National Wildlife Refuge. The Service intends to accomplish these goals, objectives, and strategies during the next fifteen years.

FISH AND WILDLIFE POPULATIONS

Fish

Objective: Document the populations of fish and other freshwater/estuarine species annually in internal creeks, lakes, canals, and adjacent waters.

Discussion: This plan is an improvement on the current management because it provides for documentation of the presence of fish species and quarterly studies and investigations of fisheries resources and water quality parameters. These studies and investigations will help evaluate the impact of refuge management on fisheries resources.

Strategies:

- Document presence or absence of fish species as they are observed.
- Conduct quarterly studies and investigations on fisheries resources and water quality parameters.
- Assist others in conducting studies and investigations to the extent possible.

Invertebrate Species

Objective: Document presence or absence of invertebrate species as they are identified.

Discussion: This plan is an improvement on the current management because it provides for documentation of the presence of invertebrate species and invertebrate population surveys in moist soil units, ditches and canals every five years. These surveys will help evaluate the impact of refuge management on invertebrates.

Strategies:

- Conduct invertebrate population surveys in moist soil units, ditches, and canals every five years prior to raising water levels.
- Document presence or absence of invertebrate species as they are observed.
- Assist others in conducting studies and investigations to the extent possible.

Land Birds

Objective: Document the use of resting, nesting, and foraging habitat by land birds annually.

Discussion: This plan is an improvement on the current management because it provides for documentation of the presence of land bird species and grassland bird surveys in farmland filter strips each spring and fall. These surveys will help evaluate the impact of refuge management on land birds.

Strategies:

- Document presence or absence of land bird species as they are observed.
- Assist others with and/or conduct banding activities as requested or directed.
- Assist others with and/or conduct studies and investigations, as requested.
- Conduct grassland bird surveys in farmland filter strips each spring and fall.
- Monitor response of land birds to habitat management activities using point counts or another statistically valid method in selected habitats for selected species.

Mammals

Objective: Monitor, collect data from, and manage for black bear, red wolf, white-tailed deer, and other selected mammals annually.

Discussion: This plan is an improvement on the current management because it provides for documentation of the presence of mammal species. These surveys will help evaluate the impact of refuge management on mammals.

Strategies:

- Document presence or absence of mammal species as they are observed.
- Document black bear and white-tailed deer populations in cooperation with cooperating agencies, organizations, and universities.
- Maintain communication with the Red Wolf Recovery Team and its population monitoring efforts.
- Assist others in conducting studies and investigations to the extent possible.

Reptiles and Amphibians

Objective: Monitor reptile and amphibian populations as opportunities present themselves.

Discussion: This plan is an improvement on the current management because it provides for documentation of the presence of reptile and amphibian species and monthly breeding surveys. These surveys will help evaluate the impact of refuge management on reptiles and amphibians.

Strategies:

- Document presence or absence of reptile and amphibian species as they are observed.
- Assist others in conducting studies and investigations to the extent possible.
- Conduct monthly breeding surveys of reptiles and amphibians.

Shorebirds

Objective: Document the use of habitat for shorebirds, to the extent possible, during the spring and fall migration and through the winter.

Discussion: This plan is an improvement on the current management because it provides for documentation of the presence of shorebird species and woodcock and snipe surveys. These surveys will help evaluate the impact of refuge management on shorebirds.

Strategies:

- Assist others with banding activities as directed.
- Document presence or absence of shorebird species as they are observed utilizing International Shorebird Survey (ISS) protocols.
- Count shorebirds in areas specifically managed for shorebirds.
- Assist others with and/or conduct studies and investigations to the extent possible.
- Conduct woodcock and snipe surveys during fall migration and in winter.

Waterbirds (Marsh Birds and Wading Birds)

Objective: Document the use of habitat for waterbirds (wading birds and marsh birds) continuously.

Discussion: This plan is an improvement on the current management because it provides for rookery surveys. These surveys will help evaluate the impact of refuge management on wading birds.

Strategies:

- Document presence or absence of waterbirds (wading birds and marsh birds) as they are observed.
- Count waterbirds in areas specifically managed for waterbirds.
- Assist others in conducting studies and investigations to the extent possible.
- Conduct rookery surveys during the nesting season.

Waterfowl

Objective: Document the use of wintering habitat for 2,000 tundra swans and 6,000 dabbling ducks annually from November to March.

Discussion: This plan provides for the same activities as the current management does. The current surveys help evaluate the impact of refuge management on waterfowl.

Strategies:

- Conduct about 18 ground surveys from October through March.
- Conduct about 12 aerial surveys bimonthly from October through March.
- Conduct productivity surveys for tundra swans each winter as requested.
- Monitor 40 wood duck nest boxes annually.
- Assist others with and/or conduct banding activities as directed.
- Meet annual wood duck quota.
- Assist others with and/or conduct studies and investigations to the extent possible, as requested.

Threatened and Endangered Species

Objective: Protect threatened and endangered animal species and associated habitats as identified.

Discussion: This plan is an improvement on the current management because it provides for annual surveys of alligators. These surveys and the surveys currently conducted will help evaluate the impact of refuge management on threatened and endangered species.

Strategies:

- Conduct aerial surveys every five years to locate red-cockaded woodpecker cavity trees.
- Groundtruth aerial surveys for red-cockaded woodpecker cavities as identified.
- Monitor and band red-cockaded woodpeckers annually to determine population characteristics.
- Document occurrence of alligators and conduct annual surveys during spring and summer.
- Document occurrence of bald eagles and monitor nesting activity annually.
- Conduct aerial and ground surveys for red wolves continuously.

HABITAT MANAGEMENT

Freshwater Pools, Ponds, and Lakes

Objective: Protect about 1,582 acres of freshwater pools, ponds, lakes, creeks and canals continuously for the benefit of waterfowl, wading birds, fish, amphibians and other wildlife annually.

Discussion: This plan is an improvement on the current management because it provides for studies and investigations on water quality parameters every five years. These studies will help evaluate the impact of refuge management on water quality.

Strategies:

- Compile existing data for water quality to establish baseline.
- Conduct studies and investigations on water quality parameters every five years.
- Evaluate impacts to water quality and create management recommendations to improve conditions, where feasible.

Brackish Marsh

Objective: Protect and manage 19,014 acres of brackish marsh continuously for the benefit of waterfowl, wading birds, land birds, and other wildlife and fisheries.

Discussion: This plan is an improvement on the current management because it provides for scientific evaluations of selected management activities. These studies will help evaluate the impact of refuge management on brackish marsh.

Strategies:

- Maintain 2,000 to 3,000 acres of optimum quality emergent brackish marsh annually.
- Utilize prescribed fire, herbicide application, and mechanical vegetation management.
- Allow and assist minimal scientific evaluations of selected management activities.

Managed Wetlands

Objective: Provide about 1,903 acres of managed wetlands continuously for a variety of wildlife, 1,200 acres of which will be managed to provide high quality moist soil habitat for the benefit of waterfowl, marsh birds, and shorebirds.

Discussion: This alternative is an improvement on the current management because it provides for an increase in acreage from 900 to 1,200 acres and evaluations of vegetation production annually.

Strategies:

- Manage water levels and vegetation to provide optimum conditions for waterfowl and marsh birds.
- Manage headlands to provide tall native grass habitat for marsh birds.
- Monitor vegetation annually to evaluate the effectiveness of water and vegetation management.
- Allow and assist evaluations of vegetation production annually.

Cropland

Objective: Manage 3,481 acres of cropland continuously, 1,500 acres of which will be managed to produce food for wintering waterfowl, black bear, red wolf, and other wildlife; and 1,500 acres of which will be managed as filter strips to effect water quality and to provide habitat for grassland birds, ground-nesting birds, and other wildlife.

Discussion: This plan is an improvement on the current management because it provides for monitoring the survival and growth of planted hardwoods in the cropland. This monitoring will help evaluate the impact of refuge management on cropland. The filter strips are 75 feet on either side of 150-foot-wide crop fields on a landscape with ditches 300 feet apart. Tundra swans seem to be reluctant to feed in the relatively narrow 150-foot-wide fields. Revised recommendations for filter strip widths will allow their narrowing to 25 feet on either side of a 250-foot crop field.

Strategies:

- Allow and assist evaluations of vegetation production annually.
- Convert 15 acres of cropland annually to nonalluvial hardwoods to provide corridors and habitat for a variety of wildlife.
- Monitor survival and growth of planted hardwoods annually.
- Evaluate the use of crop fields by tundra swans.
- Consider making filter strips more narrow and crop fields wider when the Conservation Reserve Program contract expires in fields close to moist soil areas.

Cypress-Gum Forest

Objective: Protect, monitor, and inventory 7,515 acres of cypress-gum forest habitat continuously for black bear, colonial nesting birds, American bald eagle, land birds, and other wildlife.

Discussion: The plan provides for the same activities as the current management does. The studies conducted by other agencies, organizations, and universities will help evaluate the impact of refuge management on cypress-gum forest.

Strategy:

- Allow and assist other agencies, organizations, and universities to conduct studies and investigations.

Atlantic White Cedar Forest

Objective: Protect 6,725 acres of white cedar habitat and manage selected areas continuously for land birds and other wildlife.

Discussion: This plan is an improvement on the current management because it provides for monitoring and inventory of selected areas periodically and managing selected areas within the white cedar habitat type to ensure perpetuation of the habitat type. This monitoring will help evaluate the impact of refuge management on Atlantic white cedar forest.

Strategies:

- Monitor and inventory selected areas periodically.
- Manage selected areas within the white cedar habitat type to ensure perpetuation of the habitat type.
- Allow and assist other agencies, organizations, and universities to conduct studies and investigations.

Mixed Pine/Hardwood Forest

Objective: Protect 24,468 acres of mixed pine/hardwood forest habitat continuously for red wolf, black bear, American bald eagle, land birds and other wildlife.

Discussion: This plan is an improvement on the current management because it provides for monitoring the habitat for its value for the variety of wildlife species present. This monitoring will help evaluate the impact of refuge management on the mixed pine/hardwood forest.

Strategies:

- Monitor and inventory the habitat annually for its value for the variety of wildlife species present.
- Allow and assist other agencies, organizations, and universities to conduct studies and investigations.

Non-alluvial Hardwood Forest

Objective: Protect 14,703 acres of non-alluvial hardwood forest habitat continuously for red wolf, black bear, American bald eagle, land birds, and other wildlife.

Discussion: This plan is an improvement on the current management because it provides for restoration of 400 acres and monitoring the habitat for its value for the variety of wildlife species present. The restoration will provide more habitat and the monitoring will help evaluate the impact of refuge management on non-alluvial hardwood forest.

Strategies:

- Restore 400 acres of cropland over fifteen years.
- Monitor and inventory the habitat annually for its value for the variety of wildlife species present.
- Manage the forest canopy through timber harvest and thinning to provide an adequate understory for wildlife.
- Allow and assist other agencies, organizations, and universities to conduct studies and investigations.

Pond Pine/Shrub Pocosin

Objective: Protect and manage 50,198 acres of pond pine/shrub pocosin habitat continuously for red-cockaded woodpeckers, other land birds, red wolf, black bear, and other wildlife.

Discussion: This plan is an improvement on the current management because it provides for monitoring the habitat for its value for the variety of wildlife species present. The monitoring will help evaluate the impact of refuge management on pond pine/shrub pocosin.

Strategies:

- Monitor forest health annually.
- Treat infestations of pests and diseases as needed.
- Monitor and inventory the habitat annually for its value for the wildlife species present.
- Allow and assist other agencies, organizations, and universities to conduct studies and investigations.

Pond Pine/Cane Pocosin

Objective: Protect and manage 4,275 acres of pond pine/cane pocosin habitat continuously for red-cockaded woodpeckers, other land birds, red wolf, black bear, and other wildlife.

Discussion: This plan is an improvement on the current management because it provides for monitoring the habitat for its value for the variety of wildlife species present and restoration of areas killed by the southern pine beetle. The monitoring will help evaluate the impact of refuge management on pond pine/cane pocosin.

Strategies:

- Monitor forest health annually.
- Treat infestations of pests and diseases as needed.
- Monitor and inventory the habitat annually for its value for the wildlife species present
- Restore areas killed by the southern pine beetle.
- Allow and assist other agencies, organizations, and universities to conduct studies and investigations.

High Shrub Pocosin

Objective: Protect and manage 14,186 acres of high shrub pocosin habitat continuously for black bears and land birds.

Discussion: This plan is an improvement on the current management because it provides for monitoring the habitat for its value for the variety of wildlife species present. The monitoring will help evaluate the impact of refuge management on high shrub pocosin.

Strategies:

- Monitor and inventory the habitat for its value for the wildlife species present.
- Allow and assist other agencies, organizations, and universities to conduct studies and investigations.

Low Shrub Pocosin

Objective: Protect 4,210 acres of low shrub pocosin habitat continuously for black bear and land birds.

Discussion: This plan is an improvement on the current management because it provides for monitoring the habitat for its value for the variety of wildlife species present. The monitoring will help evaluate the impact of refuge management on low shrub pocosin.

Strategies:

- Monitor and inventory the habitat annually for unique plant communities and its value for the wildlife species present.
- Allow and assist other agencies, organizations, and universities to conduct studies and investigations.

Threatened and Endangered Species

Objective: Protect threatened and endangered plant species and associated habitats as identified.

Discussion: This plan provides for the same activities as the current management does. The studies will help evaluate the impact of refuge management on threatened and endangered species.

Strategy:

- Allow and assist other agencies, organizations, and universities to conduct studies and investigations.

VISITOR SERVICES

Hunting

Objective: Provide annual opportunities for public hunting use days as follows: waterfowl, 350; other migratory birds, 125; upland game, 1,000; and big game, 2,400.

Discussion: This plan is an improvement on the current management because it provides for more big game hunting, an evaluation of hunting with pursuit hounds, and increased information and law enforcement.

Strategies:

- Evaluate, develop and update refuge hunting regulations annually.
- Evaluate the potential to provide bear hunting, wild turkey, and increased quail hunting opportunities.
- Meet annually with hunters and North Carolina Wildlife Resources Commission representatives to discuss refuge hunting.
- Provide opportunities for hunting with pursuit hounds in selected areas (approximately 83,000 acres).
- Evaluate the potential to provide new opportunities for hunting with pursuit hounds on the west side of the refuge (Gum Forest Unit).
- Evaluate the discontinuation of hunting with pursuit hounds east of U.S. 264, and the area north of U.S. 64 and east of Billy's Ditch.
- Provide opportunities for hunting with retrievers in selected areas (approximately 34,000 acres).
- Provide opportunities for hunting without dogs on approximately 35,000 acres. Hunting without dogs is allowed on all areas open to hunting.
- Improve quality through increased information and law enforcement.

Fishing

Objective: Provide access opportunities for 4,250 fishing visits annually.

Discussion: This plan is an improvement on the current management because it provides for more visitors by providing more access on the refuge and improving maintenance of access areas.

Strategies:

- Work with partners to maintain nine fishing and boating access areas on refuge and one universally accessible fishing platform around the refuge.
- Improve and maintain parking and access roads for five fishing and boating access areas on refuge.
- Disseminate fishing information via the refuge visitor center.

Environmental Education

Objective: Provide environmental education opportunities for 1,000 students per year on the refuge and 500 students per year off the refuge to meet demand. Provide environmental education opportunities for up to 35,000 additional students annually after refuge visitor center is completed.

Discussion: This alternative is an improvement on the current management because it provides for a 100 percent increase in visitation on the refuge and 100 percent increase off the refuge. The new visitor center will provide a valuable venue for programs and volunteers will be an important asset in conducting the programs.

Strategies:

- Train staff, college interns, work campers, and community volunteers to conduct education programs continuously.
- Construct visitor center with space for environmental education programs.

Interpretation

Objective: Provide interpretation opportunities for 42,500 visitors, including staff/volunteer-conducted talks for 375 visitors, tours for 375 visitors, and demonstrations for 375 visitors; 6,250 kiosk visits; and 29,375 visits on existing interpretive trails annually. Provide interpretive opportunities for 700,000–800,000 annual visitors in a newly constructed visitor center.

Discussion: This plan is an improvement on the current management because it provides for a 25 percent increase in visitation. This increase in planned capacity would meet the current demand for interpretive programs. The new visitor center and increased trail maintenance will be valuable assets to facilitate the increased capacity.

Strategies:

- Train staff, college interns, work campers, and community volunteers to conduct education programs continuously.
- Improve interpretive programming and facilities (e.g., trails, kiosks, signage, and brochures) continuously.
- Construct visitor center to provide interpretive opportunities.

Wildlife Observation

Objective: Provide 45–50 quality guided observation tours annually, averaging 8 people each to meet current levels of use. Maintain observation facilities for 12,500 annual visits.

Discussion: This plan is an improvement on the current management because it provides for a 25 percent increase in observation opportunities by providing more tours and maintaining access areas better.

Strategies:

- Maintain roads, trails, boardwalks, and platforms for access to wildlife observation opportunities continuously.
- Evaluate the need for additional quality, low impact wildlife observation opportunities continuously.
- Consider and manage means and methods of access (e.g., horseback riding, canoeing, kayaking, and bicycling) for wildlife observation continuously.

Wildlife Photography

Objective: Provide quality opportunities and facilities for wildlife photography sufficient for 2,400 visits annually.

Discussion: This plan is an improvement on the current management because it provides for a 20 percent increase in photography opportunities by maintaining access areas better.

Strategy:

- Maintain roads, trails, boardwalks, and platforms for access to wildlife photography opportunities continuously.

Public Use Facilities

Objective: Construct and operate visitor center to provide education and interpretation for Alligator River and Pea Island National Wildlife Refuges.

Discussion: The refuge currently has no central meeting place for staff, volunteers, and visitors. The entire refuge is wetlands and development on the refuge is prohibited. The Service owns land in Manteo on Roanoke Island adjacent to the National Park Service headquarters and Fort Raleigh Historic Site. Seven million tourists visit the Outer Banks just east of Manteo. A visitor center built in Manteo will serve as a gateway to refuges and other public lands in eastern North Carolina.

Strategies:

- Secure funding for the visitor center.
- Contact the engineering and contracting sections in the Service's regional office for assistance in design, contracting, and construction inspection.
- Contact the regional archeologist for a cultural resources investigation.

Nonwildlife-dependent Public Uses

Objective: Evaluate nonwildlife-dependent public uses on a monthly and case-by-case basis; regulate the numbers for certain tolerated uses to limit impacts; prohibit visits for recreational uses that are not feasible.

Discussion: This plan proposes to improve on the status quo by actively enforcing refuge regulations with a refuge law enforcement officer. The refuge is located in a heavily used tourist area on the way to the Outer Banks. Visitors are not necessarily aware of the subtle differences between permitted recreational uses on the refuge and state or national parks. There is a practical limit as to how much signage the refuge can erect and how effective the signage is, and how many of the nonwildlife-dependent recreational uses the refuge staff can prevent. The staff must prohibit noncompatible uses and enforce regulations efficiently. There are several traditional noncommercial uses of the refuge that the refuge allows by special use permit, including: gathering firewood, cutting small diameter poles for pound nets, and cutting big cordgrass to cover duck blinds.

Strategies:

- Utilize management and biological staff to evaluate requests for uses.
- Enforce regulations with a full-time law enforcement officer.

Outreach

Objective: Maintain communication with media, conservation organizations, elected officials, local communities, and other potential supporters to provide basic and detailed refuge information on programs, resources, management, and regulations to approximately ten million people continuously.

Discussion: This plan is an improvement on the current management because it provides for an increase in the outreach audience and improvement in the quality of outreach tools. The plan provides for an extensive use of the Internet as an outreach tool.

Strategies:

- Maintain inventory of and distribute refuge brochures, tear sheets, and fact sheets continuously.
- Develop press releases to publicize and report refuge activities and accomplishments as they are warranted.
- Maintain the refuge's web site continuously.
- Maintain proactive monthly schedule of outreach contacts on the Internet.

Refuge Support

Objective: Work formally with the Coastal Wildlife Refuge Society and informally with other groups to provide approximately $150,000 annually to support refuge programs and facilities.

Discussion: This plan is an improvement on the current management because it provides for a larger fund-raising effort by the refuge's Friends Group and the development of additional support groups. The refuge's new visitor center will play a substantial role in attracting additional refuge support.

Strategies:

- Identify refuge need for additional organizational support and activity; develop additional support groups as needed.

- Work formally and informally with advocacy groups.

Special Events

Objective: Work with others to plan, coordinate, and execute two major and four minor quality special events annually in eastern North Carolina for 3,000 people.

Discussion: This plan provides for a 50 percent increase in special event participation. These events attract a new and different audience to the refuge and introduce them to the Service and the refuge.

Strategies:

- Establish and maintain relationships with other agencies and organizations to conduct special events.

- Publicize events with fliers and personal contacts, in the print media, and on the Internet.

Visitor Protection

Objective: Identify safety hazards and ensure the safety of visitors by eliminating hazards; controlling access into hazardous areas; and informing visitors of potential hazards.

Discussion: This plan improves on the current management. It improves visitor protection by providing for patrols by the refuge law enforcement officer frequently enough to warn visitors of hazards. It provides for additional staff to identify hazards and react to them appropriately.

Strategies:

- Maintain an awareness of potential safety hazards and inform the proper staff when hazards are reported or discovered.

- Notify the public of safety hazards with signs and printed material.

- Conduct law enforcement patrols on a regular basis.

Volunteer Program

Objective: Recruit, train, and coordinate volunteers to donate 12,500 hours of service annually to support and enhance designated refuge programs.

Discussion: This plan proposes a 25 percent increase over the current level of management. Volunteers are critically important to the public use, biological, and maintenance programs on the refuge. College interns, work campers, and community volunteers all contribute to the volunteer effort.

Strategies:

- Recruit volunteers from the local community, conservation and youth organizations, universities, work camper news, and the Internet.
- Utilize the public use staff to coordinate the volunteers.
- Utilize the appropriate staff to train and supervise volunteers engaged in support of the public use, biological, and maintenance programs.

Commercial Ecotours

Objective: Allow permitted, quality, guided paddling ecotours and evaluate impacts on an annual basis.

Discussion: This plan maintains the current management by evaluating permits as applications are received and evaluating the impacts of the ecotour activity.

Strategies:

- Review applications for permits for paddling ecotours and grant permits to the most qualified applicants.
- Consider applications for permits for other ecotour opportunities.
- Provide training and information to permitees to ensure that visitors are aware of the refuge and its mission.

RESOURCE PROTECTION

Communication Towers

Objective: Minimize impacts to refuge resources by providing review and comment on all communication tower projects that are proposed.

Discussion: This plan is the same as the current level of management. Communication towers pose threats to migrating birds as they fly at night and strike the towers, often in large flocks. There is only one tower on the refuge, but there are great demands to erect more towers in the area in which the refuge is located. This plan provides for additional staff to assist with reviewing permits and coordinating with the operators of towers.

Strategy:

- Avoid adverse impacts to refuge resources by developing special use conditions for communication tower construction and maintenance proposals.

Utility Line and Highway Corridors

Objective: Limit impacts to refuge resources by coordinating on development and maintenance of corridors continuously.

Discussion: This plan is the same as the current level of management. The State of North Carolina and the local electric cooperative have rights-of-way through the refuge. These rights-of-way are subject to conditions that ensure compatibility with the refuge purposes. The staff reviews proposals to move those rights-of-way and acquire new rights-of-way. At the present time, the North Carolina Department of Transportation is beginning the planning process for upgrading U.S. Highway 64 from a two-lane to a four-lane system. It is expected that this project will require some new right-of-way for the highway and the adjacent utility transmission line.

Strategies:

- Minimize impacts to refuge resources by providing review and comment on all other corridor projects that are proposed.

- Avoid adverse impacts to refuge resources by developing terms and conditions to ensure the compatibility of corridor construction and maintenance proposals.

Cultural Resources

Objective: Avoid all impacts to cultural resources by following the policies and procedures in the Fish and Wildlife Service Manual continuously.

Discussion: This plan is the same as the current level of management. The Historic Preservation Act mandates that the Service protect cultural resources on the refuge. There have been no comprehensive cultural resources studies of the refuge. The staff will refer all land-disturbing activities to the Service's Regional Office.

Strategies:

- Evaluate all proposed external projects and coordinate with the Regional Office within thirty days of receiving a proposal.

- Avoid all impacts to cultural resources by coordinating all internal projects with the Regional Office within thirty days of receiving funds.

- Manage and limit impacts to identified cultural resources by restricting access to or regulating activities in the vicinity of cultural resources.

- Document above-ground resources as they are discovered or as lands are acquired and stabilize the resources.

Inholdings

Objective: Monitor at least annually, the use, management, and potential future development of approximately 1,200 acres of refuge inholdings.

Discussion: This plan is the same as the current level of management. Activities in inholdings have the potential to cause negative impacts on refuge resources. Activities on the refuge, such as prescribed burning and wetland restoration, have the potential to cause negative impacts in inholdings. The refuge works cooperatively with the owners of the inholdings to minimize conflicts.

Strategies:

- Enhance refuge resources and programs by coordinating specific inholder activities on a case-by-case basis.

- Limit impacts to refuge resources by developing special use conditions for permitted inholder activities on the refuge.

Interagency Coordination and Cooperative Agreements

Objective: Facilitate and enhance refuge programs and protect refuge resources by coordinating with local, state, federal, public, and private agencies continuously.

Discussion: This plan improves on management beyond the current level. The management of Alligator River Refuge requires an extraordinary amount of coordination because the Dare County Bombing Range, Dare County Construction and Demolition Debris Landfill, and three small communities are located within the refuge, and two federal highways run through it. The plan provides for additional staff to coordinate with other agencies and organizations.

Strategies:

- Coordinate with local, state, federal, public, and private agencies at least 25 times annually.

- Represent the Service throughout the year at a minimum of 25 local meetings, 25 state meetings, 5 national meetings, 10 public meetings, and 5 meetings with private organizations annually.

- Coordinate management programs with the Dare County Bombing Range; Dare County; North Carolina Department of Transportation; North Carolina Forest Service; and North Carolina Wildlife Resources Commission. Review and revise existing cooperative agreements by meeting formally at least once per year.

- Enhance refuge programs and resources by developing or maintaining cooperative agreements with other local, state, and federal agencies annually.

Land Protection

Objective: Acquire an estimated 1,200 acres of inholdings within the refuge, as they become available from willing sellers. Acquire an estimated 47,200 acres from the Dare County Bombing Range, as they become available. Acquire 39,140 acres of private land, as it becomes available from willing sellers.

Discussion: The refuge has an approved acquisition boundary 87,540 acres beyond the current refuge ownership. The refuge will maintain contact with the landowners within the boundary, pursue acquisition from willing sellers, and post and maintain the land that is acquired.

Strategies:

- Maintain contact with owners of land within the approved acquisition boundary.

- Survey and post boundaries, suppress wildfires, conduct prescribed burns, perform law enforcement, and incorporate the areas into existing management programs.

Law Enforcement

Objective: Ensure public safety and protect refuge resources by encouraging voluntary compliance and enforcing refuge regulations as necessary.

Discussion: This plan improves on the current management by encouraging voluntary compliance and developing cooperative agreements.

Strategies:

- Provide assistance to and coordinate with appropriate local, state, and federal law enforcement agencies to ensure compliance with local, state, and federal laws.

- Develop cooperative agreements with local and state law enforcement agencies.

Navigable Waters

Objective: Identify and manage 1,127 acres of selected navigable waters over which the refuge requires limited regulatory control to ensure protection of refuge resources.

Discussion: There are lakes, streams, bays, and inlets on and adjacent to the refuge that are waters of the State of North Carolina, but are in close proximity to refuge lands. Enforcement of state laws on these waters would be facilitated if the refuge law enforcement officers had the authority to enforce those laws. This plan proposes to develop an agreement to allow cooperative management of those waters.

Strategies:

- Identify selected navigable waters (1,127 acres) over which the refuge requires limited regulatory control to ensure protection of refuge resources.

- Consult with the state to establish a cooperative management agreement to regulate certain activities within selected waters.

- Coordinate selection of waters with Fish and Wildlife Service coordinating refuge manager.

Permits

Objective: Limit impacts to or enhance refuge resources annually by evaluating approximately 60 use proposals on a case-by-case basis.

Discussion: This plan improves management beyond current levels. It increases the capacity for permit review from 40 proposals in the status quo to 60 proposals. Visitors and researchers apply for permits to engage in recreation activities or perform research on the refuge. The staff reviews the permits and establishes and enforces conditions under which the applicants may engage in the activity. The plan adds staff to assist in permit review and development and monitoring of permit conditions. There are several traditional noncommercial uses that the refuge allows by special use permit, including the gathering of firewood; cutting small-diameter poles for pound nets; cutting big cordgrass to cover duck blinds; gigging frogs; and mooring small commercial fishing boats.

Strategy:

- Protect refuge resources annually by developing special conditions for those permitted uses that are compatible.

Pest and Exotic Animals

Objective: Limit impacts to refuge resources by monitoring, controlling, or eradicating pest animals as necessary.

Discussion: This plan maintains the current level of management. Pest animals, particularly feral cats and dogs, are a threat to wildlife populations.

Strategies:

- Encourage the refuge staff to be vigilant of pest animals continuously.

- Monitor populations of pest animals systematically and control them as necessary.

Pest and Exotic Plants

Objective: Monitor the refuge for pest plants and control and eradicate approximately 75 acres of pest plants per year in moist soil units, public use trails, and ditch banks and road shoulders in the farm unit.

Discussion: This plan maintains the current level of management. Pest plants, particularly common reed (*Phragmites australis*) and alligatorweed (*Alternanthera philoxeroides)*, are a threat to the refuge's natural vegetative communities. The refuge staff is currently managing common reed with herbicides, and pest plants on roadsides and in the vicinity of the maintenance shop with mowing.

Strategies:

- Document the distribution of and assess the impacts of pest plants on native plant communities by monitoring the entire refuge for pest plants.

- Improve and limit impacts to native plant communities by managing pest plants.

- Control 75 acres of common reed.

Significant Natural Heritage Areas

Objective: Manage significant natural heritage areas to maintain the natural vegetative communities.

Discussion: The North Carolina Natural Heritage Program has designated the majority of the refuge as a significant natural heritage area in recognition of the integrity of the vegetative communities. The plan proposes to maintain the current level of management by conducting prescribed burning of fire-dependent communities at natural frequencies.

Strategy:

- Conduct prescribed burning of fire-dependent plant communities at natural frequencies to maintain the natural plant communities.

Water Quality

Objective: Monitor the water quality of pump discharges on the refuge and of runoff from the Dare County Construction and Demolition Landfill annually.

Discussion: The plan improves the management over the current level. Measuring the water quality of pump discharges annually will keep the staff aware of potential pollution from refuge ditches and moist soil units.

Strategy:

- Measure dissolved oxygen, pH, turbidity, conductivity, and temperature annually.

Wildlife Disease Control and Prevention

Objective: Manage refuge resources to minimize the potential for wildlife disease continuously.

Discussion: This plan maintains the current level of management. There have not been any significant incidences of wildlife disease on the refuge.

Strategies:

- Monitor for outbreaks continuously.
- Minimize losses from disease outbreaks continuously.
- Coordinate with local, state, and federal agencies as necessary to monitor and minimize wildlife disease.

REFUGE ADMINISTRATION

Capital Property Management

Objective: Use increased level of resources to effectively operate, maintain, and dispose of capital property; and acquire minimum equipment necessary to support refuge programs.

Discussion: This plan maintains the current level of capital management. The addition of a refuge operations specialist and computer specialist will increase the refuge's capability to manage capital property.

Strategies:

- Conduct one capital property inventory annually.
- Manage capital property according to the Fish and Wildlife Service Manual.

Financial Management

Objective: Manage budget and develop and administer contracts continuously in accordance with Fish and Wildlife Service policy.

Discussion: This plan maintains the current level of financial management.

Strategies:

- Develop annual and long-term budgets.
- Develop and execute contracts.
- Process travel vouchers.
- Maintain Refuge Operating Needs System (RONS) and Maintenance Management System (MMS) databases by adding new needs and deleting funded projects.
- Apply for flex funding and other grants.

Office Space and Utilities

Objective: Coordinate with the General Services Administration to provide adequate office space and parking facilities in Manteo for the staff levels prescribed in this plan.

Discussion: The refuge headquarters is currently in leased office space that has the staff fragmented and cramped. The plan provides for the Service to construct a new office on Service-owned land in Manteo, across the street from the National Park Service headquarters and Fort Raleigh Historic Site.

Strategies:

- Provide fuel, office supplies, and utilities for refuge operations and staff continuously.
- Manage office space according to the Fish and Wildlife Service Manual continuously.
- Construct a new headquarters and visitor center on property in Manteo currently owned by the Service.

Personnel Management

Objective: Hire and manage minimum levels of staff (24.75 full-time equivalents) to meet refuge objectives at approved full-time equivalent levels.

Discussion: This plan maintains the current level of personnel management and adds five positions to better meet the goals, objectives, and strategies in the plan.

Strategies:

- Recognize employee performance annually through the employee incentive program.
- Provide the minimum 40-hour staff training opportunity for professional, technical, and leadership development goals.
- Manage personnel according to the Fish and Wildlife Service Manual.

Real Property Management

Objective: Use the level of funding and staff in this plan to maintain existing buildings, grounds, firebreaks, structures, roads, and equipment to protect the health and safety of the refuge staff and public continuously.

Discussion: The refuge maintains a number of buildings, pumps, water control structures, and parking lots in addition to 100 miles of gravel roads. This plan maintains the current level of management of those facilities and adds a Service-owned office and visitor center in Manteo.

Strategies:

- Evaluate the need for, acquire, and maintain additional buildings, structures, and equipment to support refuge programs continuously.
- Maintain the quality, quantity, and extent of current public use facilities and those specified in approved public use plans continuously.
- Conduct one real property inventory annually.
- Manage real property according to the Fish and Wildlife Service Manual continuously.

All Risk Management

Objective: Prepare for and respond to risks present on the refuge daily and risks brought by natural disasters continuously.

Discussion: The management of 152,260 acres of land involves the management of inherent risks of having employees and visitors working and recreating on the land. The refuge is also subject to natural disasters in the form of wildfires, hurricanes, and severe storms. This plan maintains the current level of management.

Strategies:

- Respond to wildfires on a case-by-case basis following current approved plan.
- Respond to storms on a case-by-case basis.
- Respond to catastrophes on a case-by-case basis.
- Assess risk to human health and safety and provide minimal property protection.
- Assess facility designs for surviving risk events.
- Evaluate and determine mitigation measures.

V. Plan Implementation

INTRODUCTION

This chapter outlines the staff and activities that will execute the strategies specified in Chapter IV and the new staff, budget, equipment, and facilities that are needed. The priorities assigned to the Refuge Operations Needs System (RONS) and Maintenance Management System (MMS) projects in Appendix VIII determine the priorities of the strategies. There is no direct correlation between a specific position, piece of equipment, or facility and a specific strategy because any one position, piece of equipment, or facility executes more than a single strategy.

PROPOSED PROJECTS

The proposed projects are summarized in Tables 14–18.

Table 14. Projects supporting Wildlife Strategies.

Strategy	Projects
Personnel Projects	
Conduct surveys, monitoring, studies, and investigations.	Use existing wildlife biologist. Recruit, hire, and train new forester (RONS 00003) and wildlife biologist (RONS 00007).
Protect wildlife.	Use existing law enforcement officer. Hire new law enforcement officer (RONS 00098).
Manage budget, contracts, personnel, and property.	Use existing project leader, deputy project leader, refuge manager, assistant manager, administrative officer, and office assistant. Recruit, hire, and train new refuge operations specialist (RONS 02001).
Apply for flexible fund and other grants.	Use existing wildlife biologist. Recruit, hire, and train new forester (RONS 00003) and wildlife biologist (RONS 00007).
Equipment Projects	
Maintain, repair, and replace equipment to survey and protect wildlife.	Replace equipment (various MMS projects). Replace vehicles (various MMS projects).

Table 15. Projects supporting Habitat Strategies.

Strategy	Projects
Personnel Projects	
Conduct surveys, monitoring, studies, and investigations.	Use existing wildlife biologist. Recruit, hire, and train new forester (RONS 00003) and wildlife biologist (RONS 00007).
Conduct prescribed burning.	Use existing fire management officer, wildlife biologist, forestry technicians, and engineering equipment operators. Recruit, hire, and train new forester (RONS 00003) and wildlife biologist (RONS 00007).
Protect habitat.	Use existing law enforcement officer. Hire new law enforcement officer (RONS 00098).
Manage budget, contracts, personnel, and property.	Use existing project leader, deputy project leader, refuge manager, assistant manager, administrative officer, and office assistant. Recruit, hire, and train new refuge operations specialist (RONS 02001).
Apply for flexible fund and other grants.	Use existing wildlife biologist. Recruit, hire, and train new forester (RONS 00003) and wildlife biologist (RONS 00007).
Equipment Projects	
Maintain, repair, and replace equipment to manage habitat.	Replace equipment (various MMS projects). Replace vehicles (various MMS projects).
Facility Projects	
Maintain, repair, and replace facilities to manage habitat.	Replace bulkheads and water control structures (various MMS projects).

Table 16. Projects supporting Public Use Strategies.

Strategy	Projects
Personnel Projects	
Plan, design, and conduct programs and outreach.	Use existing park rangers. Recruit, hire, and train new park rangers
Maintain education, interpretation, wildlife observation, and wildlife photography facilities.	Use existing maintenance staff and volunteers. Recruit, hire, and train two new maintenance workers (RONS 97018 and 00092) and a heavy mobile equipment mechanic (RONS 00096).
Protect visitors.	Use existing law enforcement officer. Recruit, hire, and train new law enforcement officer (RONS 00098).
Manage budget, contracts, personnel, and property.	Use existing project leader, deputy project leader, refuge manager, assistant manager, administrative officer, and office assistant. Recruit, hire, and train new refuge operations specialist (RONS 02001).
Apply for flexible fund and other grants.	Use existing project leader, deputy project leader, assistant manager, and park rangers. Recruit, hire, and train new park rangers.
Equipment Projects	
Maintain, repair, and replace equipment to maintain facilities as necessary.	Replace equipment (various MMS projects). Replace vehicles (various MMS projects).
Facility Projects	
Maintain, repair, and replace facilities as necessary.	Replace parking lots, kiosks, boat ramp, and boat dock (various MMS projects).

Table 17. Projects supporting Resource Protection Strategies.

Strategy	Projects
Personnel Projects	
Maintain cooperation with agencies, organizations, and permit holders. Review permits and develop conditions for uses allowed by permits. Monitor pest animals and plants and permitted uses.	Use existing project leader, deputy project leader, assistant manager, and wildlife biologist. Recruit, hire, and train new refuge operations specialist (RONS 02001), forester (RONS 00003), and wildlife biologist (RONS 00007).
Maintain equipment and facilities.	Use existing maintenance staff and volunteers. Recruit, hire, and train two new maintenance workers (RONS 97018 and 00092) and a heavy mobile equipment mechanic (RONS 00096).
Enforce regulations.	Use existing law enforcement officer. Hire new law enforcement officer (RONS 00098).
Manage budget, contracts, personnel, and property.	Use existing project leader, deputy project leader, refuge manager, assistant manager, administrative officer, and office assistant. Recruit, hire, and train new refuge operations specialist (RONS 02001).
Apply for flexible fund and other grants.	Use existing project leader, deputy project leader, assistant manager, and wildlife biologist. Recruit, hire, and train new refuge operations specialist (RONS 02001), forester (RONS 00003), and wildlife biologist (RONS 00007).
Equipment Projects	
Maintain, repair, and replace equipment as necessary.	Replace equipment (various MMS projects). Replace vehicles (various MMS projects).
Facility Projects	
Maintain, repair, and replace facilities as necessary.	Replace parking lots, and kiosks (various MMS projects).

Table 18. Projects supporting Refuge Administration Strategies.

Strategy	Projects
Personnel Projects	
Manage budget, contracts, personnel, and property.	Use existing project leader, deputy project leader, refuge manager, assistant manager, administrative officer, and office assistant. Recruit, hire, and train new refuge operations specialist (RONS 02001).
Maintain equipment and facilities.	Use existing maintenance staff and volunteers. Recruit, hire, and train two new maintenance workers (RONS 97018 and 00092) and a heavy mobile equipment mechanic (RONS 00096). Recruit, hire, and train new computer specialist (RONS 00094).
Equipment Projects	
Maintain, repair, and replace equipment as necessary.	Replace equipment (various MMS projects). Replace vehicles (various MMS projects).
Facility Projects	
Maintain, repair, and replace facilities as necessary.	Replace bulkheads, water control structures, parking lots, wildlife observation platforms, and kiosks (various MMS projects).

REFUGE ADMINISTRATION

The Service administers Alligator River National Wildlife Refuge from an office in Manteo, North Carolina, ten miles east of the refuge's eastern boundary. Construction on the refuge is prohibited because the entire refuge is wetland. The staff stores the refuge's equipment on a site that previous owners had developed. The Service uses staff from the Manteo office and equipment from the refuge to also manage the Pea Island National Wildlife Refuge that is fifteen miles east of Manteo.

FUNDING AND PERSONNEL

Currently, the Service has approved a staff of 25 permanent positions to serve the Alligator River and Pea Island national wildlife refuges. Of the 25 positions, 17.8 full-time equivalents are spent on Alligator River National Wildlife Refuge. Of the 25 positions, nine are funded for fire management.

To complete the extensive wildlife habitat management and restoration projects and conduct the necessary inventorying, monitoring, and mapping activities, the refuge requires funding to maintain and replace equipment and facilities, perform studies, and more staff to administer the refuge programs. The locations of the proposed public use facilities are shown on Figure 7. The proposed staffing plan (Table 19) outlines a staff of 39 employees (24.75 full-time equivalent positions dedicated to Alligator River National Wildlife Refuge) that would enable the refuge to achieve its plan objectives and strategies within a reasonable time. The annual cost of implementing the plan, including salaries and benefits, would be $1,896,000.

Figure 7. Proposed visitor facilities for Alligator River National Wildlife Refuge.

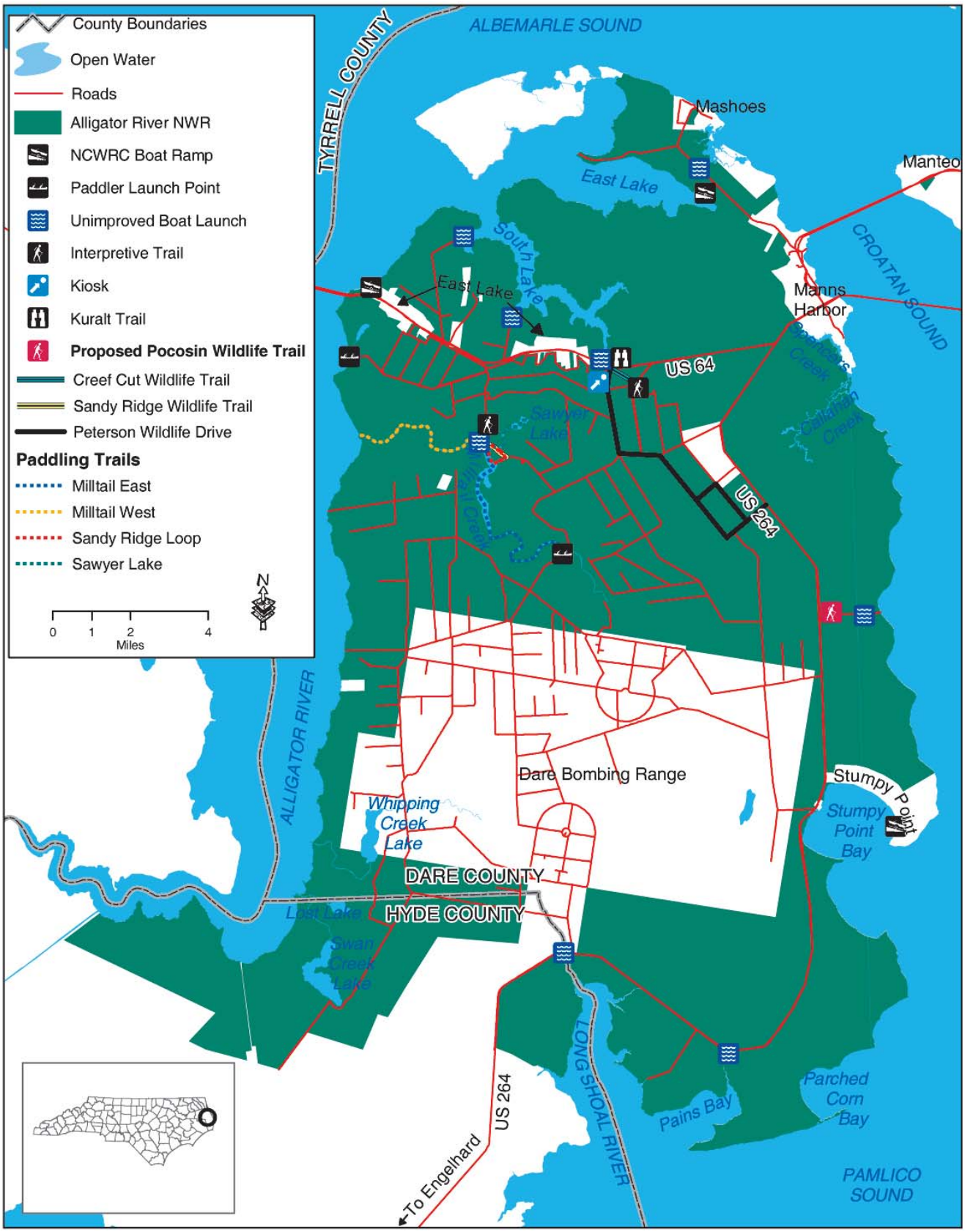


Table 19. Proposed staffing plan for Alligator River National Wildlife Refuge.

Position	Status	Percent of Time on Alligator River
Refuge Manager, GS-0485-14*	PFT	40
Deputy Refuge Manager, GS-0485-13*	PFT	70
Assistant Refuge Manager, GS-0485-12*	PFT	75
Refuge Operations Specialist, GS-0485-09**	PFT	50
Refuge Operations Specialist, GS-0485-09**	PFT	0
Wildlife Biologist, GS-0486-12*	PFT	40
Wildlife Biologist, GS-0486-11**	PFT	0
Wildlife Biologist, GS-0486-07**	PFT	55
Forester, GS-0460-11**	PFT	80
Park Ranger (Interpretation), GS-0025-12*	PFT	40
Park Ranger (Interpretation), GS-0025-11**	PFT	0
Park Ranger (Interpretation), GS-0025-09*	PFT	10
Park Ranger (Volunteer Coordinator), GS-0025-09**	PFT	40
Park Ranger (Law Enforcement), GS-0025-09*	PFT	70
Park Ranger (Law Enforcement), GS-0025-07**	PFT	50
Computer Specialist, GS-0???-11**	PFT	90
Administrative Officer, GS-0341-09*	PFT	75
Office Assistant, GS-0303-07*	PPT	75
Biological Science Technician, GS-0404-07*	PFT	50
Forestry Technician, GS-0462-07*	PFT	50
Park Ranger (Interpretation), GS-0025-05*	TEMP	10
Secretary, GS-0318-05*	TERM	75
Biological Science Technician, GS-0404-05*	TEMP	50
Student Intern, GS-0499-04*	SCEP	50
Engineering Equipment. Operator Supervisor, WS-5716-09*	PFT	75
Heavy Mobile Equipment Mechanic, WG-5716-10**	PFT	90
Engineering Equipment Operator, WG-5716-09*	PFT	90
Engineering Equipment Operator, WG-5716-09*	PFT	90
Engineering Equipment Operator, WG-5716-08*	PFT	90
Automotive Worker, WG-5823-08*	PFT	90
Maintenance Worker, WG-4749-08**	PFT	50
Maintenance Worker, WG-4749-05**	PFT	100
Maintenance Worker, WG-4749-06*	TERM	30

Position	Status	Percent of Time on Alligator River
Fire Management Program		
Fire Management Officer, GS-0460-12*	PFT	50
Fire Management Officer (Wildland Urban Interface), GS-0401-11*	PFT	40
Prescribed Fire Specialist, GS-0401-07*	PFT	40
Forestry Technician (Fire), GS-0462-08*	PFT	80
Forestry Technician (Fire Program Technician) (Fire), GS-0462-07**	PFT	100
Forestry Technician (Fire), GS-0462-06*	PFT	80
Forestry Technician (Fire), GS-0462-04*	PFT	80
Engineering Equipment Operator (Fire), WG-5716-08*	PFT	80
Engineering Equipment Operator (Fire), WG-5716-08*	PFT	80
Engineering Equipment Operator (Fire), WG-5716-08*	PFT	80
Red Wolf Program		
Wildlife Biologist, GS-0486-13*	PFT	0
Wildlife Biologist, GS-0486-09*	PFT	0
Wildlife Biologist, GS-0486-11*	PFT	0
Wildlife Biologist, GS-0486-09*	PFT	0
Wildlife Biologist, GS-0486-07*	TERM	0
Biological Science Technician, GS-0404-07*	PFT	0
Office Assistant, GS-0303-07*	TERM	0

PFT = Permanent Full Time employee
TERM = Term Employee (up to four years)
TEMP = Temporary Employee (not to exceed one year)
SCEP = Student Cooperative Education Program

VOLUNTEERS

The refuge depends on volunteers extensively, especially for its visitor services programs. Volunteers currently contribute 10,000 staff hours; this plan anticipates contributions of 12,000 hours. The refuge utilizes volunteers from the community, college interns, and work campers. The college interns rotate through work assignments in the visitor services, biology, and maintenance programs. The staff recruits work campers for the skills the refuge needs. The refuge provides quarters for college interns and pads for recreational vehicles for the work campers.

PARTNERSHIP OPPORTUNITIES

A major objective 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 establish partnerships with sporting clubs, elementary and secondary schools, and community organizations. At regional and state levels, the Service might establish partnerships with organizations such as the North Carolina Wildlife Resources Commission, the North Carolina Division of Marine Fisheries, The Nature Conservancy, Ducks Unlimited, and National Audubon Society. At the local government level, the refuge has already established partnerships with Dare County and the North Carolina Division of Water Resources for snagging logs from creek channels on the refuge after Hurricane Isabel.

The refuge's volunteer program and the other partnerships generated would depend upon the number of staff positions the Service provides the refuge. As the Service commits staff and resources to the refuge, the refuge will take the opportunities to expand the volunteer program and develop partnerships.

STEP-DOWN MANAGEMENT PLANS

A comprehensive conservation plan is a strategic plan that guides the management direction of the refuge. Before the staff can implement some of the strategies and projects, they must prepare or update detailed step-down management plans. To assist in preparing and implementing the step-down plans, the refuge staff will develop partnerships with local agencies and organizations. The staff will develop these plans in accordance with the National Environmental Policy Act, which requires the identification and evaluation of alternatives and public review and comment prior to their implementation.

Biological Inventory/Monitoring Plan (Develop): This plan will describe inventory and monitoring techniques and time frames. The staff will inventory all plant communities and associations in the refuge, as well as all trust species (migratory birds including land birds, neotropical passerines, and waterfowl); listed species (federal and state threatened and endangered species and species of concern); key resident species; and monitor population trends.

Habitat Management Plan (Develop): This plan will describe the overall desired future habitat conditions needed to fulfill the refuge's purpose and objectives. The plan will include sections dealing with each habitat type on the refuge and an analysis of the potential effects of global climate change on that habitat type. The staff will develop procedures, techniques, strategies, and timetables for achieving desired future conditions into an overall plan.

Moist Soil/Water Management Plan (Update): This plan will describe the strategies and procedures (timing and duration of flooding and disturbance) for manipulating the refuge's water management units to meet habitat management objectives.

Marsh Management Plan (Develop): This plan will describe strategies for meeting the refuge's marsh management objectives. The plan will also address scrub/shrub habitat management.

Integrated Pest Management Plan (Develop): This plan will address the complex issue of bringing exotic and nuisance plants and animals to a maintenance control level on the refuge. It will cover chemical pesticide use (aerial and ground application), mechanical eradication, and biological controls. The Nuisance/Exotic Animal and Plant Control plans will be sections of this plan.

Nuisance/Exotic Animal Control Plan (Update): This plan (as part of the Integrated Pest Management Plan) will describe survey, removal or control, and monitoring techniques for both terrestrial and aquatic nuisance and exotic animals (vertebrate and invertebrate). The plan will include wild dogs, feral cats, and resident Canada geese.

Nuisance/Exotic Plant Control Plan (Develop): This plan (as part of the Integrated Pest Management Plan) will describe survey, removal or control, and monitoring techniques for both terrestrial and aquatic nuisance and exotic plants.

Fire Management Plan (Update): This plan will describe wildfire and prescribed fire management techniques that the staff will employ on the refuge. The wildlife habitat objectives will guide planning for prescribed burning. Wildfire control descriptions will include initial attack strategies and cooperative agreements with other agencies.

Visitor Services Plan (Develop): This plan will describe the refuge's wildlife-dependent recreation, environmental education, and interpretive programs. It will address specific issues or items such as access, facility requirements, site plans, and universal accessibility for visitors with disabilities. The environmental education, fishing, hunting, and sign plans will be sections of this plan.

Environmental Education Plan (Develop): This plan will reflect the objectives and strategies of the comprehensive conservation plan and address environmental education guidelines following Service standards.

Fishing Plan (Update): This plan, as part of the Visitor Services Plan, will address specific aspects of the refuge's fishing program. It will define season structures, fishing areas, methods, access, universal accessibility for anglers with disabilities, facilities needed, and refuge-specific regulations.

Hunting Plan (Update): This plan, as part of the Visitor Services Plan, will address specific aspects of the refuge's hunting program. It will define season structures, area designations, methods, access, universal accessibility for hunters with disabilities, facilities needed, and refuge-specific regulations.

Sign Plan (Update): This plan, as part of the Visitor Services Plan, will describe the refuge's strategy for informing visitors via signage. It will incorporate Service guidelines.

Law Enforcement Plan (Update): This plan will provide a reference to station policies, procedures, priorities, and programs concerning law enforcement.

MONITORING AND ADAPTIVE MANAGEMENT

Adaptive management is a flexible approach to long-term management of biotic resources under which the staff utilizes the results of ongoing monitoring activities and other information to evaluate and change practices. 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, the staff would adopt specific survey, inventory, and monitoring protocols for the refuge. They would evaluate habitat management strategies systematically to determine management effects on wildlife populations. They would use the information to refine approaches and determine how effectively the objectives are being accomplished. Evaluations would include ecosystem team and other appropriate partner participation. If monitoring and evaluation indicate undesirable effects for target and nontarget species and/or communities, then the refuge would alter its management projects. Subsequently, the staff would revise the refuge's comprehensive conservation plan.

The Service would describe specific monitoring and evaluation activities in the step-down management plans.

PLAN REVIEW AND REVISION

The staff will review this comprehensive conservation plan annually to determine the need for revision. A revision would occur if and when substantial information becomes available, such as a change in ecological conditions or when the Service plans a major refuge expansion. The staff would augment the plan 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 would be subject to public review and compliance with the National Environmental Policy Act.

Appendix I. Glossary

Adaptive Management	A process in which projects are implemented within a framework of scientifically driven experiments to test predictions and assumptions outlined within the comprehensive conservation plan. The analysis of the outcome of project implementation helps managers determine whether current management should continue as is or whether it should be modified to achieve desired conditions.
Alternative	Alternatives are different means of accomplishing refuge purposes, goals, and objectives and contributing to the National Wildlife Refuge System. A reasonable way to fix the identified problem or satisfy the stated need.
Approved Acquisition Boundary	A project boundary that the Director of the Fish and Wildlife Service approves upon completion of the detailed planning and environmental compliance process.
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. The National Wildlife Refuge System's focus is on indigenous species, biotic communities, and ecological processes.
Biological Integrity	The biotic composition, structure, and functioning at genetic, organism, and community levels comparable with historic conditions including the natural biological processes that shape genomes, organisms, and communities.
Canopy	A layer of foliage; generally, the upper-most layer in a forest stand. It can be used to refer to mid- or under-story vegetation in multi-layered stands. Canopy closure is an estimate of the amount of overhead tree cover (also canopy cover).
Categorical Exclusion	A category of actions that do not individually or cumulatively have a significant effect on the human environment and have been found to have no such effect in procedures adopted by a federal agency pursuant to the National Environmental Policy Act of 1969.
CFR	Code of Federal Regulations.

Compatible Use	A wildlife-dependent recreational use or any other use of a refuge that, in the sound professional judgment of the Refuge Manager, will not materially interfere with, or detract from, the fulfillment of the mission or the purposes of the refuge. 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 the refuge; provides long-range guidance and management direction for the Refuge Manager to accomplish the purposes, goals, and objectives of the refuge; and contributes to the mission of the National Wildlife Refuge System and meets relevant mandates.
Conservation Easement	A legal document that provides specific land-use rights to a secondary party. A perpetual conservation easement usually grants conservation and management rights to a party in perpetuity.
Cooperative Agreement	A simple habitat protection agreement in which no property rights are acquired. An agreement is usually long term and can be modified by either party. Lands under a cooperative agreement do not necessarily become part of the National Wildlife Refuge System.
Corridor	A route that allows movement of individuals from one region or place to another.
Cover Type	The present vegetation of an area.
Cultural Resources	The remains of sites, structures, or objects used by people of the past.
Cypress and Tupelo Swamp	Found in low-lying areas, swales and open ponds that hold water several months, if not all of the year. Large hollow trees are used as bear den sites.
Deciduous	Pertaining to perennial plants that are leafless for sometime during the year.
Ecological Succession	The orderly progression of an area through time in the absence of disturbance from one vegetative community to another.
Ecosystem	A dynamic and interrelating complex of plant and animal communities and their associated non-living environment.
Ecosystem Management	Management of natural resources using systemwide 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.

Environmental Health	The composition, structure, and functioning of soil, water, air, and other abiotic features comparable with historic conditions, including the natural abiotic processes that shape the environment.
Even-aged Forests	Forests that are composed of trees with a time span of less than 20 years between oldest and youngest individuals.
Endangered Species	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.
Endemic Species	Plants or animals that occur naturally in a certain region and whose distribution is relatively limited to a particular locality.
Environmental Assessment	A concise 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 a finding of no significant impact.
Fauna	All the vertebrate or invertebrate animals of an area.
Federal Trust Species	All species where the federal government has primary jurisdiction, including federally threatened or endangered species, migratory birds, anadromous fish, and certain marine mammals.
Fee-title	The acquisition of most or all of the rights to a tract of land. There is a total transfer of property rights with the formal conveyance of a title. While a fee title acquisition involves most rights to a property, certain rights may be reserved or not purchased, including water rights, mineral rights, or use reservation (the ability to continue using the land for a specified time period, or the reminder of the owner's life).
Finding of No Significant Impact	A document prepared in compliance with the National Environmental Policy Act, supported by an environmental assessment, which 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.

Floodplain Woods	Bottomland hardwood forests. Consists of hardwoods (old-growth and midsuccession-aged timber) and cypress tupelo stands found on low ridges that drain slowly and subject to flooding. Species include overcup, willow, and water oaks, sweetgum, and green ash. Old-growth typically exceeds 120 years of age. Red oaks were removed in the 1940s. Midsuccession-aged timber is logged timber that may need restoration to improve wildlife habitat; missing several key oak species.
Fragmentation	The process of reducing the size and connectivity of habitat patches. The disruption of extensive habitats into isolated and small patches.
Goal	Descriptive, open-ended, and often broad statements of desired future conditions that convey a purpose but does not define measurable units.
Geographic Information System	A computer system capable of storing and manipulating spatial data.
Ground Story (flora)	Vascular plants less than one meter in height, excluding tree seedlings.
Herbaceous Wetland	Annually or seasonally inundated with vegetation consisting primarily of grasses, sedges, rushes, and cattail.
Historic Conditions	The composition, structure, and functioning of ecosystems resulting from natural processes that we believe, based on sound professional judgment, were present prior to substantial human-related changes to the landscape.
Habitat	The place where an organism lives. The existing environmental conditions required by an organism for survival and reproduction.
Indicator Species	A species of plant or animal that is assumed to be sensitive to habitat changes and represents the needs of a larger group of species.
Inholding	Privately owned land inside the boundary of a national wildlife refuge.
Issue	Any unsettled matter that requires a management decision.
Migratory	The seasonal movement from one area to another and back.
Monitoring	The process of collecting information to track changes of selected parameters over time.

National Environmental Policy Act	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 this Act with other planning requirements, and prepare appropriate policy documents to facilitate better environmental decision-making.
National Wildlife Refuge	A designated area of land, water, or an interest in land or water within the National Wildlife Refuge System.
National Wildlife Refuge System	Various categories of areas administered by the Secretary of the Interior for the conservation of fish and wildlife, including species threatened with extinction, all lands, waters, and interests therein administered by the Secretary as wildlife refuges, wildlife ranges, game ranges, wildlife management areas, or waterfowl production areas.
Native Species	Species that normally live and thrive in a particular ecosystem.
Neotropical Migratory Bird	A bird species that breeds north of the United States/Mexican border and winters primarily south of that border.
Objective	A concise quantitative (where possible) target statement of what will be achieved. Objectives are derived from goals and provide the basis for determining management strategies. Objectives should be attainable and time-specific.
Planning Area	A planning area may include lands outside existing planning unit boundaries that are being studied for inclusion in the unit and/or partnership planning efforts. It may also include watersheds or ecosystems that affect the planning area.
Planning Team	A planning team prepares the comprehensive conservation plan. Planning teams are interdisciplinary in membership and function. A team generally consists of the a planning team leader; refuge manager and staff biologists; staff specialists or other representatives of Service programs, ecosystems or regional offices; and state partnering wildlife agencies as appropriate.
Preferred Alternative	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.
Refuge Operating Needs System	A national database that contains the unfunded operational needs of each refuge. Projects included are those required to implement approved plans and meet goals, objectives, and legal mandates.

Refuge Purposes	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 subunit.
Seral Forest	A forest in the mature stage of development, usually dominated by large, old trees.
Sink	A habitat in which local mortality exceeds local reproductive success for a given species.
Sink Population	A population in a low-quality habitat in which the birth rate is generally less than the death rate and the population density is maintained by immigrants from source populations.
Source	A habitat in which local reproductive success exceeds local mortality for a given species.
Source Population	A population in a high-quality habitat in which birth rate greatly exceeds death rate and the excess individuals leave as migrants.
Step-down Management Plans	Step-down management plans provide the details necessary to implement management strategies and projects identified in the comprehensive conservation plan.
Strategy	A specific action, tool, or technique or combination of actions, tools, and techniques used to meet unit objectives.
Threatened Species	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.
Trust Species	Species for which the Fish and Wildlife Service has primary responsibility, including most federally listed threatened and endangered species, anadromous fish once they enter the inland coastal waterways, and migratory birds.
Understory	Any vegetation with canopy below or closer to the ground than canopies of other plants.
Wildlife Corridor	A landscape feature that facilitates the biologically effective transport of animals between larger patches of habitat dedicated to conservation functions. Such corridors may facilitate several kinds of traffic, including frequent foraging movement, seasonal migration, or the once-in-a-lifetime dispersal of juvenile animals. These are transition habitats and need not contain all habitat elements required by migrants for long-term survival or reproduction.

Wildlife-dependent Recreation	A use of a refuge involving hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation. The National Wildlife Refuge System Improvement Act of 1997 specifies that these are the six priority general public uses of the System.

Appendix II. References and Literature Cited

Allen, C., M. Corcoran, L. McDade, J. Travis and D. Wheeler. 1979. An ecological survey of selected inland Dare County sites, with evaluation for conservation potential. Unpublished report. North Carolina Department of Natural Resources and Community Development, Division of Parks and Recreation, North Carolina Natural Heritage Program. 53 pp.

Allen, T. G. 1998. *Black Bear Population Dynamics and Habitat Use in Coastal North Carolina.* MS Thesis, University of Tennessee, Knoxville, Tennessee. 131 pp.

Ash, A., C. McDonald, E. Kane and C. Pories. 1983. *Natural and Modified Pocosins: Literature Synthesis and Management Options.* U.S. Department of the Interior, Fish and Wildlife Service, Division of Biological Services. FWS/OBS/04. 165 pp.

Baker, W. and W. Smith. 1965. *Survey and Classification of the Scuppernong-Alligator Rivers and Tributaries, North Carolina.* North Carolina Wildlife Resources Commission, Division of Inland Fisheries. 15 pp. + tables and appendices.

Barick, F. B. and T. S. Critcher. 1975. *Wildlife and Land Use Planning with Particular Reference to Coastal Counties.* North Carolina Wildlife Resources Commission. Raleigh, North Carolina. 168 pp.

Bellrose, F. C. 1976. *Ducks, Geese, and Swans of North America.* Stackpole Books, Harrisburg, Pennsylvania. 544 pp.

Braswell, A. L. and J. E. Wiley. 1982. Preliminary survey of the amphibians and reptiles of First Colony Firm's land on mainland Dare County. Pages 62–95 in E. Potter, ed., *A Survey of the Vertebrate Fauna of Mainland Dare County, North Carolina.* North Carolina Biological Survey, Raleigh, North Carolina. 190 pp.

Clark, M. K., D. S. Lee, and J. B. Funderburg, Jr. 1985. The mammal fauna of Carolina bays, pocosins, and associated communities in North Carolina. *Brimleyana* No. 11:1-38.

Cowardin, L., V. Carter, F. C. Golet and E. T. LaRoe. 1979. *Classification of Wetlands and Deepwater Habitats of the United States.* U.S. Fish and Wildlife Service, Office of Biological Services FWS/OBS-79/31. 131 pp.

Davidson, W. R. 1992. *Alligator River National Wildlife Refuge Deer Herd Health Check.* Southeastern Cooperative Wildlife Disease Study, Athens, Georgia.

Davidson, W. R. 1998. *Alligator River National Wildlife Refuge Deer Herd Health Check.* Southeastern Cooperative Wildlife Disease Study, Athens, Georgia.

Eubanks, T., P. Kerlinger and R.H. Payne. 1993. High Island, Texas: A case study in avitourism. *Birding* 25(6):415-420).

Eubanks, Ted and John Stoll. 1999. *Avitourism in Texas: Two Studies of Birders in Texas and their Potential Support for the Proposed World Birding Center.* Texas Parks and Wildlife, Contract No. 44467.

Folta, J. E. 1998. *Reproduction, Survival, and Denning Ecology of Black Bears on the Dare County Peninsula, North Carolina.* MS Thesis, University of Tennessee, Knoxville. 120 pp.

Frayer, W. E., T. J. Monahan, D. C. Bowen and F. A. Graybill. 1983. *Status and Trends of Wetlands and Deepwater Habitats in the Conterminous United States: 1950s to 1970s.* U.S. Fish and Wildlife Service, Washington, DC. 32 pp.

Fredrickson, L. H. and M. E. Heitmeyer. 1988. Waterfowl Use of Forested Wetlands of the Southern United States: An Overview. Pages 307–323 in M.W. Weller, ed., *Waterfowl in Winter*. University of Minnesota Press, Minneapolis, Minnesota.

Halls, L. K. 1984. *White-tailed Deer: Ecology and Management.* Stackpole Books. Harrisburg, Pennsylvania. 870 pp.

Halls, L. K. and T. H. Ripley. 1961. *Deer Browse Plants of Southern Forests.* U.S. Forest Service, Southeastern Forest Experiment Station. 78 pp.

Hamel, P. B. 1992. *The Land Manager's Guide to the Birds of the South.* The Nature Conservancy and U.S. Department of Agriculture, Forest Service. Atlanta, Georgia.

Hamilton, R. J. 1978. *Ecology of the Black Bear in Southeastern North Carolina.* MS Thesis, University of Georgia, Athens, Georgia.

Hamilton, R. J. and L. Marchinton. 1977. Denning and related activities of black bears in the coastal plain of North Carolina. Pages 121–126 in *Bears: Their Biology and Management.* Bear Biology Association Conference Series No. 3, Kalispell, Montana.

Hardy, D. M. 1974. *Habitat Requirements of the Black Bear in Dare County, North Carolina.* MS Thesis, Virginia Technical Institute and State University, Blacksburg, Virginia. 121 pp.

Hefner, J. H. and J. D. Brown. 1984. Wetland trends in the southeastern United States. *Wetlands* 4:1-11.

Hester, J., Jr. and B. Copeland. 1975. *Nekton Population Dynamics in the Albemarle Sound and Neuse River Estuaries.* University of North Carolina Sea Grant College, Raleigh, North Carolina. UNC-SG-5-02. 129 pp.

Hunter, W. C., D. N. Pashley and R. E. F. Escano. 1992. Neotropical migratory land bird species and their habitats of special concern within the Southeast region. Pages 159–169 in D.M. Finch and P. W. Stangel, eds., *Status and Management of Neotropical Migratory Birds.* U.S. Forest Service, General Technical Report RM-229, Fort Collins, Colorado.

Hunter, W. C., L. H. Peoples and J. A. Collazo. 2001. *South Atlantic Coastal Plain Partners in Flight Bird Conservation Plan.* Partners in Flight, www.partnersinflight.org.

Johnson, H., S. Winslow, D. Crocker, B. Holland, Jr., J. Gillikin and D. Taylor. 1980. *Biology and Management of Mid-Atlantic Anadromous Fishes under Extended Jurisdiction.* Special Science Report 36. North Carolina Department of Natural Resources and Community Development, Division of Marine Fisheries, Morehead City. 204 pp.

Kerlinger, P. 1994. *The Economic Impact of Birding Ecotourism on Communities Surrounding Eight National Wildlife Refuges.* Washington, DC: National Fish and Wildlife Association.

Kerlinger, P. 1999. Birding Tourism and Dauphin Island.

Landers, J. L., R. J. Hamilton, A. S. Johnson, and R. L. Marchinton. 1979. Foods and habitat of black bears in southeastern North Carolina. *Journal of Wildlife Management* 43(l): 143-153.

Lee, D. S., M. K. Clark, and J. B. Funderburg, Jr. 1982. A preliminary survey of the mammals of mainland Dare County, North Carolina. Pages 20–61 in E. F. Potter, ed*., A Survey of the Vertebrate Fauna of Mainland Dare County, North Carolina.* North Carolina Biological Survey, Raleigh, North Carolina.

Mathis, M. A. and J. J. Crow. 2000. *The Prehistory of North Carolina: An Archaeological Symposium.* Raleigh, North Carolina: North Carolina Division of Archives and History.

McDonald, C. B., A. N. Ash and E. S. Kane. 1983. *Pocosins: A Changing Wetland Resource.* U.S. Department of the Interior, Fish and Wildlife Service, Division of Biological Survey FWS/OBS-83/32. 22 pp.

Mitsch, W. J. and J. G. Gosselink. 1993. *Wetlands.* Second edition. Van Nostrand Reinhold, New York, New York. 722 pp.

Monschein, T. 1981. Values of pocosins to game and fish species in North Carolina. Pages 155–170 in C. Richardson, ed., *Pocosin Wetlands.* Hutchinson Ross Publishing Company, Stroudsburg, Pennsylvania.

National Audubon Society. 1998. Campaign on HR 3267. National Audubon Society, New York, New York.

Nettles, V. V. 1985. *Alligator River National Wildlife Refuge Deer Herd Health Check.* Southeastern Cooperative Wildlife Disease Study, Athens, Georgia.

New Jersey Department of Environmental Protection. 2000. *Wildlife-associated Recreation on the New Jersey Delaware Bayshore.* New Jersey Division of Fish and Wildlife, Trenton, New Jersey.

Noffsinger, R. E., R. W. Laney, A. M. Nichols, D. L. Stewart and D. W. Steffeck. 1984. *Prulean Farms, Inc.: A Fish and Wildlife Coordination Act Report.* U.S. Fish and Wildlife Service, 200 pp.

North Carolina Economic Security Commission. 2002. Largest Employers by County. www.ncesc.com.

North Carolina Economic Security Commission. 2004. Unemployment Rates by County. www.ncesc.com.

North Carolina Division of Parks and Recreation. 2001. *North Carolina Coastal Plain Paddle Trails Guide.* North Carolina Division of Parks and Recreation, Seven Springs, North Carolina.

North Carolina State University. 1974. *Status of Black Bear in North Carolina (Research) Habitat Suitability for Black Bear, Annual Job Progress Report.* Project W-56-2-VI-C.

Peacock, S. L. and J. M. Lynch. 1982. *Natural Areas Inventory of Mainland Dare County, North Carolina.* N.C. Department of Natural Resources and Community Development, Office of Coastal Management CEIP Report No. 27.

Potter, E. F. 1982a. Wintering and breeding birds of pocosins and adjacent agricultural fields in Dare County, North Carolina. Pages 96–190 in E. Potter, ed., *A Survey of the Vertebrate Fauna of Mainland Dare County, North Carolina.* North Carolina Biological Survey, Raleigh, North Carolina. 190 pp.

Potter, E. F., ed. 1982b. *A Survey of the Vertebrate Fauna of Mainland Dare County, North Carolina.* North Carolina Biological Survey, Raleigh, North Carolina. 190 pp.

Riggs, S. R. and D. K. Belknap. 1988. Upper Cenozoic processes and environments of continental margin sedimentation: eastern United States. Pages 131–176 in R. E. Sheridan and J. A. Graw, eds., *The Geology of North America, Volumes 1-2, the Atlantic Continental Margin.* U.S. Geological Society of America.

Robison, T. M. 1977. *Public Water Supplies of North Carolina, Northern Coastal Plain.* U.S. Department of the Interior, Washington, DC. pp. 49–50.

Schafale, M. P. and A. S. Weakely. 1990. *Classification of the Natural Communities of North Carolina: Third Approximation.* North Carolina Natural Heritage Program, Raleigh, North Carolina. 325 pp.

Sharitz, R. and J. Gibbons. 1982. *The Ecology of Southeastern Shrub Bogs (Pocosins) and Carolina Bays: A Community Profile.* U.S. Department of the Interior, Fish and Wildlife Service, Division of Biological Services, Washington, DC. FWS/ OBS-82/04. 93 pp.

Tetterton, B. and G. Tetterton. 1998. *North Carolina County Fact Book.* Vols. I and II. Broadfoot's of Wendell, Wendell, North Carolina.

U.S. Army Corps of Engineers. 1982. *Draft Environmental Impact Statement: Prulean Farms, Inc., Dare County.* September 1982. U.S. Army Corps of Engineers, Wilmington District, Regulatory Functions Branch, Wilmington, North Carolina.

U.S. Department of Agriculture. 1997. *Census of Agriculture, North Carolina, 1997.* Washington, D.C.: U.S. Department of Agriculture.

U.S. Department of Agriculture, Forest Service. 2002. *Forest Statistics for the Northern Coastal Plain of North Carolina, 2000.* Resource Bulletin SRS-83. Washington, D.C.: U.S. Government Printing Office.

U.S. Department of Agriculture, Natural Resources Conservation Service. 2001. *Soil Survey of Hyde County, North Carolina.* USDA Natural Resources Conservation Service, Washington, DC.

U.S. Department of Agriculture, Soil Conservation Service. 1985. *Hydric Soils of the State of North Carolina, 1985.* U.S. Department of Agriculture, Soil Conservation Service in cooperation with the National Technical Committee for Hydric Soils. Washington, DC. Unpaginated.

U.S. Department of Agriculture, Soil Conservation Service. 1992. *Soil Survey of Dare County, North Carolina.* USDA Soil Conservation Service, Washington, DC.

U.S. Department of Commerce, Bureau of the Census. 2000a. U.S.A. Counties 2000, General Profile: Dare County, North Carolina. Washington, DC: U.S. Government Printing Office.

U.S. Department of Commerce, Bureau of the Census. 2000b. U.S.A. Counties 2000, General Profile: Hyde County, North Carolina. Washington, DC: U.S. Government Printing Office.

U.S. Department of Commerce, Bureau of the Census. 1997a. Economic Census, Dare County, North Carolina. Washington, D.C.: U.S. Government Printing Office.

U.S. Department of Commerce, Bureau of the Census. 1997b. Economic Census, Hyde County, North Carolina. Washington, D.C.: U.S. Government Printing Office

U.S. Department of Commerce, Bureau of the Census. 2000a. Small Area Income and Poverty Estimates Program, 2000: Model-Based Income and Poverty Estimates for Dare County, North Carolina. Washington, DC: U.S. Government Printing Office.

U.S. Department of Commerce, Bureau of the Census. 2000b. Small Area Income and Poverty Estimates Program, 2000: Model-Based Income and Poverty Estimates for Hyde County, North Carolina. Washington, DC: U.S. Government Printing Office.

U.S. Environmental Protection Agency. 1997. Nature-based Tourism.

U.S. Fish and Wildlife Service. 1981. *Significant Wildlife Resource Areas of North Carolina.* U.S. Fish and Wildlife Service, Asheville Area Office, Asheville, North Carolina. 139 pp.

U.S. Fish and Wildlife Service. 2001. *National Survey of Fishing, Hunting and Wildlife-associated Recreation.* Washington, DC.

U.S. Fish and Wildlife Service. 2001. *National Survey of Fishing, Hunting, and Wildlife-Associated Recreation - North Carolina.* Washington, DC.

Vogelsang, Hans. 2001. *Assessing the Economic Impact of Ecotourism Developments on the Albemarle/Pamlico Region.* Greenville, North Carolina: East Carolina University, Department of Recreation and Leisure Studies.

Watts, B. D. and B. J. Paxton. 2002. *Investigating the Distribution, Population Status, and Habitat Requirements of the Wayne's Black-throated Green Warbler in the Northern South Atlantic Coastal Plain.* Center for Conservation Biology Technical Report Series, CCBTR-02-08. College of William and Mary, Williamsburg, Virginia. 21 pp.

Appendix III. Relevant Legal Mandates

NATIONAL WILDLIFE REFUGE SYSTEM AUTHORITIES

The mission of the Fish and Wildlife Service is to conserve, protect, and enhance the Nation's fish and wildlife and their habitats for the continuing benefit of the American people. The Service is the primary federal agency responsible for migratory birds, endangered plants and animals, certain marine mammals, and anadromous fish. This responsibility to conserve our Nation's fish and wildlife resources is shared with other federal agencies and state and tribal governments.

As part of this responsibility, the Service manages the National Wildlife Refuge System. This system is the only nationwide system of federal lands managed and protected for wildlife and their habitats. The mission of the National Wildlife Refuge System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Alligator River National Wildlife Refuge is managed as part of this system in accordance with the National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997, the Refuge Recreation Act of 1962, Executive Order 12996 (Management and General Public Use of the National Wildlife Refuge System), and other relevant legislation, executive orders, regulations, and policies.

KEY LEGISLATION/POLICIES FOR PLAN IMPLEMENTATION

The Alligator River National Wildlife Refuge Draft Comprehensive Conservation Plan describes and illustrates management area projects with standards and guidelines for future decision-making and the staff may adjust them through monitoring and evaluation, as well as amendment and revision. The plan approval establishes conservation and land protection goals, objectives, and specific strategies for the refuge and its expansion. The Refuge Manager has identified and approved compatible recreation uses specific to the refuge. This plan provides for systematic stepping down from the overall direction as outlined when making project or activity level decisions. This level involves site-specific analysis (e.g., Forest Habitat Management Plan) to meet National Environmental Policy Act requirements for decision-making.

Antiquities Act (1906): Authorizes the scientific investigation of antiquities on federal land and provides penalties for unauthorized removal of objects taken or collected without a permit.

Migratory Bird Treaty Act (1918): Designates the protection of migratory birds as a federal responsibility. This Act enables the setting of seasons, and other regulations including the closing of areas, federal or non-federal, to the hunting of migratory birds.

Migratory Bird Conservation Act (1929): Establishes procedures for acquisition by purchase, rental, or gift of areas approved by the Migratory Bird Conservation Commission.

Migratory Bird Hunting and Conservation Stamp Act (1934): Authorized the opening of part of a refuge to waterfowl hunting.

Fish and Wildlife Act (1956): Established a comprehensive national fish and wildlife policy and broadened the authority for acquisition and development of refuges.

Fish and Wildlife Coordination Act (1958): Allows the Fish and Wildlife Service to enter into agreements with private landowners for wildlife management purposes.

Refuge Recreation Act (1962): Allows the use of refuges for recreation when such uses are compatible with the refuge's primary purposes and when sufficient funds are available to manage the uses.

Land and Water Conservation Fund Act (1965): Uses the receipts from the sale of surplus federal land, outer continental shelf oil and gas sales, and other sources for land acquisition under several authorities.

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. (Refuge Administration 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 for which the refuge was established. The Refuge Improvement Act clearly defines a unifying mission for the Refuge System; establishes the legitimacy and appropriateness of the six priority public uses (hunting, fishing, wildlife observation, wildlife photography and environmental education and interpretation); establishes a formal process for determining compatibility; established the responsibilities of the Secretary of the Interior for managing and protecting the System; and requires a Comprehensive Conservation Plan for each refuge by the year 2012. This Act amended portions of the Refuge Recreation Act and National Wildlife Refuge System Administration Act of 1966.

Architectural Barriers Act (1968): Requires federally owned, leased, or funded buildings and facilities to be accessible to persons with disabilities.

National Environmental Policy Act (1969): Requires the disclosure of the environmental impacts of any major federal action significantly affecting the quality of the human environment.

Endangered Species Act (1973): Requires all federal agencies to carry out programs for the conservation of threatened and endangered species.

Rehabilitation Act (1973): Requires that programmatic and physical accessibility be made available in any facility funded by the Federal Government, ensuring that anyone can participate in any program.

Clean Water Act (1977): Requires consultation with the U.S. Army Corps of Engineers for major wetland modifications.

Executive Order 11988 (1977): Each federal agency shall provide leadership and take action to reduce the risk of flood loss and minimize the impact of floods on human safety, and preserve the natural and beneficial values served by the flood plain.

Emergency Wetlands Resources Act (1986): The purpose of the Act is to promote the conservation of migratory waterfowl and to offset or prevent the serious loss of wetlands by the acquisition of wetlands and other essential habitat, and for other purposes.

Federal Noxious Weed Act (1990): Requires the use of integrated management systems to control or contain undesirable plant species; and an interdisciplinary approach with the cooperation of other federal and state agencies.

Americans With Disabilities Act (1992): Prohibits discrimination in public accommodations and services.

Executive Order 12996 Management and General Public Use of the National Wildlife Refuge System (1996): Defines the mission, purpose, and priority public uses of the National Wildlife Refuge System. It also presents four principles to guide management of the system.

Executive Order 13007 Indian Sacred Sites (1996): Directs federal land management agencies to accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners, avoid adversely affecting the physical integrity of such sacred sites, and where appropriate, maintain the confidentiality of sacred sites.

Emergency Wetland 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 also requires the Secretary of the Interior to establish a National Wetlands Priority Conservation Plan, requires the states to include wetlands in their Comprehensive Outdoor Recreation Plans, and transfers to the Migratory Bird Conservation Fund an amount equal to import duties on arms and ammunition.

Endangered Species Act of 1973 (16 U.S.C. 1531-1544, 87 Stat. 884), as amended: Public Law 93-205, approved December 28, 1973, repealed the Endangered Species Conservation Act of December 5,1969 (P.L. 91-135, 83 Stat. 275). The 1969 act amended the Endangered Species Preservation Act of October 15, 1966 (P.L. 89-669, 80 Stat. 926). The 1973 Endangered Species Act provided for the conservation of ecosystems upon which threatened and endangered species of fish, wildlife, and plants depend, both through federal action and by encouraging the establishment of state programs. The Act authorizes the determination and listing of species as threatened and endangered; prohibits unauthorized taking, possession, sale, and transport of endangered species; provides authority to acquire land for the conservation of listed species, using land and water conservation funds; authorizes establishment of cooperative agreements and grants-in-aid to states that establish and maintain active and adequate programs for threatened and endangered wildlife and plants; authorizes the assessment of civil and criminal penalties for violating the Act or regulations; and authorizes the payment of rewards to anyone furnishing information leading to arrest and conviction of anyone violating the Act and any regulation issued there under.

Environmental Education Act of 1990(20 USC 5501-5510; 104 Stat. 3325): Public Law 101-619, signed November 16,1990, established the Office of Environmental Education within the Environmental Protection Agency to develop and administer a federal environmental education program. Responsibilities of the Office include developing and supporting programs to improve understanding of the natural and developed environment, and the relationships between humans and their environment; supporting the dissemination of educational materials; developing and supporting training programs and environmental education seminars; managing a federal grant program; and administering an environmental internship and fellowship program. The Office is required to develop and support environmental programs in consultation with other federal natural resource management agencies, including the Fish and Wildlife Service.

Executive Order 11988, Flood Plain Management: The purpose of this Executive Order, signed May 24, 1977, 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 flood plain 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 flood plains.

Fish and Wildlife 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 of the Interior 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.

Antiquities Act (16 USC 431 - 433)--The Act of June 8, 1906, (34 Stat. 225): This act authorizes the President of the United States to designate as National Monuments objects or areas of historic or scientific interests on lands owned or controlled by the United States. The Act required that a permit be obtained for examination of ruins, excavation of archaeological sites and the gathering of objects of antiquity on lands under the jurisdiction of the Secretaries of Interior, Agriculture, and Army, and provided penalties for violations.

Archaeological Resources Protection Act (16 U.S.C. 470aa - 47011)-- Public Law 96-95, approved October 31, 1979, (93 Stat. 721): This act largely supplanted the resource protection provisions of the Antiquities Act for archaeological items. It established detailed requirements for issuance of permits for any excavation for or removal of archaeological resources from Federal and Indian lands. It also established civil and criminal penalties for the unauthorized excavation, removal, or damage of any such resources; for any trafficking in such resources removed from Federal and Indian lands in violation of any provision of federal law; and for interstate and foreign commerce in such resources acquired, transported or received in violation of any state or local law.

Public Law 100-588, approved November 3, 1988, (102 Stat. 2983) lowered the threshold value of artifacts triggering the felony provisions of the Act from $5,000 to $500, made attempting to commit an action prohibited by the Act a violation, and required the land managing agencies to establish public awareness programs regarding the value of archaeological resources to the nation.

Archaeological and Historic Preservation Act (16 U.S.C. 469-469c)--Public Law 86-523, approved June 27, 1960, (74 Stat. 220), and amended by Public Law 93-291, approved May 24, 1974, (88 Stat. 174): This act directed federal agencies to notify the Secretary of the Interior whenever a federal, federally assisted, or licensed or permitted project may cause loss or destruction of significant scientific, prehistoric or archaeologic data. The Act authorized use of appropriated, donated and/or transferred funds for the recovery, protection and preservation of such data.

Historic Sites, Buildings and Antiquities Act (16 U.S.C. 461-462, 464-467)--The Act of August 21,1935, (49 Stat. 666) popularly known as the Historic Sites Act, as amended by Public Law 89-249, approved October 9,1965, (79 Stat. 971): This act declared it a national policy to preserve historic sites and objects of national significance, including those located on refuges. It provided procedures for designation, acquisition, administration and protection of such sites. Among other things, National Historic and Natural Landmarks are designated under authority of this Act. As of January, 1989, thirty-one national wildlife refuges contained such sites.

National Historic Preservation Act of 1966 (16 U.S.C. 470-470b, 470c-470n)--Public Law 89-665, approved October 15, 1966, (80 Stat. 915) and repeatedly amended: This act provided for preservation of significant historical features (buildings, objects and sites) through a grant-in-aid program to the states. It established a National Register of Historic Places and a program of matching grants under the existing National Trust for Historic Preservation (16 U.S.C. 468-468d).

The Act established an Advisory Council on Historic Preservation, which was made a permanent independent agency in Public Law 94-422, approved September 28, 1976 (90 Stat. 1319). That Act also created the Historic Preservation Fund. Federal agencies are directed to take into account the effects of their actions on items or sites listed in, or eligible for listing in, the National Register of Historic Places. As of January 1989, ninety-one such sites on national wildlife refuges are listed in this Register.

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 of 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 Hunting and Conservation Stamp Act (16 U.S.C. 718-718j, 48 Stat. 452), as amended: The Duck Stamp Act, of March 16, 1934, requires each waterfowl hunter, 16 years of age or older, to possess a valid federal hunting stamp. Receipts from the sale of the stamp are deposited in a special Treasury account known as the Migratory Bird Conservation Fund and are not subject to appropriations.

National and Community Service Act of 1960 (42 U.S.C. 12401:104 Stat. 3127), Public Law 101-610, signed November 16,1990: This act authorizes several programs to engage citizens of the United States in full- and/or part-time projects designed to combat illiteracy and poverty, provide job skills, enhance educational skills, and fulfill environmental needs. Several provisions are of particular interest to the Fish and Wildlife Service.

American Conservation and Youth Service Corps: A federal grant program established under Subtitle C of the law, the Corps offers an opportunity for young adults between the ages of 16-25, or in the case of summer programs, 15-21, to engage in approved human and natural resources projects which benefit the public or are carried out on Federal or Indian lands. To be eligible for assistance, natural resource programs must focus on improvement of wildlife habitat and recreational areas, fish culture, fishery assistance, erosion, wetlands protection, pollution control and similar projects. A stipend of not more than 100 percent of the poverty level will be paid to participants. A Commission established to administer the Youth Service Corps will make grants to States, the Secretaries of Agriculture and Interior and the Director of ACTION to carry out these responsibilities.

National Environmental Policy Act of 1959 (P.L. 91-190,42 U.S.C. 4321-4347, January 1, 1970, 83 Stat. 852) as amended by Public Law 94-52, July 3, 1975, 89 Stat. 258, and Public Law 94-83, August 9,1975, 89 Stat. 424): Title I of the 1969 National Environmental Policy Act requires that all federal agencies prepare detailed environmental impact statements for every recommendation or report on proposals for legislation and other major federal actions significantly affecting the quality of the human environment. The 1969 statute stipulated the factors to be considered in environmental impact statements, and required that federal agencies employ an interdisciplinary approach in related decision-making and develop means to ensure that unquantified environmental values are given appropriate consideration, along with economic and technical considerations. Title II of this statute requires annual reports on environmental quality from the

President to the Congress, and established a Council on Environmental Quality in the Executive Office of the President with specific duties and functions.

National Wildlife Refuge System Improvement Act of 1997: Public Law 105-57, amended the National Wildlife Refuge System Act of 1966 (16 U.S.C. 668dd-ee), and provided guidance for management and public use of the Refuge System. The Act mandates that the Refuge System be consistently directed and managed as a national system of lands and waters devoted to wildlife conservation and management. The Act establishes priorities for recreational uses of the Refuge System. Six wildlife-dependent uses are specifically named in the Act: hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation. These activities are to be promoted on the Refuge System, while all non-wildlife-dependent uses are subject to compatibility determinations. A compatible use is one that, in the sound professional judgment of the Refuge Manger, will not materially interfere with, or detract from, fulfillment of the National Wildlife Refuge System Mission or refuge purpose(s). As stated in the Act, The mission of the system is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans. The Act also requires development of a Comprehensive Conservation Plan for each refuge and that management be consistent with the plan. When writing a plan for expanded or new refuges, and when making management decisions, the Act requires effective coordination with other federal agencies, state fish and wildlife or conservation agencies, and refuge neighbors. A refuge must also provide opportunities for public involvement when making a compatibility determination.

North American Wetlands Conservation Act (103 Stat. 1968; 16 U.S.C. 44O1~4412) Public Law 101-233, enacted December 13, 1989: This act 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 Act converts the Pittman-Robertson account into a trust fund, with the interest available without appropriation through the year 2006, to carry out the programs authorized by the Act, along with an authorization for annual appropriation of $15 million plus an amount equal to the fines and forfeitures collected under the Migratory Bird Treaty Act. Available funds may be expended, upon approval of the Migratory Bird Conservation Commission, for payment of not to exceed 50 percent of the United States' share of the cost of wetlands conservation projects in Canada, Mexico, or the United States (or 100 percent of the cost of projects on federal lands). At least 50 percent and no more than 70 percent of the funds received are to go to Canada and Mexico each year.

Refuge Recreation Act of 1952: 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.

Refuge Revenue Sharing Act (16 U.S.C. 715s): Section 401 of the Act of June 15,1935, (49 Stat. 383) provided for payments to counties in lieu of taxes, using revenues derived from the sale of products from refuges. Public Law 88-523, approved August 30,1964, (78 Stat. 701) made major revisions by requiring that all revenues received from refuge products, such as animals, timber and minerals, or from leases or other privileges, be deposited in a special Treasury account and net receipts distributed to counties for public schools and roads. Public Law 93-509, approved December 3, 1974, (88 Stat. 1603) required that moneys remaining in the fund after payments be transferred to the Migratory Bird Conservation Fund for land acquisition under provisions of the Migratory Bird Conservation Act. Public Law 95-469, approved October 17, 1978, (92 Stat. 1319)

expanded the revenue sharing system to include National Fish Hatcheries and Service research stations. It also included in the Refuge Revenue Sharing Fund receipts from the sale of salmonid carcasses. Payments to counties were established as follows: on acquired land, the greatest amount calculated on the basis of 75 cents per acre, three-fourths of one percent of the appraised value, or 25 percent of the net receipts produced from the land; and on land withdrawn from the public domain, 25 percent of net receipts and basic payments under Public Law 94-565 (31 U.S.C. 1601-1607, 90 Stat. 2662). This amendment also authorized appropriations to make up any difference between the amount in the fund and the amount scheduled for payment in any year. The stipulation that payments be used for schools and roads was removed, but counties were required to pass payments along to other units of local government within the county that suffer losses in revenues due to the establishment of Service areas.

The Sikes Act: Military lands comprise over 25 million acres that are largely protected from development and that represent diverse habitat types containing a wealth of plant and animal life. These lands preserve ecologically important native habitats such as old-growth forests, tall-grass prairies, and vernal pool wetlands. In many cases, these lands are havens for rare and unique plant and animal species.

The Sikes Act recognizes the importance and value of military lands to natural resources. It seeks to ensure that these ecosystems are protected and enhanced while allowing the military lands to continue to meet the needs of military operations.

The Sikes Act (16 USC 670, et seq.) requires the Department of Defense (DoD) to develop and implement Integrated Natural Resources Management Plans (INRMPs) for military installations. The law was originally enacted in 1960, and has been amended several times since enactment. INRMPs are prepared cooperatively with the U. S. Fish and Wildlife Service (Service) and State fish and wildlife agencies to ensure proper consideration of fish, wildlife, and habitat needs. INRMPs are required at almost 380 military installations across the Nation, and direct the management and use of the lands on these installations.
The Sikes Act and the INRMPs require integration of many different aspects of natural resource management. Through the Sikes Act, the Service helps military installations manage their natural resources by providing expertise on the following issues:

- endangered species
- fisheries and aquatic resources
- invasive species
- migratory birds
- law enforcement
- wetlands
- environmental contaminants.

Wilderness Act of 1954: Public Law 88-577, approved September 3,1964, directed the Secretary of the Interior, within 10 years, to review every roadless area of 5,000 or more acres and every roadless island (regardless of size) within National Wildlife Refuge and National Park Systems for inclusion in the National Wilderness Preservation System.

Appendix IV. Public Involvement

SUMMARY OF PUBLIC SCOPING MEETINGS

The Service invited agencies, organizations, businesses, and citizens to participate in a series of public scoping meetings held on February 15, 16, 20, 22, and 23, 2001, in Washington, Swan Quarter, Plymouth, Columbia, and Manns Harbor, North Carolina, respectively. A total of 176 citizens attended these five public scoping meetings. The staff introduced the attendees to the refuge and its planning process and asked them to identify their issues and concerns. The Service published announcements giving the locations, dates, and times for these public meetings in the *Federal Register* and legal notices in local newspapers. The Service also sent press releases to local newspapers and public service announcements to television and radio stations. Service personnel placed 50 posters announcing the meeting in local post offices, local government buildings, and stores.

The planning team expanded the issues and concerns to include those generated by the agencies, organizations, businesses, and citizens from the local community. These issues and concerns formed the basis for the development and comparison of the objectives in the different alternatives described in the environmental assessment.

The objectives were subjects of discussion at a second-round public meeting held on April 26, 2005, in Manns Harbor, North Carolina. The Service published announcements giving the location, date, and time for this public meeting as legal notices in local newspapers. In addition, press releases were sent to local newspapers and public service announcements to television and radio stations. Service personnel placed 75 posters announcing the meeting in local post offices, local government buildings, and stores.

The issues raised at the meetings are summarized in the next few pages, followed by worksheets that were completed by the participants at each workshop.

Alligator River National Wildlife Refuge
Comprehensive Conservation Plan Scoping Meetings
February 15, 16, 20, 22, and 23, 2001

Area of Concern	Issue	Disposition
Wildlife-General	Continue surveys.	In plan.
	Conduct surveys.	In plan.
	Consider wildlife first.	In plan.
	Consider non-game species in management.	In plan.
	Share data with other agencies.	In plan.
	Discuss plant and wildlife species occurring on the refuge and focus on federally listed species and state-listed and sensitive species that may be of management concern	In plan.

Area of Concern	Issue	Disposition
Wildlife-General (continued)	Increase study and protection of reptiles, amphibians, and invertebrates (inventory).	In alternative 3.
	Describe life histories of species occurring on the refuge.	Not practical to include in plan.
Wildlife-Fish	Evaluate water management impacts to fish and wildlife on each refuge.	Dependent on willingness of partners to conduct research.
Wildlife-Invertebrates	Evaluate food chain impacts of fire ants on other species.	Dependent on willingness of partners to conduct research.
Wildlife-Mammals	Control bear populations.	Currently conducting population survey. Results may justify hunting for bear.
	Develop beaver management guidance.	Specific guidance will be in the nuisance animal step-down plan.
	Study deer population carrying capacities and determine whether hunting needs to be increased.	In alternative 3.
Habitat-General	Increase study and protection of plants (inventory).	Protection in all alternatives, inventory in alternatives 2 and 3.
	Make sure the management practices fit the wildlife requirements.	In all alternatives.
Habitat-Canals	Develop erosion and sediment control plans and best management practices for canal and road maintenance activities.	All alternatives propose to maintain vegetated road shoulders and canal banks.
Habitat-Nonriverine Wet Hardwood Forest	Evaluate the status of American elm on refuge between Milltail and Navy Shell Road.	Dependent on willingness of partners to conduct research.
Habitat-Roads	Develop erosion and sediment control plans and best management practices for canal and road maintenance activities.	All alternatives propose to maintain vegetated road shoulders and canal banks.
	Evaluate impacts of the practice of daylighting roads on adjacent canal hydrology.	Dependent on willingness of partners to conduct research.
Public Use-General	Coordinate public uses to avoid user conflicts	In plan.
	Coordinate public uses with the Bombing Range (especially roads)	Uses are coordinated as much as possible. Many bombing range operations are not scheduled well in advance.
Public Use-Hunting	Develop a program for dog hunting.	The refuge has areas designated for hunting with pursuit hounds and retrievers.

Area of Concern	Issue	Disposition
Public Use-Hunting (continued)	Discuss any future limitations on dog hunting thoroughly with the public.	Any changes will be subject to the National Environmental Policy Act that requires public notification.
	Expand areas available for dog hunting (Milltail Creek to Poplar Ridge).	Evaluation of expansion in alternatives 2 and 3.
	Initiate working group meetings for dog hunters.	Annual meetings in alternatives 2 and 3.
	Work with dog hunters to maintain or improve relationships	Annual meetings in alternatives 2 and 3. Comments are welcome any time.
	Make open areas practical for hunting.	The open areas are accessible for more months currently than they were in 2001. Most areas with resting waterfowl are still closed during the months when waterfowl are present.
	Make sure hunting areas correspond to road closures, for accessibility.	Road closures often correspond to poor road conditions despite the hunting season.
	Rotate hunting areas or distribute more evenly across landscape.	Areas for retrieving dogs set where waterfowl are located. Areas for pursuit hounds avoid waterfowl and bears. Additional areas for hunting without dogs could be considered.
	Continue to allow dog hunting on the refuge	In plan.
Public Use-Environmental Education	Develop a facility on mainland Dare County that is part of a cooperative multi-agency effort to educate the public and conduct research on the value and function of the types of wetlands	In alternatives 2 and 3.
Public Use-Access	Allow off road vehicles on selected refuge areas.	Only vehicles that can be licensed by the state are allowed on the refuge roads. Off road use in wildlife habitat is prohibited.
	Consider providing more refuge access.	The refuge has adequate access with 100 miles of roads and 9 boat ramps on and 1 boat ramp off the refuge.
	Conduct comprehensive review of the road system across the refuge to balance the public use with ecological requirements.	Dependent on willingness of partners or availability of grants to conduct review.
Public Use-Non-Wildlife Dependent Public Use	Continue to allow horseback riding on the refuge.	Horseback riding still allowed by special use permit.
	Add horseback riding as a priority public use.	Priority public uses designated by Congress.

Area of Concern	Issue	Disposition
Public Use-Non-Wildlife Dependent Public Use	Increase programs for horseback riders.	Horseback riding still allowed by special use permit.
Resource Protection-Land Protection	Consider and evaluate the long-term costs and methods for acquiring land to create corridors.	Will be in land protection step-down plan.
	Determine whether easements could include transfer of rights (i.e. dog hunting) between refuge and landowner property.	Will be in land protection step-down plan.
	Determine whether fee-simple is more advantageous than easement purchase	Will be in land protection step-down plan.
Resource Protection-Law Enforcement	Discuss what law enforcement means for the refuge in the plans.	In plan.
	Increase funding for law enforcement	In plan.
	Increase law enforcement staff	One full time officer hired since 2001. Second full time officer in alternative 3.
Resource Protection-Pest Plants	Evaluate distribution of noxious weeds and exotic species.	In all alternatives.
	Control invasive species.	In all alternatives.
Resource Protection-Wilderness	Avoid putting wilderness where popular commercial fish landings and deer hunting occur. Review drainage easements for wilderness.	Wilderness inventory suggested areas that are not close to commercial fish landings. Deer hunting would be allowed if wilderness is considered in the future.
	Avoid putting wilderness areas too close to populated areas	Wilderness inventory suggested areas that are not fire dependent habitats. Fire would be a minimum tool if wilderness is considered in the future.
	Discuss fire management in wilderness.	Wilderness not nominated. Fire would be a minimum tool if wilderness is considered in the future.
	Consider areas with ditches that could be restored.	Wilderness inventory discounted areas with drainage ditches because they serve as firebreaks and drain areas that are not on the refuge.
	Consider eastern wilderness act.	Wilderness inventory suggested areas that are all more than 5,000 acres. Smaller areas are dissected by drainage ditches and firebreaks necessary for fire management.

Area of Concern	Issue	Disposition
Resource Protection-Wilderness	Consider smaller areas than 5,000 acres.	Wilderness inventory suggested areas that are all more than 5,000 acres; smaller areas are dissected by drainage ditches and firebreaks necessary for fire management.
	Evaluate the impacts of wilderness designation on adjacent refuge uses.	Wilderness inventory suggested areas that are not currently actively managed for wildlife and are not fire dependent habitats.
	Evaluate and discuss the impacts to wildlife in general.	Wilderness inventory suggested areas that are not currently actively managed for wildlife.
	Evaluate the impacts of jet noise on wilderness.	National guidance directs the refuge to ignore jet noise.
	Review drainage easements for wilderness.	Wilderness inventory discounted areas with drainage ditches.

ALLIGATOR RIVER NATIONAL WILDLIFE REFUGE PLANNING ISSUES WORKSHEET

ACTIVITY	WHAT WOULD YOU LIKE US TO DO?			
	Keep the Same	Eliminate	Increase	Decrease
WILDLIFE SURVEYS AND MANAGEMENT				
Waterfowl Survey and Management	46%	7%	43%	4%
Shorebird Survey and Management	48%	4%	41%	7%
Land Bird Survey and Management	46%	4%	39%	11%
Reptile/Amphibian Survey and Management	36%	4%	46%	14%
Fish Survey and Management	43%	7%	47%	3%
Endangered Species Survey and Management	34%	14%	41%	11%
Black Bear Management	21%	10%	55%	14%
White-tailed Deer Management	33%	13%	50%	4%
WILDLIFE HABITAT ACTIVITIES				
Water Management (Farming, Moist Soil Management)	48%	4%	30%	18%
Prescribed Burning	42%	6%	35%	17%
Forest Thinning	33%	11%	37%	19%
Mechanical Vegetation Management (Mowing, Disking)	48%	0%	37%	15%
Chemical Vegetation Management	49%	17%	17%	17%
Shoreline Maintenance	55%	11%	26%	8%
Planting, Seeding, Clearing for Habitat Improvement	42%	6%	45%	7%
Habitat Restoration (Hydrology, Reforestation)	34%	3%	52%	11%
Wildlife Management	35%	4%	54%	7%
Insect and Disease Management	44%	6%	44%	6%
Exotic and Invasive Species Eradication	40%	3%	50%	7%
Special Protection Status (Wilderness)	40%	20%	32%	8%
PUBLIC USE ACTIVITIES AND FACILITIES				
Fishing	38%	7%	45%	10%
Hunting	35%	9%	26%	30%

ACTIVITY	WHAT WOULD YOU LIKE US TO DO?			
	Keep the Same	Eliminate	Increase	Decrease
Environmental Education (School Students)	30%	0%	60%	10%
Environmental Education (School Teachers)	34%	0%	55%	11%
PUBLIC USE ACTIVITIES				
Wildlife Interpretation (Formal Programs)	32%	4%	43%	21%
Wildlife Interpretation (Printed Material)	37%	4%	37%	22%
Wildlife Interpretation (Walking Trails)	40%	3%	41%	16%
Wildlife Interpretation (Canoeing Trails)	43%	3%	36%	18%
Wildlife Interpretation (Buildings, Kiosks)	46%	3%	29%	22%
Wildlife Interpretation (Interpretative Signs)	41%	4%	33%	22%
Wildlife Photography Opportunities	38%	4%	46%	12%
Wildlife Observation Opportunities	38%	4%	42%	16%
Vehicle Parking Lots	51%	9%	32%	8%
Access for Fishing, Boating, Canoeing	46%	4%	46%	4%
LAW ENFORCEMENT ACTIVITIES				
Visitor Protection	73%	0%	21%	6%
Wildlife Protection	41%	0%	50%	9%
Trespass Violations	48%	0%	48%	4%
Littering/Dumping Violations	41%	0%	59%	0%
Hunting and Fishing Compliance Checks	50%	4%	46%	0%
OPERATION AND MAINTENANCE				
Canal Maintenance	43%	0%	52%	5%
Road and Firebreak Maintenance	52%	0%	43%	5%
Facilities Maintenance (Signs, Buildings)	50%	5%	33%	12%
Dike and Trail Maintenance	59%	0%	35%	6%
Water Control Structures, Pump Stations	57%	0%	31%	12%
Boundary Posting	40%	7%	46%	7%

DRAFT PLAN COMMENTS AND SERVICE RESPONSES

This section summarizes the public comments that were received on the Draft Comprehensive Conservation Plan and Environmental Assessment for Alligator River National Wildlife Refuge, and the Service's responses to each comment. The Draft CCP/EA was made available for public review and comment from June 5 to July 14, 2006.

(NOTE: Comments were electronically scanned and reproduced as accurately as possible.)

North Carolina Division of Coastal Management
(Comments submitted by Stephen Rhynas, NC Division of Coastal Management, and Chrys Baggett of the NC Department of Administration State Clearinghouse)

Comment 1:
"The proposed action will be occurring within Dare and Hyde Counties, which are coastal counties within the meaning to the Coastal Zone Management Act of 1972, as amended (CZMA). The CZMA requires that Federal agencies proposing activities within a State's coastal zone to provide the State, in this case, the NC Division of Coastal Management, with a consistency determination prior to implementing the activity to document that the proposed activity would comply with the enforceable policies of North Carolina's approved coastal management program and would be conducted consistent with the State's coastal management program."

Response: Comment noted.

Comment 2:
"Based on our review of the Draft, the broad goals, objectives, and strategies outlined appear to be consistent with the State's coastal program. Nevertheless, the Draft notes that the management plan proposes the following types of activities: "The refuge would maintain interior or exterior roads to provide all-weather vehicular access to a broad segment of the public. Administrative roads would be available for vehicular and pedestrian access to support wildlife-dependent recreation to the extent that these opportunities do not interfere substantially with or detract from the achievement of wildlife conservation. The staff would maintain 2 half-mile trails, 12 miles of paddling trails, 10 miles of wildlife drives, one wildlife observation platform, and an interpretive kiosk." Many of these projects have a potential to effect coastal resources and would thus require consistency review by DCM before implementation. Conformance of the proposed Federal activity with the enforceable policies of the State's certified coastal management program was not evaluated in the Draft."

Response: Comment noted.

Comment 3:
"Though not a requirement, 15 CFR 930.37 provides a Federal agency with the discretion to use its NEPA documents "as a vehicle" for its consistency determination. Inclusion of the consistency analysis into the environmental documents simplifies the environmental review process and focuses the decision-making process by condensing the required analysis into one document. At this point in time, USFWS may either incorporate the consistency analysis into the final document or it may prepare a stand-alone consistency determination. Prior to implementing the proposed comprehensive conservation plan, the USFWS will need to submit to DCM a consistency determination and obtain the concurrence of DCM."

Response: The refuge prepared a Consistency Determination for the Comprehensive Conservation Plan and submitted it to the Division of Coastal Management on October 17, 2006 for review. The review concluded with a determination that the proposed Federal activity is consistent, to the maximum extent practical, with the enforceable policies of the North Carolina coastal management program. We further understand that development projects (as determined by statutory definition) will require additional consistency review as they are funded and plans become finalized.

Comment 4:
"DCM recommends, under NEPA, that Appendix III (Relevant Legal Mandates) and the Regulatory Effects Section be revised to incorporate a review of the proposed action with the Coastal Zone Management Act and North Carolina's coastal management program. This review would an independent analysis and not part of the consistency review process."

Response: Appendix III has been modified to include a discussion on the Coastal Zone Management Act of 1972, as amended, and the North Carolina Coastal Area Management Act. The "Regulatory Effects Section" has been modified to include reference to the Coastal Zone Management Act of 1972.

Comment 5:
"DCM also recommends, as part of the consistency review process, that the USFWS review the applicability of 15 CFR 930.33(a)(4) and 15 CFR 930.36(c). Pursuant to 15 CFR 930.33(a)(4), the USFWS may request that environmentally beneficial activities conducted in compliance with the Alligator River National Wildlife Refuge's Comprehensive Conservation Plan be excluded from further consistency review. Furthermore, pursuant to 15 CFR 930.36(c), the USFWS may propose a general consistency determination when a Federal agency proposes repeated activities (other than a development project) where the incremental actions do not affect any coastal use or coastal resource when performed separately."

Response: Comment noted. The response to Comment 3 addresses part of this comment.

Comment 6:
"North Carolina's coastal zone management program consists of, but is not limited to, the Coastal Area Management Act, the State's Dredge and Fill Law, and the land use plan of the County and/or local municipality in which the proposed project is located. In preparing the consistency determination the USFWS will need to review these documents and to evaluate the conformance of the proposed comprehensive conservation plan with the State's coastal program. The website for the Division of Coastal Management can be found at: http://dcm2.enr.state.nc.us/index.htm. The State's consistency webpage is located at: http://dcm2.enr.state.nc.us/Permits/consist.htm. Additionally, NOAA's Office of Ocean and Coastal Resources Management (OCRM) has a webpage on the consistency process at: http:// coastalmanagement.noaa.gov/czm/federal_consistency.html."

Response: The Consistency Determination submitted on October 17, 2006 reflected consideration and review of the referenced documents.

Comment 7:
"DCM encourages the USFWS to include North Carolina's Coastal Reserve Program for inclusion as a State Partner. Should the USFWS have any questions on the consistency process relative to the proposed comprehensive conservation plan, please give me a call. Thank you for your consideration of the North Carolina Coastal Management Program."

Response: The Fish and Wildlife Service in general and the refuge staff in particular welcome the opportunity to partner with the North Carolina Coastal Reserve Program. It is only through mutual cooperation that a better understanding of each agency's mission and purpose will occur, and more importantly, our natural resources will realize greater benefits through a collaborative effort.

Defenders of Wildlife
(Comments submitted by Noah Matson, Director, Federal Lands Program)

Comment 1:
"Thank you for the opportunity to comment on the Draft Comprehensive Conservation Plan and Environmental Assessment (CCP/EA) for the Alligator River National Wildlife Refuge. Defenders of Wildlife is a non-profit, public interest institution with nearly 500,000 members nationwide dedicated to the protection of all native wild animals and plants in their natural communities. Defenders has been a long-time advocate for the Refuge System and continues to take a special interest in the Refuge System planning process. Defenders published the Citizen's Wildlife Refuge Planning Handbook in 1999 to help the public understand the refuge planning process. In addition, Defenders served as a judge in last year's Refuge System planning awards.

Defenders has the following comments on the proposed CCP/EA."

Response: Comments noted.

Comment 2:
"Wilderness Review – Despite the fact that the CCP/EA identifies five potential wilderness study areas that meet the specific criteria for wilderness designation, none of them are recommended in the preferred alternative. The CCP/EA does not provide any reasonable justification for not recommending these five areas as wilderness. The CCP/EA states:

In effect, these lands would be managed and utilized the same way whether designated as wilderness or not. Therefore, it was decided not to propose the acreage as wilderness, since the designation would offer little additional protection. (CCP/EA at 86).

Even if the designation would provide "little additional protection" compared to current management, this does not constitute a valid reason for not recommending the areas as wilderness. Based on the assumption that designation would provide "little additional protection," why, then, are the areas recommended for wilderness designation in Alternative 3?

Furthermore, statements in the CCP/EA actually refute the argument that wilderness designation would provide "little additional protection" to the potential wilderness study areas. Regarding Unit 8, the CCP/EA states that:

This area, in which dog hunting for bear is currently prohibited, was identified by local hunters during comprehensive conservation plan public scoping meetings as one of the best potential bear hunting areas on the refuge. However, if this area becomes a wilderness study area, the use of dogs would almost certainly be prohibited, due to the expected increase in motorboat use for that activity (CCP/EA at 291).

Obviously, wilderness designation would provide additional protection for this unit by securing the prohibition of dog hunting. Additionally, the CCP/EA indicates that public use in the five units would, in fact, have negative consequences:

Frequent pedestrian traffic would result in habitat destruction. (CCP/EA at 86).

Therefore, we recommend the FWS reevaluate the Wilderness Review and propose all units that meet the specific criteria for wilderness designation."

Response: Comments noted. Refuge planning policy requires a wilderness review as part of the comprehensive conservation planning process. The wilderness review is attached in Section B, as Appendix IX. Minor changes were made to the plan.

Comment 3:
"Turkey Hunting – The issue of expanding the hunting program to include turkey hunting is identified in each of the alternatives. Defenders of Wildlife is not against regulated hunting programs on national wildlife refuges. However, the CCP/EA is unclear in its justification for the potential expansion of the hunting program to include turkey hunting. For example, the CCP/EA states that:

Currently, the turkey population is doing well with a number of sightings each year (CCP/EA at 166).

We feel that this is much too vague to provide adequate justification for a potential turkey hunting program as a population management strategy. If no research has been conducted to determine the size of the population that exists on and around the Refuge, how could the FWS justify a population management strategy and hunting program for the species? Prior to any expansion of the hunting program that would include turkey hunting, we strongly recommend the FWS complete the following:

- Estimate the population size of wild turkey on and around the refuge;
- Develop a specific strategy that will address how the FWS will adequately monitor the turkey population over time, especially if a hunting program is established for the species."

Response: The text about the turkey population doing well is indeed an anecdotal type of comment. However, it is based upon substantial increases in sightings of individual turkeys as well as flocks of 20–25 birds on the refuge. The steady increase in the number of sightings each year by lay persons and professional wildlife biologists strongly suggests a significant increase in numbers compared to the original release of 16 birds for the restoration project in 1999. Most wildlife biologists consider this to be a population that is doing well.

Prior to expanding the hunting program to include any additional species, the refuge will use sound professional judgment and best available science to make the decision with regards to species and the type of hunting pressure that would be allowed. In addition, the refuge will consult with professional wildlife biologists with the North Carolina Wildlife Resources Commission (NCWRC) before adding species to the hunting program. Hunting for certain species such as the wild turkey or black bear would likely be a permit system, possibly administered by the NCWRC with regards to issuing permits, and that would regulate numbers of hunters and areas that could be hunted. The first and foremost goal is to provide healthy wildlife populations with recreational opportunities being subordinate to that goal.

Comment 4:
"Trapping of Furbearers – The Compatibility Policy (65 Federal Register 62491) states that:

Implicit within the definition of sound professional judgment is that adequate resources (including financial, personnel, facilities, and other infrastructure) exist or can be provided by the Service or a partner to properly develop, operate, and maintain the use in a way that will not materially interfere with or detract from fulfillment of the refuge purpose(s) and the System mission ... If adequate resources cannot be secured, the use will be found not compatible and cannot be allowed.

The CCP/EA states that:

The refuge needs additional resources to conduct this use. The existing staff cannot administer permits and monitor this use as part of routine management duties. (CCP/EA at 223).

Despite the fact that adequate resources do not exist, this use is still determined to be compatible. This determination violates the Compatibility Policy. Not only does the refuge not have the resources to conduct or monitor this use, but the ability to successfully monitor the use is an essential function in maintaining its compatibility. For instance, if the FWS does not have the resources to monitor this use, how can the FWS ensure there won't be incidental take of endangered red wolves, alligators and other non-target wildlife? The CCP/EA clearly implies this risk by stating that "...no trapping program, regardless of how well it is designed, can prevent the possible take of other species. The refuge staff will require trappers to report the incidental take of other species." (CCP/EA at 223).
Voluntary reporting of incidental take of other species, including federally listed species, is not an acceptable monitoring program for any use. In the CCP/EA, the FWS clearly acknowledges the fact that the refuge lacks sufficient resources to conduct this use, and should therefore identify this use as incompatible."

Response: The statement in the CCP/EA has been rewritten to more accurately reflect the current situation on the refuge with regards to trapping. Given current levels of requests for trapping Special Use Permits on the refuge, there are adequate resources to issue and monitor the program. Usually, there are only 1–2 requests for any given year, and there are some years when there are no requests for trapping furbearers on the refuge. Most of the requests received are from individuals who have trapped most of their lives as a recreational pursuit (even though they sell most of the pelts they catch) more than a type of subsistence trapping. It is widely known that interest in trapping is highly correlated with the price of furbearer pelts for many "intermittent" trappers. These are the trappers that could affect an increase in permit requests in the future. As the furbearer market is highly dependent upon demand, fur prices change rapidly and interest in trapping declines proportionately.

Current furbearer trapping is limited to species of management concern.

To help resolve some issues with regards to trapping, many states are establishing trapper education programs and requiring certification through these programs prior to purchasing a trapping license. Such a program will help to educate new and experienced trappers on appropriate traps for the target species, the proper methods for setting traps to reduce trapping non-target species and reducing injury, and continue to reinforce a code of outdoor ethics. The State of North Carolina is currently developing a trapper education program and we fully support their efforts.

Comment 5:
"Special Use Permits – All of the noncommercial uses that the refuge allows by special use permit (including the gathering of firewood, cutting small-diameter poles for pound nets, cutting big cordgrass to cover duck blinds, mooring small commercial fishing boats, and gigging frogs) are extractive uses, as opposed to scientific research uses, for which the FWS has not completed compatibility determinations. Included in Alternative 3, and notably missing from the preferred alternative, is a plan to monitor permitted activities (special use permits) for impacts to the biological resources and assets of the refuge. Without monitoring the impacts, how can FWS verify that the use is, and remains, compatible? We strongly recommend that the preferred alternative adopt a plan to monitor activities allowed by special use permits on the refuge in order to ensure that each use remains compatible and does not materially interfere with or detract from fulfillment of the refuge purpose(s) and the System mission.

The plan also adds staff to assist in permit review and development and monitoring of permit conditions. We feel that additional staff should be sought to monitor permitted activities, not to increase the capacity for permit review. The plan has outlined the need for additional refuge staff to conduct refuge management actions towards achieving the refuge's primary purposes, including conserving unique wetland habitats for migratory birds and other wildlife. Providing additional staff to expedite the permit review process does not serve the interests of the refuge, but, rather, serves the interests of a few visitors seeking special use permits to conduct extractive, non-traditional activities on the refuge."

Response: Uses stated in the comment appear to be derived from the text under the heading "Non-priority Public Uses" on page 61. Public input requested that these uses be allowed in the future. Of these described uses, the only one not covered by an existing Compatibility Determination is "cutting big cordgrass to cover duck blinds." Use of vegetative materials to cover waterfowl hunting blinds is a traditional use in the area before the refuge was established and has occurred on the refuge since it was established. Most of the activity was on a very small scale and was barely noticeable. During 2004, cutting Phragmites and big cordgrass increased substantially on the southern end of the refuge and a need to regulate the activity became apparent. As they were discovered, individuals were advised of the need to obtain a Special Use Permit prior to collecting the plant material. To date, there have been no requests for a SUP to collect plant material for duck blinds. A Compatibility Determination will be completed prior to deciding whether or not to issue a SUP for that use.

While the refuge does not have specific staff dedicated to monitoring uses on the refuge, all staff and the general public are constantly providing feedback with regards to impacts on uses. For example, the wood gathering permit for pound net stakes was significantly modified several years ago when the refuge biologist discovered that one permittee had almost established a logging operation on the refuge. The new permit restricts the number of stakes that can be collected in any given area as well as the types of equipment that can be used. Naturally, additional staff would make monitoring uses and permit conditions more effective, but that should not be interpreted to mean that monitoring and incorporation of remedial measures for those activities with adverse impacts are not occurring on the refuge with current staffing levels.

Comment 6:
"Surveys of Deformities of Reptiles and Amphibians – Under the preferred alternative, the refuge staff would not conduct surveys of deformities of reptiles and amphibians on the refuge. Due to the presence of productive cropland on and around the refuge, with the presence of pesticides and herbicides, we feel these surveys are crucial. Deformities may result from the presence of certain chemicals in the water, which may otherwise appear to be clean. Regularly surveying for deformities will alert refuge staff to a contamination of the refuge by toxic substances, which can pose a serious threat to the health of entire populations of wildlife on the refuge.

In the CCP/EA, the Service discusses the degradation of water quality on the refuge as "the most critical issue on the refuge." Water quality is major factor contributing to the formation of deformities in reptiles and amphibians. The potential exists for deformities to create ecological problems on the refuge, so the refuge staff must take precautions and survey for deformities to provide early detection of a contamination."

Response: The refuge has been involved in a pilot study to identify "hot spots" for malformed amphibians. Sampling was done in and around the cropland on the refuge as well as interior portions of the refuge not associated in any way with the cropland. Although deformities were found and were pretty much evenly distributed throughout the sample areas, it was determined that the rate of deformities was not sufficient to justify including the refuge as one of the primary study areas for the current studies.

The statement in the draft CCP/EA that "water quality is the most critical issue on the refuge" is one that is easily misinterpreted as it is worded. The text on page 166 has been edited to more accurately describe the water quality issue. Within refuge boundaries, the use of substantial filter strips on field borders and limiting pesticide use to only those approved by the Service and only when needed does not result in the same level of water quality degradation that would be expected from areas not incorporating such best management practices. This may explain why the rate of deformities in amphibians was no greater than other areas away from the farm unit and may also partially explain why the refuge did not have significant deformity rates overall.

Comment 7:
"Global Warming and Sea Level Rise – We are very pleased that the CCP includes a discussion of the impacts of global warming and sea level rise on the Refuge. However, we believe the CCP can be strengthened by including specific strategies to address both current and future impacts of climate change on the Refuge's wildlife and habitat. Climate change has the potential to disrupt the delicate balance of entire ecosystems and threaten the biological integrity of the Refuge. By not including a plan to actively manage the Refuge in response to climate change, we believe FWS will not be able to adequately manage and protect the Refuge, and therefore fulfill the Refuge's specific legislative purpose."

Response: Comments noted. The CCP has been changed to more clearly reflect actions to date and future refuge plans to address the effects of global warming on refuge lands. The refuge has established a cooperative record of working towards a better understanding of impacts to refuge lands resulting from global climate change and especially the effects of rising sea level. However, the CCP has a 15-year planning horizon and, for this reason, it is difficult to recognize, plan for, and implement management actions to soften the consequences of global climate change within such a relatively short planning period. Accepting the change that will inevitably occur as a result of global climate change and then managing for optimum wildlife habitat as the change occurs will be more productive than trying to prevent or protect the refuge from the change.

Predicting effects from global climate change on the future refuge landscape would be possible only in a most general way. The most recent models suggest that, if sea level continues to rise at current rates, most of the refuge we know today will be either marsh or under water within the next 100 years. The CCP may have been rewritten 6–7 times during that period. At best, the current CCP can recognize that there are impacts on refuge and other lands as a result of climate change. These impacts may be in the form of rising sea level, increased storm frequencies, or increased intensity of individual storms. Beyond the recognition of these effects and adaptively managing the landscape to the extent technically and economically possible, there is a standing commitment to pro-actively accept the responsibility of working with the research community to provide data for managing habitat for changes brought about by increased hydrologic regimes and salinity.

Comment 8:
"Aquatic Vegetation Surveys and Water Quality Studies – According to the CCP/EA, the most critical issue on the refuge is the water quality of the streams, bays, and sounds surrounding it. In fact, the CCP/EA states:

Non-point source pollution has decreased the water quality over the years. Submerged aquatic vegetation has also decreased. The submerged aquatic vegetation provides food for waterfowl and habitat for fisheries resources (CCP/EA at 166).

Despite the importance of aquatic vegetation to waterfowl and fisheries on the refuge, the preferred alternative does not include a plan for refuge staff to ever survey aquatic vegetation. Alternative 3, however, does include a plan to survey aquatic vegetation every two years. We strongly recommend the Service include a periodic survey of aquatic vegetation on the refuge in the final CCP.

Again, FWS acknowledges water quality as the most critical issue on the refuge. Yet, the Service's preferred alternative outlines minimal strategies to monitor this important issue. Alternative 3, which is not thy Service's preferred alternative, provides a plan to monitor water quality more frequently (quarterly instead of annually for pump discharge, and every 2 years instead of every 5 years for freshwater, ponds, and lakes), and more rigorously (including monitoring for heavy metals and toxics) than the Service's preferred alternative. In order to examine the "critical issue" of water quality, the refuge should make it a top priority to establish a plan to monitor and study water quality on the refuge."
Response: The statements in the CCP/EA with regards to water quality and water quality degradation are referring to the rivers, creeks, bays, and sounds surrounding the refuge. None of these systems are part of the refuge as the refuge boundary stops at the shoreline. However, these waters flow through and around the refuge, depending upon the direction of the wind tide. Management actions on the refuge are not causing significant degradation in water quality either within or outside the boundaries other than discharge of freshwater into estuarine systems. Numerous water control structures have been installed in canal systems to slow down the discharge of fresh water and restore a more natural hydrology to the peninsular system.

Submerged aquatic vegetation (SAV) is not found to any great extent in the creeks and rivers within or adjacent to the refuge. This is due to the dark, deep water with low pH and DO. Consequently, waterfowl used in these systems is mostly for roosting and loafing. The shallow waters of the bays and sounds adjacent to the refuge are or should be populated by a variety of SAV species such as eel grass, widgeon grass, and Sago pond weed. Numerous point and non-point source discharges as well as various fishing and dredging activities throughout these aquatic systems and not associated with the refuge have degraded water quality over time and have certainly impacted the quantity and quality of SAV beds in the sounds and bays. Although it is difficult for the refuge to be able to justify conducting off-refuge surveys, we have supported SAV survey efforts in Back Bay, Currituck Sound, and Pamlico Sound through ecosystem projects.

Certain species of the emergent aquatic vegetation on the refuge (growing on or from shorelines of creeks, lakes, or rivers) consists of nuisance, exotic species such as Phragmites or alligator weed. As funds become available the refuge has and will continue to survey problem areas and conduct control activities to the extent possible. Cattail, duckweed, arrow arum, Peltandra, Sagittaria, pickerel weed, blue flag, and slough grass are other wetland/aquatic plants found on the refuge along with other wetland plants that can grow on vegetative mats, but are not considered to be nuisance or exotic species and are not subjected to control measures.

Comment 9:
"Economic Environment – According to the CCP/EA, a recent survey in North Carolina showed that wildlife observers and photographers have higher average daily expenditures than both anglers and hunters combined. Additionally, the CCP/EA states:

Under Alternatives 2 and 3, development of wildlife-dependent recreation programs and facilities and improved publicity would lead to greater economic benefits from increased tourism (CCP/EA at 168).

Revenue generated from refuge visitors is an important factor that is address in the CCP/EA, but not all refuge uses generate equal revenue. Since wildlife observation and photography are non-extractive uses that have minimal impact on the refuge and have been shown to bring significantly more money to the local economy, we recommend the Service dedicate more of its resources (providing programs and facilities, and improving publicity) targeted toward promoting these uses over others.

Findings from a 2005 report commissioned by Defenders of Wildlife measured tourist interest in participating in these activities. The study, Red Wolves: Creating Economic Opportunity through Ecotourism in Rural North Carolina, found that more than 90 percent of surveyed Outer Banks visitors were willing to make one or more day-trips to the "Inner Banks" areas to take part in activities in this region, including wildlife and nature viewing activities (Lash and Black 2005).

Lash, Dr. Gail Y. B. and Pamela Black, Ursa International. 2005. Red Wolves: Creating Economic Opportunity through Ecotourism in Rural North Carolina. Unpublished report, 97 pp."

Response: Comments noted.

Comment 10:
"Threatened and Endangered Wildlife – Although the plan provides for annual surveys of the species, the refuge staff would not implement a management program for the federally listed red-cockaded woodpecker, bald eagle or American alligator. According to the CCP/EA, the goal for wildlife and fish populations on the refuge is to:

Inventory, protect, and manage healthy and viable populations of threatened and endangered species, other priority wildlife, and fish (CCP/EA at 66).

Despite its vast importance to the purpose of the refuge and the mission of the National Wildlife Refuge System, the plan does not attempt to satisfy this goal. The CCP/EA states that:

Recovery and protection of threatened and endangered plants and animals is an important responsibility delegated to the Service and its national wildlife refuges (CCP/EA at 58).

We feel that implementing a management program to optimize conditions for all federally listed species on the refuge is a part of the basic duties the refuge staff must include in the CCP."

Response: Comments noted. These comments reflect a level of detail that extends well beyond the scope of a general planning document such as the CCP. However, as a result of the CCP there will be a number of step-down plans written for the purpose of achieving the goals and objectives of the CCP. The Biological Inventory/Monitoring Plan discussed on page 99 of the CCP/EA states that listed species will be included in the refuge monitoring program. Management plans for species such as the red-cockaded woodpecker and bald eagle habitat will be addressed in either sub-plans or the Habitat Management Plan, or both. These step-down plans will include a level of detail sufficient for refuge management decisions consistent with law, regulation, and policy. Management decisions will incorporate best available science and sound professional judgment as required by regulation and policy.

Comment 11:
"Threatened and Endangered Plants – Due to the lack of sufficient data regarding the presence of federally listed plant species on the refuge, we strongly recommend that FWS include in the CCP a plan to conduct a comprehensive botanical survey of plant species on the refuge. The FWS will not be able to "inventory, protect, and manage healthy and viable populations of threatened and endangered species" on the refuge if the refuge staff does not have adequate knowledge of which species inhabit the refuge."

Response: Although not considered comprehensive, the PULSE vegetative community sampling program has several sites located on the refuge. Beyond that effort, the most comprehensive plant community surveys have been the survey work for the Prulean Farms Coordination Act Report habitat evaluation which pre-dates the refuge. The other vegetative surveys are mostly specific to plants growing in moist soil management units with other plant species added as they are encountered on the refuge. While it is not the end product of intense and exhaustive surveys, the plant species list in Appendix VI is a reasonable approximation of plant species occurring on the refuge. Even though our knowledge of plant species presence/absence is certainly not complete, it is adequate for making management decisions, especially in consultation with appropriate professionals. The refuge will continue to monitor selected plant communities in selected areas of the refuge to address specific management concerns, i.e., forest health issues and invasives.

Comment 12:
"Wildlife and Habitat Management Programs – Under the preferred alternative, the refuge staff would not implement management programs with inventory data on mammals (other than black bears and red wolves), fish, invertebrates, reptiles, or amphibians. The plan does not even provide for surveying and monitoring of fish populations. Additionally, the plan only calls for managing white cedar and mixed pine-hardwood forests, rather than managing all habitat types as directed in Alternative 3. We feel that gathering inventory data on all groups of species and managing for all habitat types are vital tasks the refuge staff must perform in order to 'maintain and restore the biological integrity, diversity, and environmental health of the refuge.' 66 Federal Register 3822."

Response: Comments noted. Again, this level of detail will be addressed when the Biological Inventory/Monitoring Plan and Habitat Management Plan step-down plans are prepared. Not all species will be monitored and not all habitats will be "managed" in the strictest sense of the terminology as this would require a very large Biological/Natural Resources Program staff and budget. Key species and habitat types will be identified for inventory/monitoring efforts. When sufficient data are collected on these species, new species may be substituted. However, it is not a realistic expectation to think that all species and all habitat types will be inventoried, monitored, and managed concurrently.

Comment 13:
"Cropland Management – In relation to the clearing of bottomland hardwood forests in the South Atlantic Coastal Plain, the CCP/EA states:

Much of the development has been for crop production and these areas have potential for restoration, as crop prices do not justify the maintenance of intensive drainage systems required to maintain production (CCP/EA at 15).

The intensive drainage systems required to maintain crop production on the refuge cannot be justified. Although FWS suggests that the primary purpose of the agricultural program is to provide food and habitat for wintering waterfowl, the FWS itself acknowledges the fallacy of this argument.

One of the biggest challenges to the management and restoration efforts underway in the South Atlantic Coastal Plain, and one that affects refuges in particular, is the need to meet long-term management objectives that address comprehensive ecosystem needs. Often, management for one species or species group conflicts with the management objectives for another species or species group. The tendency is to pursue short-term priorities that frequently change as scientific knowledge expands and interests in special resources shift. Biologists must exercise caution to prevent the start-up of management and restoration actions that are difficult to reverse and fail to meet the long-tem, comprehensive management needs of the ecosystem or a specific area within the ecosystem. An example might be a tendency to totally manage Alligator River NWR in an effort to provide habitat for many species of waterfowl that require a managed herbaceous wetland. Such an approach may overlook the critical habitat needs of neotropical migratory land birds that prefer shrubby habitat (CCP/EA at 16).

The continuation of crop production on the refuge is an example of a management action FWS cautions against in the discussion above. FWS should manage the refuge to address comprehensive ecosystem needs rather than manage for individual species or groups of species.

In order to meet long-term management objectives that address comprehensive ecosystem needs, FWS should comply with the FWS Policy on Maintaining the Biological Integrity, Diversity, and Environmental Health of the National Wildlife Refuge System, which states:

When we develop refuge goals and objectives during the Comprehensive Conservation Plan process we include goals and objectives for maintaining and restoring the biological integrity, diversity, and environmental health of the refuge. 66 Federal Register 3822.

We plan for the maintenance and restoration of biological integrity, diversity, and environmental health while considering all three in an integrated and holistic manner. The highest measure of biological integrity, diversity, and environmental health is viewed as those intact and self-sustaining habitats and wildlife populations that existed during historic conditions. 66 Federal Register 3819."

Response: Comments noted. In order to understand why the farming program is important to refuge management, it is necessary to first understand how the cropland was created from the swamps of mainland Dare County. Prior to the land become part of the refuge, the area was logged and a perimeter dike was built followed by digging a canal network, using the borrow material to build the adjacent road system. The canal/road system divided the land into blocks that could be drained by pumping. Smaller v-ditches were dug to delineate individual fields within a block. These fields were cleared of all vegetation, raked for roots and stumps, and then graded to a crown in the middle of the field. Part of the grading process sloped the field from the "headland" end towards the "collector canal" end to facilitate the flow of water. This system was necessary since the soils do not percolate water as non-hydric soils would.

All of the land clearing and grading lowered the elevation of the farm fields to a point that pumping is necessary to keep water off of them except for the headland ends and crowns of the fields near the headlands. Breaching the perimeter dike would result in a very large lake unless pumping capabilities were somehow maintained. Consequently, restoring the cropland to the original habitat type is simply not possible without very intense management and a commitment to pumping in perpetuity.

Mineral and organic soils within the perimeter dike could be restored to other forested habitat types. For example, oaks and other high wildlife value hardwoods could be planted on the mineral soils while cypress and Atlantic white cedar could be planted in the organic relict sloughs throughout the farm unit. This type of management would also require a commitment to pumping to maintain the habitat types.

The refuge has opted to partially restore wetland values and function to nearly 2000 acres of cropland by managing the areas for moist soil vegetation. This is a management strategy that encourages growth of wetland plant species with some limited supplemental planting of small grains for wildlife. Water levels are managed to maintain appropriate soil moisture for wetland plants and maturation of the planted small grains. Flooding is normally done in late fall to depths averaging 6–18 inches, depending upon where you measure in the sloped fields. Near the V-ditches at the collector canal end water depths may be 2 feet. When properly managed these moist soil units provide habitat for waterfowl and marsh birds. The headland ends of the fields and crowns provide excellent habitat for upland birds, grassland bird species, rodents, rabbits, white-tail deer, black bear, and red wolf. Remaining cropland is farmed through a cooperative program and this provides an important food source for many wildlife species including migratory birds such as waterfowl, mourning dove, woodcock, snipe, and rails as well as helping to maintain a prey base for the red wolf and many birds of prey.

The point of providing all of this information is to illustrate that it would be neither feasible nor prudent to embark on a management direction seeking to restore habitat types that would essentially reduce within and between habitat type diversity. The refuge is trying to use the landscape changes induced by mankind to optimize habitat for the broadest range of wildlife species possible. This management strategy maintains the biological integrity and diversity of the refuge and it contributes to enhancing species diversity within and between habitat types as well as regional diversity.

Comment 14:
"Again, thank you for this opportunity to comment on the draft CCP for Alligator River National Wildlife Refuge. We look forward to working with the FWS in strengthening the management of the refuge."

Response: Comment noted.

Animal Protection Institute
(Comments submitted by Monica Engebretson, Project Director; and Camilla Fox, Director of Wildlife Programs)

Comment 1:
"On behalf of the Animal Protection Institute (API) and our supporters nationwide, we are pleased to offer these comments on the Draft Comprehensive Conservation Plan and Environmental Assessment (Draft CCP/EA) for Alligator River National Wildlife Refuge (NWR).

Our organization is very concerned that in managing National Wildlife Refuges, the U.S. Fish and Wildlife Service (FWS) has strayed far from its own policy, which "directs that wildlife comes first in the National Wildlife Refuge System" (602 FW § 1.4A; emphasis added). Many refuges allow, and even encourage, activities detrimental to wildlife, including hunting, fishing, trapping, motor boating, and jet skiing. In many instances, these recreational uses are permitted in the absence of thorough and accurate biological data on the species inhabiting and migrating through the refuge.

While the National Wildlife Refuge System Improvement Act of 1997 16 U.S.C. § 668dd, et seq. (hereafter "the Act") establishes hunting as a priority use, the Act also requires refuges to conduct rigorous scientific research into the status of refuge wildlife populations and use this information to guide refuge planning.

It is our hope that the Alligator River NWR management team will help to restore this public land system to its original purpose of providing a "refuge and breeding place" for "migratory birds, other wild birds, game animals, fur-bearing animals, and for the conservation of wild flowers and aquatic plants." (Per Public Law 268).

Requirements of the National Wildlife Refuge System Improvement Act of 1997

The Act requires that the FWS "ensure the biological integrity, diversity and environmental health of the [Refuge] System are maintained" (Section 7(e)(2)(B), National Wildlife Refuge System Improvement Act) and that refuge planning be firmly grounded in these concepts. A thorough discussion and investigation of the biological integrity, diversity, and environmental health of a refuge must therefore occur before planning can ensue.

In developing each comprehensive conservation plan under this subsection for a planning unit, the Secretary, acting through the Director, shall identify and describe ... the distribution, migration patterns, and abundance of fish, wildlife, and plant populations and related habitats within the planning unit - Section 7(e)(2)(B), National Wildlife Refuge System Improvement Act

Furthermore, FWS regulations require that before the sanctioning of hunting, trapping, or fishing can occur, a determination must be made that "wildlife are surplus to a balanced conservation program on any wildlife refuge area" (50 C.F.R. §31.2 et seq.). To determine if there is a surplus of wildlife on a refuge, the "populations and requirements of wildlife species. .. shall be determined by population census, habitat evaluation, and other means of ecological study" (Id. at §31.1).

The mere presence of a species on a refuge is not evidence of a surplus; rather, a surplus determination has to consider both the population size and requirements of the target species. If no surplus is determined, then, unless the species is damaging or destroying federal property within a refuge, the species cannot be subject to live removal or lethal control, including through official animal control operations.

According to the draft CCP/EA (pg 99) a Biological Inventory/Monitoring Plan does not yet exist for the Alligator River NWR and no expected date for a completed plan is available.

While the draft CCP/EA (pg 34 and 35) does describe some general and historic information on black bear and white tailed deer in Dare County, the document admits that a reliable estimate of the black bear population on the refuge has yet to be completed, and no estimate of the current deer population was provided. Information regarding habitat use of refuge furbearers is limited to a decade's old (1983) study on natural and modified pocosins. Again, no population estimates or trends for furbearers on the refuge were provided.

Therefore, to attempt to determine compatible wildlife-dependent recreation for Alligator River NWR until a biological inventory has been is fully implemented and analyzed may violate these mandates. This is especially true for the consideration of hunting and trapping since both activities result in the direct and intentional removal of species and can negatively impact populations, particularly when such activities are geographically focused to particular regions/areas."

Response: Comments noted.

Comment 2:
"Potential Negative Impacts of Hunting and Trapping on the Refuge – The Draft CCP/EA fails to evaluate the impacts of consumptive use activities on refuge wildlife. As mentioned above, the FWS acknowledges that a biological inventory has not been fully implemented, and that there is a lack of accurate data on hunted and trapped species other than white-tailed deer. As a consequence, we assume that the biological baseline data is inadequate or nonexistent. We question how hunting and trapping can be deemed compatible on the refuge in absence of this essential information.

Indeed, the Draft CCP EA notes that, "The Service had recently withdrawn permission to trap because the refuge did not have an approved trapping plan." Yet, trapping was deemed as a "compatible use" in the Compatibility Determination section of the Draft CCP/EA.

The Draft CCP/EA also fails to provide adequate compatibility determinations for both trapping and hunting activities.

The justification for deeming hunting compatible is that, "hunting is on of the public use recreational activities that the 1997 National Wildlife Refuge System Improvement Act specifically identifies as a use to be allowed where possible on refuges," and "The refuge uses deer hunts a management tools to protect the diverse ecosystem." The justification for deeming trapping compatible is similarly weak, "Trapping is a wildlife population management tool used to regulate the population of certain wildlife species."

However, the FWS offers no indication that the impacts of hunting or trapping have actually been studied. Further there is no indication that baseline population data of unexploited wildlife has ever been collected. As a consequence, it would be nearly impossible to determine with accuracy any change in population dynamics as a result of consumptive use. The FWS cannot determine that hunting and trapping on the refuge have no impact simply because they have not looked. In essence FWS seems to have accepted a "don't look, don't see" policy with regard to consumptive use impacts on the refuge.
It also appears that the hunting program relies heavily on state wildlife agency season limits which have not been independently and rigorously evaluated by the FWS. What are the current populations of the targeted species and what models were used to determine these data?

Aside from the obvious detrimental effects to the individual animals killed, hunting disrupts, resting, foraging behavior and increases stress and caloric exertion potentially decreasing survival and fitness. These factors should be systematically researched before a compatibility determination assessed. For example, the FWS recently found foxhunting to be incompatible with the purpose of Crab Orchard National Wildlife Refuge in Illinois largely because unleashed dogs would cause "substantial disturbance to resident and migratory wildlife." It seems reasonable that hunting deer with dogs would have a similar impact on the wildlife of Alligator River NWR; however, the hunting with dogs is deemed compatible in designated areas.

For the above reasons, the Draft CCP/EA does not allow for the adequate evaluation and consideration of the proposed alternatives. It is therefore premature for the FWS to issue a Final CCP and EA.

API contends the FWS must fully analyze its preferred alterative in a revised Draft CCP/EA and re-circulate an amended version of these documents for public comment."

Response: Comments noted.

Comment 3:
"Body-Gripping Traps Pose Serious Hazard to Non-Target Wildlife – There is widespread agreement among veterinarians, veterinary associations, biologists and the general public that the primary traps used today—legholds and Conibears—are both inhumane and indiscriminate.

In addition, leghold traps and Conibear traps pose a serious hazard to non-target wildlife, including threatened and endangered species (T&E species). Records obtained from state and federal wildlife agencies by API show that bald eagles, lynx, wolves, and other species listed under the Endangered Species Act have been injured and killed in leghold and Conibear traps. Recently, when animal advocates provided documentation that three Bald Eagles and numerous Canada Lynx had been incidentally killed in traps set for coyotes in the state of Maine, the Maine Attorney General ruled that the state Inland Wildlife & Fisheries agency had to end its coyote trapping program until the state obtained an Incidental Take Permit (ITP) under the Endangered Species Act from the FWS. We contend this is just the beginning of a much larger issue regarding the significant hazards traps pose to threatened and endangered species and that both state and federal wildlife management agencies are required by law to mitigate harm and seek ITPs if there is potential harm/take of T&E species from the use of traps. The Draft CCP/EA for Alligator River NWR, however, fails to address this issue.

Any assessment of trapping on refuges must include a thorough literature review of trap studies and of the potential impacts traps may have on non-target wildlife. We cite the following as examples of studies that should be incorporated into the assessment of any trapping activity on the refuge:

A. Leghold traps

The Animal Welfare Institute sent a questionnaire to veterinarians in Illinois, Michigan, New York, Texas, North Dakota, Washington, and Louisiana. Veterinarians were asked if they supported or opposed the use of this trap. An overwhelming percentage, 79.3 percent of the 936 veterinarians responding, opposed steel-jawed leg-hold traps. The Animal Welfare Institute survey also requested information relative to injuries to pets and wild animals. More than 4,000 injuries or deaths of domestic or non-target animal were reported from the 936 veterinarians in seven states (CDFG pg. 95-96).

Atkeson (1956) reported that >24% of minks, raccoons and foxes were crippled while escaping from leghold traps set in on a National Wildlife Refuge in Alabama over a four year period. In contrast, opossums and skunks were crippled in only 2% of captures. For the purposes of this study, "all animals were considered crippled that pulled out of traps, escaped by wringing off or gnawing off feet, or escaped with traps." During a study of population dynamics in Canada, MacPherson (1969) found most trapped arctic foxes he observed had ingested pieces of their own hair, bone and skin. The struggle can also lead to a variety of bone fractures, including simple, compound and compression fractures. Olsen et al. (1986) observed a 91% leg fracture rate for coyotes caught in unpadded traps, while 3 of 4 captured kit foxes caught had nearly or completely amputated their trapped leg. Damage to teeth and gums can occur when a captured animal attacks the trap with its mouth in an attempt to escape (MacPherson 1969; England 1982; Van Ballenberghe 1984; Keuhn et al. 1986; Kern et al.

1994; Hubert et al. 1997), though this type of injury is generally ignored by most trapping studies (Onderka et al. 1990). Englund (1982) found severe dental injuries in 58% of adult foxes captured in leghold traps while Van Ballenberghe (1984) reported that injuries to teeth, lips and gums occurred in 46% of 109 wolves captured. Other studies corroborate these findings (Berchielli and Tullar 1980; Novak 1981; Englund 1982; Van Ballenberghe 1984; Tullar 1984; Kuehn et al. 1986; Linhart et al. 1988; Olsen et al. 1988; Onderka et al. 1990; Phillips et al. 1992; Kern et al. 1994; Mowat et al. 1994; Proulx et al.. 1994; Phillips et at. 1996; Hubert et al. 1997).

Despite the preponderance of evidence showing that leghold traps cause severe injuries to captured animals, most studies have actually underestimated the extent of injuries caused by these devices. With very few exceptions (Onderka et al. 1990; Huber et al. 1997) injury studies have limited their analysis of injuries to the trapped limb (Tullar 1984; Olsen et al. 1986, 1988; Houben et al. 1993; Gruver et al. 1996; Phillips et al. 1996) or the leg plus the head (Van Ballenberghe 1984; Kern et al. 1994) and thus have not considered injuries to other areas of the body. The importance of examining the whole body was stressed by Hubert et al. (1997), who found leg injury scores of coyotes were approximately 15% lower than whole body scores. Without an analysis of the entire body, critical injures may be missed and therefore the true extent of injury not determined.

Aside from the injuries they cause, leghold traps are notorious for not being species-specific. Beasom (1974), Berchielli and Tullar (1980), and Novak (1981) found non-target animals comprised 56%, 32% and 76% of leghold captures, respectively and Beasom (1974) noted that "more individuals and species of animals were caught with steel traps in this study than with any other control methods used."

B. "Padded" Leghold traps

While padded leghold traps are ostensibly more humane than unpadded traps, studies confirm that even padded traps can cause significant damage to trapped animals.

"In a letter to the Department dated August 13, 1990, Dr. N. C. Buyukmihci, DVM, Associate Professor of Surgery, University of California, Davis, writes: 'Several Studies have been done comparing the effects of padded verses unpadded traps on various animals. These have shown that both could and did cause the same degree of damage to a limb, including laceration of skin and fracture of bones'" (CDFG pg. 98).

"Padded leghold traps show injury reduction for some species, but not for others. They have failed to consistently reduce injuries to raccoons, (Bishop 1990 ... The No.1½ size padded traps cause fewer injuries to foxes than standard traps, but there was no difference of bobcats. Considering research findings to date, Soft Catch traps achieve injury reduction for some species, but not for others (Bishop 1990, from CDFG)."

While padded leghold traps have been shown to reduce the occurrence and severity of injuries in a number target species by 48–85% (Saunders and Roswell 1984; Olsen et al. 1986; Onderka et al. 1990), injuries have not been eliminated and injuries to smaller non-target species may be especially severe. Even if captured animals are alive when released, any injury or disfigurement will invariably reduce an animal's ability to survive. Van Ballenberghe (1984) noted that "Reduced fitness and shortened life span ultimately resulting from capture caused injuries may be as important to consider as proximate mortality."

New devices have the potential to reduce the incidence of non-target captures. Pan tension devices (PTD) have been shown to exclude up to 98% of non-target animals in studies (Turkowski et al. 1984; Phillips and Gruverd 1996). However, since PTDs also reduce target capture rates it is unlikely that they will be widely used by commercial and recreational trappers. If the refuges insist that leghold traps are needed for research then padded traps equipped with pan tension devices should be required.

C. Conibear Traps

As a trap designed to kill animals instantly, the Conibear poses a serious hazard to T&E species and other non-target wildlife. While studies suggest that the ability of kill-type traps to produce rapid death have been greatly improved, for a number of species (Proulx et al. 1989; Barrett et al. 1989; Proulx et al. 1990; Proulx and Barrett 1993; Proulx et al. 1995) there have been no significant advances in reducing non-target captures. Research has shown that for every target animal captured at least 2 other non-target animals are caught (Novak 1987; Barret et al. 1989; Proulx and Barrett 1993).

The California Department of Fish and Game reported that, "Several factors keep this trap from killing consistently and quickly, including the size of the animal, the species involved, the position of the animal at trap closure, and the impact and clamping levels of the trap. The most significant flaw is the trigger system that performs erratically, preventing a fatal blow to the animal's body (CDFG pg. 94)."

Response: Comments noted. This level of detail is not appropriate for a general planning document such as the CCP. However, as a result of the CCP there will be a number of step-down plans written for the purpose of achieving the goals and objectives of the CCP. These step-down plans will include a level of detail sufficient for refuge management decisions consistent with law, regulation, and policy. Management decisions will incorporate best available science and sound professional judgment as required by regulation and policy.

Comment 4:
“Alternatives to Lethal Control – It is well known that killing wildlife as a means to resolve human/wildlife conflicts is ineffective in the long run, an important argument that the Draft CCP/EA fails to adequately address. When animals are killed, they leave behind a habitat vacancy that new animals eventually fill - particularly if the attracting features or resources have not been eliminated.

Moreover animals are commonly viewed as "overpopulated" or "overabundant" when the animals (a) threaten human life or livelihood; (b) depress the densities of species favored by humans; or (c) are "too numerous for their own good" i.e. when some animals are periodically in poor condition and undergo natural mortality, as through natural selection (Macnab 1985). None of these situations, however, represent an actual "overpopulation" of animals in a biological sense.

Research indicates that killing predators to protect ground-nesting birds does not reliably increase breeding populations of ground-nesting birds; where such increases have been documented, they tend to be temporary at best (Cote and Sutherland 1997). Lethal predator control raises ethical questions and may be no more effective, especially over the long-term, than innovative non-lethal solutions (Goodrich and Buskirk1995).

Whether there is an actual or perceived need to control wildlife there are many humane, non lethal, methods available to resource and refuge managers to alleviate conflicts. For example, with regard to beaver conflicts, the construction of water-level control devices could be used to prevent flooding and could serve as a humane substitute for trapping and killing beavers. Such devices have been successfully implemented by municipalities and state wildlife agencies in a number of states, including Maine and Connecticut, and should be used more frequently by federal wildlife management agencies.

In addition, the National Wildlife Research Center (NWRC) has developed a product called GonaCon TM—a new gonadotropin-releasing hormone immunocontraceptive vaccine. A single shot can successful keep female deer infertile for up to 4 years. Preliminary data from ongoing field studies near Silver Spring MD, on white-tailed deer shows the vaccine to be 85% - 90% effective. NWRC scientists hope GonaCon will receive its FDA approval and be available for non-regulatory use with in the next 2-3 years.

The Draft CCP/EA also identified resident Canada Geese as a potential nuisance animal on the refuge that may require "removal or control." Innolytics, LLC has developed a product called OvoControl which has been approved by the Environmental Protection Agency and has been proven to be successful in reducing resident geese populations.

The core technology for OvoControl centers on the proven ability to significantly decrease the hatchability of eggs by feeding medicated bait to birds during the reproductive season. The effect is fully reversible and care has been taken to develop a feeding system, which will limit exposure to non-target species.

Where legitimate conflicts exist and population reduction is deemed necessary as a last resort, or as the most humane solution, non-lethal reproductive control may offer refuge managers a more scientifically-based and exacting control over deer and geese populations than hunting.

With the above issues in mind, we request that the FWS provide the following information in a revised Draft CCP/EA:

Current and historic (last 20 years) population status of species targeted in refuge trapping and or lethal control programs.

Number of target and non-target animals trapped each year under the past trapping program(s) and projected data on number of animals trapped under any proposed action.
Impacts of species-specific "overpopulations" on ecosystem and / or other species.
Description, and degree, of damage to facilities/habitat as a result of perceived "overpopulations" of targeted species, if any, and effects of trapping or lethal control in past years on perceived damage and on targeted species populations.
Wounding and retrieval rates of hunting on the refuge.

We also ask that the FWS discuss and evaluate the following:

The population demography of the species in question.
Have any alternative methods of habitat protection/facilities management been explored?
What efforts have been taken to reduce trap-related injuries to captured animals?
What are the real and potential impacts of trapping and lethal control to non-target species, including threatened and endangered species?

What efforts have, will, or are being taken to ensure that non-target species will not be injured or killed by the current control programs?
Feasibility of implementing non-lethal water-level control devices for controlling beaver damage (including, but not limited to, Beaver Deceiver devices, Clemson Levelers, Beaver Bafflers, diversion dams, pipe systems).

Feasibility of implementing other non-lethal beaver control methods including, but not limited to, different types of fencing (including wire mesh and electrical systems), tree wrapping and textural and taste repellents."

Response: This level of detail is not appropriate for a general planning document such as the CCP. However, as a result of the CCP there will be a number of step-down plans written for the purpose of achieving the goals and objectives of the CCP. These step-down plans will include a level of detail sufficient for refuge management decisions consistent with law, regulation, and policy. Management decisions will incorporate best available science and sound professional judgment as required by regulation and policy. Professional wildlife biologists are involved with resource management decisions.

Comment 5:
"Public Opposition to Recreational Killing of Wildlife on National Wildlife Refuges – Theodore Roosevelt established Pelican Island as the first refuge in 1903 as an "inviolate sanctuary" for the protection of the brown pelican. The original intent and purpose of subsequent refuges were clear: the protection of wildlife from exploitation and deliberate harm. Most Americans still view wildlife refuges as places where wild animals are protected from human interference. That is in fact the common definition of the word "refuge."

The majority of Americans oppose the recreational and commercial killing of wildlife on National Wildlife Refuges. The results of a 1999 national Decision Research public opinion poll support this assertion.

78% of those polled opposed allowing refuge officials to kill wildlife by trapping, hunting, or poisoning. 71% agree that as long as refuge officials can remove dangerous animals, there is no reason to allow any other killing of animals on refuge property. 88% agreed that wildlife and habitat preservation should be the highest priority of the refuge system. 83% disagreed that the rights of hunters and trappers are more important than the need to protect wildlife on refuges.

Given the overwhelming public opposition to the allowance of consumptive use activities on National Wildlife Refuges any proposal to expend limited resources maintaining and establishing new hunting programs at the refuge would be fiscally irresponsible. Moreover, efforts to manage and regulate hunting can quickly detract from efforts aimed at more important refuge purposes including migratory bird and endangered species protection.

In addition, it is clear that the vast majority of Americans would support the use of humane, non-lethal approaches to resolving conflicts with beaver and other wildlife."

Response: Comments noted.

Comment 6:
"Conclusion – We appreciate the opportunity to comment on this issue, which is of great importance to our members and supporters nationwide.

We contend the FWS must implement a rigorous biological inventory and analysis of the fish and wildlife populations as required by law (16 U.S.C. § 668dd(a)(4)(N)) before making any compatibility determinations. Moreover, the FWS must fully analyze the site-specific and cumulative impacts of all proposed activities affecting the environment and wildlife inhabiting the refuge, which this Draft CCP and EA have failed to do.

We request that that the feasibility of non-lethal alternatives be evaluated and presented.

We look forward to reviewing a revised Draft CCP/EA when these documents become available and request to be informed of their availability for further comment."

Response: Comments noted. Best available science and sound professional judgment will be the primary basis for natural resource management decisions. In some cases there will be an adequate data base or research will be ongoing to provide data. Some management decisions will be made based upon the expertise of competent, professional wildlife biologists and refuge management professionals integrating the principles of wildlife management, the mission of the NWRS, and the purpose of the refuge.

Dare County Bombing Range
(Comments submitted by Bryan Henderson, Seymour Johnson Air Force Base)

Comment 1:
"General Comments: Draft CCP should note any cooperative NR planning with SJAFB /DCBR natural resources and range management staff and specific areas of planning [T/E (RCW) species population and habitat management, wetland management, migratory bird management to minimize BASH risks and issues, invasive species control, cooperative smoke management, cooperative wildland fire management and prescribed burning strategies]."

Response: Comments noted. The refuge agrees that it is imperative that the SJAFB/DCBR staff and refuge staff coordinate planning to the maximum extent practical.

Comment 2:
"CouId note FWS-AF Cooperative Plan Development in the following sections:

Page 1, Section A, I. Background – Beneficial to note and summarize the relationship to FWS - SJAFB/DCBR "Partners" and the cooperative development referring to cooperative INRMP and CCP species and habitat management, suggested language/paragraph on Sikes Act, and the cooperative development of the INRMP for SJAFB/DCBR with USFWS field office, ANWR and NC WRC.

As the Dare County Bomb Range sits entirely within the boundaries of the Alligator River National Wildlife Refuge, it is important that both the ARNWR CCP and the DCBR's Integrated Natural Resource Management Plan and the DCBR Comprehensive Range Plan be in general agreement for the management of natural resources on the Dare County peninsula. This is required under the Sikes Act (Title 16 USC 670a-670o, 74 Stat 1052) to carry out a program to provide for the conservation and rehabilitation of natural resources on military installations.

Each installation is required to prepare an INRMP in cooperation with the Secretary of the Interior, acting through the Director of the US FWS, and the head of each appropriate state fish and wildlife agency; and prepare and implement the INRMP to reflect the mutual agreement of the parties concerning conservation, protection, and management of fish and wildlife resources. Because of the geographical relationship of the DCBR to the ARNWR, these plans should be in agreement."

Response: Comments noted. The reference to the Sikes Act has been added to the CCP in the appropriate sections.

Comment 3:
"Page 57, Section III, Plan Development. Note SAJAFB/DCBR natural resources staff support to the Planning Team. Due to DCBR lying within the ANWR, we would request the opportunity for a DCBR natural resources staffer to actively participate on the CCP Planning Team. (We also will solicit the active participation by the ARNWR in the DCBR INRMP planning process and INRMP development). It would be good to identify common goals for RCW & red wolf management, invasive species/Phragmites control, pest and health surveillance (West Nile Virus), wildland fire management planning, prescribed burning, cooperative law enforcement to protect DCBR wildlife resources and DCBR assets, smoke management."

Response: Just as the refuge extended invitations for others to participate in development of the CCP, we welcome the opportunity to work the DCBR staff in finalizing the CCP. The refuge agrees that it is imperative that the SJAFB/DCBR staff and refuge staff coordinate planning to the maximum extent practical.

Comment 4:
"Recommend that CCP note that Prescribed Burning for fuel load reduction and RCW habitat maintenance and related smoke management be coordinated closely with DCBR Range management and NR management staff. Recommend providing Range and NR management staff Contact Info (name/phone/address/e-mail/fax number) along with SJAFB/DCBR's comments to USFWS for inclusion in the Final CCP."

Response: This level of detail is not appropriate for a general planning document such as the CCP. However, as a result of the CCP there will be a number of step-down plans written for the purpose of achieving the goals and objectives of the CCP. These step-down plans will include the level of detail referenced in this comment.

Comment 5:
"Page 45, Outdoor Recreation in the Area. While the last sentence in the bottom of the page refers to NCWRC manages hunting activities at DCBR, suggest elaborating on the current recreation program activities on DCBR and restrictions related to training mission requirements, limitations, - Note who is responsible for conservation law enforcement (NC WRC, others?)."

Response: Due to the general nature of the discussion in this paragraph, we do not believe it is warranted to deliver a detailed explanation of outdoor recreation at this time. Upon preparation of a step-down plan concerning outdoor recreation, it would be more appropriate to provide detailed explanations on the full extent of recreational opportunities and limitations thereof. It would also be more appropriate to deal with training mission requirements by the agencies in a step-down plan. With regard to conservation law enforcement on the range, your agreement with the North Carolina Wildlife Resources Commission to manage the area as a game land provides full authority to the state wildlife enforcement officers on conservation and some other matters. Refuge law enforcement officers, other federal law enforcement officers, and special agents would have authority to enforce certain conservation law and regulation, depending upon the circumstances.

Comment 6:
"Suggest FWS add Sikes Act to Appendix III, Relevant Legal Mandates, pages 200–201."

Response: A discussion on the Sikes Act has been added to Appendix III.

Comment 7:
"Plan wants to increase Visitors by 25%, Outdoor Photo by 20% and Student visits by 100%. Will this impact DCBR and accidental trespass into unsafe areas?"

Response: Although an increase in visitation rates does increase the probability of an increase in associated problems, the refuge does not anticipate any significant problems in the number of problems such as federal trespass into unsafe areas. Continuing education by the refuge and DCBR will be necessary with or without an increase in the visitation rate. The refuge anticipates continued increases in public use whether planned for or not as the local population grows. Therefore, the CCP acknowledges the increase and expresses a general management approach that will deal with the anticipated increase in a beneficial manner.

Comment 8:
"Communication Towers – USAF supports management to limit number and size of towers constructed on refuge, specifically in areas adjacent to DCBR."

Response: Because of known impacts to migratory birds, the refuge would attempt to limit the number and size of communication towers proposed to be placed on refuge land and we would likely be opposed to locating such a structure adjacent to the refuge. However, we have little authority to comment on projects occurring off the refuge.

Comment 9:
"Interagency Coordination – USAF continues to support coordination and cooperation between USFWS and USAF and will attend FWS hosted local meetings."

Response: See the response to Comment 3.

Comment 10:
"Significant Natural Heritage Areas – USAF supports ecosystem designation of NHP areas and encourages prescribed burning especially joint jurisdictional burns."

Response: Comment noted.

Comment 11:
"Step-down Plans – USAF requests planning involvement with step down plans that would benefit from ecosystem strategies and would allow USFWS plans and DCBR's INRMP to be mutually beneficial to resources."

Response: See the response to Comment 3.

Comment 12:
"Plan needs to identify/recognize bear hunting season on DCBR."

Response: The bear hunting season at the DCBR was being planned at the same time the draft CCP was being prepared. A detailed discussion on hunting seasons and species to be hunted will be more suited for the step-down plan that deals with hunting. The DCBR recreational opportunities will be detailed in the appropriate step-down plan.

Comment 13:
"Plan needs to identify access restrictions to DCBR (gates, weapons footprints, etc.)."

Response: See the response to Comment 5.

Comment 14:
"Alternative 2 states that the USFWS will mange water levels to create optimum habitat. Does this include the management of water levels within the ditch network on the peninsula? How will this water management impact ground and surface waters on the DCBR? Will water management result in impoundment of surface water on DCBR and will impoundment impact existing vegetation communities and DCBR Operations?"

Response: For the most part, active water management will occur primarily within and adjacent to the farm unit. The remainder of the refuge will be subjected to "passive" water management which will consist of installing/replacing culverts or water control structures, or other management actions such as removing beaver dams where necessary. The primary objective for the refuge outside of the farm unit will be to restore or mimic natural hydrologic conditions to the extent possible to protect the ecological integrity of the unique wetlands that led to one of the primary purposes for establishing the refuge.

Comment 15:
"The prescribed fire program on the ARNWR should include a review of historical wildfire regimes on the refuge, identification of prescribed fire regimes to recover or maintain fire dependent ecosystems, and the documentation of ecological end points for the prescribed fire program."

Response: This has been done to a limited extent in the current Fire Management Plan. Identifying appropriate fire regimes for maintaining (which includes regeneration) the fire dependent/fire tolerant ecosystems on the refuge is certainly an area in need of considerably more research. These types of data needs can be better addressed through a revised Fire Management Plan as we gain new insight into the dynamics of fire ecology in these wetland systems. A general planning document such as the CCP is not the most appropriate document for addressing these topics.

Comment 16:
"The CCP does not identify all federal, state, and local government, and NGO partners. The NC Wildlife Resources Commission is the only identified partner. The US Air Force, US Navy, NC DENR, The Nature Conservancy, Sierra Club, NC Heritage Program, and the NC Coastal Federation are just a few of the existing partners that should be included in the CCP."

Response: Assuming this comment is directed towards the paragraphs on page 99 under the heading "Partnership Opportunities," we have added the suggested state and federal agencies as well as additional NGOs to the section.

Comment 17:
"Although the NC Natural Heritage Program has proposed Heritage Areas within the refuge, no Heritage Areas currently exist on the ARNWR. The three Heritage Areas that currently exist on the DCBR comprise vegetation types found on the ARNWR."

Response: The NC Department of Environment and Natural Resources Natural Heritage Program (NHP) staff contacted the refuge on several occasions in the past with regards to establishing Natural Area designations within the refuge. Each time the refuge response has been that of willingness to work with the program, but we are not aware of any designations to date. The refuge has assumed that the NHP staff is continuing to pursue designations on the refuge through the appropriate processes.

Comment 18:
"The Figure 3 soils map should include soil series delineation for the peninsula. The characterization of soils by water table and flooding ignores the seasonal and annual variability in precipitation and storm events affect the depth of the water table and flooding."

Response: The soils map in Figure 3 has been changed to reflect soil series delineation. Due to a scale factor, the map is useful only for very general analyses. It is only through information provided in the text and in Table 3 that a reader can gain insight into the nature of the soil types on the peninsula and through additional knowledge of the annual meteorological variations some insight into events such as flooding or seasonal changes in the water table.

Comment 19:
"Figure 4 and the community descriptions that follow list vegetation habitat types that do not conform to the National Vegetation Classification (NVC) as required by the Federal Geographic Data Committee."

Response: The Federal Geographic Data Committee National Vegetation Classification list was neither finalized nor readily available when Biological Reviews were conducted prior to beginning planning and preparation of the CCP. Furthermore the NVC community descriptions are not readily adaptable to certain habitat types found on the refuge. It is our understanding that the overall objective of the such standards is to support the use of a consistent national vegetation classification system (NVCS) to produce uniform statistics from vegetation cover data at the national level for the purpose of facilitating compilation of regional and national summaries that may be used to eventually support a detailed, quantitative, geo-referenced basis for vegetation cover modeling, mapping, and analysis. The CCP is a general planning document to be used as guidance for refuge management over a 15-year window in time. It is not intended as a document for geographical data analysis for the purpose of disseminating spatial geographic data. For these reasons, a decision was made to use the habitat types that most accurately reflected the vegetative communities and that had already been incorporated into the planning process. Upon preparation of the Habitat Management Step-Down Plan it will be appropriate to cross-reference the NVCS nomenclature at that time.

Comment 20:
"The description of existing vegetation communities ignores the impacts of commercial logging operations on the peninsula that began in the early 1800s. There is no discussion of the historical distribution of dominant species such as Atlantic white cedar or the role of Buffalo City timber companies in the clear cutting of cedar, cypress, and pine into the 1930s."

Response: Comments noted. While this information would contribute to the historical perspective, it can be presented more appropriately in the Habitat Management Step-Down Plan when it is prepared.

Comment 21:
"Information on plant and animal species surveys conducted by the NC Natural Heritage Program should be included in the discussion of fauna and flora surveys."

Response: Considerable information on flora and fauna discussed in the CCP document was either derived from or was substantiated by various publications done through the Natural Heritage Program and the North Carolina Biological Survey. Both sources of information are cited in Appendix II.

Comment 22:
"The CCP does not include any information on RCW population surveys, active and inactive colony trees and forage areas, or restoration goals. This information should be coordinated with RCW restoration activities on DCBR."

Response: Comment noted. While this level of detailed information is essential for management plan development, it can be presented more appropriately in the Biological Inventory/Monitoring Step-down Plan when it is prepared. It is anticipated that RCW management will be a significant component of the step-down plan. Upon completing the RCW Management Plan and upon receiving funding, there is an expectation that RCW management on the refuge will intensify. The refuge staff welcomes the opportunity to coordinate with the DCBR natural resources staff on wildlife management matters.

Comment 23:
"The Habitat Management strategies for forest types state that USFWS will "monitor," "inventory" and "manage" these areas. There is no additional information on these activities. For example, how will Atlantic white cedar, a species dependent on catastrophic wildfire to regenerate, be managed on the refuge? Does the management of this species include restoration efforts to achieve historical land cover area?"

Response: Comments noted. While this information would contribute to the CCP, it can be presented more appropriately in the Habitat Management Step-down Plan when it is prepared. However, habitat management strategies will include a thorough analysis of Atlantic white cedar, including the historical extent of this habitat type and regeneration. The refuge will be considering all habitat types from a historical extent perspective and wildlife habitat requirements.

Comment 24:
"The CCP should address future effects of global climate change-driven sea level rise on the refuge. Immediate attention should include the impacts of salt water intrusion into the ditch network and surface water, identification of historical coastal land areas loss and mitigation strategies, and an assessment of impacts of USFWS mitigation strategies on private lands. A one-foot elevation contour map should be added to CCP. Areas at risk over time should be identified based on best available science."

Response: The CCP has a 15-year planning horizon and, for this reason, it is doubtful that there will be little change in the landscape that can be linked directly with global climate change. Predicting effects from global climate change on the future refuge landscape will be possible only in a most general way. The most recent models suggest that, if sea level continues to rise at current rates, most of the refuge we know today will be either marsh or under water within the next 100 years. At best, the CCP can recognize that there are impacts on refuge and other lands as a result of climate change and commit to pro-actively accepting the responsibility of supporting research to provide data for adaptively managing landscape changes brought about by increased hydrologic regimes and salinity.

Comment 25:
"The CCP should include a map of private lands within and surrounding the refuge. How will private lands impact implementation of the CCP?"

Response: Color coding on the maps shown in Figure 1, Figure 5, Figure 6, and Figure 7 illustrate the extent of refuge lands. Areas that are not colored (white on white paper) are non-refuge lands and may be either private or, in the case of the Dare County Bombing Range, owned by another federal, state, or local agency. Implementation of the CCP's Preferred Alternative should have no effect on these lands, and the adjacency of private lands is not expected to affect the refuge's ability to implement the Preferred Alternative.

Comment 26:
"There is no discussion of the impacts of 50+ years of wildland fire exclusion on vegetation or ecological endpoint of the ARNWR prescribed fire program. The CCP should also include a discussion of joint jurisdictional prescribed fire management with the US Air Force and Navy to reduce wildland fire risk and protect lives and private property at the Wildland Urban Interface (WUI). The CCP should include important details on the refuge's Prescribed Fire Program."

Response: Comments noted. This has been done to a limited extent in the current Fire Management Plan. A general planning document such as the CCP is not the most appropriate document for addressing these topics. However, we are in complete agreement with regards to coordination for joint jurisdictional prescribed fire management to reduce wildland fire risks. The most appropriate forum for such discussions and planning is through periodic coordination meetings, Fire Management Plan revisions, and annual planning agreements or fire prescriptions. We welcome the opportunity to work with the DCBR and adjacent communities to protect lives and property at the wildland/urban interface.

The Nature Conservancy
(Comments submitted by Jeff DeBlieu, The Nature Conservancy)

Comment 1:
"I am writing to provide The Nature Conservancy's comments on the most recent (May 2006) Draft Comprehensive Conservation Plan and Environmental Assessment for the Alligator River National Wildlife Refuge. We appreciate having the opportunity to comment on this draft of the CCP. We hope these comments are useful to the refuge staff, and we look forward to working with you to further improve the plan and to support its implementation.

Our comments will touch on a number of elements in the plan. However, we are most concerned about the impacts that sea-level rise—and other climate-related forces— can be expected to have on the refuge. In one way or another, these are likely to be the most significant issues facing Alligator River and other conservation lands in eastern North Carolina.

Although the CCP acknowledges that sea level along the North Carolina coast will increase by two to three feet in the next 100 years, it does not adequately address the potential consequences of sea-level rise on the refuge or propose strategies to mitigate them. This may be because the plan is intended to cover only the next 15 years. Nevertheless, sea-level rise and other climate change-related phenomena have the potential to trigger such radical ecosystem changes on the entire Albemarle-Pamlico Peninsula that planning for how to deal with them should not be postponed.

In a brief discussion of sea-level rise on page 58, the CCP foresees apparently gradual changes in habitat types as water levels rise and species shift "upslope." For instance, it predicts that freshwater marshes will expand into pocosins and hardwoods and that bald cypress and swamp tupelo forests will expand into hardwood. However, sea-level rise models based on high-resolution elevation data of the Albemarle-Pamlico Peninsula show that much of the refuge actually will be inundated by even a one-foot increase in sea level. A two to three feet increase will transform vast areas of what are now terrestrial ecosystems into open water. For all practical purposes, this will eliminate the refuge as a management entity.

The rate of sea-level rise in eastern North Carolina was about two inches per decade during the latter half of the 20th century. The rate will in all probability increase within the next 15 years. (All models and scenarios considered in the International Panel on Climate Change Report of 2001 projected that the rate of local sea level rise in the 21st century will be significantly more than in the 20th century at the great majority of coastal locations.)

Other factors that could exacerbate the effects of sea-level rise and lead to even more rapid ecosystem transformation include: (a) organic soils not being able to accrete fast enough to keep up with an increasing rate of sea-level rise; (b) increased salinity in creeks, canals and ditches penetrating into the interior of the refuge, causing sulphate reduction of organic soils and soil subsidence; (c) increased flooding, greater storm surges and increased shoreline erosion from more frequent and potentially more powerful hurricanes; and (d) increased tidal ranges and wave energy in Pamlico Sound, especially if sea-level rise and larger storms cause the Outer Banks to be substantially breached.

The CCP does not appear to take these issues into consideration. Nor does it consider whether historic alterations to refuge lands or current management practices (i.e., fire, cropland and moist soil management) could interact negatively with any of these factors.

In discussing the refuge's conservation priorities, the Comprehensive Conservation Plan points out that:

> "One of the biggest challenges to the management and restoration efforts underway in the South Atlantic Coastal Plain, and one that affects refuges in particular, is the need to meet long-term management objectives that address comprehensive ecosystem needs. Often, management for one species or species group conflicts with the management objectives for another species or species group. The tendency is to pursue short-term priorities that frequently change as scientific knowledge expands and interests in special resources shift. Biologists must exercise caution to prevent the start-up of management and restoration actions that are difficult to reverse and fail to meet the long-term, comprehensive management needs of the ecosystem or a specific area within the ecosystem."

In addition, the plan says the most important challenges facing the refuge are "securing adequate funding and personnel and then successfully addressing historical habitat alterations and hydrological functions."

We agree completely with the necessity of a long-term ecosystem approach. We also agree that repairing the damage of past habitat and hydrological alterations are critical needs, especially since we suspect that many past practices have made the landscape more susceptible to climate-related stresses and increased the likelihood that sea-level rise will have deleterious effects on the ecological integrity of the system. (In addition, there is a consensus that these practices, coupled with similar practices on many other parts of the Albemarle-Pamlico Peninsula, have had a negative effect on the quality of surrounding estuarine waters.)
Yet as now written, the CCP does not include sea-level rise in the matrix of "comprehensive ecosystem needs." Nor do any of the proposed goals and objectives in the chapter on Management Direction explicitly say how you plan to deal with habitat and hydrological alterations.

The National Wildlife Refuge System Improvement Act of 1997 (NWRSIA) states that Comprehensive Conservation Plans "shall identify and describe . . . significant problems that may adversely affect the populations and habitats of fish, wildlife, and plants within the planning unit and the actions necessary to correct or mitigate such problems."

This planning process provides the perfect opportunity to begin preparing for how the refuge will reckon with these other issues, which the planning team has identified as the refuge's major challenges."

Response: Comments noted and the refuge concurs with the information presented in these comments. The refuge has a history of working towards a better understanding of impacts to refuge lands resulting from global climate change and especially the effects of rising sea level. However, the CCP has a 15-year planning horizon and, for this reason, it is difficult to recognize, plan for, and implement management actions to soften the consequences of global climate change within such a relatively short planning period. Predicting effects from global climate change on the future refuge landscape would be possible only in a most general way. The most recent models suggest that, if sea level continues to rise at current rates, most of the refuge we know today will be either marsh or under water within the next 100 years. The CCP may have been rewritten 6–7 times during that period. At best, the current CCP can recognize that there are impacts on refuge and other lands as a result of climate change. Beyond that recognition there is a standing commitment to proactively accept the responsibility of working with the research community to provide data for adaptively managing habitat to accommodate landscape changes brought about by increased hydrologic regimes and salinity.

Comment 2:
"It may be that you intend to address them more specifically while writing detailed step-down plans for habitat management, biological inventories and monitoring, moist soil/water management and fire management. This is not explicitly stated in the CCP, and the brief descriptions of what each step-down plan will entail do not appear to include these larger issues.

We believe it is essential that the Alligator River CCP include specific, measurable, science-based objectives for restoring and maintaining refuge integrity within the context of sea-level rise and a changing climate. We recognize that this is a major undertaking and that there are limited resources available to the refuge system at this time. However, these issues are paramount to Alligator River's future. Not to deal with them in the CCP would be a major shortcoming."

Response: Comments noted. While the level of information requested would certainly contribute to the CCP, it can be presented more appropriately in the Habitat Management Step-down Plan or other step-down plans when they are prepared. We have modified descriptions of the Habitat Management Plan and Marsh Management Plan on page 99 to include mention of the effects of global climate change and rising sea level.

Comment 3:
"The Nature Conservancy has begun working with several other conservation organizations to develop strategies for how we can help maintain the integrity of eastern North Carolina's significant conservation lands. As you know from the climate change workshop you helped us with earlier this year, many scientists and other government agencies are also interested in and concerned about how climate change will affect this region. I know The Nature Conservancy would be willing to work with you to help address these issues at Alligator River—and believe others would as well.
I would be happy to meet with you at your convenience to discuss our comments further and volunteer to assist in the continued development and implementation of the plan."

Response: Comments noted. The refuge continues to look forward to a healthy working relationship with conservation organizations and others on the issue of global climate change. In 2006 the refuge was identified as one of the 10 most endangered national wildlife refuges as a direct result of global warming by the Defenders of Wildlife. This recognition emphasizes the need to develop adaptive management strategies to continue to provide the highest quality wildlife habitat possible, even with the advent of habitat type shifts from forested to emergent wetlands.

County of Dare
(Comments submitted by Stan White, Chairman, Dare County Board of Commissioners)

Comment 1:
"Thank you for providing a copy of the draft Comprehensive Conservation Plan and Environmental Assessment for the Alligator River National Wildlife Refuge and the opportunity to comment on this draft plan. On behalf of the Dare County Board of Commissioners, I offer the following comments:

1. I am glad to see that Alternative 2 selected for implementation proposes the expansion of visitor services especially hunting and fishing opportunities on the refuge property. This issue is of particular significance to the residents and visitors to Dare County and efforts to increase visitor services on the refuge is appropriate. Especially important to the residents of the Mainland villages is shoreline access, including boat ramps and parking areas. Although the draft plan discusses maintenance of existing boat facilities, it is the opinion of the County that expansion of the number of shoreline access points should be a goal of the management plan."

Response: Comments noted. Although most access is primitive at best, water access is currently available through the existing road system and at access areas owned and maintained by the North Carolina Wildlife Resources Commission (NCWRC). It is the refuge's intent to continue to provide the access points under the control of the refuge. As far as is known at this time, the NCWRC will continue to provide boating access in at least as many areas as they currently maintain. It is not likely that new access roads will be constructed on the refuge due to law, regulation, and policy. Whether or not the refuge would receive funding to upgrade primitive access areas at the end of existing roads would depend upon funding levels over the next 15 years. Based upon the current budget situation, it is not likely that such funding will become available. Although the refuge is committed to maintaining existing access points, it cannot commit to adding new locations or make significant improvements to existing locations.

Comment 2:
"2. The draft plan states that USFWS currently owns land on Roanoke Island near the National Park Service offices on which a visitor center is planned for construction. Elsewhere in the draft plan, the strategies call for additional acquisition of land from the Bombing Range and private land owners if opportunities occur. I strongly encourage the USFWS to consider purchase of land on the Mainland for the construction of the visitor center versus the construction of a visitor center on Roanoke Island. I am aware that much of the refuge land is not suitable for construction but the location of a visitor center on the refuge would be more conducive for visitor services than from a site on Roanoke Island."

Response: Comments noted.

Comment 3:
"3. The draft plan discusses interagency coordination and cooperative agreements with local, state, and federal agencies and specifically lists some agencies. The County of Dare is not named in the list although the plan mentions the three small communities that are located within the refuge. These three small communities are within the unincorporated portions of Dare County and I would like to request that the County of Dare be added to the list of local agencies on page 83 of the draft plan."

Response: Comments noted. The refuge welcomes the opportunity to coordinate refuge management activities with the County of Dare. The CCP has been modified to include Dare County on pages 83 and 99 as well as in other sections.

Comment 4:
"4. The Highway 64 corridor is located within the refuge land and long-term transportation plans call for the widening of this corridor and replacement of the Alligator River Bridge. The widening of Highway 64 and the bridge replacement are essential transportation infrastructure improvements for Dare County. I sincerely hope that these improvements will not be delayed or detrimentally impacted by management plans of the USFWS. Language should be added to the section on utility line and highway corridors to specifically list these planned improvements and state the position of the USFWS on to these planned improvements."

Response: Comments noted. The refuge is aware of the upcoming plans to build a new high-rise bridge over Alligator River and to upgrade the present US 64 to a 4-lane transportation system. Other than a willingness to work with the N.C. Department of Transportation, the U.S. Fish and Wildlife Service does not currently have a position on this transportation project as there is no proposed alternative. Consequently, there is no meaningful way to assess how the project may affect the refuge. As alternatives are presented and to meet our responsibility for maintaining the ecological integrity of the refuge, we will review and evaluate the effects of this highway project on various components of the ecosystem, including, but not limited to, wildlife populations; plant community composition (including induced changes in vegetative composition and habitat structure); hydrology; and aquatic ecology. These considerations are mandated by law, regulation, and policy. Those uses that do not compromise the mission of the National Wildlife Refuge System or the purpose for which the refuge was established may be allowable. Any proposed use cannot compromise the ecological integrity of refuge lands. In the absence of adequate information, the proposed use cannot be found compatible and a right-of-way permit cannot be issued. Provided that all agencies, organizations, and individuals acknowledge the refuge's Congressionally established mandate, agree to work within the legal framework governing use of refuge lands, and include refuge recommendations in the early phases of planning, there should be no project delays. The extent to which others take various actions because they may not like what they hear or it is not what they want to see is beyond the control of the refuge.

B. S. Achau
(Comment submitted by B. S. Achau, concerned citizen)

Comment 1:
"This refuge has been bought and paid for by national taxpayers, yet this group and the group of future children who will grow up to try to have this refuge as part of their world are also ignored."

Response: Comment noted.

Comment 2:
"Park Mgt [sic] lets local profiteers call the shots. Those shots include hunting, the brutal encouragement of human gun wackos to pick up a weapon to kill. This kind of encouragement has in fact brought about situations like Columbine, Jonesboro, Red Lake, where children get the idea it's OK to solve situations with guns and it's OK to kill God's creatures. They start with that brutalization of killing. I very much oppose letting these brutes into a place called a sanctuary.

I think all hunting should be banned. It takes a lot of staff time to try to monitor and they do not 'monitor' it very well so that poaching and illegal hunting goes on once it is let in the door. I think any trapping should also be banned."

Response: Comments noted.

Comment 3:
"Prescribed burning is done by idiots. Anyone who will load up our air with fine particulate matter so that this matter can travel thousands of miles and cause lung cancer, heart attacks, strokes, allergies, pneumonia and asthma is surely an idiot because he has not bothered to inform himself of air pollution and the health effects of that air pollution. I think you should let the senior citizens groups in on what you are doing to kill them."

Response: Comments noted.

Comment 4:
"Wildlife watchers are peaceful folk who outspend hunters twenty to one and don't bother to muck up the place with lead shot which deteriorates in air/water and soil and which can grow up in plants, causing them to be lead soaked. Lead affects children's brains and red blood cells, so to allow any use of lead at all is extremely dangerous for having healthy children."

Response: Comments noted.

Comment 5:
"Remember, that the refuge should be there for our children and grandchildren. All of the destructive uses you propose have a toll.

I also think it is time that God's creatures—the animals and birds—have a peaceful way to lay their heads. It is time to get the dangerous human gun wackos out of this place."

Response: Comments noted.

Appendix V. Decisions and Approvals

INTRA-SERVICE SECTION 7 BIOLOGICAL EVALUATION

Originating Person: Mike Bryant
Telephone Number: 252-473-1131
E-Mail: mike_bryant@fws.gov
Date: 10/07/05

Project Name: Alligator River National Wildlife Refuge Comprehensive Conservation Plan

I. Service Program:
___ **Ecological Services**
___ **Federal Aid**
___ **Clean Vessel Act**
___ **Coastal Wetlands**
___ **Endangered Species Section 6**
___ **Partners for Fish and Wildlife**
___ **Sport Fish Restoration**
___ **Wildlife Restoration**
___ **Fisheries**
_X_ **Refuges/Wildlife**

II. State/Agency: North Carolina/U.S. Fish and Wildlife Service

III. Station Name: Alligator River National Wildlife Refuge

IV. Description of Proposed Action (attach additional pages as needed): Implementation of the Comprehensive Conservation Plan for Alligator River National Wildlife Refuge by adopting the proposed alternative that provides guidance, management direction, and operation plans for the next 15 years.

V. Pertinent Species and Habitat:

A. Include species/habitat occurrence map:

B. Complete the following table:

SPECIES/CRITICAL HABITAT	STATUS
Bald Eagle	Threatened
Red-cockaded Woodpecker	Endangered
Red Wolf	Endangered
American Alligator	Threatened

VI. Location (attach map):

A. Ecoregion Number and Name: Roanoke-Tar-Neuse-Cape Fear No. 34

B. County and State: Dare and Hyde Counties, North Carolina

C. Section, township, and range (or latitude and longitude):

D. Distance (miles) and direction to nearest town: 5 miles west of Manteo, North Carolina across the Croatan Sound

E. Species/habitat occurrence:

Bald Eagle - Record of occurrence in counties within 20 years. Occasionally observed on refuge; nesting has occurred on the refuge.

Red-cockaded Woodpecker - Record of occurrence in counties within 20 years. Observed on the refuge and property adjacent to the refuge; there are approximately 1–3 clusters on the refuge.

Red Wolf - Record of in counties occurrence within 20 years.
Experimental population established and monitored on the refuge.

American Alligator - Record of occurrence in counties within 20 years.
Observed on the refuge and property adjacent to the refuge; nesting occurs on the refuge.

VII. Determination of Effects:

A. Explanation of effects of the action on species and critical habitats in item V. B (attach additional pages as needed).

SPECIES/CRITICAL HABITAT	IMPACTS TO SPECIES/CRITICAL HABITAT
Bald Eagle	Disturbance by staff and visitors during nesting season.
Red-cockaded Woodpecker	Disturbance by staff and visitors during nesting season. Lack of understory management.
Red Wolf	Disturbance by staff and visitors. Saturation of habitat by hydrology restoration.
American Alligator	Disturbance by boaters and anglers. Water quality degradation and lack of marsh habitat.

B. Explanation of actions to be implemented to reduce adverse effects.

SPECIES/CRITICAL HABITAT	ACTIONS TO MITIGATE/MINIMIZE IMPACTS
Bald Eagle	Restrict access to nesting area.
Red-cockaded Woodpecker	Restrict access to nesting area. Allow pines to grow old enough to develop cavities. Manage understory to maintain height below cavities.
Red Wolf	Restrict access to den sites when wolves are in the area. Monitor the effect of hydrology restoration.
American Alligator	Restrict access when alligators are in the area. Cooperate with state agencies to monitor and improve water quality. Monitor the status of marsh habitat.

VIII. Effect Determination and Response Requested:

SPECIES/CRITICAL HABITAT	DETERMINATION			RESPONSE REQUESTED[1]
	NE	NA	AA	
Bald Eagle		X		
Red-cockaded Woodpecker		X		
Red Wolf		X		
American Alligator		X		

[1]*DETERMINATION/RESPONSE REQUESTED:*

NE = no effect. This determination is appropriate when the proposed action will not directly, indirectly, or cumulatively impact, either positively or negatively, any listed, proposed, candidate species or designated/proposed critical habitat. Response requested is optional but a concurrence is recommended for a complete administrative record.

NA = not likely to adversely affect. This determination is appropriate when the proposed action is not likely to adversely impact any listed, proposed, candidate species or designated/proposed critical habitat or there may be beneficial effects to these resources. Response requested is a concurrence.

AA = likely to adversely affect. This determination is appropriate when the proposed action is likely to adversely impact any listed, proposed, candidate species or designated/proposed critical habitat. Response requested for listed species is formal consultation. Response requested for proposed or candidate species is conference.

Mike Bryant — 10-7-05

Signature (originating station) — **Date**

Title

IX. Reviewing Ecological Services Office Evaluation:

A. Concurrence ✓ **Nonconcurrence** _____

B. Formal consultation required _____

C. Conference required _____

D. Informal conference required _____

E. Remarks (attach additional pages as needed):

Jon Avery — 01/23/06

Signature — **Date**

Actng Ecological Services Supervisor — Raleigh ES Office

Title — **Office**

COMPATIBILITY DETERMINATION

Alligator River National Wildlife Refuge Compatibility Determination

Uses: The following uses were considered for compatibility determination reviews: hunting, fishing, wildlife observation, photography, environmental education, interpretation, and trapping of selected furbearers for population management. A description and anticipated biological impacts for each use are addressed separately in this Compatibility Determination. Additional compatibility determinations for non-priority uses and refuge management economic activities are on file at the refuge office.

Refuge Name: Alligator River National Wildlife Refuge.

Date Established: 1984

> **Establishing and Acquisition Authority(ies):** 16 U.S.C. Sec 742f(a)(4) (Fish and Wildlife Act of 1956), 16 U.S.C., Sec. 460k-1 (Refuge Recreation Act of 1952), *1*6 U.S.C., Sec. 668dd(a)(2) (National Wildlife Refuge System Administration Act of 1966), and 16 U.S.C., Sec. 3901 (b) 100 Stat. 1583 (Emergency Wetland Resources Act of 1986).

Refuge Purpose: The purpose of Alligator River National Wildlife Refuge, as reflected in the refuge's authorizing legislation, is to protect and conserve migratory birds, and other wildlife resources through the protection of wetlands, in accordance with the following laws:

> *...for the development, advancement, management, conservation, and protection of fish and wildlife resources...* 16 U.S.C. Sec 742f(a)4 (Fish and Wildlife Act of 1956);
>
> *...for the benefit of the United States Fish and Wildlife Service, in performing its activities and services...* 16 U.S.C. Sec. 742f(b)1 (Fish and Wildlife Act of 1956).
>
> *...suitable for (1) incidental take of fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species…* 16 U.S.C., Sec. 460k-1 (Refuge Recreation Act of 1952);
>
> *...the Secretary…may accept and use…real…property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors…*16 U.S.C., Sec. 460k-2; 16 U.S.C., Sec. 460k-460k-4 (Refuge Recreation Act of 1952);
>
> *...conservation, management, and restoration of fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans…1*6 U.S.C., Sec. 668dd(a)(2) (National Wildlife Refuge System Administration Act of 1966).
>
> *…for the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions…*16 U.S.C., Sec. 3901 (b) 100 Stat. 1583 (Emergency Wetland Resources Act of 1986).

National Wildlife Refuge System Mission:

The mission of the 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.*

Other Applicable Laws, Regulations, and Policies:

Antiquities Act of 1906 (34 Stat. 225)
Migratory Bird Treaty Act of 1918 (15 U.S.C. 703-711; 40 Stat. 755)
Migratory Bird Conservation Act of 1929 (16 U.S.C. 715r; 45 Stat. 1222)
Migratory Bird Hunting Stamp Act of 1934 (16 U.S.C. 718-178h; 48 Stat. 451)
Criminal Code Provisions of 1940 (18 U.S.C. 41)
Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d; 54 Stat. 250)
Refuge Trespass Act of June 25, 1948 (18 U.S.C. 41; 62 Stat. 686)
Fish and Wildlife Act of 1956 (16 U.S.C. 742a-742j; 70 Stat.1119)
Refuge Recreation Act of 1962 (16 U.S.C. 460k-460k-4; 76 Stat. 653)
Wilderness Act (16 U.S.C. 1131; 78 Stat. 890)
Land and Water Conservation Fund Act of 1965
National Historic Preservation Act of 1966, as amended (16 U.S.C. 470, et seq.; 80 Stat. 915)
National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668dd, 668ee; 80 Stat. 927)
National Environmental Policy Act of 1969, NEPA (42 U.S.C. 4321, et seq; 83 Stat. 852)
Use of Off-Road Vehicles on Public Lands (Executive Order 11644, as amended by Executive Order 10989)
Endangered Species Act of 1973 (16 U.S.C. 1531 et seq; 87 Stat. 884)
Refuge Revenue Sharing Act of 1935, as amended in 1978 (16 U.S.C. 715s; 92 Stat. 1319)
National Wildlife Refuge Regulations for the Most Recent Fiscal Year (50 CFR Subchapter C; 43 CFR 3101.3-3)
Emergency Wetlands Resources Act of 1986 (S.B. 740)
North American Wetlands Conservation Act of 1990
Food Security Act (Farm Bill) of 1990 as amended (HR 2100)
The Property Clause of the U.S. Constitution Article IV 3, Clause 2
The Commerce Clause of the U.S. Constitution Article 1, Section 8
The National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57, USC668dd)
Executive Order 12996, Management and General Public Use of the National Wildlife Refuge System, March 25, 1996
Title 50, Code of Federal Regulations, Parts 25-33
Archaeological Resources Protection Act of 1979
Native American Graves Protection and Repatriation Act of 1990

Compatibility determinations for each description listed were considered separately. Although for brevity, the preceding sections from Uses through Other Applicable Laws, Regulations, and Policies are only written once within the plan, they are part of each descriptive use and become part of that compatibility determination if considered outside of the comprehensive conservation plan.

Description of Use: *Hunting*

The refuge is a mixture of pocosins (shrub wetlands), forest blocks of pine and hardwoods, marshes, managed wetlands (moist-soil areas), agricultural areas, and interconnected streams, ditches. The pocosins have bay species (red bay, sweetbay, loblolly bay), gallberry, sweet gallberry, sweet pepperbush, fetterbush, river cane, and pond pine. Other forest types have a great variety of tree species that includes bald cypress, oaks, black gum, hickory, elm, green ash, red maple, and sweetgum. This rich forested wetland provides habitat for a number of wildlife species including white-tailed deer, black bear, squirrel, raccoon, land birds, marsh birds, and waterfowl.

Many of the local residents enjoy an informal, rural lifestyle that includes frequent recreational use of the area's natural resources. Hunting and fishing have been, and continue to be, popular uses of refuge lands. It is estimated that 3,500 visits per year are attributed to hunting activities. The refuge has permitted hunting since 1984. The administration, as well as special regulations for hunting, has changed over time but the majority of the program has remained unchanged.

The draft comprehensive conservation plan calls for the continued hunting of deer and other wildlife as allowed by state and federal laws and regulations. All hunts fall within the framework of the state's open seasons and follow state regulations. There are additional refuge-specific regulations to supplement state regulations. The staff reviews refuge-specific regulations annually and incorporates them into the refuge hunting brochure. The draft comprehensive conservation plan would increase law enforcement presence during hunting seasons; would evaluate the hunt program annually; and modify seasons, hunt areas, or regulations if necessary. The refuge could add hunting areas as the refuge expands through an active land acquisition program. Implementation of the proposed alternative, as described in the draft comprehensive conservation plan, would ensure that opportunities for various types of wildlife-dependent recreation would continue for future generations.

Availability of Resources: There is adequate funding to ensure compatibility and to administer this use at its current level. The existing permanent, full-time law enforcement officer and public use specialist are needed to assist with hunting program administration and visitor services.

Anticipated Impacts of the Use: Current literature suggests that hunting mortality is compensatory. Factors, such as reproduction, emigration, immigration, and habitat quality and quality, influence population size more than regulated hunting. The Service does not anticipate adverse impacts to huntable wildlife populations as a result of regulated hunting.

Disturbance to non-game migratory birds would be minimal. It is anticipated that the current levels and expected future levels of hunting would not directly, indirectly, or cumulatively impact any listed, proposed, or candidate species or designated/proposed critical habitat. The incidental take of other wildlife species, either illegally or unintentionally, may occur.

At current and anticipated public use levels, incidental take will be very small and would not directly or cumulatively impact current or future populations of wildlife, either on this refuge or in the surrounding areas.

Implementation of an effective law enforcement program and development of site-specific refuge regulations and special conditions will eliminate most incidental take problems.
Public Review and Comment: Methods used to solicit public review and comments included mailing post cards to people showing interest during the comprehensive conservation planning (CCP) process; copies of the draft CCP were distributed to local, state, and federal agencies, to government officials representing the area, and to the public on request; made available in local libraries, and news releases which were published as follows: June 7 in the Virginia Pilot/Ledger Star and the

Raleigh News and Observer, June 8 in the Coastland Times, and June 11 in the Outer Banks Sentinel. In addition, local radio stations broadcast the announcement intermittently during the comment period. This compatibility determination was part of the Draft Comprehensive Conservation Plan and Environmental Assessment for Alligator River National Wildlife Refuge, which was announced in the Federal Register on May 30, 2006 (71 FR 30687) and made available for public comment for 45 days until July 14, 2006. Appendix D. summarizes the public comments.

Determination (check one below):

_____ Use is Not Compatible

__X__ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility: The refuge permits hunting in accordance with refuge regulations as well as State of North Carolina regulations and licensing requirements. An Environmental Assessment is on file at the refuge headquarters as part of the Hunting Plan. Following completion of the comprehensive conservation plan, the staff will revise the Hunting Plan. The following stipulations will help ensure the refuge hunting program is compatible with refuge purposes.

Refuge hunting permits are required.

Vehicles are restricted to designated refuge roads and parking lots.

Use of firearms, bows, and other weapons are prohibited except during designated hunting seasons.

Hunting deer with dogs is allowed on the refuge in designated areas only.

All hunts are designed to provide quality user opportunities based upon wildlife population demographics and biological parameters. Hunt season dates and bag limits will be adjusted as needed to achieve balanced wildlife population levels within carrying capacities, regardless of impacts to user opportunities.

As the staff collects and analyzes data, it could implement additional refuge-specific regulations. These regulations could include, but may not be limited to, season dates that differ from those in surrounding state zones, refuge permit requirements, and closed areas on a permanent or seasonal basis. The objectives of the regulations may be to reduce disturbance to specific wildlife species or habitats, such as bird rookeries, wintering waterfowl or threatened and endangered species, to allow hunting when staff is available to administer it, or to provide for public safety).

An effective law enforcement program is implemented and site-specific refuge regulations and special conditions are developed.

Justification: Hunting is compatible with the purposes for which the refuge was established and the mission of the National Wildlife Refuge System. It is one of the public use recreational activities that the 1997 National Wildlife Refuge System Improvement Act specifically identifies as a use to be allowed where possible on refuges. The refuge uses deer hunts as management tools to protect the diverse ecosystem.

NEPA Compliance for Refuge Use Decision: *Place an X in appropriate space.*

___ Categorical Exclusion without Environmental Action Statement

___ Categorical Exclusion and Environmental Action Statement

_X_ Environmental Assessment and Finding of No Significant Impact

___ Environmental Impact Statement and Record of Decision

Mandatory 15-Year Re-evaluation Date: __6/8/2022__

Description of Use: *Fishing*

Sport fishing is a common public use on the state waters of the creeks, rivers, bays, and sounds from the shorelines located on the Alligator River National Wildlife Refuge and the banks of ditches and moist-soil units on the refuge. It is estimated that 3,400 visits per year are attributed to fishing and related activities. Fish creel limits, boating safety and license requirements are in accordance with State of North Carolina regulations. The Service maintains a canoe and kayak launch area on Milltail Creek. The state maintains public boat ramps for small boats on waters adjacent to the refuge. Development of more public access to the water on the refuge would allow the public to utilize these fishery resources.

Availability of Resources: There is adequate funding to ensure compatibility and to administer the use at its current level.

Anticipated Impacts of the Use: Recreational fishing should not adversely affect the fisheries resource, wildlife resource, endangered species, or any other natural resource of the refuge. There may be some limited disturbance to certain species of wildlife and some trampling of vegetation; however, this should be short-lived and relatively minor and would not negatively impact wetland values of the refuge.

Improvement of access would create some disturbance to the natural environment during construction and lead to increased public use on the state and refuge waters. If the refuge staff identifies wildlife disturbance at these sites as a problem in future years, they will close the areas during sensitive seasons to eliminate this concern. The staff will carry out all construction activities in compliance will all applicable state and federal laws and regulations.

Public use of the waters will increase as a result of improved access, but the level of use is not expected to cause detrimental wildlife disturbance.

Law enforcement activities will control the problems associated with littering and illegal take of fish. Providing information to refuge visitors about rules and regulations, along with increased law enforcement patrol, will keep these negative impacts to a minimum.

Public Review and Comment: Methods used to solicit public review and comments included mailing post cards to people showing interest during the comprehensive conservation planning (CCP) process; copies of the draft CCP were distributed to local, state, and federal agencies, to government officials representing the area, and to the public on request; made available in local libraries, and news releases which were published as follows: June 7 in the Virginia Pilot/Ledger Star and the

Raleigh News and Observer, June 8 in the Coastland Times, and June 11 in the Outer Banks Sentinel. In addition, local radio stations broadcast the announcement intermittently during the comment period. This compatibility determination was part of the Draft Comprehensive Conservation Plan and Environmental Assessment for Alligator River National Wildlife Refuge, which was announced in the Federal Register on May 30, 2006 (71 FR 30687) and made available for public comment for 45 days until July 14, 2006. Appendix D. summarizes the public comments.

Determination (check one below):

_____ Use is Not Compatible

_X_ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility: Conflicts between fishermen and others using the refuge have not been a problem in the past and are not expected to be a problem in the future. A continued law enforcement presence can minimize associated violations, such as taking under size fish, open fires, and littering. The following stipulations will help ensure the refuge fishing program is compatible with refuge purposes.

- All fishing tackle must be attended at all times.
- Leaving boats on the refuge overnight is prohibited.
- Fishing allowed during daylight hours only.
- An effective law enforcement program is implemented and site-specific refuge regulations and special conditions are developed.
- Information is provided to refuge visitors about rules and regulations.

Justification: Refuge regulations permit fishing of state and refuge waters under state regulations. The goal of recreational fishing is to provide a quality fishing experience on a sustainable basis. The 1997 National Wildlife Refuge System Improvement Act lists fishing as a priority public use activity that the Service should provide and expand where possible. Improved access facilities will reduce bank erosion and habitat disturbance, while providing additional quality fishing opportunities.

NEPA Compliance for Refuge Use Decision: *Place an X in appropriate space.*

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

Mandatory 15-Year Re-evaluation Date: __6/8/2022__

Description of Use: *Wildlife Observation and Photography*

Wildlife observation uses such as bird watching, hiking, and nature photography are popular. It is estimated that 60,000 visits per year are attributed to wildlife observation and related activities.

The refuge staff anticipates that an increase in wildlife-dependent uses will occur over the next few years as facilities and access are improved and especially as the public and conservation groups become more aware of the excellent birding and wildlife viewing opportunities on the refuge.

There are 100 miles of refuge roads maintained for public vehicle travel. The refuge maintains the paved Creef Cut Trail accessible to disabled visitors along U.S. Highway 64. An observation platform and the Sandy Ridge Trail are at the southern end of Buffalo City Road. Proposed road and trail upgrades are shown in draft comprehensive conservation plan (Figure 7).

Availability of Resources: There is adequate funding to ensure compatibility and to administer the use at its current level.

Anticipated Impacts of the Use: Wildlife observation and photography activities will result in some disturbance to wildlife. Some minimal trampling of vegetation also may occur.

Construction of foot trails, boardwalks, observation platforms, and upgrading refuge roads will alter small portions of the natural environment. Visitors cause other potential negative impacts violating refuge regulations, such as littering or illegally taking plants or wildlife. Use of refuge roads by the public does incur added maintenance costs.

Public Review and Comment: Methods used to solicit public review and comments included mailing post cards to people showing interest during the comprehensive conservation planning (CCP) process; copies of the draft CCP were distributed to local, state, and federal agencies, to government officials representing the area, and to the public on request; made available in local libraries, and news releases which were published as follows: June 7 in the Virginia Pilot/Ledger Star and the Raleigh News and Observer, June 8 in the Coastland Times, and June 11 in the Outer Banks Sentinel. In addition, local radio stations broadcast the announcement intermittently during the comment period. This compatibility determination was part of the Draft Comprehensive Conservation Plan and Environmental Assessment for Alligator River National Wildlife Refuge, which was announced in the Federal Register on May 30, 2006 (71 FR 30687) and made available for public comment for 45 days until July 14, 2006. Appendix D. summarizes the public comments.

Determination (check one below):

_____ Use is Not Compatible

__X__ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility: Prior to construction, the refuge staff will obtain permits from local, state, and federal regulatory agencies to reduce the possibility of negatively impacting wetlands, cultural resources, or protected species. Law enforcement patrol of public use areas will continue to minimize violations of refuge regulations. The staff will close refuge roads to the public during nesting seasons and migratory waterfowl seasons to minimize wildlife disturbance. The staff will monitor public use for wildlife observation and photography to document any negative impacts. If any negative impacts become noticeable, the Service will take corrective action to reduce or eliminate the effects on wildlife.

The staff will prohibit visitors from traveling in areas around nests, rookeries, and managed wetlands. The refuge will locate refuge road systems, foot trails, boardwalks, and wildlife observation platforms opened to pedestrian use by the public to minimize disturbance that could occur in these sensitive areas. If the staff identifies unacceptable levels of disturbance at any time, they will close sensitive sites to public entry.

Proper planning prior to construction, sediment retention, and grade stabilization features will reduce negative impacts to wetlands, threatened and endangered species, and species of special concern. Impacts, such as trampling vegetation and wildlife disturbance by refuge visitors, do occur, but are presently not significant. Upgrading refuge roads will reduce soil erosion associated with the current dirt roads and trails.

Justification: Wildlife observation and photography are important public uses on Alligator River National Wildlife Refuge and are allowed under refuge regulations. The 1997 National Wildlife Refuge System Improvement Act identified wildlife observation as a priority pubic recreational use.

NEPA Compliance for Refuge Use Decision: *Place an X in appropriate space.*

___ Categorical Exclusion without Environmental Action Statement

___ Categorical Exclusion and Environmental Action Statement

_X_ Environmental Assessment and Finding of No Significant Impact

___ Environmental Impact Statement and Record of Decision

Mandatory 15-Year Re-evaluation Date: 6/8/2022

Description of Use: *Environmental Education and Interpretation*

Environmental education and interpretation are those activities that seek to increase the public's knowledge and understanding of wildlife, national wildlife refuges, ecology, and land management, as well as contribute to the conservation of natural resources. The refuge environmental education and interpretation activities conducted by refuge staff or trained volunteers have served 40,000 users annually. Refuge staff will develop and provide curriculum and support materials to area teachers for use both on and off the refuge. They will also maintain informational kiosks and interpretive panels at key refuge entrance points, and wildlife observation platforms as part of the environmental education and interpretation program.

Availability of Resources: Based on a review of the refuge's budget allocated for these activities, funding is adequate to ensure compatibility and to administer these uses at current levels. The current programs are dependent on volunteers. The management of the volunteer program will be essential to successfully implement the education and visitor use program.

Anticipated Impacts of the Use: Construction of facilities, such as boardwalks, kiosks and observation platforms, will alter small portions of the natural environment on the refuge. The refuge staff will obtain proper permits through the county, state, and federal regulatory agencies prior to construction to ensure resource protection. The use of on-site, hands-on, action-oriented activities to accomplish environmental education and interpretive tours may impose a low-level impact on the sites used for these activities. These low-level impacts may include trampling of vegetation and temporary disturbance to wildlife species in the immediate area. Educational activities held off of the refuge will not create any biological impacts on the resource.

Public Review and Comment: Methods used to solicit public review and comments included mailing post cards to people showing interest during the comprehensive conservation planning (CCP) process; copies of the draft CCP were distributed to local, state, and federal agencies, to government officials representing the area, and to the public on request; made available in local libraries, and news releases which were published as follows: June 7 in the Virginia Pilot/Ledger Star and the Raleigh News and Observer, June 8 in the Coastland Times, and June 11 in the Outer Banks Sentinel. In addition, local radio stations broadcast the announcement intermittently during the comment period. This compatibility determination was part of the Draft Comprehensive Conservation Plan and Environmental Assessment for Alligator River National Wildlife Refuge, which was announced in the Federal Register on May 30, 2006 (71 FR 30687) and made available for public comment for 45 days until July 14, 2006. Appendix D. summarizes the public comments.

Determination (check one below):

_____ Use is Not Compatible

__X__ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility: Zoning of visitor activities by time and space, clustering public use facilities, proper monitoring, educating visitors, and enforcement will ensure compatibility with the purposes of the refuge and mission of the National Wildlife Refuge System. Through periodic evaluation of trails and visitor contact points, the visitor services program will assess resource impacts. If the refuge staff determines that human impacts are detrimental to important natural resources, the staff will take actions to reduce or eliminate those impacts. Major portions of the refuge will remain undeveloped, without public interpretive facilities.

Proper planning and placement of facilities will ensure that wetlands, threatened or endangered species, or species of special concern are not negatively impacted.

Justification: The 1997 National Wildlife Refuge System Improvement Act identified environmental education and interpretation as activities that refuges should provide and expand. Educating and informing the public through structured environmental education courses, interpretive materials, and guided tours about migratory birds, endangered species, wildlife management, and ecosystems will lead to improved support of the Service's mission to protect our natural resources.

NEPA Compliance for Refuge Use Decision: *Place an X in appropriate space.*

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

Mandatory 15-Year Re-evaluation Date: 6/8/2022

Description of Use: *Trapping of Furbearers*

The staff may direct management of furbearer populations through trapping. Some species are at a sufficiently high level on the refuge to adversely affect ecosystem functions and values. For example, beavers can flood and convert large acreages of forested habitat to marsh. Nutria are exotic animals that consume great quantities of marsh grass and burrow into dikes of managed wetlands (moist-soil units) and raccoons can have negative effects on the reproduction of forest breeding birds and wood ducks. Protection and management of habitat are central components of the plan. To this end, trapping and/or hunting remain the only viable methods to manage furbearer population levels. Trapping a harvestable surplus for population restoration purposes would be administered through a special use permit issued by the refuge.

Availability of Resources: The refuge has adequate resources to conduct this use at current levels. The existing staff administers the permits and monitors this use as part of routine management duties.

Anticipated Impacts of the Use: Targeted removal of raccoon and nutria from portions of the refuge will reduce the negative impacts these species are having on ecosystem functions. Regulated trapping of raccoon populations will reduce the nest predation this species causes to neotropical birds and wood ducks. Nutria management will protect marsh grass and dikes of managed wetlands (moist-soil units). However, no trapping program, regardless of how well it is designed, can prevent the possible take of other species. The refuge staff will require trappers to report the incidental take of other species. There will be a negligible impact on other wildlife species in both the short and long term.

Public Review and Comment: Methods used to solicit public review and comments included mailing post cards to people showing interest during the comprehensive conservation planning (CCP) process; copies of the draft CCP were distributed to local, state, and federal agencies, to government officials representing the area, and to the public on request; made available in local libraries, and news releases which were published as follows: June 7 in the Virginia Pilot/Ledger Star and the Raleigh News and Observer, June 8 in the Coastland Times, and June 11 in the Outer Banks Sentinel. In addition, local radio stations broadcast the announcement intermittently during the comment period. This compatibility determination was part of the Draft Comprehensive Conservation Plan and Environmental Assessment for Alligator River National Wildlife Refuge, which was announced in the Federal Register on May 30, 2006 (71 FR 30687) and made available for public comment for 45 days until July 14, 2006. Appendix D. summarizes the public comments.

Determination (check one below):

_____ Use is Not Compatible

__X__ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility: As the refuge staff implements a trapping program on the refuge, it will monitor the program closely to assess the potential adverse effects on other wildlife as well as the benefits to game and nongame species and their habitats. The staff will modify the program as needed to ensure healthy populations. Trappers will carry out all trapping activities under a refuge special use permit. The staff will limit trappers by number, area, and season in order to target problem areas and minimize any impacts. The Service will require special conditions for all trapping activities to minimize incidental take of the red wolf. The staff will require each trapper to report the number and location of trapping activity and all wildlife taken.

Justification: Trapping is a wildlife population management tool used to regulate the population of certain wildlife species. Wildlife managers may need a regulated trapping program to maintain furbearer populations at acceptable levels, conduct research, or relocate animals for population restoration.

NEPA Compliance for Refuge Use Decision: *Place an X in appropriate space.*

___ Categorical Exclusion without Environmental Action Statement

___ Categorical Exclusion and Environmental Action Statement

_X_ Environmental Assessment and Finding of No Significant Impact

___ Environmental Impact Statement and Record of Decision

Mandatory 10-Year Re-evaluation Date: __6/8/2017__

Approval of Compatibility Determination

The signature of approval is for all compatibility determinations considered within the comprehensive conservation plan for Alligator River 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: Michael R. Bryant
(Signature/Date)

Regional Compatibility Coordinator: 8/6/08
(Signature/Date)

Refuge Supervisor: 8/12/08
(Signature/Date)

Regional Chief, National Wildlife Refuge System, Southeast Region: 8-13-08
(Signature/Date)

Appendix VI. Refuge Biota

ANIMALS
BIRDS

COMMON NAME	SCIENTIFIC NAME
BIRDS	
Anhinga	*Anhinga anhinga*
Bittern, American	*Botaurus lentiginosus*
Blackbird, Brewer's	*Euphagus cyanocephalus*
Blackbird, Red-winged*	*Agelaius phoeniceus*
Blackbird, Rusty	*Euphagus carolinus*
Blackbird, Yellow-headed	*Xanthocephalus xanthocephalus*
Bluebird, Eastern*	*Sialia sailis*
Bobolink	*Dolichonyx oryzivorus*
Bobwhite, Northern*	*Colinus virginianus*
Brant	*Branta bernicla*
Bufflehead	*Bucephala albeola*
Bunting, Indigo*	*Passerina cyanea*
Bunting, Painted	*Passerina ciris*
Bunting, Snow	*Plectrophenax nivalis*
Canvasback	*Aythya valisineria*
Catbird, Gray*	*Dumetella carolinensis*
Cardinal, Northern*	*Cardinalis cardinalis*
Chat, Yellow-breasted*	*Icteria virens*
Chickadee, Carolina*	*Poecile carolinensis*
Chuck-will's Widow*	*Caprimulgus carolinensis*
Cormorant, Double-crested	*Phalacrocorax auritus*
Coot, American	*Fulica americana*
Cowbird, Brown-headed*	*Molothrus ater*
Cowbird, Shiny	*Molothrus bonariensis*
Creeper, Brown	*Certhia americana*
Crow, American*	*Corvus brachyrhynchos*
Crow, Fish*	*Corvus ossifragus*
Cuckoo, Black-billed*	*Coccyzus erythropthalmus*
Cuckoo, Yellow-billed*	*Coccyzus americanus*
Dickcissel	*Spiza americana*
Dove, Mourning*	*Zenaida macroura*

COMMON NAME	SCIENTIFIC NAME
BIRDS	
Dove, Rock*	*Columba livia*
Dowitcher, Long-billed	*Limnodromus scolopaceus*
Dowitcher, Short-billed	*Limnodromus griseus*
Duck, American Black*	*Anas rubripes*
Duck, Ring-necked	*Aythya ferina*
Duck, Ruddy	*Oxyura jamaicensis*
Duck, Wood*	*Aix sponsa*
Eagle, Bald (Threatened)*	*Haliaeetus leucocephalus*
Eagle, Golden	*Aquila chrysaetos*
Egret, Cattle	*Bubulcus ibis*
Egret, Great	*Ardea alba*
Egret, Snowy	*Egretta thula*
Falcon, Peregrine	*Falco peregrinus*
Finch, House*	*Carpodacus mexicanus*
Finch, Purple	*Carpodacus purpureus*
Flicker, Northern*	*Colaptes auratus*
Flycatcher, Acadian*	*Empidonax virescens*
Flycatcher, Ash-throated	*Myiarchus cinerascens*
Flycatcher, Great Crested*	*Myiarchus crinitus*
Flycatcher, Scissor-tailed	*Tyrannus forficatus*
Gadwall	*Anas strepera*
Gallinule, Purple	*Porphyrio martinica*
Gnatcatcher, Blue-Gray*	*Polioptila caerulea*
Goldeneye, Common	*Bucephala clangula*
Goldfinch, American*	*Carduelis tristis*
Goose, Canada	*Branta canadensis*
Goose, Snow	*Chen caerulescens*
Goshawk, Northern	*Accipiter gentilis*
Grackle, Boat-tailed	*Quiscalus major*
Grackle, Common*	*Quiscalus quiscula*
Grebe, Horned	*Podiceps auritus*
Grebe, Pied-billed	*Podilymbus podiceps*
Grosbeak, Blue*	*Passerina caerulea*
Grosbeak, Evening	*Coccothraustes vespertinus*
Grosbeak, Rose-breasted	*Pheucticus ludovicianus*
Gull, Bonaparte's	*Larus philadelphia*

COMMON NAME	SCIENTIFIC NAME
BIRDS	
Gull, Great Black-backed	*Larus marinus*
Gull, Herring	*Larus argentatus*
Gull, Laughing	*Larus atricilla*
Gull, Ring-billed	*Larus delawarensis*
Harrier, Northern	*Circus cyaneus*
Hawk, Broad-winged	*Buteo platypterus*
Hawk, Cooper's	*Accipiter cooperii*
Hawk, Red-shouldered*	*Buteo lineatus*
Hawk, Red-tailed*	*Buteo jamaicensis*
Hawk, Rough-legged	*Buteo lagopus*
Hawk, Sharp-shinned	*Accipiter straitus*
Heron, Great Blue*	*Ardea herodias*
Heron, Green*	*Butorides virescens*
Heron, Little Blue	*Egretta caerulea*
Heron, Black-crowned Night	*Nycticorax nycticorax*
Heron, Tri-colored	*Egretta tricolor*
Heron, Yellow-crowned Night	*Nyctanassa violacea*
Hummingbird, Ruby-throated*	*Archilochus colubris*
Ibis, Glossy	*Plegadis falcinellus*
Ibis, White	*Eudocimus albus*
Jaeger, Long-tailed	*Stercorarius longicaudus*
Jay, Blue*	*Cyanocitta cristata*
Junco, Dark-eyed	*Junco hyemalis*
Kestrel, American	*Falco sparverius*
Killdeer*	*Charadrius vociferus*
Kingbird, Eastern*	*Tyrannus tyrannus*
Kingbird, Western	*Tyrannus verticalis*
Kingfisher, Belted*	*Ceryle alcyon*
Kinglet, Golden-crowned	*Regulus satrapa*
Kinglet, Ruby-crowned	*Regulus calendula*
Kite, Mississippi	*Ictinia mississippiensis*
Kite, Swallow-tailed	*Elanoides forficatus*
Lark, Horned	*Eremophila alpestris*
Longspur, Lapland	*Calcarius lapponicus*
Loon, Common	*Gavia immer*
Loon, Red-throated	*Gavia stellata*

COMMON NAME	SCIENTIFIC NAME
BIRDS	
Mallard*	*Anas platyrhynchos*
Martin, Purple*	*Progne subis*
Meadowlark, Eastern*	*Stumella magna*
Merganser, Hooded	*Lophodytes cucullatus*
Merganser, Red-breasted	*Mergus serrator*
Merlin	*Falco columbarius*
Mockingbird, Northern*	*Mimus polyglottos*
Moorhen, Common	*Gallinula chloropus*
Nighthawk, Common	*Chordeiles minor*
Nuthatch, Brown-headed*	*Sitta pusilla*
Nuthatch, Red-breasted	*Sitta canadensis*
Nuthatch, White-breasted*	*Sitta carolinensis*
Oriole, Baltimore	*Icterus galbula*
Oriole, Orchard*	*Icterus spurius*
Osprey*	*Pandion haliaetus*
Ovenbird*	*Seiurus aurocapilla*
Owl, Barn	*Tyto alba*
Owl, Barred*	*Strix varia*
Owl, Eastern Screech*	*Megascops asio*
Owl, Great Horned*	*Bubo virginianus*
Owl, Long-eared	*Asio otus*
Owl, Northern Saw Whet	*Aegolius acadicus*
Owl, Short-eared	*Asio flammeus*
Parula, Northern*	*Parula americana*
Pelican, Brown	*Pelecanus occidentalis*
Phoebe, Eastern	*Sayomis phoebe*
Pintail, Northern	*Anus acuta*
Pipit, American	*Anthus rubescens*
Plover, Black-bellied	*Pluvialis squatarola*
Plover, Semipalmated	*Charadrius semipalmatus*
Rail, Black*	*Laterallus jamaicensis*
Rail, Clapper*	*Rallus longirostris*
Rail, King*	*Rallus elegans*
Rail, Virginia*	*Rallus limicola*
Rail, Yellow	*Coturnicops noveboracensis*
Redpoll, Common	*Carduelis flammea*

COMMON NAME	SCIENTIFIC NAME
BIRDS	
Redhead	*Aythya americana*
Redstart, American	*Setophaga ruticilla*
Robin, American*	*Turdus migratorius*
Sandpiper, Least	*Calidris minutilla*
Sandpiper, Semipalmated	*Calidris pusilla*
Sandpiper, Solitary	*Tringa solitaria*
Sandpiper, Spotted	*Actits macularius*
Sandpiper, Western	*Calidris mauri*
Sapsucker, Yellow-bellied	*Sphyrapicus varius*
Scaup, Greater	*Aythya marila*
Scaup, Lesser	*Aythya affinis*
Scoter, Black	*Melanitta nigra*
Scoter, Surf	*Melanitta perspicillata*
Shoveler, Northern	*Anas clypeata*
Shrike, Loggerhead	*Lanius ludovicianus*
Siskin, Pine	*Carduelis pinus*
Skimmer, Black	*Rynchops niger*
Sora	*Porzana carolina*
Snipe, Common	*Gallinago gallinago*
Sparrow, American Tree	*Spizella arborea*
Sparrow, Chipping	*Spizella passerina*
Sparrow, Clay-colored	*Spizella pallida*
Sparrow, Field*	*Spizella pusilla*
Sparrow, Fox	*Passerella iliaca*
Sparrow, Grasshopper	*Ammodramus savannarum*
Sparrow, Henslow's	*Ammodramus henslowii*
Sparrow, House*	*Passer domesticus*
Sparrow, Lark	*Chondestes grammacus*
Sparrow, Le Conte's	*Ammodramus leconteii*
Sparrow, Lincoln's	*Melospiza lincolnii*
Sparrow, Nelson's Sharp-tailed	*Ammodramus nelsoni*
Sparrow, Saltmarsh Sharp-tailed	*Ammodramus caudacutus*
Sparrow, Savannah	*Passerculus sandwichensis*
Sparrow, Seaside*	*Ammodramus maritimus*
Sparrow, Song	*Melospiza melodia*
Sparrow, Swamp	*Melospiza georgiana*

COMMON NAME	SCIENTIFIC NAME
BIRDS	
Sparrow, Vesper	*Pooecetes gramineus*
Sparrow, White-crowned	*Zonotrichia leucophrys*
Sparrow, White-throated	*Zonotrichia albicollis*
Starling, European*	*Stumus vulgaris*
Storm-Petrel, Wilson's	*Oceanites oceanicus*
Swallow, Bank	*Riparia riparia*
Swallow, Barn*	*Hirundo rustica*
Swallow, Northern Rough-winged	*Stelgidopteryx serripennis*
Swallow, Tree	*Tachycineta bicolor*
Swan, Tundra	*Cygnus columbianus*
Swift, Chimney*	*Chaetura pelagica*
Tanager, Scarlet	*Piranga olivacea*
Tanager, Summer	*Piranga rubra*
Teal, American Green-winged	*Anas crecca*
Teal, Blue-winged	*Anas discors*
Tern, Bridled	*Stema anaethetus*
Tern, Caspian	*Stema caspia*
Tern, Common	*Stema hirundo*
Tern, Forster's	*Stema forsteri*
Tern, Gull-billed	*Stema nilotica*
Tern, Least	*Stema antillarum*
Tern, Royal	*Stema maxima*
Tern, Sandwich	*Stema sandvicensis*
Tern, Sooty	*Stema fuscata*
Thrasher, Brown*	*Toxostoma rufum*
Thrush, Gray-cheeked	*Catharus minimus*
Thrush, Hermit	*Catharus guttatus*
Thrush, Swainson's	*Catharus ustulatus*
Thrush, Wood*	*Hylocichla mustelina*
Titmouse, Tufted*	*Baeolophus bicolor*
Towhee, Eastern*	*Pipilo erythrophthalmus*
Turkey, Wild*	*Meleagris gallopavo*
Veery	*Catharus fuscescens*
Vireo, Blue-headed	*Vireo solitarius*
Vireo, Philadelphia	*Vireo philadelphicus*
Vireo, Red-eyed*	*Vireo olivaceus*

COMMON NAME	SCIENTIFIC NAME
BIRDS	
Vireo, Warbling	*Vireo gilvus*
Vireo, White-eyed*	*Vireo griseus*
Vireo, Yellow-throated	*Vireo flavifrons*
Vulture, Black	*Coragyps atratus*
Vulture, Turkey*	*Cathartes aura*
Warbler, Bay-breasted	*Dendroica castanea*
Warbler, Black-and-white*	*Mniotilta varia*
Warbler, Blackpoll	*Dendroica striata*
Warbler, Blackburnian	*Dendroica fusca*
Warbler, Black-throated Blue*	*Dendroica caerulescens*
Warbler, Black-throated Green*	*Dendroica virens*
Warbler, Blue-winged	*Vermivora pinus*
Warbler, Canada	*Wilsonia canadensis*
Warbler, Cape May	*Dendroica tigrina*
Warbler, Chestnut-sided	*Dendroica pensylvanica*
Warbler, Connecticut	*Oporomis agilis*
Warbler, Golden-winged	*Vermivora chrysoptera*
Warbler, Hooded*	*Wilsonia citrina*
Warbler, Kentucky	*Oporomis formosus*
Warbler, Magnolia	*Dendroica magnolia*
Warbler, Mourning	*Oporomis philadelphia*
Warbler, Nashville	*Vermivora ruficapilla*
Warbler, Orange-crowned	*Vermivora celata*
Warbler, Palm AR	*Dendroica palmarum*
Warbler, Pine*	*Dendroica pinus*
Warbler, Prairie*	*Dendroica discolor*
Warbler, Prothonotary*	*Protonotaria citrea*
Warbler, Swainson's*	*Limnothlypis swainsonii*
Warbler, Tennessee	*Vermivora peregrina*
Warbler, Wilson's	*Wilsonia pusilla*
Warbler, Worm-eating*	*Helmitheros vermivorum*
Warbler, Yellow	*Dendroica petechia*
Warbler, Yellow-rumped	*Dendroica coronata*
Warbler, Yellow-throated*	*Dendroica dominica*
Waterthrush, Northern	*Seiurus noveboracensis*
Waxwing, Cedar*	*Bombycilla cedrorum*

COMMON NAME	SCIENTIFIC NAME
BIRDS	
Wigeon, American	*Anas americana*
Whip-poor-will*	*Caprimulgus vociferus*
Woodcock, American	*Scolopax minor*
Woodpecker, Downy*	*Picoides pubescens*
Woodpecker, Hairy*	*Picoides villosus*
Woodpecker, Pileated*	*Dryocopus pileatus*
Woodpecker, Red-bellied*	*Melanerpes carolinus*
Woodpecker, Red-cockaded*	*Picoides borealis*
Woodpecker, Red-headed	*Melanerpes erythrocephalus*
Wood Pewee, Eastern*	*Contopus virens*
Wren, Carolina*	*Thryothorus ludovicianus*
Wren, House*	*Throglodytes aedon*
Wren, Marsh*	*Cistothorus palustris*
Wren, Sedge	*Cistothorus platensis*
Wren, Winter	*Troglodytes troglodytes*
Yellow-throat, Common*	*Geothlypis trichas*
Yellowlegs, Greater	*Tringa melanoleuca*
Yellowlegs, Lesser	*Tringa flavipes*

COMMON NAME	SCIENTIFIC NAME
MAMMALS	
Bat, Big Brown	*Eptesicus fuscus*
Bat, Eastern Pipistrelle	*Pipistrellus subflavus**
Bat, Evening	*Nycticeius humeralis**
Bat, Hoary	*Lasiurus cinereus**
Bat, Little Brown	*Myotis lucifugus*
Bat, Rafinesque's Big-eared	*Plecotus rafinesquii*
Bat, Red	*Lasiurus borealis**
Bat, Silver-haired	*Lasionycteris noctivagans*
Bear, American Black	*Ursus americanus*
Beaver, American	*Castor canadensis*
Bobcat	*Lynx rufus*
Cottontail, Eastern	*Sylvilagus floridanus*
Deer, White-tailed	*Odocoileus virginianus*
Fox, Gray	*Urocyon cinereoargenteus*
Mink, American	*Mustela vison*
Mole, Eastern	*Scalopus aquaticus**
Mole, Star-nosed	*Condylura cristata*
Mouse, Cotton	*Peromyscus gossypinus*
Mouse, Eastern Harvest	*Reithrodontomys humulis**
Mouse, Golden	*Ochrotomys nuttalli*
Mouse, House	*Mus musculus*
Mouse, White-footed	*Peromyscus leucopus**
Mouse, Cotton	*Peromyscus gossypinus*
Muskrat	*Ondatra zibethicus*
Nutria (Exotic)	*Myocastor coypus*
Opossum	*Didelphis virginiana*
Otter, Northern River	*Lontra canadensis*
Rabbit, Marsh	*Sylvilagus palustris*
Raccoon, Northern	*Procyon lotor*
Rat, Brown (Exotic)	*Rattus norvegicus*
Rat, Hispid Cotton	*Sigmodon hispidus**
Rat, House (Exotic)	*Rattus rattus*

COMMON NAME	SCIENTIFIC NAME
MAMMALS	
Rat, Marsh Rice	*Oryzomys palustris*
Shrew, Least	*Cryptotis parva**
Shrew, Short-tailed	*Blarina brevicauda**
Shrew, Southeastern	*Sorex longirostris*
Squirrel, Eastern Gray	*Sciurus carolinensis*
Squirrel, Southern Flying	*Glaucomys volans*
Vole, Meadow	*Microtus pennsylvanicus*
Vole, Woodland	*Microtus pinetorum*
Weasel, Long-tailed	*Mustela frenata*
Wolf, Red (Endangered)	*Canis rufus*

** Denotes species that have not been documented on the refuge but are expected to occur.*

COMMON NAME	SCIENTIFIC NAME
REPTILES AND AMPHIBIANS	
Alligator, American (Threatened)	*Alligator mississippiensis*
Amphiuma, Two-toed	*Amphiuma means*
Anole, Green (Carolina Anole)	*Anolis carolinensis**
Bullfrog	*Rana catesbeiana*
Copperhead	*Agkistrodon contortrix*
Cottonmouth, Eastern	*Agkistrodon piscivorus*
Frog, Brimley's Chorus	*Pseudacris brimleyi*
Frog, Carpenter	*Rana virgatipes*
Frog, Green	*Rana clamitans*
Frog, Little Grass	*Pseudacris ocularis*
Frog, Pickerel	*Rana palustris*
Frog, Southern Cricket	*Acris gryllus*
Frog, Southern Leopard	*Rana utricularia (Rana sphenocephala)*
Lizard, Eastern Fence	*Sceloporus undulatus*
Lizard, Slender Glass	*Ophisaures attenuatus*
Mudturtle, Eastern	*Kinosternon subrubrum*
Peeper, Spring	*Pseudacris crucifer*
Racer, Black	*Coluber constrictor*
Racerunner, Six-lined	*Cnemidophorus sexlineatus**
Rattlesnake, Canebrake (Timber)	*Crotalus horridus*

COMMON NAME	SCIENTIFIC NAME
REPTILES AND AMPHIBIANS	
Salamander, Atlantic Coast Slimy	*Plethodon chlorobryonis*
Salamander, Many-lined	*Stereochilus marginatus*
Salamander, Marbled	*Ambystoma opacum*
Skink, Broad-headed	*Eumeces laticeps*
Skink, Ground	*Scincella lateralis*
Skink, Southeastern Five-lined	*Eumeces inexpectatus*
Slider, Yellow-bellied	*Trachemys scripta scripta*
Snake, Banded Water	*Nerodia fasciata fasciata*
Snake, Black Rat	*Elaphe obsoleta obsoleta*
Snake, Black Swamp	*Seminatrix pygaea*
Snake, Brown	*Storeria dekayi*
Snake, Brown Water	*Nerodia taxispilota*
Snake, Carolina Salt Marsh	*Nerodia sipedon williamengelsi*
Snake, Coastal Plain Milk	*Lampropeltis triangulum triangulumXelapsoides*
Snake, Corn (Red Rat Snake)	*Elaphe guttata*
Snake, Eastern Garter	*Thamnophis sirtalis*
Snake, Eastern Hognose	*Heterodon platirhinos**
Snake, Eastern King	*Lampropeltis getula*
Snake, Eastern Mud	*Farancia abacura abacura*
Snake, Eastern Ribbon	*Thamnophis sauritus*
Snake, Eastern Worm	*Carphophis amoenus*
Snake, Glossy Crayfish	*Regina rigida*
Snake, Rainbow	*Farancia erytrogramma*
Snake, Redbelly	*Storeria occipitomaculata*
Snake, Redbelly Water	*Nerodia erythrogaster erythrogaster*
Snake, Ringneck	*Diadophis punctatus*
Snake, Rough Green	*Opheodrys aestivus*
Terrapin, Diamondback	*Malaclemys terrapin*
Toad, Eastern Narrow-mouthed	*Gastrophryne carolinensis*
Toad, Fowler's	*Bufo fowleri*
Toad, Southern	*Bufo terrestris*
Treefrog, Cope’s Gray	*Hyla chrysoscelis*
Treefrog, Green	*Hyla cinerea*
Treefrog, Pine Woods	*Hyla femoralis*

COMMON NAME	SCIENTIFIC NAME
REPTILES AND AMPHIBIANS	
Treefrog, Squirrel	*Hyla squirella*
Turtle, Common Musk	*Sternotherus odoratus*
Turtle, Common Snapping	*Chelydra serpentina*
Turtle, Eastern Box	*Terrapene carolina*
Turtle, Painted	*Chrysemys picta*
Turtle, Redbelly	*Chrysemys rubiventris*
Turtle, Spotted	*Clemmys guttata*

** Denotes species that have not been documented on the refuge but are expected to occur based upon distribution maps.*

COMMON NAME	SCIENTIFIC NAME
FISH	
Alewife	*Alosa pseudoharengus*
Anchovy, Bay	*Anchoa mitchilli*
Bass, Largemouth	*Micropterus salmoides*
Bass, Striped	*Morone saxatilis*
Bluegill	*Lepomis macrochirus*
Bowfin	*Amia calva*
Bullhead, Brown	*Ameiurus nebulosus*
Bullhead, Yellow	*Ameiurus natalis*
Catfish, Channel	*Ictalurus punctatus*
Catfish, White	*Ameiurus catus*
Chubsucker, Lake	*Erimyzon sucetta*
Crappie, Black	*Pomoxis nigromaculatus*
Croaker, Atlantic	*Micropogonias undulatus*
Darter, Swamp	*Etheostoma fusiforme*
Darter, Tessellated	*Etheostoma olmstedi*
Drum, Red	*Sciaenops ocellatus*
Eel, American	*Anguilla rostrata*
Flier	*Centrarchus macropterus*
Flounder, Southern	*Paralichthys lethostigma*
Flounder, Summer	*Paralichthys dentatus*
Gar, Longnose	*Lepisosteus osseus*
Goby, Naked	*Gobiosoma bosci*

COMMON NAME	SCIENTIFIC NAME
FISH	
Herring, Blueback	*Alosa aestivalis*
Hogchoaker	*Trinectes maculatus*
Killifish, Banded	*Fundulus diaphanus*
Madtom, Tadpole	*Noturus gyrinus*
Menhaden, Atlantic	*Brevoortia tyrannus*
Mosquitofish	*Gambusia affinis*
Mudminnow, Eastern	*Umbra pygmaea*
Mullet, Striped	*Mugil cephalus*
Mullet, Yellow	*Mugil curema*
Needlefish, Atlantic	*Strongylura marina*
Perch, Pirate	*Aphredoderus sayanus*
Perch, Silver	*Bairdiella chrysoura*
Perch, White	*Morone americana*
Perch, Yellow	*Perca flavescens*
Pickerel, Chain	*Esox niger*
Pickerel, Redfin	*Esox americanus*
Pumpkinseed	*Lepomis gibbosus*
Shad, American	*Alosa sapidissima*
Shad, Gizzard	*Dorosoma cepedianum*
Shad, Hickory	*Alosa mediocris*
Shiner	*Notropis spp.*
Shiner, Golden	*Notemigonus crysoleucas*
Silverside, Inland	*Menidia beryllina*
Skilletfish	*Gobiesox strumosus*
Spot	*Leiostomus xanthurus*
Sturgeon, Atlantic	*Acipenser oxyrhynchus*
Sunfish, Banded	*Enneacanthus obesus*
Sunfish, Bluespotted	*Enneacanthus gloriosus*
Sunfish, Mud	*Acantharchus pomotis*
Swampfish	*Chologaster cornuta*
Tonguefish, Blackcheek	*Symphurus plagiusa*
Trout, Spotted Sea	*Cynoscion nebulosus*
Warmouth	*Lepomis gulosus*
Crab, Blue	*Callinectes sapidus*

COMMON NAME	SCIENTIFIC NAME
OTHER AQUATIC SPECIES	
Crab, Brackish-Water Fiddler	*Uca minax*
Crayfish	*Procambarus acutus*
Oyster, Common	*Crassostrea virginica*
Periwinkle, Marsh	*Littorina irrorata*
Shrimp, Brown	*Penaeus aztecus*
Shrimp, Freshwater	*Palaemonetes paludosus*
Shrimp, Pink	*Penaeus duorarum*
Shrimp, White	*Penaeus setiferus*

COMMON NAME	SCIENTIFIC NAME
FLORA - TREES	
Ash, Carolina	*Fraxinus caroliniana*
Ash, Green	*Fraxinus pennsylvanica*
Baldcypress	*Taxodium distichum*
Pondcypress	*Taxodium ascendens*
Bay, Loblolly	*Gordonia lasianthus*
Beech, American	*Fagus grandifolia*
Cedar, Atlantic White	*Chamaecyparis thyoides*
Cedar, Eastern Red	*Juniperus virginiana*
Cheery, Black	*Prunus serotina*
Chinaberry (Exotic)	*Melia azedarach*
Chokeberry, Red	*Aronia arbutifolia/ Sorbus arbutifolia*
Cottonwood, Eastern	*Populus deltoides*
Cottonwood, Swamp	*Populus heterophylla*
Dogwood, Flowering	*Cornus florida*
Elm, American	*Ulmus americana*
Gum, Swamp Black	*Nyssa sylvatica biflora*
Hickory, Shagbark	*Carya ovata*
Hickory, Sweet Pignut	*Carya ovalis*
Holly, American	*Ilex opaca*
Magnolia, Llarge-flower	*Magnolia grandiflora*
Magnolia, Sweet Bay	*Magnolia virginiana*

COMMON NAME	SCIENTIFIC NAME
FLORA - TREES	
Maple, Red	*Acer rubrum*
Mimosa	*Albizia julibrissin*
Mulberry, Red	*Morus rubra*
Oak, Cherrybark	*Quercus pagoda*
Oak, Laurel	*Quercus laurifolia*
Oak, Live	*Quercus virginiana*
Oak, Overcup	*Quercus lyrata*
Oak, Shumard	*Quercus shumardii*
Oak, Southern Red	*Quercus falcata*
Oak, Swamp Chestnut	*Quercus michauxii*
Oak, Water	*Quercus nigra*
Oak, White	*Quercus alba*
Oak, Willow	*Quercus phellos*
Pecan	*Carya illinoensis*
Persimmon	*Diospyros virginiana*
Pine, Loblolly	*Pinus taeda*
Pine, Pond	*Pinus serotina*
Pine, Slash	*Pinus elliottii*
Pondcypress	*Taxodium ascendens*
Poplar, Yellow (Tulip tree)	*Liriodendron tulipifera*
Sassafras	*Sassafras albidum*
Sourwood	*Oxydendrum arboreum*
Sweetgum	*Liquidambar styraciflua*
Sycamore	*Platanus occidentalis*
Willow, Black	*Salix nigra*

COMMON NAME	SCIENTIFIC NAME
FLORA - SHRUBS	
Alder, Smooth	*Alnus serrulata*
Azalea, Dwarf	*Rhododendron atlanticum*
Azalea, Swamp	*Rhododendron viscosum*

COMMON NAME	SCIENTIFIC NAME
FLORA - SHRUBS	
Alder, Smooth	*Alnus serrulata*
Bay, Red	*Persea borbonia*
Bayberry	*Morella heterophylla*
Beautyberry, French Mulberry	*Callicarpa americana*
Blackberry	*Rubus argutus*
Blueberry, Black Highbush	*Vaccinium atrococcum*
Blueberry, Highbush	*Vaccinium corymbosum*
Buckthorn Bully	*Sideroxylon lycioides*
Buttonbush	*Cephalanthus occidentalis*
Chinquapin, Eastern	*Castanea pumila*
Crabapple, Southern	*Malus angustifolia*
Cranberry	*Vaccinium macrocarpon*
Dangleberry	*Gaylussacia frondosa*
Deerberry, Gooseberry	*Vaccinium stamineum*
Dewberry, Bristly	*Rubus hispidus*
Dogwood, Swamp	*Cornus stricta*
Elder, Marsh	*Iva frutescens*
Elderberry	*Sambucus canadensis*
Fetterbush	*Lyonia lucida*
Fetterbush, Doghobble	*Leucothoe axillaris*
Fetterbush	*Leucothoe racemosa*
Gallberry, Bitter (Inkberry)	*Ilex glabra*
Gallberry, Sweet	*Ilex coriacea*
Hercules' Club	*Aralia spinosa*
Hercules' Club	*Zanthoxylum clava-herculis*
Holly, Deciduous	*Ilex decidua*
Holly, Yaupon	*Ilex vomitoria*
Hophornbeam, Eastern	*Ostrya virginiana*
Huckleberry, Dwarf	*Gaylussacia dumosa*
Indigobush	*Amorpha fruticosa*
Ironwood	*Carpinus caroliniana*

Laurel, Sheep	*Kalmia angustifolia*
Leatherleaf	*Cassandra calyculata*
Maleberry, Male-Blueberry	*Lyonia ligustrina*
Mallow, Seashore	*Kosteletzkya virginica*
Mallow, Swamp Rose	*Hisbiscus moscheutos*
Olive, Wild	*Osmanthus americanus*
Pepperbush, Sweet	*Clethra alnifolia*
Possumhaw	*Viburnum nudum*
Privet, Chinese (Exotic)	*Ligustrum sinense*
Rose, Swamp	*Rosa palustris*
Sea-myrtle, Salt meadow bush	*Baccharis halimifolia*
Serviceberry	*Amelanchier obovalis*
Shadbush	*Amelanchier canadensis*
Sparkleberry, Tree	*Vaccinium arboreum*
Staggerbush	*Lyonia mariana*
Strawberrybush, American	*Euonymus americanus*
Sumac, Poison	*Toxicodendron vernix*
Sumac, Winged	*Rhus copallina*
Sweetspire, Virginia	*Itea virginica*
Titi, leatherwood	*Cyrilla racemiflora*
Waxmyrtle	*Morella cerifera*
Winterberry (Black holly)	*Ilex verticillata*
Witchhazel	*Hamamelis virginiana*
Willow, Coastal Plain	*Salix caroliniana*

COMMON NAME	SCIENTIFIC NAME
FLORA - WOODY VINES	
Crossvine	*Anisostichus capreolata/Bignonia capreolata*
Creeper, Trumpet	*Campsis radicans*
Creeper, Virginia	*Parthenocissus quinquefolia*
Summer grape	*Vitis aestivalis*
Grape, Muscadine	*Vitis rotundifolia*
Grape, Summer	*Vitis aestivalis*

COMMON NAME	SCIENTIFIC NAME
FLORA - WOODY VINES	
Crossvine	*Anisostichus capreolata/Bignonia capreolata*
Creeper, Trumpet	*Campsis radicans*
Greenbrier	*Smilax smallii*
Greenbrier, Cat	*Smilax glauca*
Greenbrier, Common	*Smilax rotundifolia*
Greenbrier, Coral	*Smilax walteri*
Greenbrier, Earleaf	*Smilax auriculata*
Greenbrier, Laurel	*Smilax laurifolia*
Greenbrier, Saw	*Smilax bona-nox*
Honeysuckle, Coral	*Lonicera sempervirens*
Honeysuckle, Japanese	*Lonicera japonica*
Ivy, Eastern Poison	*Toxicodendron radicans*
Jessamine, Yellow	*Gelsemium sempervirens*
Peppervine	*Ampelopsis arborea*

COMMON NAME	SCIENTIFIC NAME
FLORA - GRASSES	
Bentgrasses	*Agrostis spp.*
Bermudagrass (Exotic)	*Cynodon dactylon*
Bluegrass, Annual	*Poa annua*
Bluestem, Bushybeard	*Andropogon glomeratus*
Broomsedge	*Andropogon virginicus*
Cane, River	*Arundinaria gigantea*
Cordgrass, Big	*Spartina cynosuroides*
Cordgrass, Saltmeadow	*Spartina patens*
Cordgrass, Smooth	*Spartina alterniflora*
Corn	*Zea mays*
Crabgrass	*Digitaria sanguinalis*
Cutgrass, Giant	*Zizaniopsis miliacea*
Cutgrass, Rice	*Leersia oryzoides*
Dropseed	*Sporobolus spp.*

COMMON NAME	SCIENTIFIC NAME
FLORA - GRASSES	
Fescue, Tall	*Lolium arundicaneum*
Foxtail	*Alopecurus carolinianus*
Foxtail, Giant	*Setaria magna*
Foxtail, Bristlegrass	*Setaria spp.*
Gamagrass, Eastern	*Tripsacum dactyloides*
Goosegrass, India (Exotic)	*Eleusine indica*
Grass, Rabbitfoot (Exotic)	*Polypogon monspeliensis*
Knotgrass, Joint paspalum	*Paspalum distichum*
Millet, Wild (Barnyardgrass)	*Echinochloa crusgalli*
Millet, Walter's	*Echinochloa walteri*
Milo (Exotic)	*Sorghum bicolor*
Mulegrass, Muhly	*Muhlenbergia spp.*
Orchardgrass (Exotic)	*Dactylis glomerata*
Panicum, Fall	*Panicum dichotomiflorum*
Paspalum species	*Paspalum spp.*
Plumegrass, Sugarcane	*Saccharum giganteum*
Purpletop	*Tridens flavus*
Reed, Common	*Phragmites australis*
Reedgrass	*Calamagrostis cinnoides*
Rice, Wild	*Zizania aquatica*
Saltgrass, Seashore	*Distichlis spicata*
Sawgrass	*Cladium jamaicense*
Sloughgrass	*Beckmannia syzigachne*
Sprangletop	*Leptochloa filiformis*
Switchcane	*Arundinaria tecta*
Switchgrass	*Panicum virgatum*
Watergrass, Southern	*Hydrochloa caroliniensis*
Wheat, Winter (Exotic)	*Triticum spp.*

COMMON NAME	SCIENTIFIC NAME
FLORA - GRASSLIKE PLANTS	
Arrowgrass, Threerib	*Triglochin striatum*
Beaksedge, Fascicled	*Rhynchospora fascicularis*
Beaksedge, Millet	*Rhyncospora miliacea*
Beaksedge, White	*Rhynchospora alba*
Bulrush, Algal	*Scirpus confervoides*
Bulrush, AmericanThree-square	*Schoenoplectus pungens*
Bulrush, Softstem	*Schoenoplectus tabernaemontani*
Cottongrass, Tawny	*Eriophorum virginicum*
Flatsedge, Redroot	*Cyperus erythrorhizos*
Nutgrass	*Cyperus esculentus*
Rush, Nut	*Scirpus oligantha*
Rush, Giant	*Schoenoplectus robustus*
Sedge	*Carex leptalea*
Sedge	*Carex lurida*
Sedge, Hairy Umbrella	*Fuirena squarrosa*
Sedge, Dwarf Uumbrella	*Fuirena pumila*
Spikerush, Bald	*Fimbristylis spadicea*
Spikerush, Blunt	*Eleocharis obtusa*
Spikerush, Common	*Eleocharis palustris*
Spikerush, Dwarf	*Eleocharis parvula*
Spikerush, Foursquare	*Eleocharis quadrangulata*
Spikerush, Slender	*Eleocharis acicularis*
Spikerush, Path	*Eleocharis tenuis*
Rush, Black Needle	*Juncus roemerianus*
Rush, Canada	*Juncus canadensis*
Rush, Creeping	*Juncus repens*
Rush, Sharp-fruit	*Juncus acuminatus*
Rush, Soft	*Juncus effuses*
Umbrella-sedge	*Cyperus polystachyos*
Umbrella-sedge	*Cyperus spp.*

COMMON NAME	SCIENTIFIC NAME
FLORA - GRASSLIKE PLANTS	
Woolgrass	*Scirpus cyperinus*

COMMON NAME	SCIENTIFIC NAME
FLORA - FORBS (BROADLEAF HERBACEOUS PLANTS)	
Alligatorweed (Exotic)	*Alternanthera philoxeroides*
Ammannia	*Ammannia teres* *Ammannia coccinea*
Arrow Arum	*Peltandra virginica*
Arrowhead, Duck Potato	*Sagittaria spp.*
Aster	*Aster spp.*
Atriplex, Pigweed	*Atriplex patula*
Bacopa spp.	*Bacopa monnieri*
Beggarticks	*Bidens spp.*
Beggarticks, Nodding	*Bidens cernua*
Bishopweed, Mock	*Ptilimnium capillaceum*
Bladderwort	*Utricularia spp.*
Buckwheat	*Fagopyrum sagittatum*
Buttercup	*Ranunculus spp.*
Buttonweed	*Diodia virginiana*
Camphorweed, marsh fleabane	*Pluchea purpurascens*
Cattail	*Typha spp.*
Chickweed	*Stellaria spp.*
Clematis, Yam-leaved	*Clematis ternifolia*
Clover, Rabbit-foot	*Trifolium arvense*
Clover	*Trifolium spp.*
Cocklebur	*Xanthium strumarium*
Cudweed	*Gnaphalium purpureum*
Cupscale, American	*Sacciolepis striata*
Dayflower, Asiatic	*Commelina communis*
Daylilly, Orange	*Hemerocallis fulva*
Dock	*Rumex spp.*

COMMON NAME	SCIENTIFIC NAME
FLORA - FORBS (BROADLEAF HERBACEOUS PLANTS)	
Dock, Swamp	*Rumex verticillatus*
Dogfennel	*Eupatorium compositifolium*
Duckweed	*Lemna spp.*
Duckweed, Great	*Spirodela spp.*
Eclipta	*Eclipta alba*
Eelgrass, Water Celery	*Vallisneria americana*
Eryngo	*Eryngium spp.*
Fireweed	*Erechtites hieracifolia*
Frogfruit	*Phyla lanceolata*
False Foxglove, Purple	*Agalinis purpurea*
False Foxglove	*Agalinis spp.*
Goldenrod	*Solidago spp.*
Goldenrod, Canada	*Solidago canadensis*
Ground-cherry, Cutleaf	*Physalis angulata*
Ground-cherry, Virginia	*Physalis virginiana*
Hatpins	*Eriocaulon compressum*
Hemlock, Water	*Cicuta maculata*
Hemp, Water	*Amaranthus cannabinus*
Hempweed, Climbing	*Mikania scandens*
Honeycup	*Zenobia pulverulenta*
Horsenettle	*Solanum carolinense*
Horsetail, Scouring Rush	*Equisetum spp.*
Horseweed	*Erigeron spp.*
Hydrangea, Climbing	*Decumaria barbara*
Iris, Blue Flag	*Iris virginica*
Leather-flower	*Clematis viorna*
Lespedeza, Creeping	*Lespedeza repens*
Lespedeza, Sericea (Exotic)	*Lespedeza cuneata*
Lizard's Tail	*Saururus cernuus*
Loosestrife, Narrow	*Lythrum lineare*
Loosestrife, Purple (Exotic)	*Lythrum salicaria*

COMMON NAME	SCIENTIFIC NAME
FLORA - FORBS (BROADLEAF HERBACEOUS PLANTS)	
Loosestrife, Swamp	*Lysimachia terrestris*
Marigold, Bur	*Bidens laevis*
Meadowbeauty	*Rhexia spp.*
Mermaidweed, Marsh	*Proserpinaca palustris*
Milfoil, Water	*Myriophyllum spp.*
Milkweed	*Asclepias spp.*
Mint	*Mentha spp.*
Mistflower (Blue Boneset)	*Eupatorium coelestinium*
Mistletoe	*Phoradendron serotinum*
Morningglory	*Ipomoea purpurea*
Muskgrass	*Chara spp.*
Mullien, Pink	*Lychnis spp.*
Naiad, Southern	*Najas guadalupensis*
Naiad	*Najas spp.*
Nitella, Stonewart	*Nitella spp.*
Onion, Wild	*Allium spp.*
Orchid, White-fringed	*Habenaria blephariglottis*
Orchid, Yellow-fringed	*Habenaria ciliaris*
Partridgeberry	*Mitchella repens*
Pea, Butterfly	*Clitoria mariana*
Pea, Partridge	*Cassia fasciculata*
Pennywort, Marsh	*Hydrocotyle umbellata*
Pennywort, Virginia	*Obolaria virginica*
Pepperweed, Field (Exotic)	*Lepidium campestre*
Pickerelweed	*Pontederia cordata*
Pigweed, Green Amaranth	*Amaranthus hybridus*
Pigweed, Mexican tea	*Chenopodium ambrosioidea*
Pink, Marsh, Rose of Plymouth	*Sabatia stellaris*
Pitcher Plant, Purple	*Sarracenia purpurea*
Pitcher Plant, Yellow	*Sarracenia flava*
Plantain	*Plantago spp.*

COMMON NAME	SCIENTIFIC NAME
FLORA - FORBS (BROADLEAF HERBACEOUS PLANTS)	
Pokeweed, Common	*Phytolacca americana*
Pondlily, Yellow	*Nuphar lutea*
Poinsettia, Annual	*Euphorbia cyathophora*
Pondweed, Claspingleaf	*Potamogeton perfoliatus*
Pondweed, Sago	*Stuckenia pectinatus*
Pondweed	*Potamogeton spp.*
Primrose, Common Evening	*Oenothera biennis*
Purslane, Common	*Portulaca oleracea*
Pussy-toes	*Antennaria plantaginifolia*
Ragweed	*Ambrosia spp.*
Rattlebox	*Ludwigia spp.*
Rattlebox (Exotic)	*Sesbania punicea*
Rattlessnake Master	Eryngium yuccifolium
Redroot, Carolina	*Lachnanthes caroliniana*
Rotala, Lowland	*Rotala ramosior*
Sesbania	*Sesbania herbacea*
Sicklepod	*Cassia obtusifolia*
Smartweed	*Polygonum spp.*
Sneezeweed	*Helenium spp.*
Sorrel, Heartwing	*Rumex hastatulus*
Sorrel, Wood	*Oxalis dillenii*
Sourgrass	*Oxalis grandis*
Soybean (Exotic)	*Glycine max*
Spadeleaf (Exotic)	*Centella asiatica*
Sphagnum	*Sphagnum spp.*
Spleenwort, Ebony	*Asplenium platyneuron*
Spuge, Spotted	*Chamaesyce maculata*
St. John's-wort	*Hypericum spp.*
St. John's-wort	*Hypericum virginicum*
Supplejack, Alabama	*Berchemia scandens*
Sundew, Spoon-leaved	*Drosera intermedia*

COMMON NAME	SCIENTIFIC NAME
FLORA - FORBS (BROADLEAF HERBACEOUS PLANTS)	
Sweetflag	*Acorus calamus*
Sweetleaf, Horse Sugar	*Symplocos tinctoria*
Thistle, Virginia	*Cirsium virginianum*
Tobacco, Rabbit, Mullein, Woolly	*Verbascum thapsus*
Trefoil, Birdsfoot (Exotic)	*Lotus corniculatus*
Vervain, White	*Verbena urticifolia*
Vetch	*Vicia spp.*
Violet	*Viola spp.*
Waterlily, White or American	*Nymphaea odorata (or tuberosa)*
Watermeal	*Wolffia spp.*
Waterweed	*Elodea spp.*
Waterwort	*Elatine spp.*
Waxweed	*Cuphea carthagenensis*
Widgeongrass	*Ruppia maritima*
Yellow-eyed Grass	*Xyris spp.*

COMMON NAME	SCIENTIFIC NAME
FLORA - MOSSES AND FERNS	
Chainfern, Netted	*Woodwardia areolata*
Chainfern, Virginia	*Woodwardia virginica*
Fern, Bracken	*Pteridium aquilinum*
Fern, Cinnamon	*Osmunda cinnamomea*
Fern, Interrupted	*Osmunda claytoniana*
Fern, Royal	*Osmunda regalis*
Moss	*Mayaca aubletii*

Appendix VII. Priority Bird Species and their Habitats

Species	Status	Habitat			
		Brackish Marsh and Sounds	*Managed Wetlands*	Maritime Shrub, Pocosin, and Swamp Forest	Pine Forests and Savannas
(FL=Federally-listed, SL=State-listed, SC=Species of Management Concern)					
Red-cockaded Woodpecker	FL				X
Sharp-tailed Saltmarsh Sparrow	SC	X	X		
Seaside Sparrow	SC	X	X		
Black Rail	SC	X	X		
Yellow Rail	SC	X	X		
King Rail	SC	X	X		
American Bittern	SC	X	X		
Least Bittern	SC	X	X		
Sedge Wren	SC	X	X		
Marsh Wren	SC	X	X		X
Snow Goose	SC	X	X		X
Tundra Swan	SC	X	X		
Canada Goose	SC	X	X		
American Black Duck	SC	X	X		
Northern Pintail	SC	X	X		
American Green-winged Teal	SC	X	X		
Mallard	SC	X	X		
Peregrine Falcon	SC	X	X		
Northern Parula	SC			X	
Prairie Warbler	SC			X	
Eastern Painted Bunting	SC			X	
Black-throated Green Warbler	SC			X	
Pine Warbler	SC			X	
Prairie Warbler	SC			X	
Prothonotary Warbler	SC			X	
Worm-eating Warbler	SC			X	
Yellow-throated Warbler	SC			X	
Wood Duck	SC			X	
Brown-headed Nuthatch	SC			X	X
Chuck-Will's-Widow				X	X

Appendix VIII. Budget Requests

REFUGE OPERATION NEEDS (RONS) PROJECTS

Projects are ordered by the project number the first two digits of which stand for fiscal year the project was developed. The numbers are listed in the management alternatives.

Projects are listed as tier 1 projects that support approved critical mission or approved minimum staff or tier 2 projects that do not.

Project 97005 (Alligator River)
Tier 2 Project
First Year Request $162,500; Recurring Request $182,000
Station Rank (Alligator River) - 18
This project will provide the funding to hire three full-time permanent employees (one GS-9 forester, one GS-7 forestry technician, and one WG-8 equipment operator) to restore Atlantic white cedar stands on the refuge. Past logging and poor post-harvest management has resulted in over 5,000 acres of Atlantic white cedar clear-cuts on the refuge. These clear-cuts should be restored. Inventories have revealed an adequate stocking of “naturally regenerated” cedar in several of the clear-cuts. However, the cedars are being suppressed by an extremely dense growth of hardwood shrubs. The project involves “releasing” the cedars from hardwood competition by aerial application of an environmentally safe and approved herbicide. This will allow the cedar stands to grow free of competition for a few years. Plans also include planting some stands with seedlings.

Project 97007 (Alligator River)
Tier 2 Project
First Year Request $60,000; Recurring Request $5,000
Station Rank (Alligator River) - 15
This project will provide the funding to purchase 500,000 acres of recent infrared aerial photography in an electronically digitized format. The Alligator River Refuge (a forested wetland) and Pea Island Refuge (a coastal barrier island) have many unique and varied plant and animal communities. Good planning is needed to properly manage these resources and up-to-date photography is needed for good planning. This imagery will be used on the refuge’s geographic information system computer to assist in all phases of refuge management. It will also be used to document land use changes in the red wolf reintroduction area.

Project 97010 (Alligator River)
Tier 2 Project
First Year Request $40,000; Recurring Request $10,000
Station Rank (Alligator River) - 16
This project will provide the funding to install water quality monitoring stations and conduct monitoring. About 70,000 acres of the refuge are comprised of a variety of wetland habitats. A minimum of twelve water quality monitoring stations will be installed, with at least one each in all refuge moist soil units, lakes, streams, selected canals, and adjacent sound and river waters. Data collected will include water level, dissolved oxygen, pH, salinity, and temperature. This data is critically needed to document current water quality conditions and to identify problem areas so that possible solutions can be developed and implemented. A water quality enhancement plan will also be developed, approved, and implemented.

Project 97011 (Alligator River)
Tier 2 Project
First Year Request $65,000; Recurring Request $59,000
Station Rank (Alligator River) - 29
This project will provide the funding to hire a permanent full-time biological technician to develop and implement a Marsh and Water Management Plan. Two new pump sites will be installed to more effectively manage water levels in about 3,000 acres of the 5,400-acre moist soil and farm unit area. The project will provide more efficient management of water levels in the area for waterfowl food production. At critical times during high rainfall events, it will protect roads from flooding and erosion, thereby preventing unnecessary road closures to the public. Pump sites will be installed at the intersections of Milltail and North Perimeter roads and at Buffalo City and Sawyer Lake roads.

Project 97018 (Alligator River)
Tier 2 Project
First Year Request $65,000; Recurring Request $49,000
Station Rank (Alligator River) - 30
This project will provide the funding to purchase a large farm tractor and hire a permanent full-time WG-5 equipment operator. Within the refuge's 4,500-acre farm unit, about 2,000 acres are diked and managed as moist soil units for the production of waterfowl food plants. To improve the food-producing potential of these units, increased soil manipulation practices (e.g., disking, plowing, and mowing) must be conducted. However, a farm tractor of sufficient size is not currently available to the refuge to do this type of work. The purchase of a new rubber-tired, four-wheel drive farm tractor with more than 100-horsepower will meet this need. As stated earlier, the full management potential of the refuge's moist soil units cannot be realized until this piece of equipment is available to the refuge.

Project 97021 (Alligator River)
Tier 2 Project
First Year Request $100,000; Recurring Request $138,000
Station Rank (Alligator River) - 6
This project will provide the funding to add 20 new water control structures and hire a GS-9 resource specialist and a WG-8 equipment operator to manage them. The refuge has an ongoing project restoring the natural hydrology of 50,000 acres. However, this project needs to be expanded by adding 20 new water control structures and subsequently manipulating water levels. This will result in the restoration of 20,000 additional wetland acres over 5 years. The refuge contains about 70,000 acres of forested wetlands, most of which were ditched and channelized by prior owners. This resulted in an unnatural hydrology (water flow) in the area. It has caused some areas to be "too wet" and other areas to be "too dry" for extended periods of time; thereby resulting in a loss or degradation of wildlife habitat.

Project 97022 (Alligator River)
Tier 2 Project
First Year Request $85,000; Recurring Request $15,000
Station Rank (Alligator River) - 1
This project will provide the funding to control common reed (*Phragmites australis*) on 600 acres of the refuge. The Phragmites will be treated with an environmentally safe and approved herbicide by a variety of application methods. Failure to aggressively pursue control will result in the replacement of desirable vegetation by Phragmites and reduce the refuge's ability to provide suitable habitat for waterfowl and other wildlife species. Phragmites is an invasive wetland plant species that has little wildlife value. Once established, it chokes out more desirable plants and degrades the habitat for a variety of wildlife species. On the refuge, the invasion rate of Phragmites has increased over the past ten years due to management activities.

Project 97025 (Alligator River)
Tier 2 Project
First Year Request $38,000; Recurring Request $5,200
Station Rank (Alligator River) - 11
This project will provide the funding to purchase and maintain a globally positioning system (GPS) base station. The base station is needed for the collection of a variety of resource and facility data points (e.g., red wolf locations, red-cockaded woodpecker colony sites, rare plant or habitat types, roads, canals, pump sites, private land holdings). However, the collection of "accurate and precise data" is essential for successful resource and maintenance management. Accurate and precise GPS data depends on access to a community base station so that post-processing of field data can be efficiently done. Without the base station, reliable management decisions cannot be made on a landscape-scale data.

Project 97039 (Pea Island)
Tier 2 Project
First Year Request $65,000; Recurring Request $69,000
Station Rank (Pea Island) - 6
This project will provide the funding to hire a permanent full-time GS-9 assistant manager for the Pea island Refuge to coordinate and administer a growing permit issuance system. The barrier island location of the refuge results in requests for a significant number of permits on an annual basis. Most of the requests are received from: (1) North Carolina Department of Transportation on maintenance issues for North Carolina Highway 12, which bisects the refuge for 12 miles; (2) the U.S. Army Corps of Engineers on Oregon Inlet maintenance dredging and material disposal on refuge beaches; (3) U.S. Navy for maintenance of communication towers; (4) Dare County for storm damage disposal and public use facilities; and (5) University research permits. These requests must be processed through proper environmental agencies.

Project 97040 (Pea Island)
Tier 2 Project
First Year Request $56,000; Recurring Request $84,000
Station Rank (Pea Island) - 3
This project will provide the funding to hire a permanent full-time GS-9 resource specialist to improve coordination with other agencies. The refuge needs better coordination with: (1) National Park Service on public use management, maintenance, visitor comfort station, and law enforcement via a memorandum of understanding; (2) U.S. Army Corps of Engineers on beach nourishment, maintenance dredging, and Oregon Inlet Jetty; (3) North Carolina Department of Transportation on North Carolina Highway 12 issues, terminal groin, and Oregon Inlet Bridge; and (4) North Carolina Wildlife Resources Commission on waterfowl management and law enforcement. All of these activities affect the day-to-day operation of the refuge and inability to conduct these activities will negatively affect trust resources and the public safety.

Project 97041 (Pea Island)
Tier 2 Project
First Year Request $82,000; Recurring Request $49,000
Station Rank (Pea Island) - 2
This project will provide the funding to hire a permanent full-time GS-5 biological technician to conduct biweekly aerial waterfowl surveys from September through March and add or increase other wildlife surveys. The other surveys (e.g., shorebird, piping plover, raptor, sea turtle, colonial waterbird, neotropical songbird) will use standard census techniques. The project is the only way to gauge the effects of high public use and other refuge management programs on the refuge's wildlife resources. The project will improve management of these resources. The Wildlife Census Plan will

be updated and implemented. Pea Island Refuge is a 5,800-acre refuge located on a coastal barrier island that has high public use (two million visitors annually).

Project 97043 (Pea Island)
Tier 2 Project
First Year Request $32,500; Recurring Request $44,000
Station Rank (Pea Island) - 4
This project will provide the funding to hire a permanent full-time GS-5 biological technician to conduct basic nesting and production surveys on black ducks and gadwalls. The surveys will be conducted to document the effects of management on the two species. Based on the survey results, appropriate management activities will be initiated to improve habitat conditions. Black duck and gadwalls have traditionally nested in low, grassy habitat provided on the Pea Island Refuge. However, these habitats have started to succeed to more woody and brushy plant communities.

Project 97045 (Pea Island)
Tier 2 Project
First Year Request $195,000; Recurring Request $213,000; Total: $408,000
Station Rank (Pea Island) - 1
This project will provide the funding to buy equipment and hire two permanent full-time GS-7 park rangers and two WG-6 maintenance workers to serve visitors to and maintain facilities and grounds at Pea Island Refuge. Two interactive computer stations will be installed at the visitor center to help meet visitors' requests for basic information. The stations will display multimedia information on all eastern North Carolina refuges, the National Wildlife Refuge System, wildlife resources, and local destinations. A weather and vandal-proof station will be located on the outside of the visitor center in order to serve visitor needs during times when the visitor center is closed. Approximately two million visitors use the refuge annually. Some are just passing through; however, a large number stop at the visitor center for a variety of reasons.

Project 97047 (Alligator River)
Tier 1 Project
First Year Request $39,000; Recurring Request $10,000
Station Rank (Alligator River) - 5
This project will provide the funding to improve and upgrade the refuge's information resource management (IRM) capabilities by connecting all office computers and related equipment (e.g., printers, plotters, file servers, and copiers) into a modern, high-capacity local area network (LAN). The project will upgrade the existing computers, add file servers, and improve cable and router systems. The project will improve staff efficiency, productivity, and decision-making by using the many advantages of modern technology to get the latest biological reports, transmit information, respond to inquiries, and expand relationships with internal (Ecological Services Office, Migratory Bird Field Office) and external partners (National Park Service, local and state agencies). The LAN will also link all refuge computers to the office's geographic information system (GIS) computer, which will give staff immediate access to current GIS layers, and to high-speed internet access. It will also help eliminate the need for duplicate office equipment (color printers, modems) at each employee's workstation.

Project 97048 (Alligator River)
Tier 2 Project
First Year Request $210,000; Recurring Request $10,000
Station Rank (Alligator River) - 13
This project will provide the funding to buy a truck-tractor and lowboy trailer for use in all aspects of the refuge's management and maintenance programs. The refuge at present has an insufficient number of hauling units to meet the daily needs of the management, maintenance, and fire programs.

An additional hauling unit will allow the refuge to conduct public use, fire management, endangered species management, and biological management activities in a more efficient manner. The lack of ability to transport essential equipment will continue to hinder refuge operations and accomplishment of station objectives.

Project 98003 (Alligator River)
Tier 1 Project
One Time Request $432,000
Station Rank (Alligator River) - 4
This project will provide the funding to conduct a comprehensive cultural resources survey on both the 152,000-acre Alligator River Refuge and the 5,800-acre Pea Island Refuge to identify significant cultural resources. No comprehensive cultural resource evaluations have been conducted on either refuge. Both refuges are located in an area rich in significant prehistoric, Native American, and early colonial history. The outer Banks of North Carolina, where Pea Island is located, is called the "Graveyard of the Atlantic" for all the shipwrecks along the barrier islands starting in the 16th century. Roanoke Island and the adjoining mainland, where Alligator River Refuge is located, are the site of the first English colony in America and the site of the famous "Lost Colony." This project is essential to ensure the identification and protection of any potentially significant cultural resources on these two refuges. The survey will be conducted by either contract archaeologists or through agreements with local universities.

Project 98004 (Alligator River)
Tier 2 Project
First Year Request $80,000; Recurring Request $80,000
Station Rank (Alligator River) - 32
This project will provide the funding to rent 3,000 square feet of new office space as recommended by a recent office review. The General Services Administration is negotiating a five-year contract to include new office space, but an increase in funding is needed to pay for the new office space. Refuge staff has increased to more than 35 full-time employees (both permanent and seasonal) and increase seasonally with summer interns and researchers. The current office space and parking is inadequate. Increased office space will enhance safety, staff efficiency, and morale.

Project 98005 (Pea Island)
Tier 2 Project
First Year Request $85,000; Recurring Request $84,000
Station Rank (Pea Island) - 7
This project will provide the funding to hire a permanent full-time biological technician to monitor the U.S. Army corps of Engineers dredging operations and their effects on beach-dependent wildlife (e.g., shorebirds and sea turtles). Oregon Inlet is located at the north end of the refuge, which is a coastal barrier island. This inlet is the only passage through the barrier islands from the Pamlico Sound to the Atlantic Ocean and is used heavily by recreational and commercial fishing boats. The Corps of Engineers conducts intensive dredging operations to maintain the inlet's opening. This has disrupted natural coastal processes, resulting in beach erosion on the refuge. Changes in dredging operations will be recommended, as needed, to protect wildlife resources.

Project 98006 (Alligator River)
Tier 2 Project
First Year Request $40,000; Recurring Request $5,000
Station Rank (Alligator River) - 12
This project will provide the funding to conduct a comprehensive fisheries survey of refuge lakes, streams, and other water bodies (e.g., canals, ditches, and ponds) to help develop a Fishery Management Plan. The survey will include an evaluation of each aquatic habitat and its ability to support fish populations. Service

fisheries biologists will conduct the survey and plan. Very little is known about the freshwater fishery resources on the refuge. The highly acidic waters associated with organic soils, and the periodic inflow of brackish waters from surrounding sounds, make for a unique combination of aquatic conditions.

Project 98008 (Alligator River)
Tier 2 Project
First Year Request $235,000; Recurring Request $10,000
Station Rank (Alligator River) – Not Ranked
This project will provide the funding to purchase a long-reach tracked excavator for use in all aspects of the refuge's management and maintenance programs. At present, the refuge does not have an excavator that is capable of cleaning out the large canals associated with eighty to ninety miles of primary refuge roads. The new excavator will allow the refuge to conduct public use, fire management, endangered species management, and biological activities in a more efficient manner. The lack of this essential equipment will continue to hinder refuge operations and accomplishment of station objectives.

Project 98010 (Alligator River)
Tier 2 Project
First Year Request $200,000, Recurring Request $3,000
Station Rank (Alligator River) – Not Ranked
This project will provide the funding to purchase six new vehicles to meet the needs of new staff members. The refuge's vehicle fleet has been sorely neglected in terms of additions to the fleet. New staff members (both permanent and seasonal) have been added in recent years; however, no additional vehicles have been purchased due to a lack of funds. At least six new vehicles are needed to properly support all aspects of the refuge's management and maintenance programs. These vehicles will allow the refuge's public use, fire management, endangered species management, and biological program activities to be conducted in a more efficient manner.

Project 98011 (Alligator River)
Tier 2 Project
First Year Request $65,000; Recurring Request $69,000
Station Rank (Alligator River) - 10
This project will provide the funding to hire a permanent full-time GS-9 park ranger to manage the refuge volunteer program. The current refuge volunteer program documents more than 25,000 volunteer hours annually, supporting the biological, maintenance, management, and administrative programs. The current staff is not sufficient to adequately recruit, train, supervise, supply, and administer a program with a larger number of volunteers. Adding a volunteer coordinator will meet both the current need and assist in securing additional volunteer services on the refuge. Volunteers perform tasks such as sea turtle patrol, visitor contact duties, environmental talks at schools, boundary signing, and clerical duties.

Project 99001 (Alligator River)
Tier 2 Project
First Year Request $130,000; Recurring Request $118,000
Station Rank (Alligator River) - 27
This project will provide the funding to hire a permanent full-time GS-9 refuge operations specialist and a GS-5 administrative assistant to meet the administrative needs of increased activities. Expanded refuge operations and activities in program areas such as endangered species management, fire management, biological, public use, visitor services, etc., along with increased administrative tasks, has caused a decrease in overall efficiency in completing administrative functions in a timely manner. To improve refuge operations, these administrative positions are needed. The increased emphasis on

ecosystem management and the associated workload makes it necessary to have a multi-disciplined staff. This increase also necessitates the need for expanded administrative functions.

Project 99002 (Alligator River)
Tier 1 Project
One Time Request $30,000
Station Rank (Alligator River) - 3
This project will provide the funding to restore a minimum of 250,000 acres (over a 20-year period) in eight types of forested habitats found on five national wildlife refuges in the coastal plain of eastern North Carolina and southeastern Virginia. In this area, forest types, such as pine pocosins, maritime forests, Atlantic white cedar, bottomland hardwoods, and cypress-gum swamps, are greatly reduced and degraded from exploitive timbering, land clearing, drainage of wetlands, and commercial development. Water quality will improve as the forest types are restored. Endangered red wolves and red-cockaded woodpeckers, wood ducks, American woodcock, migratory land birds, and the largest remaining black bear population on the mid-Atlantic coast will greatly benefit from the restored forests. Local ecotourism and timber product businesses will also benefit. We will partner with the Department of Defense (45,000-acre U.S. Air Force/Navy bombing range), U.S. Geological Survey, U.S. Forest Service (Croatan National Forest), and the North Carolina Forest Service to accomplish the restoration of these biologically and economically important forest resources.

Project 99003 (Alligator River)
Tier 2 Project
First Year Request $65,000; Recurring Request $82,000
Station Rank (Alligator River) - 22
This project will provide the funding to hire a permanent full-time GS-11 park ranger to provide additional educational opportunities to visitors. The geographic area surrounding the refuge has the North Carolina Aquarium on Roanoke Island, the sailing ship Queen Elizabeth II State Historic Site, Cape Hatteras National Seashore, Fort Raleigh National Historic Site, Wright Brothers National Memorial, Nags Head Woods Nature Preserve, and many other natural and cultural history sites. Hundreds of school groups from a two to four state radius travel here for school field trips in the spring and fall. During the summer months, more than seven million people visit the Outer Banks. Families seek and attend educational programs that will entertain and educate their children. There are many opportunities for the Fish and Wildlife Service to be involved with these activities, and get the Service's message to the public.

Project 99004 (Alligator River)
Tier 2 Project
One Time Request $48,000
Station Rank (Alligator River) - 14
This project will provide the funding to implement an environmental contaminants study of the Dare County Landfill.

Project 00003 (Alligator River)
Tier 1 Project
First Year Request $65,000; Recurring Request $74,000
Station Rank (Alligator River) - 2
This project will provide the funding to hire a permanent full-time GS-11 forester to develop, coordinate, and implement a forest management program on the heavily forested 152,000-acre refuge. A 1999 Forest Management Review recommended a variety of needed forest habitat improvements to include restoration of hardwoods and Atlantic white cedar (a globally imperiled species), control of forest pest species, and effective management of fire-dependent pine stands. A

forester is essential for preparing and implementing site-specific forest management plans that will improve habitat for endangered species (red-cockaded woodpecker), migratory birds (waterfowl and land birds), and important resident wildlife (black bear and white-tailed deer) on the refuge. The forester will also prepare and administer numerous contracts that will be used to accomplish forest habitat improvements, especially in the area of Atlantic white cedar regeneration, southern pine beetle control, and the establishment of permanent fire lanes (needed for prescribed fire and wildfire protection). The forester will work with the Department of Defense resource managers on the 46,000-acre Dare County Bombing Range, which is surrounded by the refuge, to help implement a coordinated forest management program.

Project 00007 (Alligator River)
Tier 1 Project
First Year Request $65,000; Recurring Request $53,000
Station Rank (Alligator River) - 1
This project will provide the funding to hire a permanent full-time GS-7 biological technician to improve water management, wildlife monitoring, and interagency coordination on both the 152,000-acre Alligator River Refuge and the 5,800-acre Pea Island Refuge. Effective water management is essential to restoring the natural hydrology on the Alligator River Refuge, which is heavily dissected by roads, drainage canals, and ditches. It is also essential to the proper management of wetland vegetation in three artificial moist soil units on Pea Island Refuge, which benefit thousands of migratory waterfowl and shorebirds. An improved hydrology regime on Alligator River Refuge will benefit a variety of important wildlife species (e.g., endangered red wolf, black bear, waterfowl, and white-tailed deer) through an overall improvement of habitat quality and diversity. On both refuges, the biological technician will monitor water quality and quantity, water gauges, and pumps. The technician will also survey and monitor endangered red-cockaded woodpecker colonies, conduct fish population surveys, band migratory birds, control invasive plant species (Phragmites), and monitor endangered sea turtle nesting activities and marine mammal strandings. The effects of Army Corps of Engineers dredging and disposal activities on Pea Island Refuge would be monitored to compile biological information needed for management decisions concerning controversial issues associated with beach nourishment and shorebird feeding and nesting habitat.

Project 00012 (Alligator River)
Tier 2 Project
First Year Request $15,800; Recurring Request $7,000
Station Rank (Alligator River) - 25
This project will provide the funding to conduct an internal outreach program. This internal outreach program is very successful in the regions within the Service. Staff members are trained in customer service, public relations, and media relations. Public service announcements are produced using various staff members. The announcements portray the positive attributes of staff and refuge programs. The team approach in training produces a quality product.

Project 00092 (Pea Island)
Tier 1 Project
First Year Request $65,000; Recurring Request $54,000
Station Rank (Pea Island) - 1
This project will provide the funding to hire a permanent full-time WG-8 maintenance worker to help operate and maintain four refuge pump stations, numerous water control structures, and other facilities on the 5,800-acre Pea Island Refuge and the nearby 152,000- acre Alligator River Refuge. The pumps and water control structures are used to regulate the flooding and draining of three artificial impoundments on Pea Island Refuge and extensive farm management and moist soil units on the Alligator River Refuge. Effective water management is essential to restoring natural hydrology

(which has been degraded by an extensive system of roads, drainage canals, and ditches) on the Alligator River Refuge. It is also essential to the proper management of wetland vegetation in the intensively managed artificial impoundments on the Pea Island Refuge, which benefit thousands of migratory waterfowl and shorebirds. This maintenance worker is essential to the proper operation, maintenance, and repair of refuge pumps, water control structures, and other facilities (e.g., buildings, grounds, trails, vehicles, and equipment) associated with water management and other refuge operations (e.g., public use, biological, and prescribed fire). The harsh climatic and environmental conditions (e.g., corrosive salt air, hurricanes) associated with northeastern North Carolina make it necessary to have a quality preventive and cyclic maintenance program. Refuge facilities are in need of constant maintenance to increase the lifespan and efficiency of all refuge operations.

Project 00094 (Alligator River)
Tier 1 Project
First Year Request $65,000; Recurring Request $74,000
Station Rank (Alligator River) - 6
This project will provide the funding to hire a permanent full-time GS-11 computer specialist to improve automated data processing and geographic information system operations on two refuges: Alligator River and Pea Island. Refuge operations and maintenance decisions must be based on the most reliable, up-to-date information available. The use of modern automated data processing and geographic information system technology will allow the two refuges' staff (about 30 employees at present) to obtain the latest biological information, analyze data, transmit information, respond to inquiries, and communicate with partners. A computer specialist would administer and maintain the program. As fast as computer technology is advancing, the ability to efficiently gather, analyze, and disseminate information and data increases staff efficiency and fosters professional operations.

Project 00095 (Pea Island)
Tier 1 Project
First Year Request $65,000; Recurring Request $74,000
Station Rank (Pea Island) - 3
This project will provide the funding to hire a permanent full-time GS-11 wildlife biologist to expand and enhance the biological monitoring program on the 5,800-acre Pea Island Refuge and the 152,000-acre Alligator River Refuge. The field biologist will assist the senior refuge biologist and one biological technician in coordinating and conducting all wildlife and habitat surveys on the two refuges. Having a field biologist to oversee biological operations will allow the senior wildlife biologist to develop various wildlife and habitat management plans, which would then be implemented by the field biologist. These plans are essential to the proper management of a diverse number of endangered species (e.g., red wolf, red-cockaded woodpecker, piping plover, and loggerhead sea turtle) and other important wildlife species (e.g., bald eagle, American alligator, waterfowl, shorebirds, wading birds, land birds, black bear, and white-tailed deer) that use these two refuges. Habitat and fisheries surveys, based on approved plans, would also be conducted or coordinated by the wildlife biologist in consultation with Service fishery biologists, foresters, and fire management specialists.

Project 00096 (Pea Island)
Tier 1 Project
First Year Request $65,000; Recurring Request $60,000
Station Rank (Pea Island) - 4
This project will provide the funding to hire a permanent full-time WG-10 heavy equipment mechanic to maintain and repair bulldozers, road graders, draglines, farm equipment, over-the-road truck tractors, fire equipment, front-end loaders, and fixed pump stations on two refuges: the 5,800-acre Pea Island Refuge and 152,000-acre Alligator River Refuge. Currently, the refuges have no staff person qualified to maintain and repair heavy equipment (mostly diesel engines). A qualified diesel

mechanic would improve the overall refuge maintenance operations by reducing equipment downtime and by reducing transportation costs to commercial repair facilities. Also, the life of heavy equipment would be extended through an effective preventative and cyclic maintenance program conducted by this position. A large assortment of construction type heavy equipment is used to maintain the two refuges' infrastructure such as roads (more than 150 miles), dikes, water control structures, trails, and firebreaks. These refuge facilities are heavily used by the visiting public and are necessary for completing many management activities. Having a heavy equipment mechanic to properly maintain a viable fleet of equipment is necessary to support all areas of refuge management.

Project 00098 (Pea Island)
Tier 1 Project
First Year Request $65,000; Recurring Request $58,000
Station Rank (Pea Island) - 2
This project will provide the funding to hire a permanent full-time GS-7 park ranger (law enforcement) to ensure a proactive law enforcement program on this 5,800-acre refuge. At present, four dual-purpose officers provide reactive visitor safety and resource protection on this refuge and the nearby 152,000-acre Alligator River Refuge. These two refuges host more than two million annual visitors; most of them visit Pea Island Refuge. However, visitation and crime is increasing annually on both refuges. Therefore, a full-time refuge officer is needed to provide information to the visiting public (while striving for voluntary compliance) and to protect the refuge's numerous visitors from a more sophisticated criminal element. The officer is needed to protect the two refuges' significant wildlife resources such as black bear (the largest concentration of black bears on the mid-Atlantic coast) and endangered red wolf on Alligator River Refuge, and endangered sea turtles and piping plovers that nest on Pea Island Refuge. The poaching of other important wildlife (e.g., diamond-backed turtle, white-tailed deer, timber rattlesnake, and yellow-spotted turtle), illegal collecting of cultural and historic resources, and vandalizing of refuge facilities, equipment, and signs would be reduced. The refuge officer will work closely with various local, state, and federal law enforcement agencies (Department of Defense) to improve the coordination and efficiency of law enforcement operations in the vicinity of both refuges.

Project 00099 (Pea Island)
Tier 1 Project
First Year Request $65,000; Recurring Request $74,000
Station Rank (Pea Island) - 5
This project will provide the funding to hire a permanent full-time GS-11 park ranger (wildlife interpretive specialist) to plan, design, and coordinate wildlife exhibits, trails, and special events. Over two million visitors use Pea Island Refuge and the nearby Alligator River Refuge annually, and the number of visitors is increasing every year. A wildlife interpretive specialist is needed to meet the increasing demand for quality environmental education and wildlife interpretation facilities, programs, and events on the two refuges. Day-to-day public use operations and activities need to be directed at a professional level, which this position will accomplish. The wildlife interpretive specialist will also coordinate the operation of the refuge visitor center, environmental education and interpretation programs, and large volunteer program (regular volunteers from the community, college interns, work campers). This position will provide the proper oversight and coordination of these programs and an active friends group (Coastal Wildlife Refuge Society).

Project 02001 (Alligator River)
Tier 2 Project
First Year Request $65,000; Recurring Request $69,000
Station Rank (Alligator River) - 2
This project will provide the funding to hire a permanent full-time GS-9 refuge operations specialist to serve as a safety/environmental compliance coordinator and asset manager. The position would

meet ever-increasing demands for environmental protection and assurance of a safe visitor experience and employee work environment. This position will serve as the station's safety officer and be responsible for conducting periodic safety inspections, identifying safety issues, managing all safety documentation, and conducting safety meetings. Refuge environmental audits and compliance implementation will be coordinated through this position. The individual will be responsible for managing real property inventory and personal property databases and managing the stations' Service Asset and Maintenance Management System (SAMMS) computerized maintenance management software application to track maintenance expenditures, capture maintenance needs, quantify maintenance activities, and report maintenance accomplishments. The position will serve both the Alligator River and Pea Island Refuges.

Project 04001 (Alligator River)
Tier 2 Project
First Year Request $330,000; Recurring Request $41,000
Station Rank (Alligator River) - 24
This project will provide the funding to construct new refuge residences, a "duplex" (in one structure) that has two units (sides), each with 1,500–1,600 square feet. The estimated total cost is $250,000. The justification is the lack of affordable housing in the area for permanent full-time entry-level employees. The high cost of housing negatively affects the refuge's ability to attract the "best and brightest" to the Service in this area. The project includes costs for initial construction and long-term maintenance (including a staff position).

Tier 1 Refuge Operation Needs System (RONS) Projects (Projects that address critical mission criteria) (Both refuges' projects are listed because most projects are shared and benefit both refuges)

Refuge	Number	Rank	Cost	FTE	Description
			First Year, Recurring, Total First Year		
ARNWR	00007	1	65K, 53K,118K	1.0	Improve biological data collection and water management (biological technician).
ARNWR	00003	2	65K,74K,139K	1.0	Implement a comprehensive forest management program (forester).
ARNWR	99002	3	30K,0K,30K	0.0	Restore the ecosystem's coastal plain forests.
ARNWR	98003	4	432K,0K,432K	0.0	Identify and protect cultural resources.
ARNWR	97047	5	39K,10K,49K	0.0	Improve information resource management.
PINWR	00092	1	65K,54K,119K	1.0	Restore and manage important wetlands (maintenance worker).
PINWR	00098	2	65K,58K,123K	1.0	Improve resource and visitor protection (park ranger-enforcement).
PINWR	00095	3	65K,74K,139K	1.0	Expand biological monitoring programs (wildlife biologist).
PINWR	00096	4	65K,60K,125K	1.0	Improve equipment maintenance and repair (heavy equipment mechanic).
PINWR	00099	5	65K,74K,139K	1.0	Enhance public education and outreach programs (park ranger-interpretation).
PINWR	00094	6	65K,74K,139K	1.0	Provide improved computer support (computer specialist).
ARNWR	97022	1	85K,15K,100K	0.0	Reduce or eradicate invasive 'Phragmites' pest plant
ARNWR	02001	2	65K,69K,134K	1.0	Improve safety, environmental compliance, and asset management (assistant manager-facilities)
ARNWR	97021	6	100K,138K,238K	2.0	Restore hydrology on forested wetlands
ARNWR	98011	10	65K,69K,134K	1.0	Improve volunteer coordination (park ranger).
ARNWR	97025	11	38K,5.2K,43.2K	0.0	Improve resource management data collection

Refuge	Number	Rank	Cost	FTE	Description
			First Year, Recurring, Total First Year		
ARNWR	98006	12	40K,5K,45K	0.0	Improve fisheries management capabilities.
ARNWR	97048	13	210K,10K,220K	0.0	Improve resource management and maintenance operations.
ARNWR	99004	14	48K,0K,48K	0.0	Environmental contaminants study – Dare County Landfill
ARNWR	97007	15	60K,5K,65K	0.0	Improve resource management planning
ARNWR	97010	16	40K,10K,50K	0.0	Improve water quality monitoring capabilities
ARNWR	97005	18	162.5K,182K, 344.5K	3.0	Enhance natural regeneration of Atlantic white cedar (forester, forestry technician, engineering equipment operator)
ARNWR	99003	22	65K,82K,147K	1.0	Improve public outreach and education activities (park ranger).
ARNWR	04001	24	330K,41K,371K	0.0	Provide entry level employee housing.
ARNWR	00012	25	15.8K,7K,22.8K	0.0	Implement Ambassador Program.
ARNWR	99001	27	130K,118K,248 K	2.0	Improve administrative support (refuge operations specialist), administrative assistant).
ARNWR	97011	29	65K,59K,124K	1.0	Improve water level management in moist soil/farm units (biological technician).
ARNWR	97018	30	65K,49K,114K	1.0	Improve management of moist soil units (maintenance worker).
ARNWR	98004	32	80K,80K,160K	0.0	Increase refuge office space.
ARNWR	98008	99	235K,10K,245K	0.0	Improve resource management and maintenance operations (excavator).
ARNWR	98010	99	200K,3K,203K	0.0	Improve resource management and maintenance operations (vehicle fleet).
PINWR	97045	1	195K,213K,408 K	4.0	Enhance visitor services and education (park rangers, maintenance workers).
PINWR	97041	2	82K,49K,131K	1.0	Expand wildlife monitoring surveys (biological technician).

Refuge	Number	Rank	Cost	FTE	Description
			First Year, Recurring, Total First Year		
PINWR	97040	3	56K,84K,140K	1.0	Improve coordination with other resource and public use agencies (resource specialist).
PINWR	97043	4	32.5K,44K,76.5 K	1.0	Improve waterfowl nesting and production surveys (biological technician).
PINWR	97039	6	65K,69K,134K	1.0	Improve administration and coordination of special uses (refuge operations specialist).
PINWR	98005	7	85K,84K,169K	1.0	Monitor Oregon inlet dredging operations (biological technician).

PINWR = Pea Island National Wildlife Refuge
ARNWR = Alligator River National Wildlife Refuge
Project numbers have the fiscal year the project was developed as the first two numbers.

MAINTENANCE MANAGEMENT SYSTEM (MMS) PROJECTS

Project Number	Project Name	Year Planned	Cost	Combined Station Rank (Alligator River Rank)	Station Name
Alligator River Projects					
90041	Rehabilitate and Gravel Milltail Road		$0		Alligator River
95001	Replace Laurel Bay and Creef Pump Stations	2011	$1,879,000		Alligator River
97008	Construct Visitor Center and Administrative Office Complex	2011	$3,724,000	9(7)	Alligator River
97009	Construct an Informational Trail Area		$54,000		Alligator River
97049	Rehabilitate Equipment Repair Facility	2010	$522,000		Alligator River
98007	Replace Worn Shaft Bearings on Laurel Bay Waterfowl Pumps	2008	$50,000	60(52)	Alligator River
98009	Rehabilitate and Gravel Milltail Road		$0		Alligator River
98010	Replace Military Truck Tractor		$104,000		Alligator River
98011	Replace Ford 545 Mowing Tractor		$55,000	41(34)	Alligator River
98013	Replace Timer Equipment Trailer		$53,000	36(30)	Alligator River
98017	Rehabilitate Creef Cut Walking Trail		$38,000		Alligator River
98025	Rehabilitate Primary Refuge Road System	2009	$283,000	33(28)	Alligator River
98029	Replace Mowers		$274,000	50(42)	Alligator River
98030	Rehabilitate Primary Canal System	2007	$60,000	30(25)	Alligator River
98032	Replace 1978 D3 Crawler Tractor		$136,000	49(41)	Alligator River
98037	Replace Ford 6610 Mowing Tractor		$88,000	43(36)	Alligator River
98039	Replace 15-Ton Crane and 10-Ton Forklift		$120,000	14(11)	Alligator River

Project Number	Project Name	Year Planned	Cost	Combined Station Rank (Alligator River Rank)	Station Name
98041	Replace Workhorse Equipment Transport Trailer		$71,000	57(49)	Alligator River
98042	Replace John Deere 644G Front-end Loader		$186,000		Alligator River
98044	Replace Caterpillar D6H Crawler Tractor		$235,000		Alligator River
98045	Replace Caterpillar EL200B Excavator		$238,000	29(24)	Alligator River
98046	Replace John Deere 770B Road Grader		$230,000		Alligator River
98047	Replace Boat, Motor and Trailer		$55,000		Alligator River
98048	Replace Refuge Road Gates	2007	$31,000	37(31)	Alligator River
98052	Replace Water Control Structures	2011	$53,000		Alligator River
98065	Replace Worn Shaft Bearings on Creek Waterfowl Moist Soil Unit Pumps	2008	$32,000	59(51)	Alligator River
99001	Replace Nodwell Flex Tracked Vehicle		$82,000	44(37)	Alligator River
99005	Replace Allis Chalmers Front End Loader		$164,000	24(20)	Alligator River
99006	Replace ford L9000 Dump Truck		$120,000	47(40)	Alligator River
99007	Repair Parking Area Surface	2008	$43,000	21(40)	Alligator River
99009	Replace Air Boat		$39,000	38(32)	Alligator River
99011	Replace Spryte Thiokol Marsh Buggy		$110,000	45(38)	Alligator River
01001	Remove Military Facility Structures	2008	$32,000	42(35)	Alligator River
01007	Replace 1994 Ford Truck Tractor		$105,000	46(39)	Alligator River
01009	Replace 1994 Chevy Wildland Fire Pumper Unit		$64,000		Alligator River

Project Number	Project Name	Year Planned	Cost	Combined Station Rank (Alligator River Rank)	Station Name
01010	Replace 1996 Ford L9000 Truck Tractor Hauling Unit		$105,000		Alligator River
01017	Replace 1997 Ford F150 Pickup (Wolf)		$31,000		Alligator River
01018	Replace 1997 Ford F150 Pickup (Wolf)		$31,000		Alligator River
01020	Replace 1997 Dodge Ram 1500 Pickup (Wolf)		$31,000		Alligator River
01021	Replace 1998 Ford Explorer (Wolf)		$31,000		Alligator River
01023	Replace 1997 Dodge Ram 1500 Pickup (Wolf)		$31,000		Alligator River
01024	Replace 1997 Ford F350 Crewcab Pickup (Fire)		$38,000		Alligator River
01025	Replace 1996 Ford Van		$38,000	5(5)	Alligator River
01028	Replace Worn 1988 IHC Truck Tractor		$105,000	16(13)	Alligator River
01029	Replace 1979 Osh Kosh Truck Tractor and Trailer		$169,000	15(12)	Alligator River
01030	Replace 1997 Ford Explorer		$31,000		Alligator River
01031	Replace Flex Tracked Fire Fighting Tractor (AX4)		$185,000	51(43)	Alligator River
01032	Replace Flex Tracked Fire Fighting Tractor (AX2)		$233,000	32(27)	Alligator River
01033	Replace Full Tracked Fire Fighting Tractor (AX6)		$233,000	53(45)	Alligator River
01034	Replace Trailer Mounted Pump Unit Engine (Gator 1)		$21,000	10(8)	Alligator River
01035	Replace Trailer Mounted Pump Unit Engine (Gator 2)		$21,000	13(10)	Alligator River
01036	Replace Trailer Mounted 16” Water Pump (Pump 1)		$10,000	12(9)	Alligator River

Project Number	Project Name	Year Planned	Cost	Combined Station Rank (Alligator River Rank)	Station Name
01037	Replace Trailer Mounted 16” Water Pump (Pump 2)		$10,000	17(14)	Alligator River
01038	Replace Heavy Equipment Transport Trailer (Witzco)		$53000	54(46)	Alligator River
01039	Replace Heavy Equipment Transport Trailer (Boaz)		$53,000	55(47)	Alligator River
01040	Replace Ford 8260 Agricultural Tractor		$58,000		Alligator River
01041	Replace Military Excess Bucyrus Erie Dragline		$287,000	19(16)	Alligator River
01042	Replace Worn Ford 6640 Boomaxe Agricultural Tractor		$79,000	58(50)	Alligator River
01043	Replace Fully Tracked Firefighting (Tractor) Equipment (AX5)		$233,000	52(44)	Alligator River
01048	Replace Military Pettibone Forklift		$169,000	31(26)	Alligator River
02001	Replace 1998 Ford Taurus		$27,000		Alligator River
02002	Replace 1999 Ford F-250 (Wolf)		$29,000		Alligator River
02003	Replace 1999 Ford F-150		$29,000		Alligator River
02004	Replace 1999 Ford F-150		$29,000		Alligator River
02005	Replace 1999 Chevy C-7500 Dump Truck		$42,000		Alligator River
02006	Replace 2001 Dodge 2500		$29,000		Alligator River
02007	Replace 2001 Dodge 2500		$29,000		Alligator River
02008	Replace 2001 Dodge 2500		$29,000		Alligator River
02009	Replace 2000 Chevy Tahoe		$31,000		Alligator River
02010	Replace 2000 Ford Expedition (Planners)		$31,000		Alligator River

Project Number	Project Name	Year Planned	Cost	Combined Station Rank (Alligator River Rank)	Station Name
02011	Replace 2000 Chevy Astro (Planners)		$31,000		Alligator River
02012	Replace 2001 Dodge Ram 2500 (Wolf)		$29,000		Alligator River
02013	Replace 2001 Ford F-150		$29,000		Alligator River
02014	Replace 2001 Ford F-150		$29,000		Alligator River
02015	Replace 2002 Ford F-150		$29,000		Alligator River
02016	Replace 2002 Ford F-150		$29,000		Alligator River
02017	Replace 2002 Ford F-150		$29,000		Alligator River
02018	Replace 2002 Ford F-150		$29,000		Alligator River
02019	Replace 2002 Sterling L-9500		$99,000		Alligator River
02020	Replace 2002 LE Dodge LE 1500		$29,000		Alligator River
02021	Replace 2002 Ford Expedition		$31,000		Alligator River
02022	Replace 2002 Ford F-250 (Wolf)		$29,000		Alligator River
02023	Replace 2002 Ford F-250 (Wolf)		$29,000		Alligator River
02024	Replace 2002 Ford F-450		$47,000		Alligator River
02025	Replace Allis Chalmers Forklift		$42,000	40(33)	Alligator River
02026	Replace Caterpillar D3C LGP		$73,000		Alligator River
02027	Replace Case 4X4 Front End Loader		$167,000		Alligator River
02029	Replace Dresser TD12 LGP Dozer		$188,000		Alligator River
02030	Replace Trail King Dump Trailer		$42,000		Alligator River
02031	Replace Ford 8160 Agricultural Tractor		$84,000		Alligator River
02032	Replace Ford 8830 Agricultural Tractor		$94,000		Alligator River
02034	Replace Fontaine Low Boy Trailer		$63,000		Alligator River

Project Number	Project Name	Year Planned	Cost	Combined Station Rank (Alligator River Rank)	Station Name
02035	Replace John Deere 4100 Mowing Tractor		$16,000		Alligator River
02036	Replace John Deere 5400 Mowing Tractor		$31,000		Alligator River
02037	Replace Terez D7F Dozer		$261,000		Alligator River
02038	Replace 45' Bridge Trailer		$31,000		Alligator River
02039	Replace Refuge Operations Facility	2011	$1,670,000		Alligator River
02040	Construct Red Wolf Processing Facility		$131,000	2(2)	Alligator River
02043	Construct Two HAZMAT Storage Buildings		$60,000	1(1)	Alligator River
02044	Construct Biological Program Storage Building		$40,000	3(3)	Alligator River
02128	Replace champion 710A Road grader		$136,000	25(21)	Alligator River
03001	Replace Hyster Forklift		$26,000	23(19)	Alligator River
03002	Replace Worn 2002 Ford Explorer		$31,000		Alligator River
03003	Replace Worn 2002 Ford Explorer		$31,000		Alligator River
03004	Replace Worn 2003 Ford F-250 (Wolf)		$31,000		Alligator River
03005	Replace Worn 2003 F-150		$31,000		Alligator River
03006	Replace 1995 Ford F-150		$31,000	4(4)	Alligator River
03007	Replace Worn Chevy Silverado (Fire)		$37,000		Alligator River
03008	Replace 21' Boston Whaler		$63,000		Alligator River
03009	Replace Water Tender Truck (Tanker)		$73,000		Alligator River
03011	Replace 2 Worn Creef Pump Engines		$94,000	27(22)	Alligator River
03012	Replace 2 Worn Laurel Bay Pump Engines		$94,000	28(23)	Alligator River

Project Number	Project Name	Year Planned	Cost	Combined Station Rank (Alligator River Rank)	Station Name
03013	Replace Stockpile of Aggregate Road Maintenance Material	2006	$84,000	6(6)	Alligator River
03014	Rehabilitate Station Heliport		$29,000	56(48)	Alligator River
03015	Replace Laurel Bay pump Vehicular Crossing		$235,000	18(15)	Alligator River
03017	Replace Worn Caterpillar 420D Backhoe/Loader		$84,000		Alligator River
04	Rehabilitate Pump Road		$189,000		Alligator River
04001	Resurface Milltail Road (2.2 miles)	2004	$400,000		Alligator River
04002	Replace 2004 Ford F150		$30,000		Alligator River
04003	Replace 2004 Ford F650 Service Truck		$62,000		Alligator River
04004	Replace 2004 Ford F650 Service Truck (Fire)		$62,000		Alligator River
04005	Replace 2004 Ford F150 Crew Cab		$30,000		Alligator River
04006	Replace 2004 Ford F150 Crew Cab		$30,000		Alligator River
04007	Replace 2004 Ford Expedition (Fire)		$36,000		Alligator River
04008	Replace 2003 Ford F150		$30,000		Alligator River
04009	Replace 2004 Ford Expedition		$36,000		Alligator River
04010	Repave Creef Cut Trail		$35,000		Alligator River
04011	Replace Worn CAT 320 Long Reach Excavator		$180,000		Alligator River
04012	Rehabilitate Koehring Road		$696,000		Alligator River
04013	Rehabilitate Bear Road		$293,000		Alligator River
04014	Rehabilitate Blueberry Road		$285,000		Alligator River
04015	Rehabilitate Borrow Pit Road		$122,000		Alligator River
04016	Rehabilitate Brier Hall Road		$364,000		Alligator River

Project Number	Project Name	Year Planned	Cost	Combined Station Rank (Alligator River Rank)	Station Name
04017	Rehabilitate Deep Bay Road		$129,000		Alligator River
04018	Rehabilitate Grouse Road		$115,000		Alligator River
04019	Rehabilitate Long Curve Road		$933,000		Alligator River
04020	Rehabilitate Milltail Road		$975,000		Alligator River
04021	Rehabilitate Pamlico Road		$212,000		Alligator River
04022	Rehabilitate Point Peter Road		$169,000		Alligator River
04024	Rehabilitate Whipping Creek Road		$429,000		Alligator River
04025	Rehabilitate Dry Ridge Road		$717,000		Alligator River
04026	Rehabilitate Possum Road		$274,000		Alligator River
04027	Rehabilitate Twiford Road		$363,000		Alligator River
04028	Rehabilitate Buffalo City Road		$243,000		Alligator River
04029	Rehabilitate Lake Neighborhood Road		$175,000		Alligator River
04030	Rehabilitate Sandy Ridge Road		$92,000		Alligator River
04031	Rehabilitate Bay Road		$158,000		Alligator River
04032	Rehabilitate Cypress Road		$57,000		Alligator River
04033	Rehabilitate Cedar Road		$180,000		Alligator River
04034	Rehabilitate Jake Road		$80,000		Alligator River
04035	Rehabilitate West Widgeon Road		$138,000		Alligator River
04036	Rehabilitate Pollock Road		$236,000		Alligator River
04037	Rehabilitate Wigeon Road		$134,000		Alligator River
04038	Rehabilitate Canvasback Road		$173,000		Alligator River
04039	Rehabilitate Little Field Road		$115,000		Alligator River
04040	Rehabilitate Eagle Road		$113,000		Alligator River

Project Number	Project Name	Year Planned	Cost	Combined Station Rank (Alligator River Rank)	Station Name
04041	Rehabilitate Storm Road		$111,000		Alligator River
04042	Rehabilitate Reuben Road		$79,000		Alligator River
04043	Rehabilitate Sassafras Road		$59,000		Alligator River
04044	Rehabilitate Alligator Road		$323,000		Alligator River
04046	Rehabilitate H&B Road		$386,000		Alligator River
04047	Rehabilitate Richmond Road		$159,000		Alligator River
04048	Rehabilitate Chip Road		$143,000		Alligator River
04049	Rehabilitate Lake Worth Road		$107,000		Alligator River
04050	Rehabilitate Beaver Road		$165,000		Alligator River
04051	Rehabilitate River Road		$151,000		Alligator River
04052	Rehabilitate Hickory Road		$125,000		Alligator River
04053	Rehabilitate Wynne Road		$148,000		Alligator River
04054	Rehabilitate Osprey Road		$98,000		Alligator River
04055	Rehabilitate Hook Road		$151,000		Alligator River
04056	Rehabilitate North Perimeter Road		$573,000		Alligator River
04057	Rehabilitate Peterson Road		$203,000		Alligator River
04058	Rehabilitate Sawyer Lake Road		$405,000		Alligator River
04059	Rehabilitate Creef Road		$223,000		Alligator River
04060	Rehabilitate Bobcat Road		$258,000		Alligator River
04061	Rehabilitate Gadwall Road		$177,000		Alligator River
04062	Rehabilitate Link Road		$97,000		Alligator River
04063	Rehabilitate Butler Road		$290,000		Alligator River
04064	Rehabilitate Laurel Bay Road		$442,000		Alligator River
04067	Rehabilitate Blueberry Road Parking Area		$30,000		Alligator River

Project Number	Project Name	Year Planned	Cost	Combined Station Rank (Alligator River Rank)	Station Name
04068	Repair/Rehabilitate (Koehring) Wildlife Parking Area		$36,000		Alligator River
04069	Repair/Rehabilitate Pollock/Koehring Wildlife Parking Area		$26,000		Alligator River
04070	Repair/Rehabilitate Cedar Road Parking Lot		$62,000		Alligator River
04071	Repair/Rehabilitate Koehring Road Parking Lot		$25,000		Alligator River
04072	Repair/Rehabilitate Borrow Pit Parking Lot		$47,000		Alligator River
04073	Repair/Rehabilitate Peter Point Road Parking Area		$30,000		Alligator River
04077	Repair/Rehabilitate Sawyer Lake (Buffalo Ramp) Parking Area		$26,000		Alligator River
04078	Repair/ Rehabilitate Deep Bay Boat Launch Area		$51,000		Alligator River
04079	Repair/Rehabilitate Dipper Road Parking Area		$28,000		Alligator River
04080	Repair/Rehabilitate Widgeon Road Parking		$65,000		Alligator River
04080	Repair/Rehabilitate Twiford Road Parking #1		$122,000		Alligator River
04083	Repair/Rehabilitate Pamlico Road Heliport Parking Area		$34,000		Alligator River
04087	Repair/Rehabilitate Twiford Road Parking #2		$39,000		Alligator River
04097	Replace 2004 Ford F150 Pickup		$30,000		Alligator River
04098	Replace 2004 Ford F150 Pickup		$30,000		Alligator River
98014	Replace John Deere 4240 Tractor		$157,000	8(2)	Pea Island
98021	Replace South Pond Pumping Station	2008	$388,000	39(7)	Pea Island

Project Number	Project Name	Year Planned	Cost	Combined Station Rank (Alligator River Rank)	Station Name
98055	Replace Pump Station Bulkhead	2006	$27,000	35(6)	Pea Island
98057	Replace 1960 Office, Shop, Garage, and Residence	2010	$800,000	20(4)	Pea Island
98063	Replace Bulkhead				Pea Island
98064	Replace North Pond Bulkhead				Pea Island
00007	Replace Storm Damaged Water Control Structure	2009	$301,000		Pea Island
01044	Replace Gasoline Fuel Tank	2006	$25,000	7(1)	Pea Island
01045	Replace Aboveground Diesel Fuel Storage Tank	2006	$46,000	11(3)	Pea Island
01046	Replace North Pond Pump Station	2008	$474,000		Pea Island
01047	Replace New Field Pump Station	2008	$479,000	53(8)	Pea Island
03001	Transportation Planning for CCPs	2007	$261,000		Pea Island
04001	Replace Damaged Bulkhead That Protects the North Pond Moist Soil Units (West Side)	2009	$61,000	26(5)	Pea Island
04089	Repair/Rehabilitate New Inlet Parking Area		$39,000		Pea Island
04090	Repair/Rehabilitate (New Inlet) Kiosk Parking Area		$27,000		Pea Island
04091	Repair/Rehabilitate Visitor Center – Wildlife Trail Parking Area		$0		Pea Island
04092	Repair/Rehabilitate Pea Island Parking #2		$0		Pea Island
04093	Repair/Rehabilitate Pea Island (Salt Flats) Parking #5		$0		Pea Island

Project Number	Project Name	Year Planned	Cost	Combined Station Rank (Alligator River Rank)	Station Name
04094	Repair/Rehabilitate Pea Island Parking #6, #5, #4, North Kiosk, and Visitor Center/Wildlife trail Parking Areas		$62,000		Pea Island
04095	Repair/Rehabilitate North Kiosk Parking		$0		Pea Island
04096	Repair/Rehabilitate Pea Island Parking #8 (Oregon Inlet)		$57,000		Pea Island

Appendix IX. Wilderness Review

BACKGROUND

Wilderness reviews are a required component of the Fish and Wildlife Service's comprehensive conservation planning process. The primary purpose of a wilderness review is to inventory the areas on refuges that might have wilderness character and identify each area as wilderness study area. A wilderness study area must be roadless and meet one of the following size criteria:

- greater than 5,000 acres;
- a roadless island of any size; or
- less than 5,000 acres but of sufficient size to be practicably managed as wilderness.

A wilderness study area must also be natural and provide opportunities for solitude or primitive recreation. During the inventory phase of the wilderness review, the emphasis is on an assessment of wilderness character within the inventory unit. Sights and sounds originating from outside the unit, for example, those associated with military aircraft, cannot be used as justification to conclude that an area lacks wilderness character. Special values (e.g., ecological, geological, scenic, and historical) should be identified, but are not required. The determination to recommend (or not recommend) a wilderness study area to Congress for wilderness designation will be made through the comprehensive conservation plan decision-making process.

On March 26 to 28, 2001, Service managers and refuge staff met at Alligator River National Wildlife Refuge to gather information and conduct field exams for the refuge's wilderness review. The review team from that meeting is listed in the following table.

Wilderness Review Team

Team Member	Title/Affiliation	Address	Phone
Mike Bryant	Manager Alligator River NWR	P.O. Box 1969 Manteo, NC 27954	252/473-1131
John Wallace	Deputy Manager Alligator River NWR	P.O. Box 1969 Manteo, NC 27954	252/473-1131
Dennis Stewart	Wildlife Biologist Alligator River NWR	P.O. Box 1969 Manteo, NC 27954	252/473-1131
Bonnie Strawser	Wildlife Interpretative Specialist Alligator River NWR	P.O. Box 1969 Manteo, NC 27954	252/473-1131
Tom Crews	Fire Management Officer Alligator River NWR	P.O. Box 1969 Manteo, NC 27954	252/473-1131
Jerry Fringeli	Assistant Manager Mattamuskeet NWR	Route 1, Box N-2 Swan Quarter, NC 27885	252/926-4021
Wendy Stanton	Wildlife Biologist Pocosin Lakes NWR	P.O. Box 329 Columbia, NC 27925	252-796-3004
Bob Glennon	Natural Resource Planner Ecosystem Planning Office	1106 West Queen Street Edenton, NC 27932	252/482-2364
D.A. Brown	Habitat Protection Biologist Ecosystem Planning Office	1106 West Queen Street Edenton, NC 27932	252/482-2364
Donita Cotter	Wilderness Program Analyst National Office, Division of Refuges	4401 N. Fairfax Drive Arlington, VA 22203	703/358-2383

Prior to the review, using GIS database analysis of land status, transportation system, and hydrographic information, ecosystem planning staff prepared a map of wilderness inventory units potentially meeting the wilderness study area criteria (see table below and following figure). These 15 wilderness inventory units were evaluated over the course of the three-day field exercise.

Wilderness Inventory Units – Alligator River NWR (62,522 acres)

Unit	Acreage	Unit	Acreage	Unit	Acreage
7	5,139	12	2,200	17	4,710
8	7,302	13	2,823	18	6,679
9	4,424	14	1,231	19	1,689
10	4,541	15	3,112	20	3,478
11	9,804	16	2,247	21	3,144

The wilderness management policy and regulations allow motorized access and use of mechanized equipment for administrative purposes, provided such uses are the minimum necessary to accomplish wilderness objectives. For the purposes of analysis in the draft comprehensive conservation plan and environmental assessment, managers should assume that authorization of such uses would be temporary and rare in a wilderness area. If such restrictions would significantly limit the Service's ability to accomplish other resource management objectives, these impacts should be fully described in the environmental consequences sections of the draft comprehensive conservation plan and environmental assessment and would obviously be a factor for consideration in selecting a preferred alternative.

DOCUMENTATION REQUIREMENTS

Photo documentation is required for each inventory unit to record existing wilderness character; any man-made features or "imprints of man's work" that affect the unit's naturalness; and condition of boundary roads. Photographs were taken during the field review; additional photographs were later taken from sounds and streams to give a complete impression of the inventory units. These photos will be keyed to text in the wilderness inventory evaluation reports and to maps.

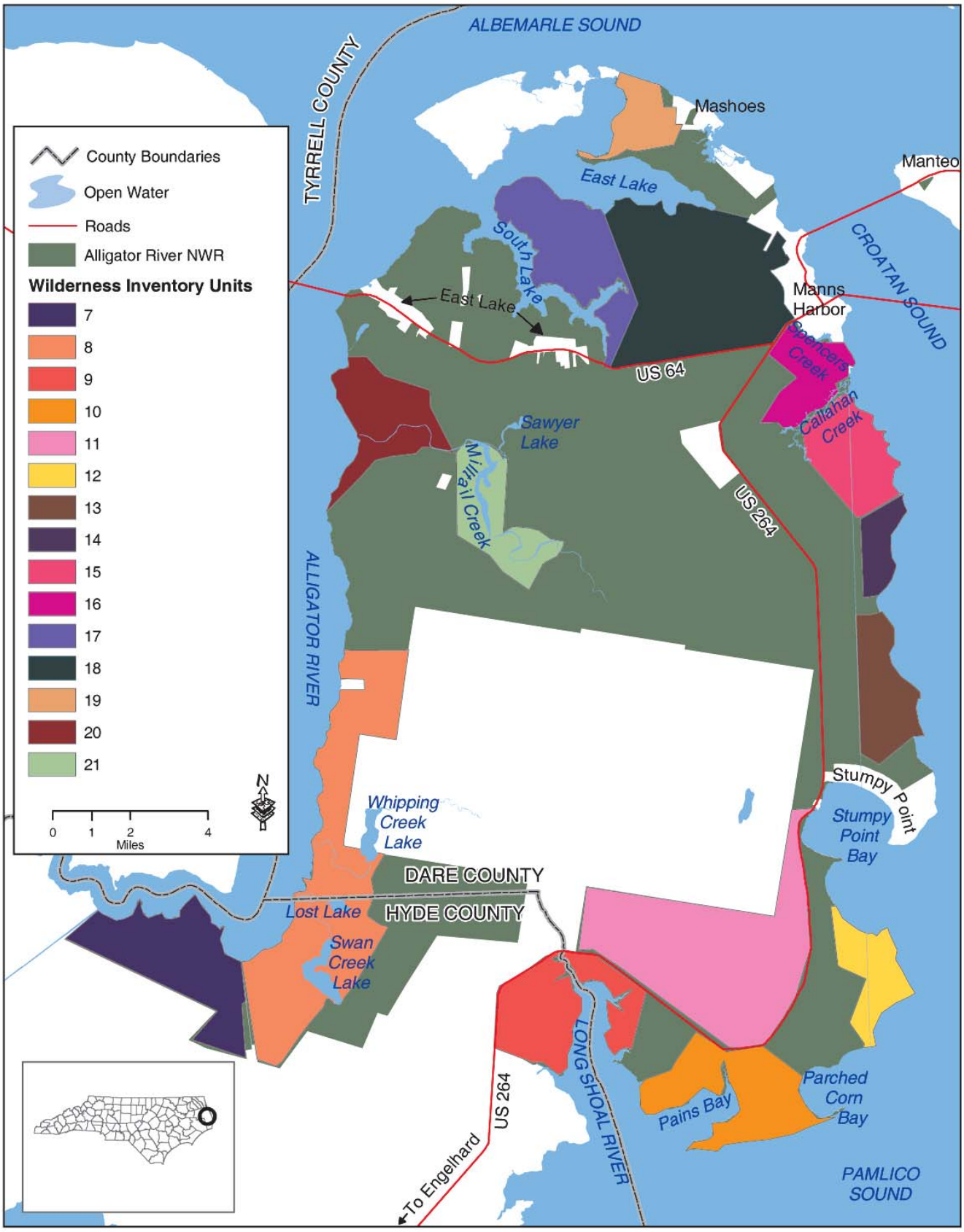
WILDERNESS MANAGEMENT

The wilderness management policy and regulations allow motorized access and use of mechanized equipment for administrative purposes, provided such uses are the minimum necessary to accomplish wilderness objectives. For the purposes of analysis in the draft comprehensive conservation plan and environmental assessment, managers should assume that authorization of such uses would be temporary and rare in a wilderness area. If such restrictions would significantly limit the Service's ability to accomplish other resource management objectives, these impacts should be fully described in the environmental consequences sections of the draft plan and environmental assessment and would obviously be a factor for consideration in selecting a preferred alternative.

RESOURCE MANAGEMENT ISSUES

Fire Management. A major concern is the need for controlled burning in areas where accumulated fuels could contribute to catastrophic wildfires, threatening the urban interface. The current smoke management guidelines have limited prescribed burns to 1,000 acres so a burn on an entire 5,000-acre tract without firebreaks is not possible.

Wilderness Inventory Units – Alligator River National Wildlife Refuge



Navigable Waters. Navigable waters (e.g., sounds, lakes, rivers, and creeks) bound most of the inventory units on Alligator River National Wildlife Refuge. These waters are under the jurisdiction of the State of North Carolina. The Service has limited authority to restrict activities, such as motorized boating, on navigable bodies of water.

Red-cockaded Woodpeckers. The federally listed red-cockaded woodpecker inhabits mature pond pine forests and requires relatively open old growth pine stands for nesting and feeding. The aggregate of nesting cavity trees is called a cluster and may include one to twenty or more cavity trees on three to sixty acres. There are three known clusters on the Alligator River National Wildlife Refuge with a possibility for six or seven clusters. The Dare County Bombing Range has five or six clusters. The Red-cockaded Woodpecker Recovery Plan designated the Alligator River clusters as a support population rather than a recovery population. Development of a Red-cockaded Woodpecker Management Plan for Alligator River National Wildlife Refuge was due by July 1, 2001. Current management activities on the refuge consist of clearing trails to the cavity trees using machetes and a brush saw, paint marking and numbering trees, notation of geographic positioning system (GPS) locations, and monitoring of nesting activity.

Southern Pine Beetle. The Southern pine beetle attacks all species of pines, including the pond pine found on Alligator River National Wildlife Refuge. The infestations are of concern because of the potential for killing red-cockaded woodpecker nest trees. On Alligator River National Wildlife Refuge, control measures have typically consisted of felling a buffer strip of green, un-infested trees at the spreading edge or front of the active infestation using a tracked feller-buncher. The width of the buffer strip is as wide as the average height of the trees. Active infestations are located in wilderness inventory units 9, 10, and 11. Infestations have been treated in units 10 and 18.

MANAGEMENT SITUATIONS SUMMARY

A management situation summary will be prepared for each identified wilderness study area. The summary includes information regarding other important resource values and uses which do not relate specifically to the key wilderness inventory criteria. It will be used primarily in evaluating alternatives and making management decisions during the study phase and in responding to questions from the public. Much of this information is required for the comprehensive conservation plan and can be summarized and the planning record referenced for more detail.

Maps of the area will be prepared showing roads, ditches, and special values such as anadromous fish spawning areas, primary and secondary nurseries, outstanding resource waters, state natural heritage areas, and location of federal and state listed threatened and endangered species. Surface disturbances would also be documented. The refuge staff indicated that some roads and ditches might be abandoned at some point in the future, following a road review.

The following types of information should be included in a management situation summary:

- refuge purposes
- historic and existing public uses
- historic and existing refuge management activities
- status of current step-down management plans (e.g., provisions of the fire management plan that
- relate to a specific wilderness study area)
- existing or proposed management practices requiring motorized access or equipment and/or
- mechanized transport
- compatibility determinations
- special use permits

- military uses and memorandums of understanding
- research uses
- commercial uses

SUMMARY OF WILDERNESS REVIEW FINDINGS

The review team identified five potential wilderness study areas at Alligator River National Wildlife Refuge (table below and following figure). The staff combined inventory units 17 and 18 to create the East Lake Wilderness Study Area; they combined inventory units 15 and 16 to create the Callahan Creek Wilderness Study Area. The boundaries of two wilderness study areas were also expanded. The staff expanded the boundary of Alice Nichols Wilderness Study Area (inventory unit 8) to include additional roadless lands on the north. They expanded the Quaking Bog Wilderness Study Area (inventory unit 11) on the northeast. The staff named wilderness inventory unit 7 the Atlantic White Cedar Wilderness Study Area Unit.

Wilderness Study Areas – Alligator River NWR

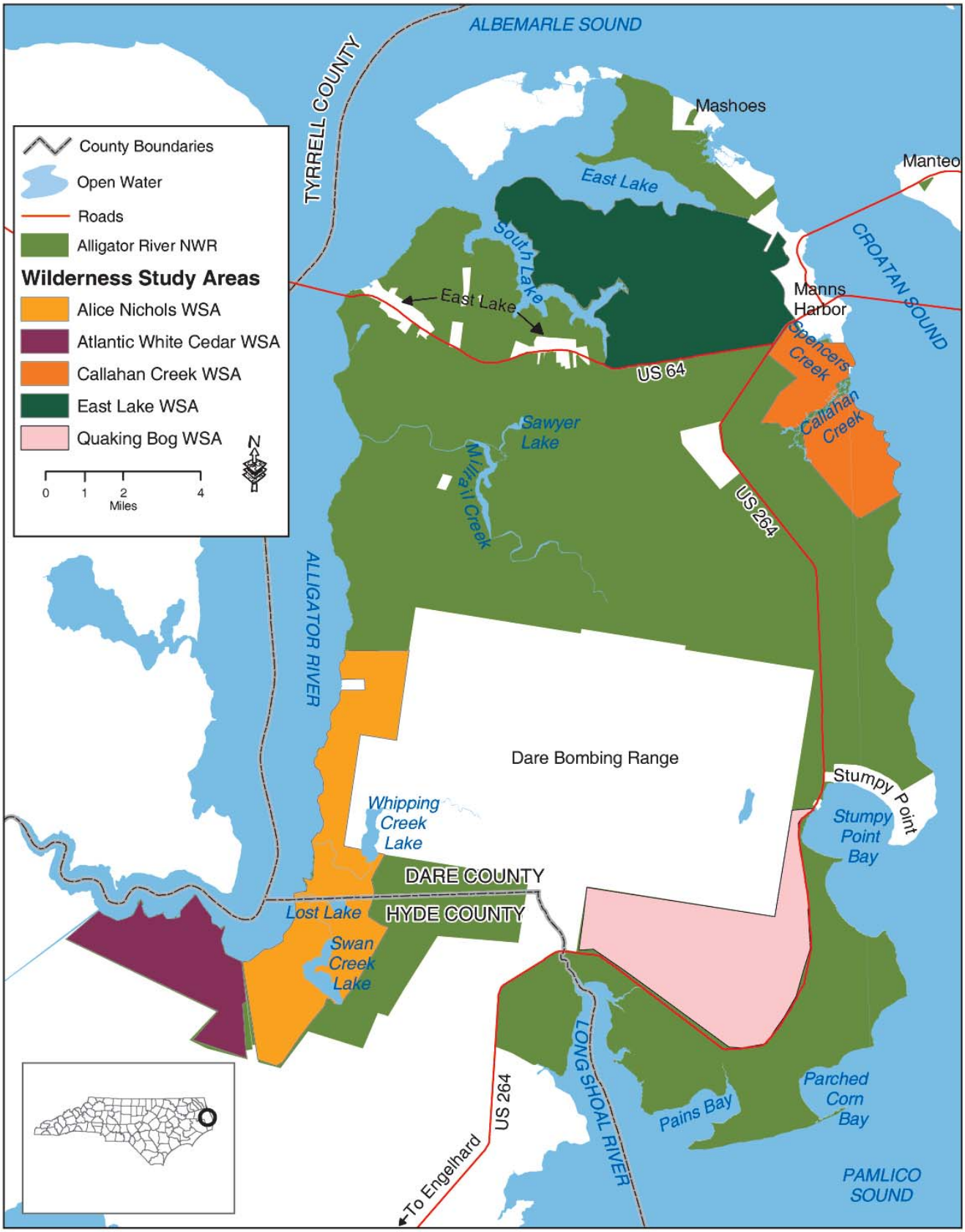
Unit Number	Suggested Name of Potential Wilderness Study Area	Acreage
7	Atlantic White Cedar Wilderness Study Area	5,139
8	Alice Nichols Wilderness Study Area	11,005
11	Quaking Bog Wilderness Study Area	10,695
15/16	Callahan Creek Wilderness Study Area	14,517
17/18	East Lake Wilderness Study Area	14,517
Total Acres		**46,715**

The findings for each of the inventory units identified in the above table, including the potential wilderness study areas, are summarized below.

Unit 7 (5,139 acres) meets the criteria for a wilderness study area. The unit is larger than 5,000 acres, apparently natural, and provides outstanding opportunities for solitude. Vegetation in the unit includes pond pine pocosin on the east end, bottomland hardwood in the middle part of the unit, and cypress/gum on the west end along the Intracoastal Waterway. Atlantic white cedar was also noted in the unit. The unit provided potential for restoration to the historically prevalent Atlantic white cedar habitat or other forested wetland types. “Atlantic White Wilderness Study Area” is the suggested name for the wilderness study area. It was noted that, since the refuge was acquired, this particular area has essentially been managed as wilderness due to its remote location, which is difficult to access.

Unit 8 (initially 7,302 acres) meets the criteria for a wilderness study area. The unit is larger than 5,000 acres, apparently natural, and provides outstanding opportunity for solitude. Vegetation is pond pine pocosin and bottomland hardwood. The north boundary of the inventory unit as initially identified is not located along a road or other man-made feature. The actual northern boundary of the roadless areas lies along Alligator Road. The eastern boundary of the roadless area is located along the boundary with Dare County Bombing range and “cherry-stems” Gator Roads 1, 2, 3 and 5. The four Gator Roads, two of which are owned and maintained by the U.S. Air Force, might potentially be abandoned and restored. South of the Dare County Bombing Range, the eastern acreage of the roadless area was recalculated and now totals 11,005 acres. It was acquired due to its location

Potential Wilderness Study Areas – Alligator River National Wildlife Refuge



and inaccessibility. This area, in which dog hunting for bear is currently prohibited, was identified by local hunters during the comprehensive conservation plan public scooping meetings as one of the best potential bear hunting areas on the refuge. However, if this area becomes a wilderness study area, the use of dogs would almost certainly be prohibited, due to the expected increase in motorboat use for that activity. The largest boundary included the abandonment of Nichols Road, which was named in memory of Alice Nichols. Any of the alternative sizes would have distinct boundaries on all sides. "Alice Nichols Wilderness Study Area" is the suggested name for this wilderness study area.

Units 9 (4,423 acres) and 10 (4,540 acres) are less than 5,000 acres in size and could not be practicably managed as wilderness. U.S. Highway 264 bounds the units on the north and east. Units 9 and 10 are both bisected into smaller parcels by waterways, Long Shoal River and Pains Bay, respectively. These waterways are used for both recreational and commercial boating purposes. Due to the units' small size, boundary configuration, and existing uses, they would be difficult to manage in a way to ensure outstanding opportunities for solitude or primitive recreation. These areas do not meet the criteria for wilderness study areas. Southern pine beetle infestations and control buffer cuts heavily impacted the naturalness for both units. Both areas have high commercial use that would affect opportunities for solitude. Both units have considerable ditching in the areas adjacent to the units that would restrict their enlargement to more acreage. Therefore, these areas were eliminated from further consideration as wilderness study areas.

Unit 11 (initially 9,803 acres) meets the criteria for a wilderness study area. The unit is larger than 5,000 acres, apparently natural, and provides outstanding opportunities for solitude. The unit encompasses an area of deep organic soils that limit potential for surface disturbing activities thereby preserving the area's natural features. It includes the unique land feature of a quaking bog, which was considered to be a supplemental value for the area. Vegetation in the unit varies from bog to low pocosin to tall pocosin to pond pine pocosin. The unit also has viable red-cockaded woodpecker habitat on the western edge. The roadless area actually includes a "finger" of land northeast of the initially identified inventory unit bound on the north by Lake Worth Road, U.S. Highway 264 on the east, and the Dare County Bombing Range on the west. Inclusion of this finger increases the unit's expanded boundary acreage by 892 acres to a total of 10,695 acres, which includes all of the roadless area in the bombing range. At some point, an alternative may be written to modify the boundary to exclude red-cockaded woodpecker habitat for management purposes. The area has a distinct boundary on three sides and the Dare County Bombing Range on the north boundary. The area was recommended as a potential wilderness study area and "Quaking Bog Wilderness Study Area" was one suggested name. It is commonly referred to as the "264 Low Pocosin Area" and that was also suggested as an alternate name.

Unit 12 (2,199 acres), Unit 13 (2,823 acres) and Unit 14 (1,230 acres) are less than 5,000 acres in size and could not practicably be managed as wilderness. The units are all bound on the east by Croatan Sound, which is a commercial fishery. The units are bordered on the west by refuge lands where natural values have been impacted by an extensive system of excavated drains that limit the possibility of enlarging the units' boundaries. These units do not meet the criteria for wilderness study areas.

Units 15 (3,112 acres) and 16 (2,247 acres) are separated by Callahan Creek, a natural feature that was originally drawn as a boundary dividing the two units. Both units are apparently natural and offer opportunities for solitude. The units are bound on the south, west, and east by drains and constructed firebreaks. Manns Harbor and Spencer's Creek border Unit 16 on the north. The review team recommended combining the two units and making the combined area (5,359 acres) a wilderness study area. The boundary may be modified to include firebreaks on the eastern boundary to protect Manns Harbor. The combined units meet the criteria for a wilderness study area, and "Callahan Creek Wilderness Study Area" was a suggested name for the site.

Adjacent Units 17 and 18, initially 4,710 acres and 6,679 acres respectively, were identified as two distinct inventory units for analysis. Significant man-made features, such as a road or drainage ditch, do not separate the units. Based on this finding, the two units were combined (11,389 acres) into one roadless area. In addition, the boundary of the combined roadless unit was extended on the east side to include additional roadless refuge lands. Drains and private lands now form the east boundary. Surface disturbances include old abandoned logging roads, sporadically situated in a north/south orientation along U.S. Highway 64. Southern pine beetle control buffer cuts also occur along the southern boundary adjacent to U.S. Highway 64. However, these disturbances are limited in size and do not affect the overall apparent naturalness of the combined unit. The densely vegetated unit is expansive for the area (14,517 acres) and provides outstanding opportunities for solitude and primitive recreation. Unit 17/18 has distinct boundaries on three sides and Manns Harbor on the east. Trapping and hunting occur in the area; these activities are allowed in wilderness study areas and designated wilderness. Most of Unit 17/18 is suitable for red-cockaded woodpecker recruitment or foraging habitat although no red-cockaded woodpeckers presently nest or forage in the area. The area killed by the southern pine beetle has tall pocosin vegetation without pines on it and would need restoration to be suitable as red-cockaded woodpecker habitat. A modified boundary could be evaluated to allow construction of firebreaks on the eastern boundary to protect Manns Harbor. Unit 17/18 meets the criteria for a wilderness study area. “East Lake Wilderness Study Area” is the suggested name for the potential wilderness study area.

Unit 19 (1,689 acres) does not meet the criteria for a wilderness study area. The unit is less than 5,000 acres. Unit 19 could not be practicably managed as wilderness because of fire protection requirements to protect residential property in the adjacent community of Mashoes.

Units 20 (3,478 acres) and 21 (3,144 acres) do not meet the criteria for a wilderness study area. The units encompass less than 5,000 acres and could not be practicably managed as wilderness. Milltail Creek, a tributary to Alligator River (a part of the Intracoastal Waterway), bisects both units. The creek is heavily used by motorized craft, including fishing and pleasure boats. Large sailboats and motorboats traveling through the Intracoastal Waterway also seek refuge in the creek during major storm events. The uses impact the quality of available opportunities for solitude and primitive recreation. Milltail Creek is a navigable waterway and the Service has limited ability to manage motorized boating uses. Vegetation in Unit 20 is in transition from a hardwood forest to a marsh due to rising sea level, beaver dam impoundments, and excess water pumped into the unit from the refuge farm units north of Laurel Bay Road.

Appendix X. Consultation and Coordination

This appendix summarizes the consultation and coordination that occurred in the processes of identifying the issues, alternatives, and preferred alternative which were presented in the Draft Comprehensive Conservation Plan; during the period of time while the Draft CCP was being prepared and distributed; and during the period of public review and comment on the Draft CCP.

The Service formed a core planning team composed of representatives from various Service divisions to prepare the Draft Comprehensive Conservation Plan and Environmental Assessment for Alligator River National Wildlife Refuge. The members of this team are identified in Table A. Initially, the team focused on identifying the issues and concerns pertinent to refuge management. The team met on several occasions from December 2000 to June 2002.

In addition, a biological review team met on the refuges in the ecosystem four times between December 1999 and December 2000 to assess the habitats on the refuges and the needs of wildlife species in the ecosystem, and make recommendations on land management and acquisition needs. Table B lists the members of this biological review team.

Throughout the planning process, the core team also sought the contributions of experts from various fields (Table C).

To expand the range of issues and to generate potential alternatives, the core planning team met in January 2001. Shortly thereafter, the team held a series of public scoping meetings on February 15, 16, 20, 22, and 23 in Washington, Swan Quarter, Plymouth, Columbia, and Manns Harbor, North Carolina, respectively, to gain the insights of local citizens and their perceptions of the issues and concerns facing the refuge.

The issues and alternatives generated from these public scoping meetings, coupled with the input of the planning team, are summarized in Appendix IV, Public Involvement. After the team developed the alternatives, it held a second-round public meeting on April 26, 2005 in Manns Harbor, North Carolina, to solicit public reaction to the alternatives. The team then selected Alternative 2 as the proposed alternative.

Table A. Core Planning Team members.

Member	Affiliation
Mike Bryant, Refuge Manager Kathy Whaley, Former Deputy Manager Jim Wigginton, Assistant Manager Dennis Stewart, Wildlife Biologist Tom Crews, Fire Management Officer Bonnie Strawser, Park Ranger Ann Marie Salewski, Park Ranger	Alligator River National Wildlife Refuge U.S. Fish and Wildlife Service Manteo, North Carolina
Robert Glennon, Natural Resource Planner David Brown, Former Habitat Protection Biologist	Ecosystem Planning Office U.S. Fish and Wildlife Service Edenton, North Carolina

Table B. Biological Review Team members.

Member	Affiliation
Bob Noffsinger, Former Supervisory Wildlife Management Biologist	Migratory Bird Field Office U.S. Fish and Wildlife Service Manteo, North Carolina
Frank Bowers, Former Migratory Bird Coordinator	Southeast Regional Office U.S. Fish and Wildlife Service Atlanta, Georgia
Chuck Hunter, Former Nongame Migratory Bird Coordinator	Southeast Regional Office U.S. Fish and Wildlife Service Atlanta, Georgia
Ronnie Smith, Fisheries Biologist	Fisheries Assistance Office U.S. Fish and Wildlife Service Edenton, North Carolina
John Stanton, Former Wildlife Biologist	Mattamuskeet National Wildlife Refuge U.S. Fish and Wildlife Service Swan Quarter, North Carolina
Wendy Stanton, Wildlife Biologist	Pocosin Lakes National Wildlife Refuge U.S. Fish and Wildlife Service Columbia, North Carolina
Dennis Stewart, Wildlife Biologist	Alligator River National Wildlife Refuge U.S. Fish and Wildlife Service Manteo, North Carolina
Ralph Keel, Former Wildlife Biologist	Great Dismal Swamp National Wildlife Refuge U.S. Fish and Wildlife Service Suffolk, Virginia
John Gallegos, Wildlife Biologist	Back Bay National Wildlife Refuge U.S. Fish and Wildlife Service Virginia Beach, Virginia
David Allen, Nongame Wildlife Biologist	North Carolina Wildlife Resources Commission New Bern, North Carolina

Table C. Expert contributors to the draft comprehensive conservation plan and their area(s) of expertise.

Name	Field of Expertise
Bill Grabill, Former Refuge Supervisor U.S. Fish and Wildlife Service Atlanta, Georgia	Refuge Management
Rufus Croom, District Conservationist USDA Natural Resources Conservation Service Plymouth, North Carolina	Soil and Water Conservation Federal Land Conservation Programs
John Gagnon, Soil Scientist USDA Natural Resources Conservation Service Edenton, North Carolina	Soil Science
Kevin Moody, NEPA Specialist U.S. Fish and Wildlife Service Atlanta, Georgia	National Environmental Policy Act
John Ann Shearer, Private Lands Biologist U.S. Fish and Wildlife Service Raleigh, North Carolina	Wetland Management, Partners for Fish and Wildlife Program
Richard Kanaski, Regional Archeologist U.S. Fish and Wildlife Service Savannah, Georgia	Cultural Resources

For a list of individuals, agencies, and organizations that contributed comments and suggestions to the draft plan and environmental assessment, see Appendix IV of this document.

Appendix XI. Finding of No Significant Impact

Introduction
The U.S. Fish and Wildlife Service proposes to protect and manage certain fish and wildlife resources in Dare and Hyde Counties, North Carolina, through the Alligator River National Wildlife Refuge (Refuge). An Environmental Assessment has been prepared to inform the public of the possible environmental consequences of implementing the Comprehensive Conservation Plan for Alligator River National Wildlife Refuge. A description of the alternatives, the rationale for selecting the preferred alternative, the environmental effects of the preferred alternative, the potential adverse effects of the action, and a declaration concerning the factors determining the significance of effects, in compliance with the National Environmental Policy Act of 1969, are outlined below. The supporting information can be found in the Environmental Assessment, Section B of the Draft Comprehensive Conservation Plan.

Alternatives
In developing the Comprehensive Conservation Plan for Alligator River National Wildlife Refuge, the Fish and Wildlife Service evaluated three alternatives:

Alternative 1. No Action Alternative
Alternative 1 represents no change from current management of the Refuge. The refuge currently manages its moist soil units very intensively by managing water levels and vegetation to create optimum habitat for migrating waterfowl, shorebirds, wading birds, and aquatic organisms. It also manages marshes and pine forests with prescribed fire. The staff surveys waterfowl, shorebirds, and wading birds on a routine basis. The refuge allows the six priority public use activities: hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation. The staff conducts extensive environmental education and interpretation programs with the assistance of 10,000 hours of volunteer service every year. The staff of Alligator River National Wildlife Refuge also manages Pea Island National Wildlife Refuge. A staff of 16.7 of the 23 full-time equivalent positions manages Alligator River Refuge. The staff manages the refuge from a rented building in Manteo, 10 miles east of the refuge.

Alternative 2.
The preferred alternative, Alternative 2, is considered to be the most effective management action for meeting the purposes of the Refuge by proposing moderate program increases. Under this alternative, the refuge would continue to manage its moist soil units very intensively by managing water levels and vegetation to create optimum habitat for migrating waterfowl, shorebirds, wading birds, and aquatic organisms. It also would manage marshes and pine forests with prescribed fire. The staff would inventory and monitor fire-dependent habitats to document their conditions and assess the effectiveness of management. The staff would survey waterfowl, shorebirds, and wading birds on a routine basis. The staff would also document presence of wildlife species as they are found and document the density of invertebrates in moist soil units. The refuge would allow the six priority public use activities: hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation. The staff would conduct extensive environmental education and interpretation programs with the assistance of 12,000 hours of volunteer service every year. The staff would conduct programs on the refuge and in the newly constructed visitor center. The staff of Alligator River National Wildlife Refuge would continue to manage the Alligator River and Pea Island national wildlife refuges. A staff of 26.75 of the 39 full-time equivalent positions would manage Alligator River Refuge. The staff would manage the refuge from a Service-owned building in Manteo, 10 miles east of the refuge.

Alternative 3.
The primary focus under Alternative 3 would be substantial program increases. Under this alternative, the refuge would continue to manage its moist soil units very intensively by managing water levels and vegetation to create optimum habitat for migrating waterfowl, shorebirds, wading birds, and aquatic organisms. It also would manage marshes and pine forests with prescribed fire and deciduous forests with thinning. The staff would inventory and monitor all habitats to document their conditions and assess the effectiveness of management. The staff would survey all wildlife species on a routine basis. The staff would also document presence of wildlife species as they are found and document the density of invertebrates in moist soil units. The refuge would allow the six priority public use activities: hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation. The staff would conduct extensive environmental education and interpretation programs with the assistance of 15,000 hours of volunteer service every year. The staff would conduct programs on the refuge and in the newly constructed visitor center. The staff of Alligator River National Wildlife Refuge would continue to manage the Alligator River and Pea Island national wildlife refuges. A staff of 37.45 of the 58 full-time equivalent positions would manage Alligator River Refuge. The staff would manage the refuge from a Service-owned building in Manteo, 10 miles east of the refuge.

Selection Rationale
Alternative 2 is selected for implementation because it directs the development of programs to best achieve the Refuge purpose and goals; emphasizes wildlife conservation as our highest priority in refuge management, collects habitat and wildlife data, and ensures long-term achievement of Refuge and Service objectives. At the same time, these management actions provide balanced levels of compatible public use opportunities consistent with existing laws, Service policies, and sound biological principles. It provides the best mix of program elements to achieve desired long-term conditions.

Under this alternative, all lands under the management and direction of the Refuge will be protected, maintained, and enhanced to best achieve national, ecosystem, and refuge-specific goals and objectives within anticipated funding and staffing levels. In addition, the action positively addresses significant issues and concerns expressed by the public.

Environmental Effects
Implementation of the Service's management action is expected to result in environmental, social, and economic effects as outlined in the comprehensive conservation plan. Habitat management, population management, land conservation, and visitor service management activities on Alligator River National Wildlife Refuge would result in wildlife habitat enhancement, increased migratory bird use, increased protection for threatened and endangered species, enhanced wildlife and fish populations, and enhanced opportunities for wildlife-dependent recreation and environmental education. These effects are detailed as follows:

The refuge's current management actions have minimal to no effects on the biological or socioeconomic environment. The proposed management actions described in Alternative 2, such as monitoring a wider range of wildlife species and habitats; managing Atlantic white cedar and mixed pine-hardwood forests, increasing opportunities for public use, and acquiring private property from willing sellers would have positive effects on the biological environment and society. Implementation of Alternative 2 would produce new economic opportunities from the salaries of the new staff, refuge expenditures in the local economy, and refuge visitors participating in outdoor recreation and environmental education opportunities. The purchase of land from willing sellers would reduce the amount of taxes paid to the counties in real estate taxes. However, this decrease in tax revenue is partially offset through refuge revenue-sharing.

BIOLOGICAL ENVIRONMENT

Each alternative considered would protect existing habitat important to migratory birds, mammals, reptiles, amphibians, fish, and invertebrates. Alternative 2 would provide data on more migratory species on the refuge and improved migratory bird habitat through sound management of various habitat types such as Atlantic white cedar, mixed pine-hardwood, and hardwood forests.

The increased public use provided in Alternative 2 may affect the refuge's wildlife populations due to disturbance and habitat degradation. However, nesting and foraging habitat for waterfowl and land birds would improve under Alternative 2 because of improved habitat management. Populations of all wildlife species would increase slightly under Alternative 2. Alternative 2 would protect sites important to migrating waterfowl, shorebirds, wading birds, and land birds.

Alternative 2 would protect sites important to federally listed species, such as the red wolf, red-cockaded woodpecker, bald eagle, and American alligator.

The refuge's white-tailed deer population is currently at carrying capacity for pocosin habitat. Under Alternative 2, habitat management actions could increase the deer population, but not significantly. The staff would monitor deer populations and use hunting to manage the populations in order to provide a compatible recreational activity and prevent habitat damage. Hunting would also ensure the health of the deer herd and minimize the effects to other wildlife species and habitat.

The refuge initiated a wild turkey restoration project in 1999 in cooperation with the North Carolina Wildlife Resources Commission. Currently, the turkey population is doing well with numerous sightings each year. Under Alternative 2, the staff would monitor the turkey population and could expand the hunting program to include wild turkey

The bear population on the refuge is at a high density relative to other bear populations in the state, region, and nation. Under Alternative 2, the staff would consider a conservative hunting program by permit only as a population management strategy. Any decision with regards to establishing a bear hunt on the refuge would require close coordination with the North Carolina Wildlife Resources Commission as the refuge is within the boundaries of the Northeastern North Carolina Bear Management Unit. Harvest would be closely monitored by refuge staff, with data collected from each harvested bear.

The National Wildlife Refuge System Improvement Act of 1997 recognizes and mandates compatible, wildlife-dependent priority uses such as hunting, fishing, wildlife observation, wildlife photography, environmental education, and interpretation be made the priority public uses of national wildlife refuges. It is through these uses that present and future generations will further develop their appreciation of fish and wildlife resources and recognize the need to protect our valuable natural resources for generations yet to come. The 1997 Act also calls upon the National Wildlife Refuge System to increase compatible, wildlife-dependent recreation where possible and especially for family oriented opportunities. Science-based expansion of the refuge hunting program as well as other programs based upon wildlife dependent uses is consistent with the spirit and intent of the Act.

The staff would develop an integrated pest management plan under Alternative 2. However, it is anticipated that the staff would continue to use some quantity of pesticides on an as-needed basis.

Alternative 2 would provide additional protection to wetlands beyond the protection afforded by existing wetland regulations. Alternative 2 would also protect landscape characteristics, such as habitat connectivity, and would provide sufficient proprietary interest in properties to restore habitats for wildlife.

Under Alternative 2, the plan would concentrate the level of recreation use and ground-based disturbance from pedestrians on boardwalks, trails, and the refuge's office and maintenance areas. However, the generally open road system allows liberal public access by vehicle, and this type of public use could still have a negative effect on some wildlife populations.

PHYSICAL ENVIRONMENT

Alternative 2 would have no negative effect on water quality from sources within the refuge. The alternative requires management of the refuge to minimize water pollution. There would be no change in point and non-point source discharges into the aquatic system from off-refuge sources as a result of refuge management actions.

Alternative 2 would have a neutral effect on soil formation processes on lands the refuge acquires by maintaining perennial natural vegetation on most of the refuge's area. Some disturbances to surface soils and topography would occur at those locations selected for administrative and public use facilities, maintenance operations, and habitat management.

Alternative 2 would positively affect the water quality in individual streams and wetlands on the refuge due to a relatively low level of soil disturbance and fertilizer and pesticide application. Other positive effects would result from the protection of groundwater recharge areas, runoff prevention, sediment retention, and minimizing non-point source pollution.

Alternative 2 would protect the aesthetic characteristics associated with natural habitats. The staff would carry out habitat management activities designed to improve forest composition and structure in such a way to minimize any short-term aesthetic effects.

SOCIAL ENVIRONMENT

Under Alternative 2, opportunities for hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation would increase. Alternative 2 would also stimulate ecotourism and potentially increase tourism expenditures in the surrounding local communities. The refuge would continue to allow a few non-priority, traditional public uses through special use permits.

Alternative 2 would allow public access by vehicle, foot, canoe, kayak, or bicycle to facilitate compatible wildlife-dependent recreation. The Service would close some areas seasonally, such as waterfowl resting and feeding areas, to all public entry to minimize disturbance to wintering waterfowl. Under Alternative 2, the Service would construct and staff a visitor center. The refuge staff would develop more education programs and tours.

ECONOMIC ENVIRONMENT

The wildlife-dependent recreational activities described under Alternative 2 (e.g., hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation) would increase visitation to the refuge and generate greater purchases of local goods and services in the economy of the surrounding communities. Development of wildlife-dependent recreation programs and facilities and improved publicity would lead to greater economic benefits from increased tourism.

Land acquisition within the refuge's approved acquisition boundary would decrease the gross property tax revenues of Dare and Hyde counties. However, there would be an increase in refuge revenue-sharing payments. Under the Refuge Revenue Sharing Act, the Fish and Wildlife Service would make annual payments to the counties to offset the loss of property tax revenues. The Refuge

Revenue Sharing Act also requires that Service lands be appraised every five years to ensure that payments to local governments remain equitable.

PUBLIC HEALTH AND SAFETY EFFECTS

Alternative 2 would not have a significant, negative effect on public health and safety. The only potential safety problems involve the possibility of boating accidents by visitors gaining access to the refuge by water; hiking and vehicular accidents occurring on the refuge's roads and trails; and accidents occurring during the hunting season. Through use of time and space zoning, signage, and publications, the possibility of potential accidents and conflicts between refuge user groups can be minimized.

REGULATORY EFFECTS

As indicated in Chapter I, Background, of the Draft Comprehensive Conservation Plan, the Service must comply with a number of federal laws, administrative orders, and policies in the development and implementation of its management actions and programs. Selection and implementation of Alternative 2 described in this environmental assessment would be in full compliance with any of these or other mandates.

CULTURAL AND HISTORIC RESOURCE EFFECTS

Alternative 2 provides additional land protection and low levels of development, thereby producing little to no negative effect on the refuge's cultural and historic resources. There is potential for negative effects through logging and construction of new trails if they should be approved. Such management actions would require review by the Service's Regional Cultural Resources Officer in consultation with the State of North Carolina's 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.

Service acquisition of land with known or potential archaeological or historical sites provides two major types of protection for these resources: protection from damage by federal activity, and protection from vandalism or theft. Land acquisition by the Service would provide some degree of protection to important cultural and historic resources.

UNCERTAINTY OF FUTURE ACTION EFFECTS

Through implementation of Alternative 2, the Service would develop detailed step-down management plans to manage the fish and wildlife populations on the refuge, based on the application of sound fish and wildlife management principles and concepts. The specific content of the step-down management plans would provide the basis for further analysis of environmental effects. Alternative 2 presents sufficient information to assess the full potential of the environmental effects of plans to be developed in the future.

CUMULATIVE EFFECTS

Cumulative effects on the environment result from incremental effects of a proposed action when these are added to other past, present, and reasonably foreseeable future actions. While cumulative effects may result from individually minor actions, they may, when viewed as a whole, become significant over time.

Implementation of Alternative 2 as described in this document includes actions relating to site development; fish and wildlife habitat and population management; land acquisition; and recreational use programs. These actions would have both direct and indirect affects (e.g., site development would result in increased public use, thus increasing littering, noise, and vehicular traffic); however, the cumulative effects of these actions over the 15-year planning period are not expected to be significant and would be dependent upon the number of projects initiated.

Potential Adverse Effects and Mitigation Measures

Wildlife Disturbance
Disturbance to wildlife at some level is an unavoidable consequence of any public use program, regardless of the activity involved. Obviously, some activities innately have the potential to be more disturbing than others. The management actions to be implemented have been carefully planned to avoid unacceptable levels of impact.

As currently proposed, the known and anticipated levels of disturbance of the management action are considered minimal and well within the tolerance level of known wildlife species and populations present in the area. Implementation of the public use program would take place through carefully controlled time and space zoning, establishment of protection zones around key sites, closures of all-terrain vehicle trails, and routing of roads and trails to avoid direct contact with sensitive areas, such as nesting bird habitat, etc. All hunting activities (season lengths, bag limits, number of hunters) would be conducted within the constraints of sound biological principles and refuge-specific regulations established to restrict illegal or non-conforming activities. Monitoring activities through wildlife inventories and assessments of public use levels and activities would be utilized, and public use programs would be adjusted as needed to limit disturbance.

User Group Conflicts
As public use levels expand across time, some conflicts between user groups may occur. Programs would be adjusted, as needed, to eliminate or minimize these problems and provide quality wildlife-dependent recreational opportunities. Experience has proven that time and space zonings, such as establishment of separate use areas, use periods, and restricting numbers of users, are effective tools in eliminating conflicts between user groups.

Effects on Adjacent Landowners
Implementation of the management action would not impact adjacent or in-holding landowners. Essential access to private property would be allowed through issuance of special use permits. Future land acquisition would occur on a willing-seller basis only, at fair market values within the approved acquisition boundary. Lands are acquired through a combination of fee title purchases and/or donations and less-than-fee title interests (e.g., conservation easements, cooperative agreements) from willing sellers. Funds for the acquisition of lands within the approved acquisition boundary would likely come from the Land and Water Conservation Fund or the Migratory Bird Conservation Act. The management action contains neither provisions nor proposals to pursue off-refuge stream bank riparian zone protection measures (e.g., fencing) other than on a volunteer/partnership basis.

Land Ownership and Site Development
Proposed acquisition efforts by the Service would result in changes in land and recreational use patterns, since all uses on national wildlife refuges must meet compatibility standards. Land ownership by the Service also precludes any future economic development by the private sector. Potential development of access roads, dikes, control structures, and visitor parking areas could lead to minor short-term negative impacts on plants, soil, and some wildlife species. When site

development activities are proposed, each activity will be given the appropriate National Environmental Policy Act consideration during pre-construction planning. At that time, any required mitigation activities will be incorporated into the specific project to reduce the level of impacts to the human environment and to protect fish and wildlife and their habitats.

As indicated earlier, one of the direct effects of site development is increased public use; this increased use may lead to littering, noise, and vehicle traffic. While funding and personnel resources will be allocated to minimize these effects, such allocations make these resources unavailable for other programs.

The management action is not expected to have significant adverse effects on wetlands and floodplains, pursuant to Executive Orders 11990 and 11988.

Coordination
The management action has been thoroughly coordinated with all interested and/or affected parties. Parties contacted include:

All affected landowners
Congressional representatives
Governor of North Carolina
North Carolina Wildlife Resources Commission
Dr. Jeffrey Crow, State Historic Preservation Officer
Local community officials
Interested citizens
Conservation organizations

Findings
It is my determination that the management action does not constitute a major federal action significantly affecting the quality of the human environment under the meaning of Section 102(2)(c) of the National Environmental Policy Act of 1969 (as amended). As such, an environmental impact statement is not required. This determination is based on the following factors (40 C.F.R. 1508.27), as addressed in the Environmental Assessment for the Alligator River National Wildlife Refuge:

1. Both beneficial and adverse effects have been considered and this action will not have a significant effect on the human environment. (Environmental Assessment, pages 167-169).

2. The actions will not have a significant effect on public health and safety. (Environmental Assessment, page 169).

3. The project will not significantly affect any unique characteristics of the geographic area such as proximity to historical or cultural resources, wild and scenic rivers, or ecologically critical areas. (Environmental Assessment, pages 169-170).

4. The effects on the quality of the human environment are not likely to be highly controversial. (Environmental Assessment, pages 167-173).

5. The actions do not involve highly uncertain, unique, or unknown environmental risks to the human environment. (Environmental Assessment, page 171).

6. The actions will not establish a precedent for future actions with significant effects nor do they represent a decision in principle about a future consideration. (Environmental Assessment, page 171).

7. There will be no cumulatively significant impacts on the environment. Cumulative impacts have been analyzed with consideration of other similar activities on adjacent lands, in past action, and in foreseeable future actions. (Environmental Assessment, page 171).

8. The actions will not significantly affect any site listed in, or eligible for listing in, the National Register of Historic Places, nor will they cause loss or destruction of significant scientific, cultural, or historic resources. (Environmental Assessment, pages 169-171).

9. The actions are not likely to adversely affect threatened or endangered species, or their habitats. (Environmental Assessment, page 165-166).

10. The actions will not lead to a violation of federal, state, or local laws imposed for the protection of the environment. (Environmental Assessment, page 169).

Supporting References

U.S. Fish and Wildlife Service. 2006. Draft Comprehensive Conservation Plan and Environmental Assessment for Alligator River National Wildlife Refuge, Dare County, North Carolina. U.S. Department of the Interior, Fish and Wildlife Service, Southeast Region.

Document Availability

The Environmental Assessment was Section B of the Draft Comprehensive Conservation Plan for Alligator River National Wildlife Refuge and was made available in May, 2006. Additional copies are available by writing: Alligator River National Wildlife Refuge, P. O. Box 1969, Manteo, NC 27954.

Sam D. Hamilton
Regional Director

6/8/07
Date