DRAFT COMPREHENSIVE CONSERVATION PLAN
AND ENVIRONMENTAL ASSESSMENT

CAPE ROMAIN NATIONAL WILDLIFE REFUGE

Charleston County, South Carolina

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

Southeast Region
Atlanta, Georgia

April 2010

TABLE OF CONTENTS

SECTION A. DRAFT COMPREHENSIVE CONSERVATION PLAN

I. BACKGROUND 1

Introduction 1
Purpose And Need For The Plan 1
u.s. Fish and Wildlife Service 1
National Wildlife Refuge System 2
Legal and Policy Context 4
National and International Conservation Plans and Initiatives 5
Relationship To State Wildlife Agency 6
Climate Change 8

II. REFUGE OVERVIEW 13

Introduction 13
Refuge History and Purpose 13
Special Designations 15
Ecosystem Context 15
Regional Conservation Plans and Initiatives 16
Ecological Threats and Problems 18
- Habitat Loss and Fragmentation 18
- Alterations to Hydrology 19
- Proliferation of Invasive Aquatic Plants and Animals 19

Physical Resources 20
- Climate 20
- Climate Change and Global Warming 20
- Geology and Topography 21
- Soils 21
- Hydrology 21
- Air Quality 22
- Water Quality and Quanity 22

Biological Resources 22
- Habitat 22
- Wildlife 24

Cultural Resources 27
Socioeconomic Environment 27
- Fishing 29
- Hunting 29
- Wildlife Watching Activities 30

Refuge Administration and Management 31
- Land Protection and Conservation 31
- Visitor Services 32
- Personnel, Operations, and Maintenance 33

III. PLAN DEVELOPMENT 35

Public Involvement and the Planning Process 35
Summary of Issues, Concerns, and Opportunities 35
- Wildlife and Habitat Management 36

Resource Protection 36
Visitor Services 36
Refuge Administration 37
Wilderness Review 37

IV. MANAGEMENT DIRECTION 39

Introduction 39
Vision 39
Goals, Objectives, and Strategies 42
Wildlife and Habitat Management 42
Habitat Management 53
Resource Protection 57
Visitor Services 64
Refuge Administration 78

V. PLAN IMPLEMENTATION 83

Introduction 83
Proposed Projects 83
Wildlife and habitat Management 83
Resource Protection 84
Visitor Services 84
Refuge Administration 85
Funding and Personnel 86
Partnership/Volunteers Opportunities 88
Step-Down Management Plans 88
Monitoring and Adaptive Management 88
Plan Review and Revision 89
Section B. Environmental Assessment 91

SECTION B. ENVIRONMENTAL ASSESSMENT

I. BACKGROUND 91

Introduction 91
Purpose and Need for Action 91
Decision Framework 92
Planning Study Area 92
Authority, Legal Compliance, and Compatibility 92
Compatibility 92
Public Involvement and the Planning Process 93

II. AFFECTED ENVIRONMENT 95

III. DESCRIPTION OF ALTERNATIVES 97

Formulation of Alternatives 97
Description of Alternatives 97
Alternative A - (Current Management - No Action) 97
Alternative B 98
Alternative C - (Proposed Alternative) 98
Features Common to all Alternatives 99

Comparison of Alternatives By Issue....99
Comparison of the Alternatives by Issue....101

IV. ENVIRONMENTAL CONSEQUENCES....117

Overview....117
Effects Common to All Alternatives....117
Environmental Justice....117
Climate Change....117
Other Management....118
Land Acquisition....118
Cultural Resources....118
Soils....119
Water Quality, Wetlands, and Flood Plains....119
Aesthetics....119
Visitor Services....119
Socioeconomic Environment....119
Public Health and Safety....119
Summary of Effects by Alternative....120
Unavoidable Impacts and Mitigation Measures....133
Water Quality from Soil Disturbance and Use of Herbicides....133
Wildlife Disturbance....133
Vegetation Disturbance....134
User Group Conflicts....134
Effects on Adjacent Landowners....134
Land Ownership and Site Development....134
Cumulative Impacts....135
Direct and Indirect Effects or Impacts....135
Short-term Uses versus Long-term Productivity....136

V. CONSULTATION AND COORDINATION....137

Overview....137
CCP Planning Team....137
Biological Review Team....137
Visitor Services Review Team....138
Other Contributors....138

APENDICES

APPENDIX A. GLOSSARY....139

APPENDIX B. REFERENCES AND LITERATURE CITATIONS....149

APPENDIX C. RELEVANT LEGAL MANDATES AND EXECUTIVE ORDERS....155

APPENDIX D. PUBLIC INVOLVEMENT....169

Summary Of Public Scoping Comments....169

APPENDIX E. APPROPRIATE USE DETERMINATIONS....171

APPENDIX F. COMPATIBILITY DETERMINATIONS....181

APPENDIX G. INTRA-SERVICE SECTION 7 BIOLOGICAL EVALUATION 197

APPENDIX H. WILDERNESS REVIEW 205

APPENDIX I. REFUGE BIOTA 207

BIRDS 207
MAMMALS 213
AMPHIBIANS AND REPTILES 214
FISHES 216

APPENDIX J. BUDGET REQUESTS 219

(To be included in Final CCP) 219

APPENDIX K. LIST OF PREPARERS 220

LIST OF FIGURES

Figure 1. Boundary and Location 14
Figure 2. Wetland Impoundments 23
Figure 3. Cape Island shoreline changes between 1954 and 2006 41

LIST OF TABLES

Table 1. Summary of projects 86
Table 2. Refuge step-down management plans related to the goals and objectives of the comprehensive conservation plan 88
Table 3. Comparison of alternatives by management issues for Cape Romain NWR 101
Table 4. Summary of environmental effects by alternative, Cape Romain NWR 121

SECTION A. DRAFT COMPREHENSIVE CONSERVATION PLAN

I. Background

INTRODUCTION

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

A planning team developed a range of alternatives that best met the goals and objectives of the refuge and that could be implemented within the 15-year planning period. This Draft CCP/EA describes the U.S. Fish and Wildlife Service's proposed plan, as well as other alternatives considered and their effects on the environment. The Draft CCP/EA will be made available to state and federal government agencies, conservation partners, and the general public for review and comment. Comments from each entity will be considered in the development of the final CCP.

PURPOSE AND NEED FOR THE PLAN

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

Specifically, the plan is needed to:

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

U.S. FISH AND WILDLIFE SERVICE

The U.S. Fish and Wildlife Service (Service) traces its roots to 1871 and the establishment of the Commission of Fisheries involved with research and fish culture. The once independent commission was renamed the Bureau of Fisheries and placed under the Department of Commerce and Labor in 1903.

The Service also traces its roots to 1886 and the establishment of a Division of Economic Ornithology and Mammalogy in the Department of Agriculture. Research on the relationship of birds and animals to agriculture shifted to delineation of the range of plants and animals so the name was changed to the Division of the Biological Survey in 1896.

The Department of Commerce, Bureau of Fisheries, was combined with the Department of Agriculture, Bureau of Biological Survey, on June 30, 1940, and transferred to the Department of the Interior as the Fish and Wildlife Service. The name was changed to the Bureau of Sport Fisheries and Wildlife in 1956 and finally to the Fish and Wildlife Service in 1974.

The Service, working with others, is responsible for conserving, protecting, and enhancing fish and wildlife and their habitats for the continuing benefit of the American people through Federal programs relating to migratory birds, endangered species, interjurisdictional fish and marine mammals, and inland sport fisheries (142 DM 1.1).

As part of its mission, the Service manages more than 540 national wildlife refuges covering over 95 million acres. These areas comprise the National Wildlife Refuge System, the world's largest collection of lands set aside specifically for fish and wildlife. The majority of these lands, 77 million acres, is in Alaska. The remaining acres are spread across the other 49 states and several United States territories. In addition to refuges, the Service manages thousands of small wetlands, national fish hatcheries, 64 fishery resource offices, and 78 ecological services field stations. The Service enforces federal wildlife laws, administers the Endangered Species Act, manages migratory bird populations, restores nationally significant fisheries, conserves and restores wildlife habitat, and helps foreign governments with their conservation efforts. It also oversees the Federal Aid program that distributes hundreds of millions of dollars in excise taxes on fishing and hunting equipment to state fish and wildlife agencies.

NATIONAL WILDLIFE REFUGE SYSTEM

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

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

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

- Fulfill the mission of the Refuge System;
- Fulfill the individual purposes of each refuge;
- Consider the needs of wildlife first;
- Fulfill requirements of comprehensive conservation plans that are prepared for each unit of the Refuge System;
- Maintain the biological integrity, diversity, and environmental health of the Refuge System; and

- Recognize that wildlife-dependent recreation activities including hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation are legitimate and priority public uses; and allow refuge managers authority to determine compatible public uses.

The following are just a few examples of your national network of conservation lands. Pelican Island National Wildlife Refuge, the first refuge, was established in 1903 for the protection of colonial nesting birds in Florida, such as the snowy egret and the brown pelican. Western refuges were established for American bison (1906), elk (1912), prong-horned antelope (1931), and desert bighorn sheep (1936) after over-hunting, competition with cattle, and natural disasters decimated once-abundant herds. The drought conditions of the 1930s "Dust Bowl" severely depleted breeding populations of ducks and geese. Refuges established during the Great Depression focused on waterfowl production areas (i.e., protection of prairie wetlands in America's heartland). The emphasis on waterfowl continues today but also includes protection of wintering habitat in response to a dramatic loss of bottomland hardwoods. By 1973, the Service had begun to focus on establishing refuges for endangered species.

Approximately 38 million people visited national wildlife refuges in 2002, most to observe wildlife in their natural habitats. As the number of visitors grows, there are significant economic benefits to local communities. In 2001, 82 million people, 16 years and older, fished, hunted, or observed wildlife, generating $108 billion. In a study completed in 2002 on 15 refuges, visitation had grown 36 percent in seven years. At the same time, the number of jobs generated in surrounding communities grew to 120 per refuge, up from 87 jobs in 1995, pouring more than $2.2 million into local economies. The 15 refuges in the study were Chincoteague (Virginia); National Elk (Wyoming); Crab Orchard (Illinois); Eufaula (Alabama); Charles M. Russell (Montana); Umatilla (Oregon); Quivira (Kansas); Mattamuskeet (North Carolina); Upper Souris (North Dakota); San Francisco Bay (California); Laguna Atacosa (Texas); Horicon (Wisconsin); Las Vegas (Nevada); Tule Lake (California); and Tensas River (Louisiana) – the same refuges identified for the 1995 study. Other findings also validate the belief that communities near refuges benefit economically. Expenditures on food, lodging, and transportation grew to $6.8 million per refuge, up 31 percent from $5.2 million in 1995. For each dollar spent on the Refuge System, surrounding communities benefited with $4.43 in recreation expenditures and $1.42 in job-related income (Caudill and Laughland, unpubl. data).

Volunteers continue to be a major contributor to the success of the Refuge System. In 2002, volunteers contributed more than 1.5 million hours on refuges nationwide, a service valued at more than $22 million.

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

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

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

LEGAL AND POLICY CONTEXT

Legal Mandates, Administrative and Policy Guidelines, and Other Special Considerations

Administration of national wildlife refuges is guided by the mission and goals of the Refuge System, congressional legislation, presidential executive orders, and international treaties. Policies for management options of refuges are further refined by administrative guidelines established by the Secretary of the Interior and by policy guidelines established by the Director of the Fish and Wildlife Service. Select legal summaries of treaties and laws relevant to administration of the Refuge System and management of the Cape Romain NWR are provided in Appendix C.

Treaties, laws, administrative guidelines, and policy guidelines assist the refuge manager in making decisions pertaining to soil, water, air, flora, fauna, and other natural resources; historical and cultural resources; research and recreation on refuge lands; and provide a framework for cooperation between Cape Romain NWR and other partners, such as the South Carolina Department of Natural Resources, Ducks Unlimited, the Nature Conservancy, and private landowners.

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

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

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

Biological Integrity, Diversity, and Environmental Health Policy

The Improvement Act directs the Service to ensure that the biological integrity, diversity, and environmental health of the Refuge System are maintained for the benefit of present and future generations of Americans. The policy is an additional directive for refuge managers to follow while achieving refuge purpose(s) and the Refuge System mission. It provides for the consideration and protection of the broad spectrum of fish, wildlife, and habitat resources found on refuges and associated ecosystems. When evaluating the appropriate management direction for refuges, refuge managers will use sound professional judgment to determine their refuges' contribution to biological integrity, diversity, and environmental health at multiple landscape scales. Sound professional judgment incorporates field experience, knowledge of refuge resources and role of refuge within an ecosystem, applicable laws, and best available science, including consultation with others both inside and outside the Service.

NATIONAL AND INTERNATIONAL CONSERVATION PLANS AND INITIATIVES

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

This Draft CCP/EA supports, among others, the Partners-in-Flight Plan, the North American Waterfowl Management Plan, the Western Hemisphere Shorebird Reserve Network, and the National Wetlands Priority Conservation Plan.

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

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

Partners-in-Flight Bird Conservation Plan. Managed as part of the Partners-in-Flight Plan, the Southeastern Coastal Plain (Bird Conservation Region 27) physiographic area represents a scientifically based land bird conservation planning effort that ensures long-term maintenance of healthy populations of native land birds, primarily non-game land birds. Non-game land birds have been vastly under-represented in conservation efforts, and many are exhibiting significant declines. This plan is voluntary and non-regulatory, and focuses on relatively common species in areas where conservation actions can be most effective, rather than the frequent local emphasis on rare and peripheral populations.

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

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

RELATIONSHIP TO STATE WILDLIFE AGENCY

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

The South Carolina Department of Natural Resources (SCDNR) developed a “Vision for the Future” when various state conservations agencies were merged together in 1994. This “Vision” guides management actions of the SCDNR. The basic framework follows.

Mission of the SCDNR:
Our mission is to serve as the principal advocate for and steward of South Carolina’s natural resources.

Vision of the SCDNR:
Our vision for South Carolina is an enhanced quality of life for present and future generations through improved understanding, wise use, and safe enjoyment of healthy, diverse, sustainable and accessible natural resources.

Our vision for the SCDNR is to be a trusted and respected leader in natural resources protection and management, by consistently making wise and balanced decisions for the benefit of the state’s natural resources and its people.

Core Values of the SCDNR:
Our actions will be guided at all times by the following shared internal values:

- Teamwork - We will accomplish our mission and achieve our vision through goal-focused, cooperative efforts that rely on effective internal and external communication and partnering.
- Integrity - We will lead by example, ensuring that our standards are high, and our actions are fair, accountable and above reproach.
- Dedication - We will maintain a steadfast commitment to the state’s natural resources and our agency’s mission.
- Excellence - We will always do our best, and continuously strive to improve our processes, activities, policies, operations, and products.
- Service - We will provide quality service that meets the needs and exceeds the expectations of the public and our own employees.

Guiding Principles of the SCDNR:
In carrying out our mission, we will continuously strive to:

- Enhance public and private partnerships and open communications necessary to cooperatively protect and manage the state's natural resources;
- Ensure that agency decisions and actions regarding the state's natural resources are based on a balance of scientific knowledge, strong conservation ethics, objectivity, fairness, and the needs and interests of the public;
- Ensure the safety and well-being of the public in their use and enjoyment of the state's natural resources;
- Ensure the continuation and effective management of hunting, fishing, boating, and other natural resources-related activities;
- Evaluate and improve agency functions and procedures to ensure efficiency, effectiveness, and accountability, emphasizing quality service to all customers, internal and external; and
- Foster an organizational culture that emphasizes effective leadership at all levels, a diverse, well-trained, and professional workforce, and an enjoyable and fulfilling work environment.

Strategy of the SCDNR:
To more effectively accomplish our mission and attain our vision, the SCDNR will work diligently toward achieving the following overarching goals and objectives during the next 5 years:

1. Enhance the effectiveness of the agency in addressing natural resource issues.
    a. Broaden strategies to address the impacts of population growth, habitat loss, environmental alterations, overuse and other challenges faced in protecting, enhancing and managing diverse natural resources;
    b. More effectively develop, coordinate, and integrate resource-specific conservation and management plans, research and policies within the agency; and
    c. Expand sound application of science for natural resource management and decision-making.
2. Improve the general operations of the agency.
    a. Develop and implement department-wide operational plans that clearly connect all agency activities to specific goals and annual accountability reports;
    b. Fully develop the agency's regional hub system;
    c. Continue to develop and maintain modern, well-integrated information systems and technology throughout the agency;
    d. Enhance and maintain effective communications throughout all levels of the agency;
    e. Maximize efficiency of internal operations and business procedures; and
    f. Aggressively pursue increases in revenue, state and federal funding, and identify new funding sources to support accomplishment of our mission.
3. Create an agency environment that supports a dedicated, professional workforce.
    a. Implement comprehensive workforce planning that is consistent with agency priorities;
    b. Expand consistent, agency-wide employee training, retention, and compensation efforts;
    c. Implement initiatives that improve employee morale and teamwork, instill a sense of pride in the agency, and emphasize the importance of its mission.
4. Enhance public trust and confidence in the agency.
    a. Foster more effective communications, outreach, and partnering with the public and State Legislature;
    b. Develop strategies that address divergent public opinion and expectations concerning issues related to accessibility, use, and protection of natural resources; and

c. Optimize our customer service through regular monitoring of constituent needs, public opinion, and agency performance; and

5. Enhance natural resource education to provide the public with knowledge necessary in making informed natural resource decisions.

The state's participation and contribution throughout this planning process will provide for ongoing opportunities and open dialogue to improve the ecological sustainment of fish and wildlife in the State of South Carolina. An essential part of comprehensive conservation planning is integrating common mission objectives where appropriate.

CLIMATE CHANGE

Climate change is the most compelling conservation challenge of our time. Accelerating climate change will amplify current resource management challenges involving habitat fragmentation, degradation, and loss, as well as urbanization, invasive species, disease, parasites, and water management. As rising temperatures affect the dynamics of complex natural systems, the potential exists for mass species extinctions and disruptions. Fortunately, the Service is in a unique position to help wildlife and ecosystems adapt to a rapidly changing climate.

Facing the climate change challenge requires working on a landscape level to integrate Service efforts with those of partners such as other federal, state and tribal agencies, conservation groups, and academic institutions. Moving forward, the Service will engage partners in a dialogue about working together to apply our resources with the best science to ensure landscapes are capable of sustaining America's fish and wildlife for generations to come.

Some of the most challenging climate change management issues include changes in the timing, location, and intensity of wildfires; changes in rain and snowfall patterns; changes in access to water resources; altered hydrology in rivers and wetlands; increased frequency of extreme weather events; and rising sea levels. Further, climate change will amplify existing management challenges involving habitat fragmentation, urbanization, invasive species, disease, parasites, and water management, all of which require an emphasis on large areas with interconnected and ecologically functional habitats capable of sustaining many species rather than single species or isolated or remnant habitats.

A team of Service employees embraced these climate change challenges and developed a Draft Climate Change Strategic Plan to guide the Service's climate change efforts. The draft plan emphasizes adaptation, mitigation, and education, and provides flexibility for resource managers to be responsive to evolving science, technology, and implementation.

Adaptation refers to management actions the Service and our partners take to reduce the impacts of climate change on fish, wildlife, plants, and habitats. The two recognized types of adaptive response to climate change are reactive and anticipatory. Mitigation is human intervention to reduce the sources or enhance the sinks of greenhouse gases. The Service must demonstrate leadership using carbon sequestration, best practices in natural resource management, and facility, fleet, travel, and other management strategies to achieve carbon neutrality by 2020. Education involves creating an essential understanding among Service employees, our partners, and our constituencies that climate change is real and happening now; climate change threatens fish and wildlife resources that we have come to value and are entrusted to protect; the Service and our partners need to develop achievable and effective goals and activities to address rapid, fundamental change in the natural world; and, perhaps most important, every member of the Service, regardless of position, can do something meaningful to reduce the threats to fish and wildlife resources from climate change.

Along with this draft plan, the team developed a series of short-term actions, which are already beginning to be implemented, and a Draft Five-Year Action Plan detailing longer-term actions to implement the draft plan when it is finalized. While the draft plan and draft action plan are finalized, the Service will move quickly to begin identifying and filling knowledge gaps, expanding capability to plan and work with partners, identifying habitats and corridors most important across landscapes, and effectively anticipating and addressing climate change.

The Draft Five-Year Action Plan establishes a basic framework within which the Service will work to help ensure the sustainability of fish, wildlife, and habitats in the face of accelerating climate change. The plan looks broadly at how climate change is affecting fish, wildlife, and habitats; what role the Service holds in the conservation community as it addresses climate change; and what the Service will contribute to that community and its campaign to ensure the future of fish and wildlife.

The draft action plan goals listed below expand on the broad categories of adaptation, mitigation, and education.

- Goal 1 – We will develop and apply capacity for biological planning and conservation design to drive conservation at broad landscape scales.
- Goal2 – We will plan and deliver landscape conservation that supports climate change adaptations by fish, wildlife, plants and habitats of ecological and societal significance.
- Goal 3 – We will develop monitoring and research partnerships that will provide complete and objective information to plan, deliver, evaluate and improve actions that help fish and wildlife adapt to accelerating climate change.
- Goal 4 – We will achieve carbon neutrality by 2020.
- Goal 5 – We will build capacity to understand, apply and share biological carbon sequestration science and work with partners to sequester atmospheric GHGs in strategic locations.
- Goal 6 – We will engage Service employees, our public and private partners, our key constituencies and stakeholders, and everyday citizens in a new era of collaborative conservation to seek solutions to the impacts of climate change and other 21st century stressors to fish, wildlife, and habitats.

During FY 2009, the Service began to take key first steps to prepare the agency for ambitious efforts to adapt to accelerated climate change in 2010 and beyond. The Directorate approved these first steps and many are being implemented in some of the Service's regions and programs. These steps are included in the Draft Five-Year Action Plan.

The 2009 actions build on the Service's commitment to implement landscape conservation through the Strategic Habitat Conservation framework and support the FY 2010 climate change budget proposal, the Service's transition strategy, the climate change strategic plan, and the short- and long-term actions now being considered. A summary of the FY 2009 actions follow below.

Develop a national adaptation strategy and inventory and monitoring program.
The Service will work with conservation organizations to address accelerated climate change more effectively by ensuring actions are coordinated across landscapes and political boundaries. In FY 2010, the Service will conduct feasibility studies for the Inventory and Monitoring Program and National Adaptation Strategy, supporting a national "blueprint" for these efforts.

Build regional and field technical capacity for climate change adaptation.
Working with our partners, the Service will create and enhance field-level capacity to provide cutting edge science and information that will help managers in making decisions related to changing climate. This includes conducting a needs assessment for establishing "regional climate science

partnerships" that will boost regional capacity for science. This capacity will be housed in regionally based partnerships called Landscape Conservation Cooperatives, which provide field-level capacity for landscape-scale biological planning and conservation design.

Build climate change leadership and management capacities.
Within the next 2 to 3 years, policy and political decisions of enormous consequence will be made at national, regional, and state levels. The Service will build capacity to affect these decisions and capitalize on the talents of its employees by establishing several key professional positions and a National Climate Change Team.

Identify priority water needs.
The Service will identify and assess priority issues related to water quality and water quantity, reflecting the best available climate change predictions and estimating the anticipated biological outcomes.

Address habitat fragmentation.
The Service will provide a report of recommendations and agency progress in promoting habitat connectivity to achieve species population objectives.

Facilitate international leadership on climate change and wildlife.
The Service will produce a framework and strategy for engaging key countries to share and acquire knowledge of climate change adaptation, mitigation, and education strategies; facilitate international exchange of personnel; and identify ways to engage the Service more effectively in the United Nations Framework Convention on Climate Change and other appropriate international forums.

Identify, prioritize, and adjust Service activities to consider the effects of climate change.
The Service will begin looking at areas where climate change can be incorporated into planning both our agency's planning efforts and those of state wildlife agencies.

Educate and communicate.
The Service will engage and educate our employees, partners, and stakeholders regarding the significance of climate change for fish and wildlife. We will also pursue an aggressive internal and external communications effort to support our climate change and landscape conservation work with employees, partners, and others.

Reduce the Service's carbon footprint.
By thoroughly documenting the Service's carbon footprint, we can begin immediately instituting practices to avoid global greenhouse gas emissions, minimize unavoidable emissions, and offset remaining emissions. Our goal is to be a "carbon neutral" organization by 2025.

Expand carbon sequestration for wildlife.
The Service will work with conservation partners to expand terrestrial carbon sequestration techniques, restore habitat, and conserve wildlife. We will use landscape conservation planning approaches to determine where, when, how much, and what habitat types should be conserved to achieve population, habitat, and carbon sequestration objectives.

Review legal, regulatory, and policy issues.
The Service response to climate change must consider necessary and appropriate changes to the legal, regulatory, and policy frameworks within which we operate. The Service will coordinate a review of these frameworks to recommend priority changes in the legal, regulatory, or policy framework that are necessary to encourage and support effective response to climate change.

Assess species vulnerability to guide conservation.
Vulnerability assessments will help identify the species and landscapes at greatest risk from accelerated climate change, and therefore constitute a crucial initial investment. The Service will develop and test climate change risk and vulnerability assessment methodologies for fish and wildlife species.

Consider climate change in grant criteria.
Service programs that administer grant programs, as appropriate, will review, evaluate, and develop new criteria that will direct appropriate funding to projects that specifically address climate change.

Assist in shaping energy policy.
Solutions to global warming are likely to focus on clean energy development. The Service will exercise its responsibility as a stakeholder in America's energy future by helping to shape energy policy that considers conservation and energy development objectives.

The Service believes that immediate action regarding climate change is critical because:

- climate change is the single greatest conservation challenge of the 21st century;
- climate change is increasingly a determinant of mission success for the Service and our partners;
- climate change reinforces our current direction of change and efforts to build partnership-based capacities for landscape-level conservation; and
- climate change requires immediate re-evaluation of near-term conservation priorities and approaches, and an alignment of our work to ensure we are investing limited resources wisely to achieve the most important conservation outcomes on landscapes impacted by climate change.

II. Refuge Overview

INTRODUCTION

REFUGE HISTORY AND PURPOSE

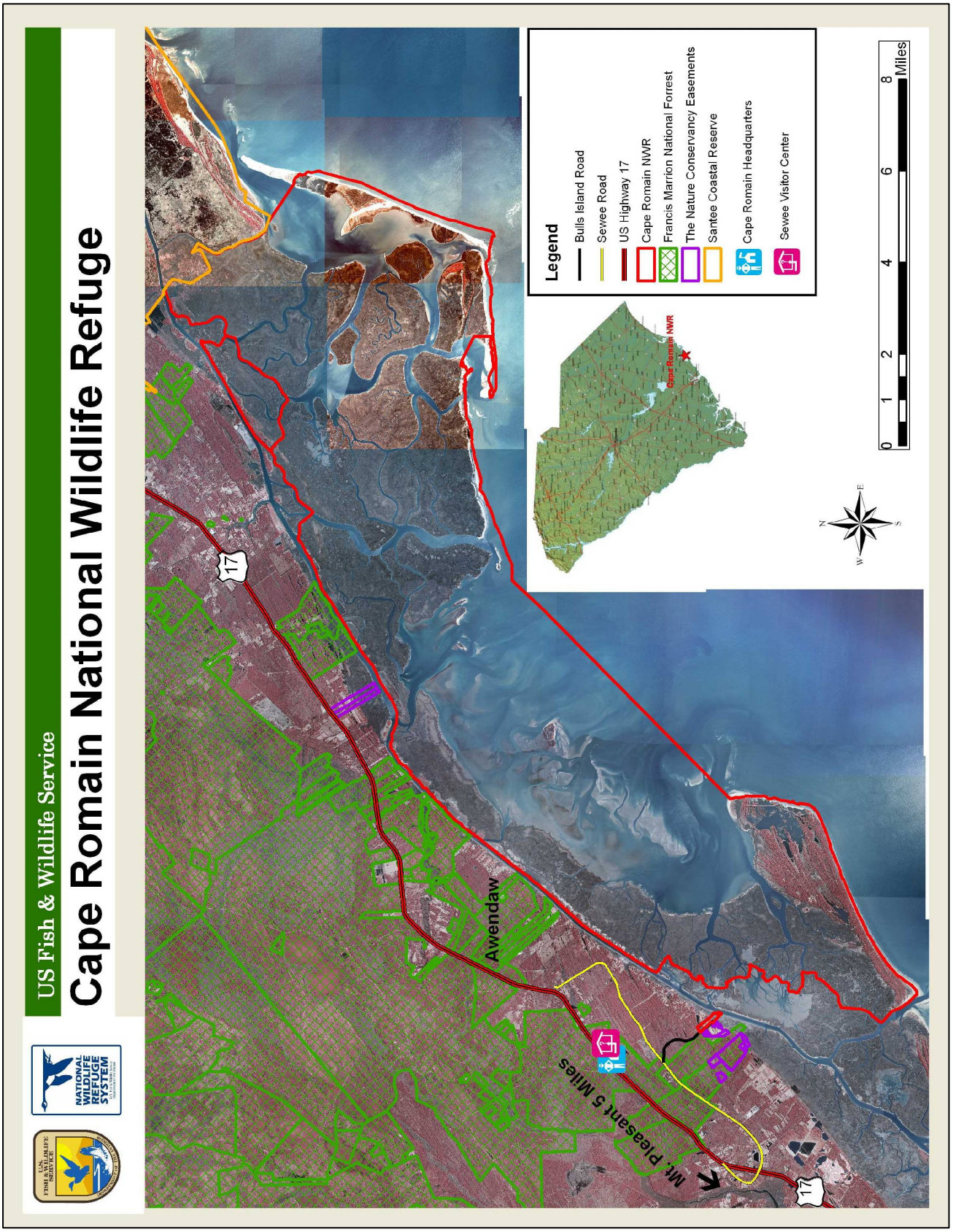
Established in 1932 as a migratory bird refuge, Cape Romain NWR encompasses a 22-mile segment of the southeast Atlantic coast. The refuge consists of 66,267 acres which include barrier islands, salt marshes, intricate coastal waterways, long sandy beaches, fresh and brackish water impoundments, and maritime forest. Points of interest include Bulls Island, Cape Island, and Lighthouse Island where two lighthouses, no longer operational, still stand.

The refuge's original objectives were to conserve in public ownership habitat for waterfowl, shorebirds, and resident species. In recent years, objectives have expanded to include: managing endangered species, protecting the 29,000 acre Class 1 Wilderness Area, and preserving the Bulls Island and Cape Island forests and associated diverse plant communities. Currently, the refuge is actively working to aid the recovery of the threatened loggerhead sea turtle.

Recognizing the high migratory bird benefits and recreational opportunities served by the lands and waters of the refuge, Cape Romain NWR was established under the Migratory Bird Conservation Act, the Fish and Wildlife Act, and the Refuge Recreation Act, thus outlining the primary purposes of these lands and waters:

> "for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. 715d (Migratory Bird Conservation Act)
>
> "to conserve and protect migratory birds…and other species of wildlife that are listed…as endangered species or threatened species and to restore or develop adequate wildlife habitat." 16 U.S.C. 715i (Migratory Bird Conservation Act)
>
> "for the development, advancement, management, conservation, and protection of fish and wildlife resources." 16 U.S.C. 742f(a)(4) "for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude." 16 U.S.C. 742f(b)(1) (Fish and Wildlife Act of 1956)
>
> "suitable for (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species." 16 U.S.C. 406k-2 (Refuge Recreation Act (16 U.S.C. 406k-406k-4), as amended)
>
> "so as to provide protection of these areas…and to ensure…the preservation of their wilderness character." (Wilderness Act of 1964, Public Law 88-577.)

Figure 1. Boundary and Location



SPECIAL DESIGNATIONS

- Cape Romain NWR is designated a Class 1 Wilderness Area for 29,000 acres.
- Cape Romain NWR is designated critical habitat for the federally listed piping plover.
- Cape Romain NWR is a Western Hemisphere Shorebird Reserve Network Site of International Importance.

ECOSYSTEM CONTEXT

An ecosystem is a geographic area including all the living organisms (people, plants, animals, and microorganisms), their physical surroundings (such as soil, water, and air), and the natural cycles that sustain them. All of these components are interconnected and managing any one component affects the others in that ecosystem. Ecosystems can be small (a single stand of aspen) or large (an entire watershed including hundreds of forest stands across many different ownerships).

The Service adopted an ecosystem approach to conservation because we can't just look at a single animal, species, or piece of land in isolation from all that surrounds it. We all realize that we are not going to achieve total conservation within the boundaries of a refuge; that we are not going to restore aquatic resources with a national fish hatchery; and that listing an endangered species is not going to conserve the entire ecosystem. All of the components are interconnected. If we disturb or manage one, all of the others will be affected. The ecosystem approach is comprehensive. It is based on all of the biological resources within a watershed and it considers the economic health of communities within that watershed. A watershed is the total land area from which water drains into a single stream, lake, or ocean.

Comprising one of the 53 ecosystems around the country, the Service's Savannah-Santee-Pee Dee Ecosystem (SSPD Ecosystem) includes the entire State of South Carolina, as well as the northeastern portion of Georgia, and the southwestern portion of North Carolina. The SSPD Ecosystem encompasses approximately 52,500 square miles and is divided into four main physiographic provinces including the Blue Ridge Mountains, Piedmont, Carolina Sandhills, and Coastal Plain provinces. Two major types of river systems traverse these provinces. Alluvial rivers originate in the mountains and piedmont and include the Great Pee Dee, Savannah, Congaree, Wateree, Catawba, and Santee rivers. Blackwater rivers originate in the coastal plain and include the Cooper, Ashley, Edisto, Salkahatchie, Combahee, Ashepoo, New, Four Holes, Little Pee Dee, Waccamaw, Black, and Lumber rivers. The SSPD Ecosystem includes several important areas with protective designations, including 14 national wildlife refuges, six national forests, four national fish hatcheries, two national estuarine research reserves, and more than 50 state parks.

A considerable acreage of tidal freshwater swamp and marsh are associated with the major river systems. In addition, the SSPD Ecosystem contains numerous palustrine wetlands that are isolated or contiguous with freshwater stream and river systems. The river basins drain into an extensive estuarine network of saltwater marsh with tidal creeks, inlets, and sounds intermixed with barrier, sea, and marsh islands. The estuarine system fuels the base of the marine food chain and provides tremendous nursery grounds for commercially important fish and shellfish.

The SSPD Ecosystem supports large populations of wading birds, shorebirds, waterfowl, game and non-game mammals, reptiles, amphibians, and anadromous fish. The habitats within the SSPD Ecosystem fall within the Atlantic Flyway. Forage, refuge, cover, and staging areas for a variety of migrating waterfowl, neotropical migratory birds, raptors, and shorebirds is provided. The several species of flora and fauna listed as federally threatened or endangered in the SSPD Ecosystem are indicative of the development pressures and habitat loss incurred. Approximately 37 animal and 31 plant species are

listed as federally threatened or endangered within the SSPD Ecosystem. Numerous species of plants and animals are candidates for listing but are not currently receiving federal protection. Several federally protected species depend on the SSPD Ecosystem for some portion of their life cycle, such as eastern cougar, West Indian manatee, red wolf, five species of whales, Carolina northern flying squirrel, Virginia big-eared bat, Indiana bat, bald eagle, peregrine falcon, wood stork, piping plover, red-cockaded woodpecker, Bachman's warbler, eastern indigo snake, loggerhead and other sea turtles, shortnose sturgeon, Carolina heelsplitter, and many plant species.

The biggest problem facing the SSPD Ecosystem is the loss of habitat through direct destruction and fragmentation, or from other impacts from human activities. The predominant stresses for the SSPD Ecosystem are: population growth, tourism, agriculture, silviculture, shipping ports, water channelization, urbanization, aquifer depletion, fire suppression, invasive species, non-point source pollution, and point source pollution. The actions of the SSPD Ecosystem Team are guided by two categories: trust resources and management issues. The trust resources include: migratory birds, anadromous fish, endangered species, and marine mammals. The management issues focus on: habitat protection and management, habitat restoration, contaminants, regulatory compliance, law enforcement, and biodiversity.

To address these threats, the management issues, and the needs of the trust resources, the SSPD Ecosystem Team pursues a mix of objectives under the following seven goals.

- To protect, restore, and enhance the biodiversity of aquatic resources, wetlands and their associated habitats on a landscape scale.
- To recover and enhance threatened, endangered, and species of special concern and the habitats upon which they depend.
- To protect, enhance, and manage migratory bird populations and the habitats upon which they depend.
- To manage national wildlife refuges and national fish hatcheries to serve as models of effective conservation of natural resources.
- To increase and enhance public awareness, support, and participation in carrying out the Service's mission through cooperative outreach efforts.
- To protect, enhance, and manage interjurisdictional and diadromous fish populations and the habitats upon which they depend.
- To perpetuate healthy native plant and animal communities threatened by invasive native and non-native plants and animals.

REGIONAL CONSERVATION PLANS AND INITIATIVES

The State Wildlife Grants (SWG) program began in FY 2002. Under this new program, Congress provided an historic opportunity for state fish and wildlife agencies and their partners to design and implement a more comprehensive approach to the conservation of America's wildlife. A requirement of SWG was that each state completes a Comprehensive Wildlife Conservation Strategy (CWCS) by October 1, 2005. Development of the CWCS is intended to identify and focus management on "species in greatest need of conservation." Congress expects SWG funds be used to manage and conserve declining species and avoid their potential listing under the Endangered Species Act.

In May 2002, the SCDNR began a process to develop the CWCS that was funded through the SWG program. The SCDNR committed to developing the strategy and began implementing the conservation actions on October 1, 2005. The goal of the strategy was to emphasize a cooperative, proactive approach to conservation while working with federal, state, and local governments; local

businesses; and conservation-minded individuals to join in the effort of maintaining the fish and wildlife resources of South Carolina (SCDNR, no date).

South Carolina's 2005 CWCS deemed the following actions to be critical: (1) Increase baseline biological inventories with emphasis on natural history, distribution, and status of native species; (2) increase commitment by natural resource agencies, conservation organizations, and academia toward establishing effective conservation strategies; (3) increase financial support and technological resources for planning and implementation of these strategies; and (4) create public-private partnerships and educational outreach programs for broad-scale conservation efforts (SCDNR, 2006).

South Carolina possesses diverse wildlife. Its habitats range from the Appalachian Mountains to the Atlantic Ocean and include many different taxonomic animal groups. SCDNR wanted to address as many of those groups as possible for inclusion in the list of priority species for the CWCS; as such, 12 taxonomic groups are included in the strategy: mammals, birds, reptiles, amphibians, freshwater fishes, diadromous fishes, marine fishes, marine invertebrates, crayfish, freshwater mussels, freshwater snails, and insects (both freshwater and terrestrial).

The CWCS identified 1,240 species to include on the state's Priority Species List. Reports were prepared for each species, guild or indicator; in these reports, authors described the species, their status, population and abundance, habitat needs, challenges, conservation accomplishments, and conservation actions. This approach allows for identification of both general conservation strategies for wildlife and habitats in South Carolina, as well as development of species-based conservation strategies. SCDNR also identified habitats critical for the priority species considered in the CWCS. Both terrestrial and aquatic habitats were considered and reports were prepared for 38 habitats (terrestrial and marine) organized within 5 ecoregions, as well as 13 ecobasins, which characterize the freshwater aquatic habitats of the state.

Eight categories of conservation strategies (Conservation Action Areas, or CAAs) were developed: Education and Outreach; Habitat Protection; Invasive and Nonnative Species; Private Land Cooperation; Public Land Management; Regulatory Actions; Survey and Research Needs; and Urban and Developing Lands. Within each CAA, conservation actions were condensed from the recommendations prepared for each animal on the Priority Species List. Some of the actions identified will affect all species included in the CWCS; others may affect only a few species. Each of these actions was prioritized and measures that indicate success of implementing the action were identified.

The CWCS considers monitoring to be crucial. Project leaders are required to produce annual progress reports for review by a steering committee and the CWCS coordination team. These reports will be evaluated for insight into adaptive management needs and reassessments of the CWCS.

South Carolina's CWCS also places strong emphasis on partnerships. Successful conservation efforts are advanced through a strong collaborative involvement between all resource stakeholders, whether private or public, governmental or nongovernmental. Task forces were convened to assist in determining important natural resource issues in South Carolina. Taxa teams were assembled to determine challenges to species and conservation actions to address those challenges. SCDNR also held public meetings to gather input from the citizens of the state. Prior to submission of the CWCS, SCDNR began creating Conservation Action Committees around the CAAs identified above.

ECOLOGICAL THREATS AND PROBLEMS

HABITAT LOSS AND FRAGMENTATION

Threats to wildlife in South Carolina and the nation first began to be recognized a century ago in the form of habitat destruction from unrestrained logging and the spread of agriculture as well as unregulated harvest for sporting and commercial purposes. After World War II, the challenges associated with sustaining wildlife populations began to accelerate and change dramatically. Many states, among them South Carolina, entered a period of rapid, sustained economic expansion and human population growth. During these "boom times," South Carolina's economy and workforce began to shift away from ones based primarily on agriculture. Migration into the state from other states (and later from other countries) increased substantially and the urban populations began to dominate the rural population demographically (SCDNR 2006).

Statewide, over 100,000 acres per year were converted from forests, farmland and other open space to urban uses from 1992 to 1997, making South Carolina the ninth-ranked state nationally in terms of total land area developed annually (USDA 1997). According to the same report, the National Resources Inventory, prepared by the Natural Resources Conservation Service (NRCS) of the U.S. Department of Agriculture (USDA), the growth rate from 1982 to 1992 was only 40,000 acres per year. Thus, land conversion was accelerating during this 15-year period. These recent urban land conversion rates represent a major burst of growth; this development trend and the conversion of rural lands to urbanized uses – with their attendant impact on habitat for wildlife – continue unabated today.

Strong economic forces are also transforming South Carolina's agricultural economy. Rising costs and falling prices are creating hardships for many family farms. As of 1997, there were approximately 4.5 million acres in agricultural production in South Carolina, representing an 18 percent drop since 1982. Long-term declines in farmland are even more dramatic: in 1954, 124,203 farms were producing goods in South Carolina and 57 percent of the land in the state consisted of farms. By 1992, the number of farms in the state had been reduced to only 20,242, comprising 23 percent of South Carolina's land use (SCDNR 2006).

As South Carolina's population continues to grow, placing ever greater pressure on undeveloped lands in the state, and driving conversion from rural to urban land uses, new challenges threaten the state's fish and wildlife. Additionally, long-standing downward trends in numbers of some species that previously had been overlooked have become more evident. In a recent state-by-state analysis of biodiversity conducted for the Nature Conservancy, South Carolina ranked 14th among all states in total number of native plant and animal species and 15th in terms of risks to native species. In a planning exercise conducted in 1994, SCDNR biologists estimated that as many as one-third of the state's vertebrate species were already then, or soon would be, experiencing serious declines (SCDNR 2006).

Elimination and fragmentation of coastal habitats have decimated wildlife species throughout the Atlantic Coast, and are recognized by the Service as serious threats to wildlife in South Carolina. The species most adversely affected by fragmentation are those that are area sensitive or require special habitat. Fragmentation affects migratory songbirds, sea turtles, beach mice, and many other species, primarily through high rates of nesting failure and predation. While more than 200 species of breeding migratory songbirds, shorebirds, waterfowl, and raptors are found in this region, some of these species have declined significantly, such as the red-cockaded woodpecker and Bachman's warbler. These species need the benefits of large, managed forest blocks to recover and sustain their existence.

Fragmentation of bottomland hardwood forests has left many of the remaining forested tracts as biological oases surrounded by inhospitable agricultural lands. Intensive agriculture has removed most of the forested corridors along sloughs that formerly connected forest patches. The loss of connectivity between the remaining forested tracts hinders the movement of a large range of wildlife between tracts, and reduces the functional value of many remaining smaller forest tracts. The severed connections also result in a loss of gene flow needed to maintain genetic viability and diversity within wildlife populations. Thus, remaining populations are rendered even more vulnerable to habitat modification and degradation. Particularly for wide-ranging species, reestablishing travel corridors to allow movement is of critical importance.

ALTERATIONS TO HYDROLOGY

The natural hydrology of a region 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 habitat relationships.

Extensive alterations to the region's hydrology occurred related to development, river channel modification, flood control levees, reservoirs, and deforestation, as well as degradation to aquatic systems from excessive sedimentation and contaminants.

Large-scale, man-made hydrological alterations have changed the spatial and temporal patterns of flooding throughout the entire Savannah/Santee/Pee Dee Rivers Ecosystem, in terms of both extent and duration of flooding, in comparison with the natural hydrology regime. This curtailment of the flooding regime has had an enormous impact on wetlands and their associated wetland-dependent species.

In coastal estuaries, the saline stratification and location of the saltwater wedge changes based on atypical levels of freshwater influxes. Factors affecting the level of freshwater inflow include erosion, sediment load changes, river runoff and pollution, dredging, and severe weather disturbances.

Southeastern states have the greatest numbers of imperiled and vulnerable freshwater fish species in the country. Channel modifications and pollution have gradually eliminated large populations of native aquatic species, including fish, mussels, snails, insects, and crustaceans. Barriers to movement prevent anadromous fish from reaching spawning grounds and key habitat areas. Many other aquatic species have similarly become isolated. Without avenues for migration, impacts from land surface pollution runoff are exacerbated. Restoration of the structure and functions of a natural wetland is complicated by the fact that wetlands depend on a dynamic interface of hydrologic regimes to maintain water, vegetation, and animal complexes and processes.

PROLIFERATION OF INVASIVE AQUATIC PLANTS AND ANIMALS

Compounding the problems faced by aquatic systems is the growing threat from invasive aquatic vegetation like alligator weed and water hyacinth. 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 (non-native) vegetation capable of aggressive growth is further threatening viability of aquatic systems. These invasive aquatic species threaten the natural aquatic vegetation important to aquatic systems, and choke waterways to a degree that often prevents recreational use.

Various species of non-native wildlife and fish also flourish in this southern coastal climate. Animals like feral hogs have caused extensive habitat damage and alterations.

PHYSICAL RESOURCES

CLIMATE

The refuge is characterized by generally pleasant weather. The southerly latitude, proximity of the ocean, and sea level elevation are the determining climatic factors which produce warm, humid summers and relatively mild temperate winters. The average maximum/minimum temperatures for July and January respectively are 89 F/73 F and 60 F/40 F and nearly 240 frost-free days are reportedly annually. Roughly 15 percent of the area's rainfall is associated with tropical storms. The coastal area of South Carolina is a moderately high-risk zone with respect to hurricane occurrences and destruction. Rainfall averages about 50 inches per year.

CLIMATE CHANGE AND GLOBAL WARMING

The Intergovernmental Panel on Climate Change (IPCC) recently concluded that warming of the climate is undeniable and could cause changes in our stewardship of land. Examples of potential changes are altered fire regimes, rain and snowfall patterns, access to water resources, hydrology in rivers and wetlands, frequency of extreme weather events, and rising sea level at coastal refuges.

Global climate change poses risks to human health and to terrestrial and aquatic ecosystems. Important economic resources, such as agriculture, forestry, fisheries, and water, also may be affected. Warmer temperatures, more severe droughts and floods, and sea-level rise could have a wide range of impacts. All these stresses can add to existing stresses on resources caused by other influences such as population growth, land-use changes, and pollution (IPCC 2007).

According to NOAA and NASA data, the Earth's average surface temperature has increased by about 1.2 to 1.4ºF since 1900. The 10 warmest years in the 20th century have all occurred within the past 15 years, with the warmest 2 years being 1998 and 2005. Some climate models, based on emissions of greenhouse gases, primarily carbon dioxide, methane, and nitrous oxide, predict that average surface temperatures could increase from 2.5 to 10.4ºF by the end of this century. Increases in atmospheric CO_2 are attributed largely to human activities, which have grown rapidly since 1945. The burning of fossil fuels adds 5.6 billion tons of carbon, and deforestation contributes another 0.4 to 2.5 billion tons of carbon to the atmosphere each year.

Global warming, resulting in melting of glaciers and ice sheets, will cause sea levels to rise. Globally, sea level has risen 4 to 10 inches during the past century. NASA estimates that yearly, 50 billion tons of ice is melting from the Greenland ice sheet. NASA aerial surveys show that more than 11 cubic miles of ice is disappearing from the ice sheet annually. Considering that land less than 10 meters above sea level contains 2 percent of the world's land surface but 10 percent of its population, major impacts could be felt by large numbers of people living on the low-lying coastlands, particularly the Gulf and east coast states.

Changes in coastal wetlands due to sea-level rise were modeled for Cape Romain NWR using the Sea Level Affecting Marshes Model (SLAMM). This model simulates the dominant processes involved in wetland conversions and shoreline modifications during long-term sea-level rise (Clough and Park 2006, www.warrenpinnacle.com/prof/SLAMM). Dramatic changes are projected for Cape Romain NWR's marshes and other near-shore habitats under the 1-meter sea-level rise scenario.

Salt marshes throughout the refuge would likely convert to open water, and barrier islands shrink in size.

In addition to the rising seas, the effects of climate change and global warming will be changes in weather/rainfall patterns, decreases in snow and ice cover, rising sea levels, and stressed ecosystems. For the southeastern United States this can mean extreme precipitation events; greater likelihood of warmer/dryer summers and wetter/reduced winter cold; and, alterations of ecosystems and habitats due to these changes in weather patterns–to name but a few possibilities. For example, a recent study of the effects of climate change on eastern United States bird species concluded that as many as 78 bird species could decrease by at least 25 percent; while as many as 33 species could increase in abundance by at least 25 percent due to climate and habitat changes.

GEOLOGY AND TOPOGRAPHY

The refuge consists primarily of barrier islands and salt marsh. The barrier islands are low elevation and have beaches and dunes on the ocean side with a mix of forest and wetlands toward the interior depending on elevations.

SOILS

The refuge contains basically three major soil associations. These include the Crevasse-Dawhoo complex; Rolling, Coastal beaches and Dune land; and Tidal marsh, Soft. Soil characteristics are closely associated with natural drainage characteristics. Crevasse soils are excessively drained, sandy soils on long narrow ridges. Ridges are 25 to 60 feet in width, 5 to 15 feet in height, and 200 to over 1,000 feet in length. Dawhoo soils are level to depressional, very poorly drained, sandy soils in narrow troughs between ridges. Troughs are 10 to 40 feet in width and from 300 to 1,000 feet in length. Coastal beaches and Dune land consist of sandy shoreline and sand dunes that border the Atlantic Ocean. Shoreline areas are nearly level fine sand beaches that are flooded twice daily by ocean tides. Dunes, which are formed by wind, are mounded areas of dry, loose sand. Tidal marsh, soft consists of broad, level tidal flats that are covered by 6 to 24 inches of saltwater at high tide. The surface layer is a dark colored soft clay, clay loam, muck, or peat and is saturated. It is underlain by gray to dark-gray, soft, fine-textured clayey material that is permanently saturated. The tidal marsh soils contain sulfide and if the soil becomes drained or aerated, the sulfide oxidizes and creates sulfuric acid (Miller 1971).

HYDROLOGY

The barrier islands of Cape Romain NWR are part of a dynamic coastal system that are continually shaped by erosion, sedimentation, storms, sea level rise, and surrounding development (Daniels et al 1993, Sexton 1995, Pilkey and Dixon 1996). Historically, the Santee River delta supplied sediment that maintained the beaches and land mass of refuge islands. However, the construction of dams and diversion canals in the 1940s stopped the supply of sediment and altered the hydrology and geomorphology of the system (Brown 1977, Lennon 1996, Hockensmith 2004). The loss of sediment supplied by the Santee River resulted in widespread massive erosion that will continue to occur (Lennon 1996). The loss of sediments coupled with sea-level rise is likely to accelerate the loss of beaches and habitats on refuge islands (Titus and Richman 2001).

AIR QUALITY

Charleston County generally has good air quality and is considered to be in attainment with the National Ambient Air Quality Standards (NAAQS), including lead, particulate matter below 2.5 microns in diameter (PM-2.5), particulate matter below 10 microns in diameter (PM-10), and sulfur dioxide (Scorecard 2005).

WATER QUALITY AND QUANITY

Prior to the dams constructed in the 1940s, the Santee River was the fourth largest river system in terms of streamflow on the east coast (Hockensmith 2004). The annual mean discharge of the river below the dams dropped from 18,500 cubic feet per second to 2,600 cubic feet per second (Hockensmith 2004). In 1985, flows to the Cooper River were rediverted to the Santee River, which brought the mean annual streamflow to 10,900 cubic feet per second (Hockensmith 2004). Periodic releases of freshwater through the Santee River dam influences water quality in the refuge, especially in the northern section (Kracker and Meaburn 2006). Timing and release of water through the dam likely has an effect on biota and warrants further study (Kracker and Meaburn 2006). Overall, water quality was good and exhibited normal variation typical of a marine influenced salt marsh ecosystem (Kracker and Meaburn 2006).

BIOLOGICAL RESOURCES

HABITAT

Estuarine Emergent Wetlands

Cape Romain is primarily (75 percent) composed of estuarine emergent wetlands dominated by smooth cordgrass. During high tide, the wetlands can be completely inundated. As the water level rises in the marsh, it carries with it aquatic organisms including fish, crustaceans, and other invertebrates. Estuarine wetlands are very important as nursery habitat for juvenile fish, crabs, and shrimp that take rRefuge among the vegetation for protection from predators. When the tide recedes, these organisms often remain in the marsh trapped in pools of water at lower elevations until the next high tide. Such pools provide excellent foraging opportunities for birds as the aquatic organisms may be highly concentrated within these refugia. The wide variety of organisms supported by estuarine marshes is linked to the range of salinities that occur there. When rain falls upstream in the Santee River drainage, it flows downstream and discharges into the estuaries surrounding Wolf and Egg Islands. This freshwater temporarily lowers the salinity in the estuaries, making them habitable for organisms that prefer fresher water. Alternatively, when rainfall is limited and salinity levels rise in the estuaries, more saline tolerant species can move in from the Atlantic Ocean and those intolerant of high salinity migrate upstream into the river system.

Beaches, Dunes, and Sand Bars

Because of dredging operations up the coast in the Santee River delta, the barrier islands in the Santee delta are sand starved. Littoral drift occurs from north to south, therefore, sand that historically came out of the Santee River harbor drifted south to deposit along the barrier islands, including Cape Romain. This sand is now dredged from the river and deposited on upland disposal sites, robbing the system of its sand supply. Cape Romain NWR has been eroding for the past 70-80 years, changing in size and shape.

Figure 2. Wetland Impoundments

Dunes, beaches, and sand bars are critical for migratory birds as loafing and roosting habitat. Even more critical for shorebirds are the invertebrate prey populations these habitats support. Horseshoe crabs spawn in the intertidal zone during high tides in May. The eggs produced by this effort provide excellent, high-quality food resources for migrating shorebirds including red knot, short-billed dowitcher, marbled godwit, ruddy turnstone, and American oystercatcher. In addition, burrowing benthic organisms such as *Donax sp.*, surf clam *Mulina*, angelwing, arc, and other small bivalves are eaten, providing additional critically important food resources. Crustaceans including fiddler crabs, ghost shrimp, and other small shrimp are utilized by Wilson's plover, gull-billed tern, whimbrel, marbled godwit, long-billed curlew, and American oystercatcher.

Maritime Forest

Cape Romain NWR contains 2,109 acres of maritime forest located mostly on Bulls Island. The maritime forest is dominated by live and southern magnolia and cabbage palm. The dominant understory species are red bay, yaupon, American holly, wax myrtle, and saw palmetto. There are loblollies and slash pines interspersed throughout and on the fringes (younger portion) of Bulls Island. A disruptive event (i.e., severe storm or wild fire) would shift the dominant overstory to the faster growing pine species. The frequency of such events would dictate the climax community. Frequent storms and/or wildfire would result in the maintenance of a "fire climax" pine dominated community. This could be controlled, to an extent, by using prescribed fire during winter months resulting in reduced fuel loads and far less severe wild fire potential. However, the remoteness of the island, difficulty of accessing the forest and small size of this forest community would not make prescribed fire economically feasible. In addition, wild fire could not escape the island to cause damage to private property, currently the frequency of wild fire and/or severe storm events would not maintain the forest in a fire climax community and the desirable state is a naturally functioning wilderness maritime forest community.

Maritime Scrub-Shrub

Maritime scrub-shrub habitat forms on the margins and within the maritime forest, especially on Bulls Island. This scrub-shrub habitat is utilized by neotropical migratory and resident songbirds, and is excellent nesting habitat for painted buntings.

WILDLIFE

Sea Turtles

Cape Island is home to the largest nesting population of turtles within the northern subpopulation of the southeastern loggerhead sea turtle. The northern subpopulation, or nesting aggregation, consists of those loggerheads that nest from North Carolina to around Cape Canaveral, Florida. These turtles are isolated from all other nesting turtles in the southeast based on genetic studies involving mitochondrial DNA. With an average of 1,000 nests per year, Cape Island is the most significant loggerhead nesting beach north of Cape Canaveral.

During the 2008 nesting season, approximately 1,431 loggerhead sea turtle nests were laid on the Cape Romain NWR. Of these, 1,325 nests were laid on Cape Island (1,114) and Lighthouse Island (211) between May 12 and August 16. The 2008 nesting season total is the second highest nesting year since 1979. In addition, two leatherback (*Dermochelys coriacea*) nests were laid on the refuge. On June 17 a nest was laid on Cape Island, and on August 14 a second nest was laid on Bulls Island. This is the second year of recorded leatherback sea turtle nesting on the refuge.

Nesting Shorebirds

Cape Romain NWR is one of 500 Important Bird Areas by the American Bird Conservancy due to its importance for nesting shorebird and colonial beach nesting birds. The refuge provides nesting habitat for Wilson's plovers, American oystercatchers, willets, and black-necked stilts. Wilson's plovers and American oystercatchers are both species of significant conservation concern, listed as high and extremely high priority species, respectively, in the regional shorebird conservation plan (Hunter et al. 2000). Both species nest on beach fronts and washed shell rakes that accrete on the edge of marshes and form small islands in bays. Willets and black-necked stilts are both listed as moderate priority in the regional shorebird conservation plan (Hunter et al. 2000) but are still worthy of consideration. Reproductive success of American oystercatchers is low and the primary cause of loss of eggs is overwash in all habitats (Thibault 2008 and report). Predators such as raccoons and mink are present and may also be a major cause of loss. The highest density of American oystercatchers in South Carolina can be found on Cape Romain NWR, with as many as 184 pairs of oystercatchers. In 2009, approximately 50 pairs of Wilson's plovers were counted in Cape Romain NWR, which also may be the highest density of nesting in South Carolina (SCDNR unpublished data).

Non-breeding, Migrating, and Over-wintering Shorebirds

Cape Romain NWR provides important stopover habitat for a variety of shorebirds that are of conservation concern. The Cape Romain Region, Cape Romain NWR and marshes and beaches south to Dewees Inlet supports almost 2,000 American oystercatchers in the winter (Sanders et al. 2004). This is almost 1/5 of the estimated American oystercatcher population on the Atlantic and Gulf coasts of the United States (Brown et al. 2005). Individuals wintering here represent every nesting population on the Atlantic coast from South Carolina north and flocks move regularly in and out of the refuge. American oystercatchers are listed as an extremely high-priority species in the regional shorebird conservation plan (Hunter et al. 2000).

Marbled godwits are identified as a species of high priority for conservation in the regional shorebird conservation plan (Hunter et al. 2000).

The subspecies *rufa*, which winters in TDF and potentially on the southeastern coast of the United States, is of special concern as the population has experienced a precipitous decline from 30,000 to 17,000 individuals between 2004 and 2005. Recently, the Service received a proposal for emergency listing of this subspecies due to these population declines. Red knots are considered to be an extremely high priority in the regional shorebird conservation plan (Hunter et al. 2000).

Other species of importance using the refuge during migration include long-billed curlew, short-billed dowitcher, and whimbrel. These species use beaches for roosting and forage in the shallow water surrounding the refuge as well as exposed mudflats during low tides. These three species are all identified as high conservation priority species in the regional shorebird conservation plan (Hunter et al. 2000).

Nesting and Foraging Colonial Beach Nesting Waterbirds

Cape Romain NWR does not support high levels of beach nesting colonial waterbirds presently. However, a large colony of brown pelicans, royal terns, black skimmers with small numbers of least, sandwich, gull-billed, Forster, and common terns exists. However, Cape Romain NWR supports the largest number of natural nesting least terns in the state as development has forced them to rooftops. The royal tern colony on Cape Romain NWR fluctuates between 600 and 2,500 nests per year. The beaches of the refuge provide important roosting habitat for nesting and post-fledging birds. In

addition, these birds use the waters within and around the refuge for foraging. Cape Romain NWR is a very important region of the southeastern United States due to its ability to support large numbers of nesting and foraging waterbirds.

Nesting and Foraging Long-legged Wading Birds

The estuaries and marshes of Cape Romain NWR and the surrounding area provide important foraging habitat for long-legged wading birds, and potentially could become nesting sites for the roseate spoonbill and wood stork. A variety of wading birds use the entire Santee River Delta and its associated wetlands to forage on small fish and estuarine invertebrates. Notably, there has been an increasing number (~15) of reddish egrets in the area post-breeding, the highest number in South Carolina. These are primarily dark plumaged adults. Nesting has been documented in the state only on Cape Romain NWR (1-2 pairs in recent years). This species has been expanding its range northward in Florida. It is reasonable to expect that nesting may increase at Cape Romain NWR in the near future.

There is some concern that food resources for these species have been impacted and could suffer greater impacts in the future. The introduction of flathead catfish into the Santee River system has caused a severe reduction in the abundance of sunfish and bullhead catfish species (preferred forage for wood storks and other wading birds). In addition, reduction in water quality and/or quantity would have negative impacts on forage species.

Wintering and Breeding Secretive Marshbirds and Sparrows

There are nearly 30,000 acres of wetlands inside the boundary of Cape Romain NWR. These wetlands are primarily emergent estuarine marshes dominated by *Spartina alterniflora* (smooth cordgrass). Other wetland types include a small amount of higher marsh and open salt marsh panne habitat. During winter (August through May), coastal cordgrass marsh is critically important for the saltmarsh sharp-tailed and Nelson's sharp-tailed sparrow. These species typically forage on insects and cordgrass seeds during winter. These birds are extremely secretive and limited to this specific estuarine salt marsh habitat. Other secretive marshbirds such as seaside sparrow, least bittern, and clapper rail utilize the refuge's salt marshes for nesting. Black rails nest in high salt marsh which is characterized by infrequent tidal inundation and dominated by cordgrass (*Spartina patens, S. alterniflora, S. cynosuroides, S. bakeri*), pickleweed (*Salicornia spp*.), and saltgrass (*Distichlis spicata*). This species has been identified as a species of very high concern in the regional waterbird conservation plan (Hunter et al. 2006). A specific monitoring protocol has been developed for secretive marshbirds as part of the National Marshbird Monitoring Program. There is also a centralized database where survey results are compiled and stored.

Reptiles

Very little is known about the herpetofauna on the refuge. The Coastal Plain is a very important region overall for herpetofauna in South Carolina with high species diversity, habitat diversity, and several rare, threatened, and endangered species occurring there. Of the approximately 142+ species of amphibians and reptiles found in the state, 113 occur in the Coastal Plain and 50 of these are endemic to this province, in South Carolina. With the complete inundation of Little Egg Island, reptiles are probably nonexistent there. Cape Romain NWR has hammocks of scrub-shrub habitat and reptiles may be present, especially on Bulls Island.

Diamondback terrapins are abundant in the waters adjacent to the refuge and we suspect high numbers are nesting on Egg and Cape Romain Islands. Presently, the two largest threats to the species at Cape Romain NWR are depredation of nests by raccoons and crab pot mortality from drowning. The University of Georgia's Marine Extension Service (MAREX) recently completed a study examining the effectiveness of several terrapin excluder devices on crab traps. Funded by the Environmental Resources Network (T.E.R.N.), MAREX personnel examined five excluder devices in St. Simons and St. Andrew estuaries during the summers of 2003 and 2004 (see http://www.dtwg.org/Regional/GA%20BRD%20synopsis.pdf). A serious problem could occur to the population if a fishery was initiated as had occurred in the Chesapeake Bay years ago almost causing a total loss of the local population. Currently, it is illegal to sell diamondback terrapins and there is a two per person limit, therefore, there should be no danger of a "legal" fishery beginning that could result in total loss of the local population.

CULTURAL RESOURCES

The refuge is rich in the history of South Carolina. Sewee Indians inhabited the area before the arrival of the settlers. The tidal creeks and bays provided the natives with ample supplies of fish, oysters, and clams. Several native middens are located on the refuge. English settlers in South Carolina made their first landing in the New World on Bulls Island to replenish their stocks of wood, water, and food before proceeding further south. They eventually established the first permanent European settlement in South Carolina at the present city of Charleston.

Bulls Bay and the creeks behind Bulls Island were reputed hideouts for pirates plundering ships along the coast. The remains of the Old Fort on Bulls Island are believed to have been a martello tower built in the early 1700s. Stories of retreating British warships restocking supplies on Bulls Island during the Revolutionary War, Confederate blockade runners using refuge tidal creeks, and the Union troops destruction of the martello tower, used as a Confederate powder magazine, are documented.

In 1925, Gayer Dominick, a banker and broker from New York, purchased Bulls Island with the intent of making it a private hunting preserve. He had the Dominick House built and made improvements to the existing impoundments to attract waterfowl. In 1936, Mr. Dominick conveyed the island to the Service to become part of the refuge.

Two lighthouses, listed on the National Register of Historic Places, still stand on Lighthouse Island. The first was built in 1827 and is the oldest of its kind still standing in the United States. The second, built in 1857, stood watch over the coastal area until 1947. Although neither is operational, they are still used as daytime landmarks for ships and fishermen.

SOCIOECONOMIC ENVIRONMENT

Cape Romain NWR is located offshore in Charleston County, South Carolina, with Awendaw and McClellanville as the two closest towns. The primary industry related activities in the area include commercial fishing and forestry.

Commercial fisheries are important to the economic and social fabric of Awendaw and McClellanville. In particular, McClellanville is a primary center for shrimp harvesting and processing. Fishery products serve local markets as well as other larger regional markets. In addition to the direct economic impacts of the fisheries, fishing communities also serve as focal points for other residents not directly supported by the fisheries.

Recreational fishing in freshwater and saltwater is an activity that attracts people without regard to race, sex, or income level and can often influence the economy of an area (Hammond and Cupka 1977; Smith and Moore 1981). A variety of fishing opportunities exist in and around Cape Romain NWR, in habitats that range from rivers to intertidal marshes, creeks, and the ocean surf.

Marine recreational fishery resources at the refuge have become very important to the economics of the area. Most recreational fishing is from small boats, but bank anglers utilize the areas around landings and bridges. In general, boating anglers undertake fishing for specific fish species, while bank anglers simply catch what they can and keep most everything. Fishing licenses are required to fish from a boat and for bank fishing.

Estuarine waters around Cape Romain NWR are considered to be among the best inshore saltwater fishing locations in the state. Inshore anglers may fish in the surf along the beaches of the barrier islands as well as from bridges, piers, and boats throughout the many rivers and tidal creeks in the surrounding area. Shore-based fishermen catch a variety of species in the marine waters including spot, Atlantic croaker, bluefish, summer and southern flounders, spotted seatrout, red drum, black drum, pinfish, southern and gulf kingfish, and sheepshead. White and brown shrimp are the species most sought by recreational shrimpers, as well as several different types of small sharks and rays. The blue crab is the primary recreationally caught crab with some incidentally caught stone crab.

High levels of exploitation by fishermen coupled with the loss of productive habitat due to coastal development and pollution have a major impact on estuarine recreational finfish stocks. For some species such as red drum, a gradual reduction in the recreational harvest has been implemented by measures such as size limits and bag limits. Assessments are regularly done to determine if such measures result in reduced mortality of highly sought recreational species throughout the region.

In 1790, South Carolina's total resident population numbered 249,073 people. According to data collected in 2003, the U.S. Census Bureau estimated the population of South Carolina to be 4,147,152 people, a 3.4 percent increase from 2000. South Carolina saw a 15.1 percent population increase from 1990 to 2000. The average population density in this state is 133.2 people per square mile (U.S. Census Bureau 2005).

Of the over 19 million acres of land in the state, seven percent (over 1.3 million acres) is publicly owned, while 93 percent (17,912,789 acres) is privately owned. The vast majority of the state is characterized as non-federal rural lands (non-federal referring to all lands in private, municipal, state or tribal ownership). Land use on non-federal lands in the state, which total 18,115,500 acres, is primarily forestland. South Carolina saw a 20 percent increase in developed lands between 1992 and 1997 (USDA 2000) and continues to see similar rates of conversion in land use.

As of 2002, there were approximately 4.85 million acres in agricultural production in South Carolina (USDA 2003). In 1982, there were approximately 5.5 million acres in agricultural production which amounts to a 12 percent drop in 20 years. The average farm in South Carolina was approximately 197 acres in size in 2002; up 2 percent from an average of 193 acres in 1997 (USDA 2003). The market value of agricultural products sold in 2003 totaled over $1.6 billion with top outputs in poultry, tobacco, and greenhouse/nursery production. Counties in South Carolina with the highest agricultural yields in 2002 were Lexington, Kershaw, York, Dillon and Orangeburg (USDA 2003).

South Carolina is rich in non-fuel raw minerals with a total of over $506 million produced in 1997 (U.S. Department of the Interior 1998). The most common minerals produced in South Carolina are: cement, clays, gemstones, peat, sand, gravel, and crushed stone. In 1997, South Carolina was the

top producer of vermiculite, ranked fourth in masonry cement, sixth in common clays, third in kaolin, and fifth in crude mica. Portland cement and crushed stone was estimated at $193 and $155 million respectively for 1997.

According to results of the USDA Forest Service Forest Inventory Analysis (FIA) published in 2000, 12.3 million acres of land in South Carolina is forested (Conner and Sheffield 2000). Non-industrial private owners, including individual and corporate timberland owners not associated with the forest product industry, own 74 percent of these lands. Timberland ownership under corporate control has increased in recent years to 19 percent or 2.0 million acres. The percentage of forests managed by the forest products industry has decreased 14 percent, from 2.3 million to 2.0 million acres over the FIA study period. Public land ownership increased to 1.2 million acres. Total softwood production increased 14 percent to 9.2 billion cubic feet while hardwood production increased just over 4 percent to 10.2 billion cubic feet.

FISHING

In 2001, 812 thousand state residents and nonresidents 16 years old and older fished in South Carolina. Of this total, 571 thousand anglers (70 percent) were state residents and 241 thousand anglers (30 percent) were nonresidents. Anglers fished a total of 10.7 million days in South Carolina— an average of 13 days per angler. State residents fished 9.8 million days, 91 percent of all fishing days within South Carolina compared to nonresidents who fished 910 thousand days—9 percent of all fishing days in the state.

Anglers 16 years old and older spent $559 million on fishing expenses in South Carolina in 2001. Trip-related expenditures including food and lodging, transportation, and other expenses totaled $318 million, or 57 percent of all their fishing expenditures. They spent $127 million on food and lodging and $64 million on transportation. Other trip expenses such as equipment rental, bait, and cooking fuel totaled $127 million. Each angler spent an average of $400 on trip-related costs during 2001. Anglers spent $228 million on equipment in South Carolina in 2001, or 41 percent of all fishing expenditures. Fishing equipment (e.g., rods, reels, line) totaled $79 million, or 35 percent of the equipment total. Auxiliary equipment expenditures (e.g., tents, special fishing clothes) and special equipment expenditures (e.g., boats, pickups) amounted to $148 million, or 65 percent of the equipment total. Special and auxiliary equipment are items that were purchased for fishing, but could be used in activities other than fishing. The purchase of other items such as magazines, membership dues, licenses, permits, stamps, and land leasing and ownership amounted to $13 million—2 percent of all fishing expenditures.

HUNTING

In 2001, there were 265 thousand residents and nonresidents, 16 years old and older, who hunted in South Carolina. Resident hunters numbered 221,000 accounting for 83 percent of the hunters in South Carolina. There were 44,000 nonresidents who hunted in South Carolina, or 17 percent of the state's hunters. Residents and nonresidents hunted 4.7 million days in 2001, for an average of 18 days per hunter. Residents hunted on 4.4 million days in South Carolina or 94 percent of all hunting days, while nonresidents spent 307 thousand days hunting in South Carolina, or 6 percent of all hunting days.

Hunters 16 years old and older spent $305 million in South Carolina in 2001. Trip related expenses such as food and lodging, transportation, and other trip costs totaled $96 million, or 31 percent of their total expenditures. They spent nearly $36 million on food and lodging and $42 million on transportation. Other expenses such as equipment rental totaled $18 million for the year. The

average trip-related expenditure per hunter was $361. Hunters spent $158 million on equipment, or 52 percent of all hunting expenditures. Hunting equipment (e.g., guns, ammunition) totaled $108 million and comprised 68 percent of all equipment costs. Hunters spent $50 million on auxiliary equipment (e.g., tents, special hunting clothes) and special equipment (e.g., boats, pickups), accounting for 32 percent of total equipment expenditures for hunting. Special and auxiliary equipment are items that were purchased for hunting but could be used in activities other than hunting. The purchase of other items such as magazines, membership dues, licenses, permits, and land leasing and ownership cost hunters $52 million, or 17 percent of all hunting expenditures.

WILDLIFE WATCHING ACTIVITIES

In 2001, 1.2 million U.S. residents 16 years old and older fed, observed, or photographed wildlife in South Carolina. Approximately 88 percent or 1 million of the wildlife watchers enjoyed their activities close to home and are called "residential" participants. Those persons who enjoyed wildlife at least 1 mile from home are called "nonresidential" participants. People participating in nonresidential activities in South Carolina in 2001 numbered 331,000, or 28 percent of all wildlife watchers in South Carolina. Of the 331,000, 204,000 were state residents and 128,000 were nonresidents.

South Carolinians 16 years old and older who enjoyed nonresidential wildlife watching within their state totaled 204,000. Of this group, 195,000 participants observed wildlife, 100,000 photographed wildlife, and 87,000 thousand fed wildlife. Since some individuals engaged in more than one of the three nonresidential activities during the year, the sum of wildlife observers, feeders, and photographers exceeds the total number of nonresidential participants.

Bird watching attracted many wildlife enthusiasts in South Carolina. In 2001, 742,000 people observed birds around the home and on trips. The majority, 78 percent, or 582,000, observed wild birds around the home while 39 percent (291,000) took trips away from home to watch birds.

Participants 16 years old and older spent $256 million on wildlife-watching activities in South Carolina in 2001. Trip related expenditures, including food and lodging ($56 million), transportation ($25 million), and other trip expenses such as equipment rental ($8 million) amounted to $89 million. This summation comprised 35 percent of all wildlife watching expenditures by participants. The average trip-related expenditure for nonresidential participants was $269 per person in 2001.

Wildlife-watching participants spent $149 million on equipment, or 58 percent of all their expenditures. Specifically, wildlife watching equipment (e.g., binoculars, special clothing) totaled $113 million, 76 percent of the equipment total. Auxiliary equipment expenditures (e.g., tents, backpacking equipment) and special equipment expenditures (e.g., campers, trucks) amounted to $36 million, or 24 percent of all equipment costs. Special and auxiliary equipment are items that were purchased for wildlife-watching recreation but can be used in activities other than wildlife-watching activities. Other items purchased by wildlife watching participants such as magazines, membership dues and contributions, land leasing and ownership, and plantings totaled $18 million, or 7 percent of all wildlife-watching expenditures.

Further information regarding fishing, hunting, and wildlife watching activities can be found in the following survey: U.S. Department of the Interior, Fish and Wildlife Service, and U.S. Department of Commerce, U.S. Census Bureau. 2001 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation.

REFUGE ADMINISTRATION AND MANAGEMENT

LAND PROTECTION AND CONSERVATION

The increasing human population in the coastal South Carolina Lowcountry area, including the Cape Romain NWR, brings a host of challenges to the area in general and to the refuge in particular. Higher resident and tourist populations will require more resorts, services, and commercial development, especially along the Atlantic seaboard and major rivers. Additional demands will likely occur for housing, government services, and infrastructure features such as recreational areas and additional transportation systems. These demands, in turn, will exert greater pressures on the area's natural environment. Human population, real estate development, and economic growth are contributing factors to the decline of wildlife and suitable habitats, open space such as grassy fields and timber plantations, and traditional lifestyles within local communities. These demands affect land use all around the refuge boundaries.

The refuge has a management agreement with South Carolina that provided jurisdiction over most of the waterways within the refuge acquisition boundary, with the exception of the regulation of the take of fin fish and shell fish. The waterways contend with a variety of wildlife disturbances, including motor boats, personal watercraft, houseboats, and associated dumping, and other recreational pressures. The Atlantic Intracoastal Waterway, which borders the refuge, serves as an important route for commercial and recreational boat traffic.

Land Acquisition

The Service acquires lands and interest in lands, such as easements, and management rights in lands through leases or cooperative agreements, consistent with legislation or other congressional guidelines and executive orders, for the conservation of fish and wildlife and to provide wildlife-dependent public use for recreational and educational purposes.

The Service's policy is to acquire land from willing sellers, and only when other protective means, such as local zoning restrictions or regulations, are not appropriate, available or effective. When land is needed to achieve fish and wildlife conservation objectives, the Service seeks to acquire the minimum interest necessary to reach those objectives. If fee title is required, the Service gives full consideration to extended use reservations, exchanges, or other alternatives that will lessen the impact on the owner and the community. Donations of desired lands or interests are encouraged.

The Service, like all federal agencies, has the power of eminent domain, which allows the use of condemnation to acquire lands and interest in lands for the public good. This power, however, requires congressional approval and is seldom used. The Service usually acquires lands from willing sellers. In all fee title acquisition cases, the Service is required by law to offer 100 percent of the property's appraised market value, as established by an approved appraisal that meets professional standards and federal requirements.

Wildland Fire Management

It is the policy of the Service to use fire when it is the most appropriate management tool for reaching habitat objectives. Wildfires, however, would be aggressively suppressed unless such natural fires are a part of an approved fire management plan. Protection of people and property is the top priority within the fire management program.

Opportunities to use prescribed fire as a management tool on the refuge are limited. However, emergent wetlands and upland forest habitat types are most likely to benefit from the use of prescribed fire as a management tool. Management of emergent wetlands can be accomplished through some combination of prescribed burning on 3-year cycles or managing water levels.

Burning, mowing, and removal are used on some wetlands to manipulate vegetation or to control shrub encroachment. Burning is an important management tool in some managed wetland areas to reduce tree and shrub encroachment for the establishment of moist-soil plants that provide food for wintering waterfowl. A program of prescribed fire is used on maritime sandhills and longleaf pine communities as a management tool for reducing fuel loadings and manipulating vegetation to meet refuge objectives.

VISITOR SERVICES

Presidential Executive Order 12996 and the Improvement Act recognized six priority public uses on national wildlife refuges as long as they are compatible with the purposes for which the refuge was established. These include hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, which "have been and are expected to continue to be generally compatible uses." However, these six uses are by no means the only permitted public uses of national wildlife refuges; other uses have been and can continue to be permitted, provided that they are determined to be compatible with the refuge purposes, including hiking, biking dirt roads, canoeing, kayaking, fishing, and general boating.

Environmental Education and Interpretation
Environmental education and interpretation programs are regularly scheduled at the Sewee Visitor and Environmental Education Center, which is jointly operated by Cape Romain NWR and Francis Marion National Forest. Coastal Expeditions, the special use permit holder for the refuge, conducts guided interpretive tours on Bulls Island.

Wildlife Observation and Photography

With over 277 species of migratory and resident birds recorded on the refuge, bird watching opportunities are good throughout the year. (See the bird checklist.) Other wildlife you may encounter on Bulls Island include the black fox squirrel, white-tailed deer, alligator, and other reptiles. With its beautiful vistas and diversity of wildlife, the refuge offers endless opportunities for nature photography.

Hiking Trails

There are two hiking trails located on Bulls Island. The forested 1-mile Middens Trail takes one past the remains of Native American shell mounds. The 2-mile Turkey Walk Trail, designated a National Recreation Trail, meanders through forest, along salt marsh, and over dikes separating freshwater impoundments. A wildlife viewing platform is located at one of the impoundments. There are also 16 miles of roads open for hiking and biking. Bicycles are not allowed on the hiking trails or beach.

Fishing

Fish the saltwater bays and creeks found within the refuge and surf-fish off of the beaches, catching spottail bass, spotted seatrout, flounder, sheepshead and black drum year-round. Go shrimping and crabbing and harvest oysters and clams when in season, which is typically September through May.

You may also fish and crab on the Garris Landing pier. All activities are allowed in accordance with state regulations. Fishing inside Bulls Island impoundments is prohibited.

Hunting
The harvest of surplus animals is a tool used to manage wildlife populations. Managed hunts maintain wildlife populations at a level compatible with the environment and provide recreational opportunities. Two annual 6-day archery hunts for white-tailed deer are offered at Bulls Island, with each scheduled hunt beginning the second Monday of November and December. Refuge rail hunts are the same as the state season.

PERSONNEL, OPERATIONS, AND MAINTENANCE

The refuge and the South Carolina Lowcountry Refuge Complex Headquarters office is located in the town of Awendaw, South Carolina, a small community with a population of approximately 1,100 people. Refuge lands border lie east of the Intracoastal Waterway and encompass a geographic area that is approximately 22 miles of coast line. The refuge facilities include the headquarters building, the Sewee Visitor Center, Dominick House, Garris Landing pier and boat ramp, Maintenance shop, and Bulls Island equipment storage area. The refuge's mechanized equipment includes numerous trucks, farm tractors, all-terrain vehicles, a loader/backhoe, bulldozer, several small boats, a transport barge, and a fire engine. The refuge staff currently includes five funded positions and a seasonal position. The refuge receives additional support from the South Carolina Lowcountry Refuge Complex staff.

Position	Status	% of time on Cape Romain	% of time on SC Low Country Complex
Project Leader GS-0485-14	FTE	25	75
Refuge Manager GS-0485-12	FTE	100	0
Refuge Biologist GS -0401-11	FTE	100	0
Supervisory Park Ranger GS-0025-12	FTE	60	40
Administrative Officer GS-0341-9	FTE	75	25
Natural Resource Planner GS-0401-12	FTE	25	75
Park Ranger GS-0025-07	FTE	100	0
LE Officer GS-0025-09	FTE	40	60
Maintenance Worker WG-4749-08	FTE	100	0
Maintenance Worker WG-4749-08	FTE	100	0
Biological Technician GS-404-05	PPT	50-95	0

III. Plan Development

PUBLIC INVOLVEMENT AND THE PLANNING PROCESS

The process of developing this Draft CCP/EA began in August 2004, with a comprehensive visitor services review conducted to evaluate the refuge's public use and environmental education and interpretation programs. This review involved a team of four visitor services specialists, including two from the Service's Southeast Regional Office and two from other national wildlife refuges. In November 2004, a biological review conducted by a team of 15 biologists representing the refuge, the Service, the South Carolina Department of Natural Resources, the Atlantic Coast Joint Venture, and Ducks Unlimited. The team conducted a review of the refuge's existing biological programs and developed a set of recommendations for future desired conditions. In February 2007, a team of 11 biologists representing the refuge, the Service, SCDNR, the Nature Conservancy, and Ducks Unlimited conducted a Wetland Habitat Management Review of Bulls Island. The review team evaluated current management of the Bulls Island impoundments and provided recommendations for future management. The recommendations of the visitor services review, biological review, and wetland management review teams helped determine the alternatives, goals, objectives, and strategies that are included in this Draft CCP/EA. The participants of the visitor services review team, biological review team, and wetland management review team are identified in Section B, Chapter V.

The core CCP planning team for Cape Romain NWR consisted of six staff members from the Service. This team was the primary decision-making team for the plan. The key tasks of this group involved defining the vision for the refuge; identifying, reviewing, and filtering the issues; defining the goals; outlining the alternatives; and drafting the plan. The CCP planning team members are:

- Kevin Godsea, Refuge Manager, Cape Romain NWR
- Raye Nilius, Project Leader, South Carolina Lowcountry Refuge Complex
- Van Fischer, Natural Resource Planner, South Carolina Lowcountry Refuge Complex
- Sarah Dawsey, Wildlife Biologist, Cape Romain NWR
- Ray Paterra, Supervisory Park Ranger, South Carolina Lowcountry Refuge Complex
- Patricia Lynch, Park Ranger, Cape Romain NWR

The planning team reviewed the recommendations of the visitor services, biological review, and wetland management review teams and conducted a comprehensive review of the refuge's overall natural resource management and public use programs. It also conducted additional internal scoping and prepared a preliminary schedule, a mailing list, and plans for public involvement. A notice of intent to prepare a CCP for the refuge was published in the *Federal Register* on January 3, 2007.

The planning team held a public scoping meeting on December 17, 2008, at the Sewee Visitor and Environmental Education Center in Awendaw, South Carolina. Meeting notices were published in the local newspapers; meeting notices were posted at the refuge; and invitations were mailed to approximately 65 individuals and groups. A total of 35 members of the public attended the meeting. The comments from this public scoping meeting are summarized in Appendix D.

SUMMARY OF ISSUES, CONCERNS, AND OPPORTUNITIES

The planning team identified a number of issues, concerns, and opportunities related to fish and wildlife protection; habitat restoration; public recreation; and management of threatened and endangered species. Additionally, the planning team considered federal and state mandates and

applicable local ordinances, regulations, and plans. The team also directed the process of obtaining public input through the public scoping meeting, comment packets, and personal contacts. All public and advisory team comments were considered. However, some issues that are important to the public are beyond the scope of the Service's authority and cannot be addressed within this planning process. The team did consider all issues that were raised throughout the planning process, and has developed a plan that attempts to balance the competing opinions regarding important issues. The team identified those issues that, in its best professional judgment, are most significant to the refuge. The significant issues are summarized below.

WILDLIFE AND HABITAT MANAGEMENT

- Control exotics, invasive and non-desirable plant communities on upland and wetland sites. To include developing partnerships with SCDNR, USGS, USDA, and other agencies or partnerships for funding and control of exotic species.
- Implement neotropical songbird surveys.
- Continue sea turtle monitoring and nest relocation on Cape, Lighthouse, and Bulls islands, and obtain funding for sea turtle management efforts.
- Maintain Bulls Island dikes and water control structures.
- Expand baseline biological inventories with an emphasis on natural history, distribution, and status of native species.
- Implement water quality monitoring.
- Conduct periodic vegetation studies to track changes in vegetation and effectiveness of invasive exotic plant control efforts.
- Protection of shorebird and seabird nesting areas.
- Increased surveys needed for refuge species.

RESOURCE PROTECTION

- Develop an understanding of local demographic changes with respect to how increased human population growth will impact user demand and impacts to refuge programs and resources (including prescribed fire smoke management).
- Evaluate potential future land acquisition areas to mitigate affects of climate change and sea level rise.
- Restore or stabilize lighthouses.

VISITOR SERVICES

- Make a determination of the condition of existing public use trails and other facilities and determine needed maintenance and improvements for safe, compatible, and appropriate uses.

- Develop the refuge volunteer program to include volunteers to assist with the biological program including bird monitoring, water quality monitoring, and/or other activities that volunteers could do depending on their level of expertise.

- Install finger pier at Garris Landing to increase public safety while using the boat ramp.

- Improve the public dock at Bulls Island. Make the dock wider and eliminate the center post style.

- Define parking areas at Garris Landing parking lot to distinguish parking for passenger vehicles and vehicles with attached trailers.

REFUGE ADMINISTRATION

- Achieve a full complement of staffing at the refuge.

- Increase number staff and/or volunteers to ensure success of biological monitoring and surveys.

- Seek long-term funding for sea turtle management efforts.

- Increase the commitment of natural resource agencies, conservation organizations, and academia to establish effective conservation strategies.

- Create public and private partnerships and educational outreach programs for broad-scale conservation efforts.

WILDERNESS REVIEW

All lands and waters of the Refuge System outside of Alaska and not currently designated as wilderness are subject to a wilderness review. Wilderness reviews are conducted concurrent with a CCP, and a summary of the review incorporated into the plan. The purpose of the wilderness review is to identify and recommend for congressional designation Refuge System lands and waters that merit inclusion in the National Wilderness Preservation System.

The wilderness review process is conducted in three phases: inventory, study, and recommendation. The inventory phase is a broad look at the planning area to identify lands and waters that meet the minimum criteria for wilderness and warrant further study for wilderness designation. These criteria include every area of at least 5,000 contiguous roadless acres or roadless areas sufficient in size to make practicable their preservation and use in an unimpaired condition; or be a roadless island of any size. Areas meeting these criteria are considered wilderness inventory areas. Wilderness inventory areas are then further evaluated for naturalness, opportunities for solitude or primitive and unconfined recreation, and special or supplemental values. Those areas that meet these criteria are identified as wilderness study areas (WSA).

In the study phase, each WSA is evaluated, through careful analysis of alternative management options, to determine its suitability for wilderness designation. The analysis considers all values (e.g., ecological, recreational, cultural, economic, symbolic), resources (e.g., wildlife, water, vegetation, minerals, soils), refuge uses, and refuge management activities within the WSA, and includes an evaluation of whether the WSA can be effectively managed to preserve its wilderness character.

The findings of the study determine whether a WSA, or portion of a WSA, will be recommended for designation as wilderness. Wilderness recommendations are forwarded or reported from the Director through the Secretary and the President to Congress in a wilderness study report.

The Service inventoried refuge lands within the planning area and do not have any additional lands to recommend for wilderness designation. Jeremy Island meets the minimum requirements of a "roadless island of any size" but the island lacks important wilderness characteristics. The results of the wilderness review are included in Appendix H.

The United States Congress designated the Cape Romain Wilderness in 1975 and it has a total of approximately 28,220 acres. Additionally, the wilderness is a designated Class I Air Quality Area under the Clean Air Act of 1977.

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 Improvement Act 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. These uses are: hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation.

Described below is the proposed CCP for managing the refuge over the next 15 years. This proposed management direction contains the goals, objectives, and strategies that will be used to achieve the refuge vision.

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

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

VISION

Cape Romain National Wildlife Refuge is an interwoven, dynamic system where tides ebb and flow through the tidal creeks of a vast expanse of salt marsh; where coastal beaches and marshes meet maritime forests; and where submerged aquatic organisms thrive and provide the foundation for estuarine life. The refuge manages, conserves, and protects these diverse habitats to support a multitude of migratory birds, sea turtles, fish, and other wildlife. The refuge provides a world-class living laboratory to foster excellence in biological and ecological research and enables students to learn and experience the natural world. Visitors can hear songbirds calling in the maritime forest, watch shorebirds feed on the tidal flats and oyster bars, or find solitude by fishing in the tidal creeks bisecting the marshy Wilderness Area.

CLIMATE CHANGE AND SEA LEVEL RISE

Cape Romain NWR is particularly susceptible to the effects of climate change and sea level rise. Coastal barrier island systems are inherently dynamic and constantly changed by the forces of nature. Accelerated sea level rise and climate change effects are sure to dramatically alter the refuge in the future.

Changes associated with climate change and sea level rise are already being observed on the refuge. Important sea turtle nesting beaches are eroding and ground water levels are closer to the surface. The net result is a decrease in suitable nesting habitat for sea turtles and reduced hatching success. Roseate spoonbills are becoming increasingly common on the refuge while historically, spoonbills were only occasional visitors during summer months. Warmer ambient temperatures are beginning to cause a shift in migration and distribution patterns of spoonbills and other bird species.

During 2006-2009, the refuge experienced extended drought conditions. Associated stresses included increased salinity in wetland impoundments, increased growth of invasive exotic Chinese tallow trees, and dieback of native vegetation. Climate change is predicted to dramatically alter rainfall patterns which will result in changes to the vegetative communities on the refuge. Increased frequency and severity of hurricanes is predicted to occur as both air and sea temperatures rise. Major storm events impacting the refuge will produce considerable changes to refuge islands and habitats.

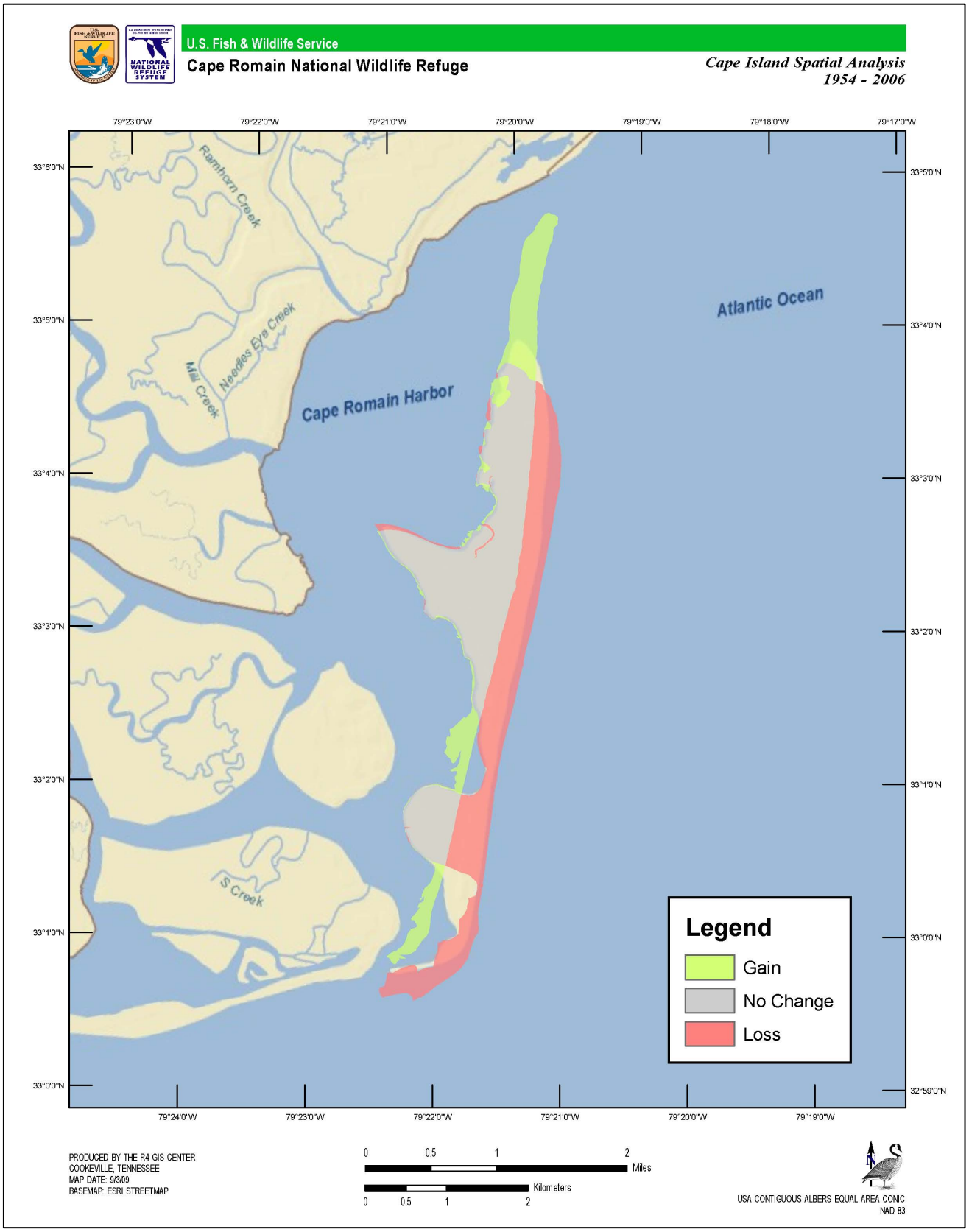
Accelerated erosion is predicted to occur as sea level rises. The barrier islands in Cape Romain NWR are composed primarily of sand and very low in elevation. Rising sea level will increase the reach of water and waves on the islands thus hastening the rate of erosion. The total loss of Sandy Point in 2009 provides a glimpse of what the refuge might encounter as sea level rises and erosion accelerates. The loss also illustrates how natural processes (hurricanes, waves) and human-induced stressors (channel dredging, reduced Santee River sediment loads) can accelerate erosion. In 1999, Sandy Point was approximately 75 acres, in 2006 it was 25 acres, and in 2009 the island disappeared. The loss of Sandy Point eliminated a prime nesting island for terns and black skimmers. Cape Island and Bulls Island lose approximately 20 linear feet of beachfront each year and an acceleration of that rate will lead to the loss of Cape Island and a large reduction in size for Bulls Island.

Climate change and sea level rise creates new management challenges for the refuge. While the specific effects may be unknown, it is clear that substantial changes are going to occur on the refuge. A critical need for management is to develop a baseline inventory of refuge resources so that climate change and sea level rise effects can be effectively measured. Further, monitoring of sea level changes at the refuge will be critical for management to track the rate of sea level rise.

These observations are supported by the findings of the Intergovernmental Panel on Climate Change (IPCC) in its *Summary Report for Policy Makers*. The IPCC describes potential future impacts that it has “very high confidence” (9 out of 10 chances) will occur.

- Coasts are projected to be exposed to increasing risks, including coastal erosion, due to climate change and sea-level rise and the effect will be exacerbated by increasing human-induced pressures on coastal areas.
- Sea-level rise will damage coastal wetlands through saltwater intrusion and increased erosion.
- Many millions more people are projected to be flooded every year due to sea-level rise by the 2080s.
- Warming in North America’s western mountains is projected to cause “decreased snowpack, more winter flooding, and reduced summer flows, exacerbating competition for over-allocated water resources.
- Disturbances from pests, diseases, and fire are projected to have increasing impacts on forests, with an extended period of high fire risk and large increases in area burned.
- Heat waves will increase during the course of the century in North America, and the “growing number of the elderly population is most at risk.

Figure 3. Cape Island shoreline changes between 1954 and 2006



The IPCC also describes impacts that it has “high confidence” (8 out of 10 chances) will occur.

- We will experience more frequent heavy rain and snow events.
- Drought will affect larger areas than currently.
- The resilience of many ecosystems is likely to be exceeded this century by an unprecedented combination of climate change, associated disturbances (e.g., flooding, drought, wildfire, insects, ocean acidification) and other global change drivers.
- For increases in global average temperature exceeding 1.5-2.5 °C … there are projected to be major changes in ecosystem structure and function, species’ ecological interactions, and species’ geographic ranges, with predominantly negative consequences for biodiversity, and ecosystem goods and services (e.g., water and food supply).
- Regional changes in the distribution and production of particular fish species are expected due to continued warming, with adverse effects projected for aquaculture and fisheries.
- Projected climate change is likely to affect the health status of millions of people through: increases in malnutrition; increased deaths, disease and injury due to heat waves, floods, storms fires and droughts; and altered distribution of some infectious disease vectors. The negative health impacts outweigh any positive impacts.
- The IPCC report describes projected impacts on each continent (see report). From a continental perspective, Africa's prospects seem particularly dire.
- In Polar Regions, it is projected that there will be reductions in thickness and extent of glaciers and ice sheets, “and changes in natural ecosystems with detrimental effects on many organisms including migratory birds, mammals and higher predators.”

Climate change and sea level rise are inherent components of the goals and objectives in this CCP. Some goals and objectives address climate change directly while others are influenced but not specific to climate change considerations. Climate change and sea level rise are going to compound existing conditions from coastal stabilization and the goals and objectives were developed to address the future effects through mitigation and adaptation.

GOALS, OBJECTIVES, AND STRATEGIES

The goals, objectives, and strategies presented are the Service’s response to the issues, concerns, and needs expressed by the planning team, the refuge staff and partners, and the public and are presented in hierarchical format. Chapter V, Plan Implementation, identifies the projects associated with the various strategies.

These goals, objectives, and strategies reflect the Service’s commitment to achieve the mandates of the Improvement Act, the mission of the Refuge System, and the purposes and vision of Cape Romain NWR. The Service intends to accomplish these goals, objectives, and strategies within the next 15 years.

WILDLIFE AND HABITAT MANAGEMENT

Goal: Threatened, endangered, and imperiled species
Conserve, protect, and enhance populations of rare, threatened, and endangered species of plants and animals at existing or increased levels on the refuge, and conserve, protect, manage, and restore native South Carolina coastal plain habitats occurring on the refuge to contribute to recovery goals.

Objective : Loggerhead Sea Turtle
Continue to work with partners to monitor and maintain the 16 miles (26km) of beaches of the Cape Romain NWR to support annual nesting targets of at least 1,200 loggerhead nests in support of sea turtle recovery efforts for the northern nesting assemblage of the North Atlantic.

Discussion: Beaches along Cape Romain NWR are important nesting areas for the loggerhead sea turtle, which is federally protected under the Endangered Species Act. The refuge has the highest nesting density for the northern nesting assemblage of loggerhead sea turtles averaging 20 percent of the entire northern nesting assemblage. Two of the three nesting beaches in the refuge have historic nesting surveys and are considered index nesting beaches. These surveys are used, along with other nesting index beaches, to monitor the trends in the northern nesting assemblage. Due to the high density of nesting on these beaches, if they were removed from the data set to determine population trends, then this would greatly compromise the ability to determine trends in the population needed to assess recovery. In order to evaluate whether these targets are met, daily surveys of the nesting beach are necessary. The refuge will continue to survey 16 miles (26km) of beaches; Cape, Lighthouse, and Bulls Island. All of the islands are only accessible by boat and require three separate crews to accomplish nesting surveys seven days a week for the duration of the nesting and hatching season. In addition, all nests will be caged in situ from mammalian predation or relocated and caged if threatened by erosion. The refuge would continue to assess hatching success and emergence success to determine productivity and justify management activities involving nest manipulation such as relocation. Trapping of mammalian predators (e.g., raccoon and mink) is essential to maximize hatchling productivity in the refuge. Currently, only Cape and Lighthouse Islands have been trapped consistently, lowering predation rates to less than one percent. Bulls Island requires a consistent trapping regime to lower the current predation levels from 40 percent to less than 10 percent, which is recommended in the Loggerhead Sea Turtle Recovery Plan. The refuge would continue to conduct daily sea turtle stranding surveys to record dead strandings and rescue live ones. Data from stranding surveys help identify and enumerate in-water threats to sea turtles. Threats on the nesting beach can also be identified during daily surveys. Short-term threats to nesting sea turtles (and their eggs and hatchlings) include poaching, predation, tidal inundation, beach erosion, and human disturbance (lighting disorientation). Threats from lighting disorientation have not been addressed on Cape Romain NWR. Mooring of house boats behind the barrier islands of the refuge have the potential to cause significant lighting disorientation of sea turtles, especially hatchlings. Due to the loss of large dunes on the northern islands in the refuge, the nesting areas on these islands are more prone to exposure from the bay side of the islands as well as the mainland. As hatchlings exit the nest cavity, they orient to the brightest light on the beach, which historically has been the ocean horizon. With competing light sources, hatchlings may easily become disoriented and move toward the back side of the island either getting lost in the vegetation and dying from dessication or predation or exiting into the bay, increasing the risk of marine predation. Long-term threats may increase with impacts resulting from climate change, including sea level rise, higher frequency storm events, and saltwater intrusion (Fish et al. 2005). Shorelines are expected to retreat dramatically with the predicted sea level rise (Gilman et al. 2007, Nicholls et al. 2007) caused by climate change (Hume 2005). Through collaborative efforts with partners, the refuge can work to reduce some of these harmful impacts and restore nesting habitat. Although not previously considered for the beaches of Cape Romain NWR, beach renourishment or dune rebuilding can be beneficial if conducted with sound biological principles, but can also have negative impacts if improperly designed. Short-term impacts can include nest entombment from sand placement or nest destruction from heavy equipment. Long-term impacts can result if the beach renourishment or dune rebuilding is designed improperly. Those impacts can include lower nesting success due to increased beach width, scarping, and/or compaction and lower reproductive success if the sand quality is poor. The refuge will work with federal

agencies, private agencies, non-governmental organizations, and academia to design and carry out beneficial research projects that can be conducted on the refuge to address issues such as impacts of nest relocation, sand temperature changes from climate change, and current sex ratio distribution. These research topics will help to monitor possible impacts from climate change and management strategies to help mitigate potential impacts.

Strategies:

- Obtain funding to hire three seasonal biological technicians to cover Cape, Lighthouse, and Bulls Island.
- Continue to work with partners and volunteers to complete the seven-person-per-day crew needed to conduct the nest protection program.
- Obtain funding to continue trapping efforts to minimize depredation of sea turtle nests and hatchlings.
- Continue partnerships to conduct research relevant to management of the program.
- Work with SCDNR to establish mooring areas in the refuge away from the backside of high-density loggerhead sea turtle nesting areas during nesting and hatching season.

Objective: Wood Stork (*Mycteria americana*)
Provide and protect foraging habitat to support wood stork recovery efforts.

Discussion: Wood storks are federally listed as an endangered species (USFWS 1997). Large numbers (several hundred) of wood storks have been seen foraging in refuge impoundments, especially Upper Summerhouse, and roosting in the trees adjacent to refuge impoundments. Smaller numbers (30 - 40) are regularly seen pre- and post-breeding season in the impoundments on Bulls Island and scattered throughout the marshes of Cape Romain NWR.

Strategies:

- Work with other federal and state agencies and conservation groups to conserve the pristine nature of the Santee River system on which the refuge is dependent.
- Conduct water quality sampling efforts.
- Conduct surveys of wood stork feeding activities; breeding and post breeding seasons.
- Manage impoundments for multiple species, including wood storks under a featured species approach for migratory ducks. Conduct wetland surveys, monitoring, and adaptive management.

Objective: Piping Plover (*Charadrius melodus*)
Provide and protect foraging, loafing, and roosting habitat to support piping plover recovery efforts.

Discussion: Piping plovers are federally listed as a threatened species (USFWS 1986). Parts of the refuge are designated critical habitat (SC-7 and SC-8) for the piping plover to include the beaches of Lighthouse Island, north and middle Raccoon Key, and the south end of Bulls Island. Currently, piping plovers are observed during shorebird surveys during the winter in small groups of 10 or less. Historical and current shorebird survey data are to be collated to determine high use areas of threatened and endangered species or species of concern to help adjust management of these areas to include closure to minimize disturbance.

Strategies:

- Increase shorebird surveys from once a month to twice a month to determine high use roosting areas.
- Initiate closure of high use areas if needed to prevent disturbance.
- Create water buffer areas around high use foraging or loafing areas to minimize disturbance. Restrict personal watercraft and airboats to minimize disturbance.

Objective: Seabeach Amaranth (*Amaranthus pumilus*)
Maintain habitat and reestablish a healthy population of Seabeach Amaranth on the refuge to support recovery efforts.

Discussion: Seabeach amaranth historically ranged from South Carolina to Massachusetts. In 1993, it was placed on the endangered species list due to extirpation from two-thirds of its historic range. Causes for decline include loss of habitat from beach development and recreation. Seabeach amaranth utilizes the northern islands of the refuge, especially Cape and Lighthouse Islands. Due to the high erosion rates of these islands and the devastating effect of Hurricane Hugo, the last documented sighting of seabeach amaranth on the refuge was in 1990, when one plant was found. A restoration effort was initiated by SCDNR and the Service's Charleston Ecological Services office in 2000 within South Carolina. Cape Romain was chosen as one of the restoration areas. During 2000-2004, 4,167 seedlings were planted on Cape, Lighthouse, and Bulls Island. Due to extreme erosion and loss of habitat on all of the refuge islands, only 13 plants were counted during the 2008 survey of Cape, Lighthouse, and Bulls Islands. Reestablishment efforts need to resume throughout the refuge where suitable habitat exists.

Strategies:

- Conduct complete survey of the refuge for Seabeach Amaranth in all potential habitat.
- Create closed areas in all areas where the plants are found
- Resume seedling plantings in suitable habitat.

Objective: American Oystercatcher (*Haematopus palliatus*)
Maintain and increase available habitat for the current level of 184 pairs of nesting and at least 600 wintering American oystercatchers to prevent listing of the species on the threatened and endangered species list.

Discussion: The eastern race of the American oystercatcher has been identified as an "extremely high priority" shorebird by U.S. Shorebird Conservation Plan. This designation is based on estimated numbers of American oystercatchers totaling less than 25,000 and the decline of suitable beach nesting habitat. The Cape Romain Region (Cape Romain NWR to southern end of Dewees Island) supported 230 (57 percent of state total) in 2002 and 227 (57 percent) in 2003 breeding pairs of American oystercatchers. In 1999, the Cape Romain Region had 57 percent (1,883) of South Carolina's wintering oystercatchers, 55 percent (1,949) in 2001 and 51 percent (1,901) in 2002. South Carolina supported just over one-third of the estimated oystercatcher population that winters on the Atlantic and Gulf coasts of the United States (approximately 10,000). The Cape Romain Region in South Carolina has both historically and recently wintered a large portion of the oystercatchers found on the Atlantic coast (Sprunt and Chamberlain 1949; Marsh and Wilkinson 1991) yet this area comprises only 7-10 percent of the length of South Carolina's coastline. It is unknown why the Cape Romain Region is one of the most important areas for the survival of this species. Due to the importance of this area to this species, research has been initiated and carried out within the refuge by SCDNR and Clemson University to

examine reproductive success, foraging habitats, and fledgling success of these birds. Data gathered so far shows low productivity due primarily to nest washout and predation. Rising sea levels are anticipated to reduce the suitable nesting habitat as well as foraging habitat within the refuge. Oystercatchers rely on oyster beds for foraging. Within the refuge boundary, the shellfish and fin fish are managed by the SCDNR with the majority of the oyster beds being either private or public harvest grounds. To better support wintering and nesting oystercatchers in the refuge, important foraging areas need to be identified and maintained in partnership with the state. Historic acreage of oyster beds needs to be ascertained to determine if restoration is needed. Sea level rise from climate change will adversely affect the health and coverage of oysters within the refuge as well as reducing suitable nesting areas. Restoration of shell rakes and beaches within the refuge may be needed as sea level rise reduces current nesting areas.

Strategies:

- Minimize disturbance to nesting shorebirds by posting signs at high-density nesting areas as well as high use roosting and foraging areas.
- Monitor mammalian predation of shorebird nests and implement predator control measures if necessary.
- Monitor nesting shorebird use of the refuge by implementing nesting season surveys of appropriate habitat. Coordinate with SCDNR to complement existing surveys.
- Conduct beach and shell rake renourishment where appropriate to increase habitat for successful productivity.
- Continue partnership with SCDNR and Clemson University for future research.
- Create water buffer areas around high use foraging or loafing areas to minimize disturbance. Restrict personal watercraft and airboats to minimize disturbance.

Objective: Wilson's Plover (*Charadrius wilsonia*)
Provide nesting habitat for at least 20 pairs of Wilson's plovers.

Discussion: The Wilson's plover is listed as threatened in South Carolina, and is considered a species of concern in the U.S. Shorebird Conservation Plan. Very little is known about this species in South Carolina. Wilson's plovers are solitary, secretive nesting shorebirds and are very hard to survey. A graduate project in 2007 looked at Wilson's plovers nesting in South Carolina and showed that Cape Romain NWR had one of the highest nesting densities in the state. The SCDNR initiated a statewide nesting survey in 2009.

Strategies:

- Minimize disturbance to nesting shorebirds by posting signs at key locations.
- Monitor mammalian predation of shorebird nests and implement predator control measures if necessary.
- Monitor nesting shorebird use of the refuge by implementing nesting season surveys of appropriate habitat. Coordinate with SCDNR to complement existing surveys.
- Continue partnership with SCDNR and academia for future research.

Objective: Red Wolf (*Canis rufus*)
Continue to aid in the recovery efforts for the red wolf by promoting environmental education, and by assisting with captive and wild wolf breeding efforts.

Discussion: The Red Wolf island propagation program was initiated in 1986 on Bulls Island. The island habitat provided an isolated area for the wolves to interact with their environment. No competition existed for the prey base, and the wolves were safe from human interaction. Captive bred wolves brought to the island could reproduce and raise young in a wild setting, which was beneficial for the reintroduction of wolves since wild born and reared animals would have a higher probability of survival. Due to budget and personnel reductions, the island propagation program was stopped in 2004. Two wolves are stilled housed at the Seewee Environmental Education Center for viewing and educational purposes. An additional pair is housed in the back pen at the center for captive breeding to assist in keeping genetic diversity within the population.

Strategies:

- Maintain four wolves at the Sewee Environmental Education Center; two wolves are for educational viewing and two wolves paired for mating to assist the recovery effort.
- Install wolf enclosure cameras to allow remote observation of wolves.
- Reestablish the Bulls Island propagation program and maintain one family of wolves on Bulls Island to assist with the recovery effort.

Objective: Modeling
Obtain species vulnerability modeling tools to assess the vulnerability of refuge-dependent species to climate change and sea level rise.

Discussion: Work with scientists to assess species vulnerability using most accurate modeling tools on species such as loggerhead sea turtles and American oystercatchers.

Goal: Contribute to sustaining healthy and viable migratory bird populations representative of South Carolina coastal ecosystems and the Atlantic Flyway.

Objective: Waterfowl
Ensure the perpetuation of a healthy wetland system, improve the infrastructure of refuge impoundments and optimize their management to provide the habitat, sanctuary, and life-history needs of wintering waterfowl, in order to help achieve population and habitat objectives of the North American Waterfowl Management Plan, Atlantic Flyway Species Management Plans, the Atlantic Coast Joint Venture (ACJV)-South Atlantic Migratory Bird Initiative's waterfowl habitat objectives, and refuge waterfowl objectives. Concurrently, use a multiple species management approach to provide habitat for migrating shorebirds, marsh birds, and wading birds.

Discussion: The South Carolina coast has long been a key area for wintering waterfowl and has a rich waterfowl tradition. In recent years, the total numbers of dabbling ducks observed in South Carolina in the Mid-Winter Inventory has declined. During this time, the flyway population trends for some duck species have been more stable. The decline in the number of mallards observed during the Mid-Winter Inventory in South Carolina has been especially noticeable. The reasons for this decline in South Carolina and other south Atlantic Flyway wintering states are not well understood and are receiving attention at the flyway level. While we try to understand the reasons behind the declines and until we can take the correct measures to reverse the trend, it is important that good and abundant winter waterfowl habitat is provided to maintain a waterfowl habitat base in South Carolina, especially in traditional wintering areas such as Cape Romain NWR.

The ACJV Waterfowl Technical Committee is presently working to develop wintering waterfowl habitat goals, specific to the Atlantic Flyway, based on the overall North American waterfowl population numbers. These flyway habitat goals will be apportioned to the state level. It is intended that these

state goals will then be stepped down further, to specific South Carolina waterfowl areas through the waterfowl technical committee of the South Atlantic Migratory Bird Initiative (SAMBI). Other habitat needs, which can be addressed in managed impoundments, will also be identified through other national and regional plans for shorebirds, marsh birds, and wading birds. Until these goals are established, Cape Romain NWR will plan to maintain habitat conditions needed to support the peak winter population numbers presently being experienced, averaging 5,000. Although Cape Romain NWR has played an important role in providing safe refuge for wintering waterfowl (one of only a few areas not open for waterfowl hunting in South Carolina), management of our impoundments may drastically change in the next 5 to 10 years. This change will be forced upon us by climate change and rising sea levels. With predicted sea level rise, the barrier islands will be greatly reduced in size, and the impoundments on Bulls Island will be more difficult to maintain. Especially susceptible to breaching is Jack's Pond (500 acres) whose dike borders the Atlantic Ocean. If breaching occurs, then the impoundment will not be restored and an intertidal regime will ensue. This will shift our management from waterfowl to wading, shore, and marsh birds.

Strategies:

- Maintain, at a minimum, the present level of food and cover which has supported an average peak waterfowl population of approximately 5,000 ducks over the period of record.
- Monitor wintering waterfowl populations by conducting weekly ground waterfowl surveys (October–March) for all managed wetland complexes on the refuge (Bulls Island).
- Conduct monthly waterfowl surveys on the entire refuge.
- Use prescribed fire to maintain wetland impoundments.
- Put in cross-dike through Jacks Creek impoundment to mitigate for anticipated breach in outer dike next to ocean.
- Replace existing aging structures, put in new structures, and clear or create drainage ditches with directed improvements to water transfer capabilities to manage approximately 820 acres of impounded wetlands with a waterfowl management focus to potentially support over 10,000 wintering migratory ducks annually.
- Establish vegetation transects in the impoundments and conduct annual fall vegetation surveys.
- Repair or replace wood duck boxes on Bulls Island and maintain them.

Objective: Shorebirds
Provide undisturbed nesting, roosting, and foraging habitat for migrating and wintering populations of shorebirds.

Discussion: Cape Romain NWR is a site in the Western Hemisphere Shorebird Reserve Network (of International Importance). The network currently has 70 sites in 10 countries, from Alaska in the north to Tierra del Fuego in southern South America. Criteria for the network of international importance are at least 100,000 shorebirds annually, or at least 10 percent of the bio-geographic population for a shorebird species. Cape Romain NWR is one of only four sites on the Atlantic coast of the United States and Canada of international or hemispheric importance. Surveys have shown that Cape Romain NWR is second only to Delaware Bay in numbers of shorebirds during spring migration.

The Cape Romain Region is one of the most important places in South Carolina for these coastal species. There are thousands of shorebirds that winter in this area. American oystercatchers and Wilson's plovers (both proposed or currently - state threatened shorebirds), nest here in higher concentrations than in other areas in our state. The Cape Romain Region is also important for

seabirds, nesting and wintering. Cape Romain NWR has one of four seabird nesting islands in the state. Human population expansion in areas adjacent to the refuge will not only harm water quality but will also create more disturbances to birds that are nesting and wintering in the area. Nesting shorebirds and seabirds place eggs on sand islands and shell rakes along the salt marsh. Boaters often unknowingly scare birds off their nests from boat wakes overwashing shell rakes and eggs and chicks overheat or can be vulnerable to predation. Also, people cause disturbance on islands that are only accessible by boat. Unregulated public use of refuge waters means lower survival and reproductive success to all vulnerable species. Providing undisturbed nesting, roosting, and foraging habitat is the most important role for the management of shorebirds within Cape Romain NWR.

Strategies:

- Conduct surveys of inner estuarine habitats to complement existing beach surveys in order to detect species such as whimbrels, curlew, spotted sandpipers, and least sandpipers.
- Conduct bi-weekly high tide roost surveys on refuge.
- Collate previous and current survey data and create GIS map to determine high use roosting areas.
- Adapt management as needed to minimize disturbance by land area closures as well as water buffer zones.
- Work with SCDNR to restrict personal watercraft within the refuge.
- Work with Service and SCDNR law enforcement to enforce no entry zones and no pets on the refuge to minimize disturbance.
- Establish a local volunteer network to help law enforcement enforce refuge regulations designed to minimize disturbance to shorebirds.
- Continue to partnership with SCDNR and academia on research projects to enhance management of shorebirds.
- Continue to partnership with SCDNR to complete breeding bird surveys in the refuge.

Objective: Wading Birds
Provide high-quality nesting and foraging habitat for long-legged wading birds.

Discussion: The estuaries and marshes of Cape Romain NWR and the surrounding area provide important foraging habitat for long-legged wading birds. Great blue herons, great egrets, snowy egrets, white ibis, tricolored herons, reddish egrets, and potentially could become a nesting site for wood storks. A variety of wading birds use the entire Santee River Delta and its associated wetlands to forage on small fish and estuarine invertebrates. Notably, there has been an increasing number (~15) of reddish egrets in the area post-breeding, the highest number in South Carolina. These are primarily dark plumaged adults. Nesting has been documented in the state only on Cape Romain (2 pairs in recent years). This species has been expanding its range northward in Florida. It is reasonable to expect that nesting may increase at Cape Romain NWR in the near future.

There is some concern that food resources for these species have been impacted and could suffer greater impacts in the future. The introduction of flathead catfish into the Santee River system has caused a severe reduction in the abundance of sunfish and bullhead catfish species (preferred forage for wood storks and other wading birds). In addition, reduction in water quality and/or quantity would have negative impacts on forage species.

Strategies:

- Survey wading bird rookeries annually.
- Protect all wading bird rookeries.
- Add structure to existing rookery on Bulls Island to increase nesting areas.
- Conduct monthly wading bird surveys on Bulls Island.
- Conduct wading bird surveys on the refuge four times annually.
- Conduct restoration of Marsh Island (the largest nesting rookery in the refuge) to mitigate for sea level rise.
- Create water buffer zones to minimize disturbance. Restrict personal watercraft and air boats.

Objective: Marsh Birds
Provide high-quality wintering habitat and breeding habitat for marshbirds.

Discussion: There are nearly 30,000 acres of wetlands inside the boundary of Cape Romain NWR. These wetlands are primarily emergent estuarine marshes dominated by *Spartina alterniflora* (smooth cordgrass). Other wetland types include a small amount of higher marsh and open salt marsh panne habitat. During winter (August through May), coastal cordgrass marsh is critically important for salt marsh sharp-tailed and Nelson's sharp-tailed sparrows. These species typically forage on insects and cordgrass seeds during winter. These birds are extremely secretive and limited to this specific estuarine salt marsh habitat. Other secretive marshbirds such as seaside sparrow, least bittern, and clapper rail utilize the refuge's salt marshes for nesting. Black rails nest in high salt marsh which is characterized by infrequent tidal inundation and dominated by cordgrass (*Spartina patens, S. alterniflora, S. cynosuroides, S. bakeri*), pickleweed (*Salicornia spp*.), and saltgrass (*Distichlis spicata*). This species has been identified as a species of very high concern in the regional waterbird conservation plan (Hunter et al. 2006). Sea level rise from climate change has the potential to greatly impact the marsh bird in Cape Romain NWR through loss of habitat. A specific monitoring protocol has been developed for secretive marshbirds as part of the National Marshbird Monitoring Program. There is also a centralized database where survey results are compiled and stored. To date, no marsh bird surveys have been conducted in the refuge. The threat of climate change coupled with the reintroduction of mink in the refuge creates cause for concern over the health of the population in the refuge. To better understand the impacts of both of these threats, marsh bird survey's need to be established to monitor the populations.

Strategies:

- Conduct winter and breeding surveys in the refuge for marsh birds.
- Implement mink trapping in the known nesting areas to minimize predation.
- Review and adapt rail hunting in accordance with survey data.

Objective: Sea Birds
Provide undisturbed nesting roosting and foraging habitat for sea birds.

Discussion: Cape Romain NWR is one of the most important areas for beach-nesting birds in South Carolina. Marsh Island and White Banks support a diverse array of seabird species and are 2 of only 5 large seabird sanctuaries in the state. Additionally, Cape Romain NWR has least tern (*Sterna antillarum*) and black skimmer (*Rynchops niger*) nesting on the barrier island beaches of Lighthouse Island, Cape Island, and Raccoon Key. During the past 5 years, these barrier islands were the only ones in South Carolina that supported seabird nesting. In 2007, these beaches supported 56 percent of South Carolina's black skimmers. Although least terns nest on roof tops and artificial sites, 75

percent of the least terns that nested on beaches in South Carolina nested in Cape Romain NWR. Although nest counts document the importance of Cape Romain NWR for seabird nesting, observations by SCDNR and Cape Romain NWR staff in the past 3 years suggest that reproductive success on the barrier islands in Cape Romain NWR is very low. Seabirds often abandon nest sites shortly after egg laying and fledglings are not observed. Current research examining the seabird nesting colonies in the refuge show that disturbance from mink entering the colony is one documented cause of nest failure. In addition to predation, sea level rise will greatly affect the productivity of nesting colonies with increasing loss of nests due to tidal inundation as well as a reduction in suitable nesting areas from erosion.

Strategies:

- Post, rope, and close to the public all potential nesting habitat on the refuge.
- Conduct nesting surveys at all known nesting rookeries.
- Trap all Islands with sea bird nesting for mammalian predators to minimize predation and increase productivity. Trap marsh areas adjacent to rookeries for mink.
- Partner with SCDNR and Clemson University to evaluate nesting and fledgling success in rookeries and determine causes of failure.
- Create water buffer zones to minimize disturbance. Restrict personal watercraft and air boats.
- Conduct shell rake or beach restoration where necessary to offset sea level rise and maximize productivity
- Work with Army Corps of Engineers to evaluate the feasibility of creating a seabird nesting island in Bulls Bay.

Objective: Land Birds
Restore the native maritime forest on Bulls Island to provide nesting, roosting, and foraging habitat for resident and migratory land birds.

Discussion: Oaks, cedar, pine, and shrub species dominate the maritime forest. Dredge spoil deposition areas are primarily covered with myrtle and cedar. These areas provide important habitat for land birds during wintering, migrating, and breeding. Particularly important is the relatively large breeding population of eastern painted buntings on the refuge. The invasion of Chinese tallow following the Category 4 Hurricane Hugo in 1989 has compromised the habitat on which the native land bird species depend. Within the next 15 years, efforts need to be directed at removing this invasive species and returning the habitat to its natural state.

Strategies:

- Complete removal of Chinese tallow from Bulls Island to restore the natural maritime forest.
- Establish monitoring for neotropical and migratory song birds on the refuge and adapt management for key species identified in the SAMBI and South Carolina Comprehensive Wildlife Conservation Strategy for which the refuge is critical for those species.
- Initiate research as needed.

Examine the spoil Islands in the refuge and use by focal species, such as the painted bunting, and work with the Army Corp of Engineers to adapt management to enhance the use of these areas if feasible.

Objective: Bald Eagle (*Haliaeetus leucocephalus*)
Over 15 year lifespan, monitor nesting bald eagle populations and continue to support bald eagle foraging and nesting habitat on the refuge.

Discussion: The number of occupied breeding areas for bald eagles in South Carolina was at a low of 13 in 1977 when studies began and has increased to 181 in 2003 and fledging 224 young (Murphy, SCDNR personal correspondence, 2003). The bald eagle is primarily associated with coasts, rivers, and lakes, usually nesting near bodies of water where it feeds (U.S. Fish and Wildlife Service 1992b). Bald eagles are present year-round on the refuge with the majority of observations occurring during breeding periods. There is one active bald eagle nest on the refuge located on Bulls Island. The bald eagle was officially taken off the endangered species list in June 2007, but it will remain in a protected status under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. Management of eagles on the refuge includes occasional nest checking from the ground, conducting midwinter bald eagle surveys, and obtaining aerial nesting results from the SCDNR as they become available.

Bald eagle habitat encompasses not only nesting structure, but also foraging areas, perch trees, and areas devoid of disturbance. The impoundments and marshes on the refuge provide ample foraging habitat. While these areas are not specifically managed for eagle foraging, activities aimed at maintaining populations of migratory waterfowl provide abundant prey for the eagles. Fishery resources in the refuge and river system also provide an important food source.

Strategies:

- Provide for secure nesting and roosting sites for bald eagles by implementing the Southeast Regional Bald Eagle Management Guidelines around known nest sites.
- Nesting trees will be protected during prescribed or wild fires and proper smoke management will be employed when eaglets are present. Reduction of vegetation under the nest tree immediately prior to the ignition of a prescribed fire can prevent harm to nest trees.
- Coordinate with state and federal law enforcement for protecting eagles on or near the refuge.
- Send any dead eagles found on or adjacent to the refuge to the National Eagle Repository per Service policy for the collection, storage, and distribution of dead bald eagles and their parts, or to a cooperative wildlife disease unit for determination of cause of death.

Goal: Provide healthy and viable native wildlife and fish populations representative of the South Carolina coastal area

Objective: Game Animals
Maintain a well-balanced and healthy deer herd to prevent overpopulation and habitat destruction and provide recreational opportunity. Keep raccoon population density at low levels to protect predation of sea turtle and ground nesting birds. Remove mink from the refuge.

Discussion: Overall, the deer herd on the refuge appears to be in satisfactory condition. Herd health surveys were conducted in 1987, 1992, and 2004. Although the health status in 2004 was essentially similar to the two previous surveys, all indicate some need for increased harvest. Long established refuge either sex archery hunts are conducted for two weeks annually. Numbers taken during these hunts vary annually but tend to be low (less than 20 deer). Some factors that influence the harvest numbers are climatic but others are based on the remote nature of the hunt. Many hunters do not take as many deer as they could because they are limited to the amount of meat they can fit into coolers. Take may need to be encouraged in order to reduce the population and increase the health of the population. The deer management program should continue to measure herd health conditions and density through abomasal parasite (AP) counts every 4 to 6 years. Control of the deer herd is necessary to make sure that present and increased levels of understory vegetation are perpetuated. Overpopulation of deer may lead to lower overall health of the herd.

Strategies:

- Continue to manage the white-tailed deer herd by offering 2-week public archery hunts on Bulls Island.
- Conduct 5-year recurring deer herd health studies in concert with the University of Georgia.
- Encourage the take of raccoons during the deer hunts to reduce the population and minimize predation of sea turtle and sea/shore bird nests.

Objective: Reptiles and Amphibians
Provide protection for high-priority reptile and amphibian species.

Discussion: Very little is known about the herpetofauna on the refuge. The Coastal Plain is a very important region overall for herpetofauna in South Carolina, with high species and habitat diversity, and several rare, threatened, and endangered species occurring there. Of the approximately 142+ species of amphibians and reptiles found in the state, 113 occur in the Coastal Plain and 50 of these are endemic to this province in South Carolina. Cape Romain NWR has hammocks of scrub-shrub habitat and reptiles may be present, especially on Bulls Island, although the saline environment prevents a large variety of herptiles from existing within the refuge.

Diamondback terrapins are abundant in the waters adjacent to the refuge, and we suspect high numbers are nesting on the northern barrier islands of the refuge, especially Cape Island, Lighthouse Island, and Raccoon Key. Presently, the two largest threats to the species at Cape Romain NWR are depredation of nests by raccoons and crab pot mortality from drowning. The University of Georgia's Marine Extension Service (MAREX) recently completed a study examining the effectiveness of several terrapin excluder devices on crab traps. Funded by the Environmental Resources Network (T.E.R.N.), MAREX personnel examined five excluder devices in St. Simons and St. Andrew estuaries during the summers of 2003 and 2004 (http://www.dtwg.org/Regional/GA%20BRD%20synopsis.pdf). A serious problem could occur to the population if a fishery was initiated as had occurred in the Chesapeake Bay years ago, almost causing a total loss of the local population.

Strategies:

- Initiate monitoring programs.
- Conduct population study on diamondback terrapins.
- Remove abandoned or derelict crab traps from the refuge to reduce mortality rate.
- Examine feasibility of enacting the mandatory use of excluder devices in the refuge.
- Conduct terrapin distribution surveys on the refuge
- Evaluate closure of smaller creeks and water bodies during terrapin mating season.
- Conduct annual alligator survey on Bulls Island.

HABITAT MANAGEMENT

Goal: Conserve, restore, and enhance diverse habitats to provide favorable conditions for migratory and native fish and wildlife species of the South Carolina coast and Atlantic Flyway.

Objective: Habitat Management Plan
Develop a habitat management plan within 1 year of CCP approval.

Objective: Estuarine Emergent Wetlands

Protect and maintain estuarine emergent wetlands.

Discussion: Cape Romain NWR is primarily (75 percent) composed of estuarine emergent wetlands dominated by smooth cordgrass. During high tide, the wetlands can be completely inundated. As the water level rises in the marsh, it carries with it aquatic organisms including fish, crustaceans, and other invertebrates. Estuarine wetlands are very important as nursery habitat for juvenile fish, crabs, and shrimp that take refuge among the vegetation for protection from predators. When the tide recedes, these organisms often remain in the marsh trapped in pools of water at lower elevations until the next high tide. Such pools provide excellent foraging opportunities for birds as the aquatic organisms may be highly concentrated within these refugia. The wide variety of organisms supported by estuarine marshes is linked to the range of salinities that occur there. When rain falls upstream in the Santee River drainage, it flows downstream and discharges into the estuaries surrounding Cape and Lighthouse Islands. This freshwater temporarily lowers the salinity in the estuaries, making them habitable for organisms that prefer fresher water. Alternatively, when rainfall is limited and salinity levels rise in the estuaries, more saline tolerant species can move in from the Atlantic Ocean and those intolerant of high salinity migrate upstream into the river system.

The diversity and abundance of aquatic fish and invertebrates in the estuary are very important for shorebirds and fish eating waterbirds. Terns, gulls, and skimmers forage in the top centimeters of the water column of tidal creeks and wetland edges, looking for small fishes or shrimp. Pelicans also use these resources but may dive deeper as do loons and grebes. Shorebirds utilize shallowly flooded or exposed mudflats, especially in the interior of the marsh at low tide. During higher tides, these areas are flooded and available for fish-eating birds such as wading birds, terns, and skimmers.

Strategies:

- Implement water quality (including fecal coliform bacteria) monitoring project.
- Work with partners to monitor climate change and the effects to the refuge to include water quality and quantity, vegetation shifts, and wildlife changes.
- Work with SCDNR to enhance or restore oysterbeds within the refuge and limit the number of mariculture operations within the refuge's boundaries.

Objective: Maritime Forest
Protect and enhance maritime forest habitat for migratory birds and other fauna.

Discussion: Cape Romain NWR contains 2,109 acres of maritime forest located mostly on Bulls Island. The maritime forest is dominated by live oak, southern magnolia, loblolly pine, and cabbage palm. The dominant understory species are red bay, yaupon, American holly, wax myrtle, and cabbage palmetto. In 1989, Hurricane Hugo (a category 4 hurricane) made landfall at Cape Romain NWR. The result was the destruction of the maritime forest on Bulls Island. The forest went from a mature closed canopy to an open successional forest overnight. A disruptive event such as this can shift the dominant overstory to the faster growing pine species. On Bulls Island, the result of this storm allowed the invasive plant Chinese tallow to become established and spread rapidly. It currently represents 35 to 40 percent of the species composition on the island. The frequency of storm or wildfire events would dictate the climax community. Frequent storms and/or wildfire would result in the maintenance of a "fire climax" pine and tallow dominated community. This could be controlled, to an extent, by using prescribed fire during winter months, resulting in reduced fuel loads and far less severe wild fire potential. However, the fuel load on Bulls Island is so severe that containing a prescribed fire would be time consuming. The remoteness of the island, difficulty of accessing the forest, and small size of the forest community would not make prescribed fire economically feasible. In addition, wild fire could not escape the island to cause

damage to private property. Currently, the frequency of wild fire and/or severe storm events would not maintain the forest in a fire climax community and the desirable state is a naturally functioning wilderness maritime forest community.

Strategies:

- Maintain the maritime forest in a natural state; excluding the use of prescribed fire because this is not a fire-dependent habitat type.
- Conduct annual inspections of the forest community for the presence of exotic or invasive species (e.g., feral hogs and tallow trees).
- Coordinate with SCDNR to have activity of the wading bird nesting colony documented annually.
- Add an additional refuge law enforcement officer and needed equipment to protect the wildlife and maritime forest habitat.
- Plant live oaks or other native species.

Objective: Beaches and dunes
Protect and enhance dune, beach, and sand spit habitat for migratory birds and sea turtles.

Discussion: The Santee River, to the north of the refuge, historically has provided the sediment which has been deposited on the refuge and kept equilibrium between erosion and accretion. In the 1940s, the Santee River was dammed and diverted for hydroelectric power and the sediment flow was stopped, thrusting the refuge into an erosion phase. In 1985, a rediversion canal was routed from Lake Moultrie to the Santee River. The purpose of the canal was to reduce the accumulation of sediment in Charleston Harbor, which required increased dredging efforts to keep the harbor navigable. The rediversion canal's water flow is through a dam at St. Stephen. The amount of sediment and flow volume of the Santee River reaching the Atlantic did increase; however, historic pre-dam sediment discharge available for accretion on the Islands to the South was not achieved and the erosion of the refuge islands continued. Today, the same problem exists, but is compounded by climate change and rising sea levels, which are and will continue to negatively affect the refuge's biodiversity and ability to sustain the natural populations that have historically inhabited this area. The refuge's barrier islands are dynamic, shaped by the natural forces of wind and wave actions from the Atlantic Ocean. Unfortunately, increases in storm events coupled with rising sea levels are eroding the refuge's beaches faster than the islands can adapt and they are subsequently becoming smaller and more unstable. It is documented that the sea level rose nearly one foot in the last 100 years in Charleston Harbor. These areas are vital not only to several species of nesting sea and shore birds and sea turtles but are vital to maintaining the estuary, which they protect.

Dunes, beaches, and sand bars are critical for nesting sea turtles, nesting shore and sea birds, and migratory birds as foraging and roosting habitat. Even more critical for shorebirds are the invertebrate prey populations these habitats support. Horseshoe crabs spawn in the intertidal zone during high tides in May. The eggs produced by this effort provide excellent, high-quality food resources for migrating shorebirds including red knot, short-billed dowitcher, marbled godwit, ruddy turnstone, sanderlings, and dunlin. In addition, burrowing benthic organisms such as *Donax sp.*, surf clam *Mulina*, angelwing, arc, and other small bivalves are eaten, providing additional critically important food resources. Crustaceans including fiddler crabs, ghost shrimp, and other small shrimp are utilized by Wilson's plover, gull-billed tern, whimbrel, marbled godwit, long-billed curlew, and American oystercatcher.

Strategies:

- Work with partners to influence Army Corps of Engineers to change deposition sites from onshore to offshore in order to increase the amount of sand transported down the coast.
- Install erosion control measures to keep sand from leaving Cape Romain NWR.
- Initiate studies of distribution, abundance, and limiting factors for benthic invertebrates.
- Work with Santee Cooper to discuss the loss of barrier island-building sediment, and to discuss potential solutions to restoring beneficial sediment discharges.

Objective: Freshwater Impoundments
Improve and enhance water management capability on Bulls Island impoundments as a contingency plan for the loss of Jacks Pond perimeter levee.

Discussion: There are nine fresh/brackish water impoundments on the refuge and all are located on Bulls Island. The largest of these is the Jacks Creek impoundment (501 acres). Due to its large size, it has traditionally supported the majority of waterfowl use on the island. The eastern side of the impoundment borders the Atlantic Ocean, and within the last 5 years, a portion of the dike has been moved inland to avoid a breach. It is estimated that the front beach is losing 25 linear feet per year. At the current rate, the present dike surrounding Jacks Creek impoundment will again be threatened from erosion within the next 5 years or possibly sooner with tropical storm activity. A viable solution to mitigate for the continual erosion would be to erect a cross dike several hundred feet west of the current easternmost dike, essentially spitting the impoundment in two. This would allow for continued management of waterfowl when the dike breaches. Additionally, there is a need to replace the culverts and failing water control structures and reestablish water conveyance ditches in the interior impoundments. Currently, water levels cannot be controlled and we have limited management capabilities in these impoundments.

Objective: Impoundment management
Continue to provide resting and foraging area to waterfowl and wading birds by retaining management capabilities in Jacks Creek impoundment.

Strategies

- Obtain funding for cross dike in Jacks Creek impoundment.
- Replace all interior water control structures.
- Add three new water control structures at Big pond and one at House pond.
- Clean out water conveyance channels for effective water delivery.
- Write water management plan as part of the habitat management plan

Objective: Shell rakes/oyster bars/tidal flats
Protect and enhance shell rakes, oyster bars, and tidal flats for migratory birds.

Discussion: Shell rakes, oyster bars, and tidal flats are extensive within the Cape Romain NWR. These habitats are utilized by shorebirds for nesting and foraging areas as well as a refuge for small fish and invertebrates. They are especially important foraging areas for the American oystercatcher. Cape Romain NWR supports the highest density of wintering American oystercatchers on the east coast presumably due to the amount of oyster beds available for foraging. The shell rakes provide nesting areas as well during the summer supporting over 200 nesting pairs. Tidal flats within the refuge provide foraging areas for 22 species of shorebirds. Cape Romain NWR ranked second only to Delaware Bay in concentrations of shorebirds during

the spring migration (Dodd and Spinks 2001). In addition to being extremely important to native wildlife, oyster beds have socio-economic importance as well. The harvest of oysters in the refuge has helped support the local economy for many years.

Strategies:

- Protect and enhance shell rakes, oyster bars, and tidal flats throughout the refuge.
- Work with SCDNR to determine historic versus current acreage of oyster beds within the refuge.
- Work with SCDNR and other partners to conduct oyster bed restoration where needed.
- Work with SCDNR and Army Corps of Engineers to help maintain the shell rakes along the Intracoastal Waterway as nesting areas for the American oystercatcher.
- Carry out restoration of shell rakes as needed to maintain adequate nesting habitat.
- Conduct water quality studies.

RESOURCE PROTECTION

Goal: Protect refuge resources through adaptive management, land acquisition, land protection, and limiting impacts of human activities and invasive species on and around the refuge.

Discussion: Climate change and sea level rise are predicted to substantially impact the refuge. Many different approaches to protecting its resources will be necessary in order to provide continued habitat for wildlife. As conditions change, management actions will adapt accordingly to the changes. Land acquisition is important in the long-term to replace refuge lands that are lost to climate change and sea level rise. Controlling invasive exotics and human impacts is important now and will likely be even more important in the future.

Objective: Land Protection
A land protection plan and acquisition boundary will be developed within 2 years of CCP approval.

Discussion: The refuge currently has fee title to almost all land within the acquisition boundary. Most of the refuge is less than 5 feet below mean sea level (MSL). Future land acquisition outside of the acquisition boundary is a management strategy to assist wildlife in adapting to climate change and sea level rise. Development is encroaching on the refuge and many of the adjacent tracts to the refuge have tidal creeks and wetlands that affect water quality in the refuge. Protecting these wetlands is critical to maintaining good water quality.

Objective:
Within 5 years of CCP approval, identify important habitat areas surrounding the refuge that are less susceptible to the effects of sea level rise for potential addition to the refuge.

Discussion: Cape Romain NWR is particularly susceptible to the detrimental effects of sea level rise given that the majority of refuge lands are low-elevation salt marsh and barrier islands. Currently, the refuge does not contain higher elevation lands that could provide a safe-haven for wildlife as the low-lying lands are lost to sea level rise. The majority of the refuge is designated wilderness, thus as refuge lands are lost, so are wilderness acres. In the future, adding higher elevation land to the refuge will be increasingly important for the conservation of wildlife and potential replacement of wilderness acres.

Objective: Land acquisition:
Throughout the life of the CCP, work with Charleston County, the State of South Carolina, and other nonprofits to complete acquisitions within an approved acquisition boundary.

Discussion: Cape Romain NWR currently is composed of 66,287 acres, all but 20 acres of the refuge is east of the Intracoastal Waterway, and 90 percent of the refuge is below 5 feet MSL. These high-quality habitats provided by the refuge and the 28,000-acre Wilderness Area are being squeezed by sea level rise, coastal erosion, and coastal development.

Most tracts within the existing acquisition boundary have been acquired or are within land protection status. However, further protection of adjacent lands is needed for climate adaptation and to protect valuable habitat from being developed.

A purposed focus area for further land protection between Highway 17 and the Intracoastal Waterway to protect diverse coastal habitats, including maritime forests, pine flat woods, and wetlands and numerous tidal creeks that flow into refuge waters, is needed. These lands are extremely valuable because they offer high-quality wildlife habitat that can be utilized by species dependent upon coastal ecosystems that are at risk of impact due to climate change and sea level rise. The protection of tracts west of the Intracoastal Waterway would also provide a wildlife corridor that connects habitats on the refuge with the undeveloped habitats of the adjacent Francis Marion National Forest. With the projected sea level rise over the next 50 to 100 years, and the accelerated coastal erosion the refuge is presently experiencing, we can predict transformative changes in the available habitat for migratory birds, sea turtles, and other coastal species. These habitat conversions will also occur on adjacent lands where there are no developed hardened barriers at present. Tidal creeks on adjacent lands will be extremely important to provide available habitat needed for wildlife to adapt as current refuge marsh lands subside to a changing sea level. Development is proceeding at a rapid rate along the South Carolina coast. Adjacent lands neighboring the refuge offer large undeveloped tracts that are prime areas for development; however, they are of great importance to the refuge's establishing purposes for protecting migratory birds. Development of these tracts would immediately reduce water quality within the refuge, affecting the aquatic life on which many species depend. The establishment of harden barriers to protect developments will also decrease the available habitat needed for wildlife adaptation to climate change. Pursue land protection options via the MBCF, NAWCA, LWCF, and other funding options to purchase tracts that would provide a contingency habitat as sea level rises and refuge land base is lost. Prioritize tracts that allow natural recession landward and thus provide resilience to sea level rise. Climate change scenarios should inform priorities for protection and rehabilitation. Emphasize connectivity with tracts that are currently protected.

Strategies:

- Work with partners to establish conservation easements on adjacent properties.
- Establish an acquisition boundary focusing on high value habitats between Highway 17 and the Intracoastal Waterway.
- Develop a partnership to fund the acquisition of key tracts.
- Potential funding sources include: LWCF, NAWCA, MBCF, County Greenbelt funding.

Objective: Water Quality/contaminants:
Within 3 years of CCP approval, install 6 water quality monitoring stations to measure salinity, dissolved oxygen, turbidity, and phosphates, nitrates, and other contaminates.

Discussion: Recently, the South Carolina Department of Environmental Health reached a proposed decision in developing total maximum daily loads (TMDLs) of fecal coliform, in accordance with Section 303(d) of the Clean Water Act, in the South Santee Watershed. Currently, harvest of shellfish is shut down within the northern boundary of the refuge during periods of high bacteria level. More study and monitoring data are needed to determine the source of fecal coliform in the area.

Strategies:

- Work with NOAA coastal services center, DHEC, and Army Corps of Engineers to establish water quality monitoring stations within the refuge.
- Work with Santee Coastal Reserve to develop monitoring protocols in the South Santee Watershed.
- Hire biologist to collect data and maintain water quality stations.
- Support the town of Awendaw and Charleston County's septic tank replacement program.

Objective: Invasive Exotic Plants
Continue control and eradication efforts of Chinese tallow and phragmities.

Discussion: Over the past 10 years, the Chinese tallow tree has infested most of Bulls Island. The coverage of Chinese tallow in the wet areas is estimated at greater than 60 percent of the species composition. A 2004 fire within the Maritime forest exacerbated the tallow infestation because it opened the canopy allowing light to the tallow seed source. Aerial application of Clearcast applied during the fall gives us the best results for controlling the infestation. Funding for these treatments is limited and unpredictable from year-to-year. Areas identified for aerial application are located in wet habitats on the island where hand treatment is not feasible and prioritized by the amount of infestation. Over the past few years, the refuge has treated nearly 500 acres on Bulls Island. After initial treatment, follow-up treatment needs to be conducted on seedlings by refuge personnel and volunteers as access to the area allows. Retreatment of these areas by aerial application may be necessary in the future.

Strategies:

- Map out 100- to 150-acre parcels and prioritize aerial application areas.
- Set up a 5-year rotation to spray five inaccessible tracts. Using a 5-year rotation should minimize the number of mature seed-bearing tallow trees and eventually the seed source will have become less viable.
- Limit fire and use wildfire suppression techniques to limit fire effects within Maritime Forest.
- Use volunteers and staff to hand treat areas along roads and levees.
- Tallow stands are serious invasive exotics, especially on Bulls Island, and a combination of herbicide application, cutting, and prescribed burning is required to bring this species into control relative to native habitats.

Objective: Control of Nuisance Plants
Control and eliminate, where feasible, exotic, invasive, and nuisance plant species on the refuge to maintain and enhance the biological integrity of the refuge's native South Carolina coastal plain habitats.

Discussion: The occurrence and spread of exotic, invasive, and nuisance plant species are two of the priority management issues facing Cape Romain NWR. Invasive species can have severe negative impacts on natural plant diversity and on wildlife habitat. Invasive species can also have

negative economic and public health and safety impacts. No comprehensive survey of exotic plants has been conducted on the refuge. Control efforts have been limited due to lack of resources. Most efforts are focused on reduction of invasive seed sources throughout the refuge, and on Chinese tallow tree and phragmites control.

Strategy:

- Identify plant species other than Chinese tallow and phragmites that require control efforts.

Objective: Invasive and Nuisance Animals
Work with the state and other partners to develop and implement a nuisance and exotic animal control plan.

Discussion: A nuisance animal control plan to target exotic and nuisance animals that pose a threat to migratory birds and threatened and endangered species is needed. Trapping of raccoon and mink is currently done under a trapping plan. However, the refuge may need to monitor predation by coyotes. In recent years, coyote populations in the state have increased, and predation of sea turtle eggs in the Yawkey Preserve has been observed and documented.

Strategies:

- Work with SCDNR to develop a mink trapping plan.
- Continue to monitor and trap raccoons on sea turtle nesting islands.
- Develop a predation control plan for the refuge.

Objective:
Reduce disturbance and restrict personal watercraft, airboats, and boats to reduce disturbance to sensitive bird nesting and foraging areas.

Discussion: Boats, boat wakes, and personal watercraft (e.g., jet skis) are very disruptive to bird populations. Buffer zones could be established around rookery islands such as marsh and white banks islands. Personal watercraft is a problem on the southern area of the refuge near Sewee Bay. This area is a significant feed area for the American oystercater. Airboats are currently not allowed on the refuge; however, a buffer zone needs to be established so noise doesn't disrupt bird feeding or compromise the Wilderness characteristics.

Strategies:

- Work with SCDNR to establish buffer zones around rookeries.
- Restrict personal watercraft on refuge.
- Work with SCDNR to establish a buffer zone for airboats.

Objective:
Continue to suppress all unwanted wildland fires occurring in Maritime forests to protect refuge resources.

Discussion: Wildfires within the Maritime forests, particularly on Bulls Island, can be harmful to wildlife and provide optimum conditions for the growth of invasive species. The amount of vegetative debris within these forests has accumulated over many years due to storms and normal winter leaf fall. These fuel loads can ignite easily causing much harm to the maritime forests. Maritime forests

are not a habitat that is fire-dependent and excessive burning can be harmful to many neotropical migratory birds that depend on the refuge as a stopover location.

These wildfires are most often caused by lightning strikes. The refuge is not currently equipped to handle wildfires. A limited number of trained staff, one fire truck, and one bulldozer are the only tools the refuge has to suppress fires.

Objective:
Develop a fire management plan within 1 year of CCP approval.

Discussion: The refuge currently does not have a fire management plan. A plan must be developed in accordance with Service policy to conduct any prescribe burns on the refuge. There are only a few hundred acres of marsh on Bulls Island that would benefit from occasional prescribed burns. Heavy weed infestation can clog these marshes and lessen the availability of quality wildlife habitat. Prescribed burns in these areas also promote seed germination needed for waterfowl and other migratory birds.

Objective: Law Enforcement
The refuge will have sufficient law enforcement staff to protect the visiting public, refuge facilities, and wildlife resources, and all officers will have adequate training and equipment to perform their duties.

Discussion: Refuge law enforcement is provided by a full-time law enforcement officer with responsibilities throughout the South Carolina Lowcountry Refuge Complex, but with primary duties at Cape Romain NWR and Waccamaw NWR. This officer is responsible for all property and resource protection; visitor services; and administration of refuge hunting and fishing programs. However, dual-function officers stationed at ACE Basin NWR and Santee NWR provide assistance throughout the complex for such things as hunts and special events. Due to the increasing work load of complex law enforcement officers, Waccamaw NWR will add a full-time law enforcement officer to staff as soon as funding becomes available. The addition of a new officer at Waccamaw NWR will allow the complex officer stationed at Cape Romain NWR to focus the vast majority of effort at Cape Romain NWR.

Strategies:

- Develop or update existing law enforcement step down plan.
- Update memorandum of understanding with USDA Forest Service.
- Provide up-to-date training and equipment for law enforcement.
- Develop memorandums of understanding with state and/or county law enforcement agencies and the SCDNR to facilitate cooperation and assistance for law enforcement activities.
- Complex law enforcement officer stationed at Cape Romain NWR will coordinate with other law enforcement officers within the complex, Service special agents, and available SCDNR officers to respond to reported or detected violations.
- Develop procedures and schedules for periodic and random law enforcement patrols to include protocol for designating emergency contacts to ensure safety of refuge law enforcement personnel.
- Hire a full-time law enforcement officer for Cape Romain NWR (and/or commission an additional dual-function officer).
- Develop procedures for adequately informing refuge visitors of hazardous conditions or areas.
- Complex law enforcement officer will coordinate with Cape Romain NWR's visitor services program manager to develop outreach strategies to assist with attaining compliance with refuge regulations as needed (i.e., littering).

Objective: Houseboats
Work with SCDNR to identify and create designated mooring locations that will reduce disturbance to sensitive areas.

Discussion: The State of South Carolina allows boats to be moored for up to 45 days in a single location. Mooring of boats typically occurs in the summer behind Cape and Lighthouse Island; however, lights from these boats can disorient nesting sea turtles. If boats are moored too closely to the islands, nesting birds could be disturbed. Captains traveling the Intracoastal Waterway often moor their vessels on the tidal creeks within the refuge and adjacent to the Intracoastal Waterway. These vessels are typically not in any one location for more than a few hours. Boat anchors from moored vessels sometimes harm commercial shellfishing grounds.

Strategies:

- Work with the SCDNR to establish mooring areas within the refuge that are less likely to disturb wildlife.
- Provide map of appropriate mooring areas to local boat owners.

Goal: Cultural Resources
Protect refuge cultural, archaeological, and historical resources in accordance with federal preservation legislation and regulations.

Objective:
Within the life of the CCP, coordinate with the Regional Archaeologist to develop a comprehensive survey of all cultural, archaeological, and historical sites on the refuge in order to protect these resources according to Service policy.

Discussion: The refuge protects numerous cultural, archaeological, and historical resources. Bulls Island has the remnants of a Martello tower, early settlement artifacts, Native American archaeological sites, and Civil War sites. Lighthouse Island has two historic lighthouses and neighboring Mill Island has the remnants of a saw mill. Additional resources likely exist and as these are discovered, the Regional Archaeologist will be consulted and protective measures initiated.

Strategies:

- Survey and document the Native American sites and middens on Bulls Island.
- Survey and document Civil War camp sites.

Objective:
Within the life of the CCP, work with partners to conduct restoration work needed to maintain the lighthouses and surroundings.

Strategies:

- Conduct comprehensive structural assessment.
- Repair the lighthouses.
- Repair the ironwork to include the 1,857 lighthouse stairs, railings, and supports.
- Conduct a minimum tool analysis for keeping the foundations, footpaths, and concrete pathways cleared of vegetation.

Goal: Wilderness
Protect and preserve the wilderness character of those refuge lands designated by Congress as part of the National Wilderness Preservation System.

Objective:
Develop a Wilderness Management Plan within 3 years of CCP approval.

Discussion: This plan will guide refuge operations and land management in designated wilderness areas in accordance with the mandates of the Wilderness Act and the Service's Wilderness Stewardship Policy. It will address the following: activities permitted and how they will be managed; public use facilities, activities, and improvements; historic and archaeological sites; public health and safety; and research and resource protection. It will also include strategies for assessing new acquisitions for wilderness designation, evaluating the threat of invasive exotic species and monitoring air quality in Class I air sheds.

Strategies:

- Inventory and assess exotic and invasive species threats.
- All refuge step-down plans need to incorporate the provisions of the Wilderness Management Plan and restrictions of the Wilderness Act. Priority should be placed on updating the habitat management plans first.

Objective:
As new lands are acquired by the refuge, consider them for wilderness designation. Within 2 years of an acquisition, conduct a Wilderness Review of the lands to determine if they meet the criteria for wilderness study areas.

Objective:
Maintain air quality monitoring (e.g., ozone/haze) station on the refuge.

Discussion: Any wilderness 5,000 acres or larger and designated prior to 1977 is considered a Class I air shed. Under the "Prevention of Significant Deterioration" provisions of the Clean Air Act, federal land managers have "an affirmative responsibility to protect the air quality related values (including visibility) of any Class I area and to consider, in consultation with the Environmental Protection Agency, whether a proposed major emitting facility will have an adverse impact on such values."

Strategies:

- Continue air quality monitoring of the Class I Cape Romain NWR Wilderness Area.
- Obtain and maintain air quality monitoring data records at the refuge.

Discussion: The Interagency Monitoring of Protected Visual Environments program establishes current visibility levels, identifies sources of existing impairment, and documents long-term trends to track progress toward meeting the National Visibility Goal stated in the Clean Air Act. Monitoring will include updating of a vegetation inventory, evaluating inshore estuary nutrient status, evaluating plankton, assessing ozone injury to vegetation, compiling a literature survey on sensitive plants, and conducting wet and dry deposition monitoring of pollutants. This monitoring is especially important due to anticipated construction of a coal burning power plant in close proximity to the Class I Wilderness Area.

Objective:
Exotic plant species will be inventoried to determine the extent of occurrence. If a problem is identified, exotics will be removed according to the minimum tool requirements of the Wilderness Act.

Objective:
Provide opportunities for public use in wilderness area that are dependent upon a wilderness setting, protect resources, and minimize disturbance to wildlife and vegetation.

Objective:
Within 5 years of CCP approval, the Service will develop and implement an educational and interpretive program that conveys an understanding and appreciation of the value and character of the refuge's designated Wilderness areas.

Strategies:

- The refuge will develop a display and associated materials that convey its Wilderness areas to the public. Theme displays on Wilderness areas and allowable public uses of these areas will be developed.
- Staff will develop educational displays, a brochure, and/or an education kit to convey the importance of Wilderness areas of the refuge.
- The refuge will incorporate information that promotes responsible use of Wilderness areas open to the public into refuge education programs.

VISITOR SERVICES

Goal: Welcome and Orient
Visitors will feel welcome and find accurate, timely, and appropriate orientation material and information on public use areas, programs, and management activities of the refuge.

Objective:
Within 3 years of CCP approval, the majority of visitors who stop at the Sewee Center, Garris Landing, Bulls Island, or the town of McClellanville boat landing will find appropriate and sufficient information for self-guided experiences on the refuge.

Discussion: Visitation to refuge public lands is limited. The refuge barrier islands are accessible only by boat. The only facilities accessible by automobile are the headquarters office, Garris Landing and pier, and the Sewee Visitor and Environmental Education Center. The refuge concessionaire provides a scheduled ferry service to Bulls Island.

The Sewee Visitor and Environmental Education Center, a facility jointly operated by the refuge and Francis Marion National Forest, is the main public interface for the refuge. In FY 2008, the center received 38,000 visitors. The 9,000-square-foot facility is owned by the Service and located off of Highway 17 on national forest land. The center provides the following: an information desk; classroom and laboratory; 82-seat auditorium: exhibit hall featuring interactive exhibits for beach, maritime forest, and salt marsh habitats; a floor map highlighting refuge islands and points of interest; a 15-minute orientation film highlighting barrier island ecology, wildlife, and refuge management practices; an interactive informational screen; and an outdoor information kiosk. Refuge and concessionaire brochures and Bulls Island map and information tear sheets are available. A sales outlet provides books and other materials which are representative of refuge and forest ecology, wildlife, and the local environment. The refuge park ranger, Forest Service information specialist, SEWEE Association staff, and volunteers staff the center.

Monthly activities and events that occur at the center or on the refuge are posted at the center, places of business, town libraries, and on community bulletin boards. The monthly event calendar is published by local news media and found on the Sewee Center website and linked to the refuge site. Annual refuge events are also posted on the refuge website.

Information/interpretive kiosks are found at Garris Landing, Bulls Island, the McClellanville boat landing, and the Francis Marion National Forest's Buck Hall Recreation Area. Information includes a refuge map, cultural and natural history, and refuge regulations. The refuge's general, hunt, and bird list brochures and Sewee Center rack cards are placed at the McClellanville Boat landing. Currently, there are no brochures available that list the mammals, reptiles, and amphibians found on the refuge.

Strategies:

- Update the Bulls Island Map/Information Tear Sheet.
- Replace the Garris Landing kiosk and include a brochure rack.
- Place a brochure rack at the Bulls Island kiosk.
- Continue to maintain the brochure rack at the McClellanville boat landing.
- Conduct inventories and design checklist brochures for mammals, reptiles, and amphibians.

Objective:
Throughout the life of the CCP, work with state and federal partners to update regulatory signs, maps, and information kiosks to comply with Service standards.

Discussion: Many different regulations apply on and around the refuge. Having current information on signs located at the refuge boat ramp and visitor center will help the public awareness of various local, state, and federal regulations.

Strategies:

- Obtain state information signs regarding fishing, shrimp baiting, crabbing, boating, hunting, etc.
- Post relevant Coast Guard information (e.g., Intercoastal Waterway).
- Place an information kiosk at Garris Landing.

Objective:
Within 1 year of CCP approval, work with the South Carolina Department of Transportation to replace refuge and visitor center directional signage for better refuge representation and visibility.

Discussion: The South Carolina Department of Transportation has placed a green refuge headquarters office sign on Highway 17 in front of the office building. Sewee Visitor Center directional signs located on Highway 17 approximately 4 miles south of the Center are also green. To provide greater visibility and to better represent the Service and refuge, all green signs would be replaced with brown ones. The refuge office and Sewee Center entrance signs would include the Service shield. The Sewee Center sign would also include the USDA Forest Service shield.

Strategies:

- Place a brown Headquarters Office sign with the Service shield in front of the office on Highway 17.
- Place brown directional signs for the Sewee Center along Highway 17.

Objective:
Maintain current and accurate information on the refuge and Sewee Center websites for public availability.

Discussion: The refuge and Sewee Center websites are vital tools for awareness and dissemination of refuge information and issues, and a means to increase the public audience and garner public support, particularly for those unable to visit the refuge due to accessibility. Both websites would be important vehicles to promote the significance of wilderness and to create awareness of climate change issues and Service initiatives undertaken in regards to climate change. Currently, the refuge park ranger manages and maintains both the refuge and center websites.

Strategies:

- Utilize the latest technology to share refuge programs and activities with those unable to visit.
- Attend annual training to ensure sites meet Service standards.
- Develop web pages devoted to wilderness and climate change.
- Develop an exhibit/panel for Sewee Center to educate the public on climate change and sea level rise.

Objective: Install two remote cameras within the red wolf enclosure to allow the public to view wolf interaction and behavior.

Discussion: Due to their shy nature, the red wolves are not usually seen at the viewing platform. The "wolf cams" will provide an opportunity for all viewers, including those with disabilities, to experience the interactions and behavior of the wolves.

Strategies:

- Install one camera in the above-ground den.
- Install one camera along the fence to view the entire enclosure.
- Install a monitor inside the visitor center.
- Connect a live feed to the website.

Goal: Wildlife-dependent Recreation
Provide opportunities for wildlife-dependent recreation in accordance with the Improvement Act.

Objective:
Within 5 years of CCP approval, complete a Visitor Services Management Plan that will include visitor services' goals, objectives, and strategies required to meet demands, while adhering to the Refuge System mission of "wildlife first."

Objective: Hunting
Provide two safe, quality archery hunts for deer annually that assist the refuge in the management for a healthy deer herd on Bulls Island.

Discussion: Archery hunts for white-tailed deer have been offered on Bulls Island for more than 50 years. Two 6-day archery hunts are offered annually on Bulls Island, the first hunt in November and the second in December. With no predators on the island, the hunt is a management tool used to maintain a healthy deer herd. The hunt also offers hunters an opportunity to participate in a wholesome recreational activity. Hunters are also allowed to take unlimited raccoons. Raccoons

depredate threatened loggerhead sea turtle nests and ground nest birds. Thus, the take of raccoons can assist in sea turtle nest recovery efforts as well as ground nesting bird productivity. A 2005 deer herd assessment indicated that the herd on Bulls Island is at or close to reaching carrying capacity and that the health of the herd would improve if the population was less.

Bulls Island is located 3 miles off the mainland and accessible only by boat. Due to logistics and safety issues, archers are permitted to camp on the island during the hunts.

Objective: Hunting
Annual deer hunts will have minimal conflicts with other visitors on Bulls Island.

Discussion: During the 6-day archery hunts, Bulls Island remains open to visitation. Visitors take personal motorcraft to the island and the concessionaire operates a ferry service to the island on regularly scheduled days. To ensure safety and reduce the potential for conflicts, designated areas would remain open for other visitors.

Strategies:

- Designate specific areas to be opened to other visitors and post signs easily visible to visitors and archers.
- Publish news releases on the hunt noting specific areas opened to other visitors.
- Work with the concessionaire to assure that tour boat visitors are aware of accessible areas.

Objective: Hunting
Review the refuge hunt program on an annual basis to monitor its success and to consider ways of improving the program.

Discussion: In 1953, the first archery hunt was held on Bulls Island with 39 participants. The following years have seen participation numbers average 75 archers during the November hunt. The number of hunters, challenge of the primitive sport, weather conditions, lunar cycle, and available mast are factors that influence the deer harvest. In 2008, 90 hunters participated in both November and December hunts and 5 deer were harvested.

During the two 6-day hunts, refuge staff and volunteers work scheduled shifts on Bulls Island to oversee the hunt program, which includes hunter registration, hunter transport to the north and south ends of the island, and recording and tagging deer harvested. The staff also transports hunters and their gear to the camping area.

Factors for consideration in future deer hunts would include deer population, hunter participation, and staff/volunteer hours required for a successful hunt program.

Objective: Hunting
Work with the SCDNR to obtain the number of rail hunt licenses issued annually to acquire accurate data on hunter participation.

Discussion: Rail hunting for King, Clapper, Sora and Virginia rails is allowed during the state season in designated portions of the refuge. Most of the tidal marsh north of Venning Creek is open except Cape, Lighthouse, Mill, and Jeremy Islands. Optimum hunting occurs only during the fall high tides, which average 3 days each season. Currently, no check-in is required and hunter data is not collected. To acquire accurate data on hunter participation, the refuge would work with the SCDNR to obtain the number of rail hunt licenses issued each year.

Objective: Hunting
Within 3 years of CCP approval, update the hunt plan to be determined by deer and rail populations, management strategies, and hunter participation.

Objective: Fishing
Provide three quality, educational youth and family fishing events annually at the Sewee Visitor and Environmental Education Center.

Discussion: The Sewee Center has a freshwater pond that is open to fishing three Saturdays annually for a Youth Fishing Rodeo, a Family Fishing Day, and in celebration of National Wildlife Refuge Week. Approximately three weeks before the youth rodeo, the pond is stocked with catfish. Brim and bass are also found in the pond. Each year, more than 85 children register for the youth fishing event. This event is an important means to raise children's awareness of fish species, fishing techniques and opportunities, and wetland habitats. Prizes are awarded for fish caught; fish art tee shirts are printed; children receive fishing booklets, fish rulers, and other printed materials; and donated lunches are served. Family Day occurs the Saturday following the Youth Rodeo with an average attendance of 75 visitors. In October, approximately 35 visitors enjoy fishing the pond.

Strategies:

- Continue to work with local organizations, the SEWEE Association, and USDA Forest Service to determine needs regarding staffing, activities, and educational materials.
- Continue to work with the Service's fish hatchery in Orangeburg to stock the Sewee pond for the event.

Objective: Fishing
Within 3 years of CCP approval, improve the public facilities at Garris Landing.

Discussion: Public facilities at Garris Landing include a 1,100-foot pier, a restroom facility, and parking area with circular paved drive. A freshwater spigot is located on the pier. There are no collection containers for monofilament.

Saltwater fishing accounts for about half of visitation to the refuge. Fishing opportunities on the refuge include shellfishing for oysters, clams and crabs, surf fishing off of the barrier island beaches, and fishing and crabbing off of the Garris Landing pier, all of which are in accordance with state regulations.

No state regulatory signs for fishing are posted at the landing. In place is a South Carolina Department of Health and Environmental Control information sign regarding mercury contamination in shellfish.

Aside from fishing and crabbing, visitors utilize the pier for wildlife viewing. Also, the concessionaire moors its private ferry at Garris Landing and visitors board the ferry at the pier.

The parking area receives heavy usage by fishermen and boaters accessing the refuge, concessionaire clientele, and wildlife viewers. Parking space is not designated and visitors park along the drive and in the grassy median. Placing a traffic counter at Garris Landing would be a means for attaining visitation numbers for the refuge.

This CCP would make improvements to parking, signage, and litter containment.

Strategies:

- Place fishing and shellfishing regulatory signs at Garris Landing.
- Define parking areas at Garris Landing to distinguish parking for passenger vehicles and vehicles with attached trailers.
- Provide monofilament collection containers at the Garris Landing pier.
- Place a traffic counter at the entrance to Garris Landing.

Objective: Fishing
Work with SCDNR to obtain numbers for shellfishing and shrimp baiting licenses to estimate visitation in refuge waters.

Discussion: Shrimp baiting occurs in the fall for 60 days with proximate dates from September 15 – November 15. Shellfishing for oysters and clams usually occurs from September 16 through May15, but in 2009, the season opened October 1 (this may continue). Shrimp baiting participation is extremely heavy and taxes the capacity of the boat ramp and parking facility at Garris Landing.

Aside from Garris Landing, other area boat landings that provide entrance to the refuge include McClellanville landing, Buck Hall Recreation Area, Wild Dunes Marina, and Gadsenville Landing. Visitors also access refuge waters from their private docks and many moor their watercraft at the public dock at Bulls Island.

Strategies:

- Obtain from SCDNR a count of the number of shrimp baiting and shellfish licenses.
- Work with the USDA Forest Service and the town of McClellanville to place traffic counters at McClellanville and Buck Hall landings.
- Place a traffic counter at the public dock at Bulls Island.

Objective: Observation/photography
Within 5 years of CCP approval, begin improvements on existing facilities, add new facilities, and implement activities to enhance opportunities for wildlife observation and photography.

Discussion: Visitors find diverse opportunities for viewing wildlife on the refuge. For visitors who do not have private boats, the Garris Landing Pier provides easy access to view a variety of bird species and saltmarsh habitat. On Bulls Island, there are two observation platforms, one at Upper Summerhouse Pond and the newly constructed platform at Jacks Creek. Placing spotting scopes on the pier and at the platforms would enhance viewing opportunities for visitors. Two hiking trails (e.g., the 1-mile Middens Trail and the 2-mile Turkey Walk—designated a national recreation trail) traverse salt marsh, maritime forest, and brackish impoundments. Currently, there are trailhead signs for both trails, which provide information on habitats and cultural/historical significance. Sixteen miles of service roads and a 5-mile stretch of beach offer abundant wildlife and landscape viewing opportunities. The Coastal Expeditions concession ferry provides viewing and photographing opportunities enroute to Bulls Island from the mainland. The concession also offers salt-marsh tours utilizing non-motorized watercraft, which, with less disturbance, allows visitors enhanced opportunities to view wildlife.

Bulls Island is approximately 6 miles in length. It is 1 1/2 miles from the boat dock to the beach on Beach Road. Currently, the means of travel on Bulls Island is by foot or bicycle. The exception is an annual auto tour offered each fall, guided by naturalist Rudy Mancke. Accessible only by boat, Bulls Island and its facilities are not handicapped accessible.

Strategies:

- Conduct motorized Birding/Driving Tours on Bulls Island on intermittent Saturdays.
- Provide an annual Refuge Photo Contest.
- Put spotting scopes on the Garris Landing pier and an observation platform at Jacks Creek.
- Maintain existing boardwalks on the Turkey Walk and Dave Clough trails.
- Maintain existing Dave Clough photo blind.

Goal: Environmental Education
Provide quality, environmental education programming to promote awareness, understanding, and appreciation of the refuge, its natural resources, and the human influences on the ecosystem.

Discussion: In FY 2008, Sewee Center staff reached over 5,750 youth through environmental education programs. Structured to meet South Carolina curriculum standards for pre-k through 7th grades, programs include a diverse array of topics including barrier island and forest ecosystems, threatened and endangered species, wildlife and habitats, birds, reptiles and amphibians, animal adaptations, and life cycles. Wilderness and climate change concepts are incorporated into programs currently offered. Most school classes are held at the center with the exception of the Earth Stewards and Barrier Island Ecology programs. These two conservation programs are conducted both on- and off-site over a 9-week period with selected schools. Field study equipment and field guides are provided for the conservation programs. Annually, the center hosts two special events, a forestry program for 4th grade and careers program for 5th grade students. Federal, state, and local agencies partner to present the forestry and careers events.

Coastal Expeditions Concession offers an “Island Quest” marine science and maritime forest field study on Bulls Island for schools and other groups. Programs are structured to meet South Carolina science curriculum standards and include barrier island ecology, beach, maritime forest, and freshwater pond explorations.

Teacher activity guides for structured programs are offered at the center and the guides can be attained from the center’s website.

Objective: Environmental Education
Within 1 year of CCP approval, ensure that the climate change message is incorporated into educational programs.

Strategies:

- Continue to incorporate climate change effects on wildlife and habitats in education programs as appropriate.
- Develop programs focused on climate change concepts and issues, targeting middle and high school students.

Objective: Environmental Education
Within 1 year of CCP approval, ensure that the wilderness message is incorporated into educational programs.

Strategies

- Continue to incorporate wilderness concepts and ethics in education programs as appropriate.
- Develop programs focused on wilderness, targeting middle and high school students.

Objective: Environmental Education
Within 1 year of CCP approval, offer wilderness trips, outside critical nesting periods, to refuge wilderness areas for youth.

Strategies:

- Target teenage scouts and other teenage youth groups.
- Develop pre-visit materials on wilderness concepts, ethics, and refuge management.
- Develop experiential activities for the wilderness visit.

Objective: Environmental Education
Provide an annual teacher workshop at the visitor center to promote awareness of refuge resources.

Discussion: Beginning in 1999, when the Sewee Earth Stewards conservation education program was developed and implemented, the refuge friend's group, SEWEE Association, has worked closely with refuge staff to provide annual training for teachers participating in the Earth Stewards program. Since 2008, the Association, in partnership with the College of Charleston, Cape Romain NWR, and Francis Marion Forest, has offered a teacher workshop with focus on local ecosystems and invasive species. The 5-day course targets teachers in grades 6-12, and offers graduate credits.

Strategy:

- Continue to partner with the local university to develop and provide training on the refuge ecosystem, utilizing refuge-specific teacher training for schools interested in providing professional development credits to their teachers.

Objective: Environmental Education
Annually recruit and train volunteers and interns to independently teach environmental education programs that focus on refuge resources, wildlife habitat management, and human influences on the ecosystem.

A number of visitor services volunteers teach various education programs at the center. Students from the local high school and university also volunteer to teach programs to fulfill internship requirements. Programs are scheduled during the school year and also on some Saturdays.

Strategies:

- Continue to utilize volunteers and school interns to deliver refuge education programs.
- Expand current natural history programs focused on resource management issues such as fire, invasive species, climate change, and wilderness.

Goal: Interpretation
Provide quality interpretive experiences designed to increase awareness and understanding of and appreciation for the Service; the Refuge System; and Cape Romain NWR resources, management practices, and issues.

Discussion: In FY 2008, 8,300 visitors participated in interpretive programs and activities that were offered through the Sewee Center. Programs included red wolf presentations and exhibit hall tours, and guided walks and tours on the refuge. There are two guided tours to Lighthouse Island, one in the spring and the second in the fall, to view the refuge's two historic lighthouses. On scheduled Saturdays, wildlife discovery programs for youth and lecture programs for adults are offered. Visitors can enjoy a 15-minute orientation film which emphasizes barrier island ecology, threatened and endangered species, cultural history, and management practices undertaken on the refuge.

Outside the center, there is a live red wolf exhibit with interpretive signage. Here, visitors can observe this extremely endangered native species and learn about its incredible history and the recovery efforts of the Service to prevent its extinction.

Objective: Interpretation
Within 5 years of CCP approval, work with partners to improve interpretive signage on the refuge.

Discussion: Interpretive signs on Bulls Island are found along the service roads and at the Old Fort foundation. Signage includes descriptions of island wildlife and habitats, water impoundment management practices, and island cultural history. The sign placed at the trailhead of the Middens trail provides visitors with a cultural history of the Native American shell mounds. The Turkey Walk trailhead sign introduces visitors to island habitats as they traverse the trail. Placing signs intermittently along the trails that would identify and describe plants, animals, and their relationships to habitat would enhance visitor awareness, and knowledge of and appreciation for refuge resources.

Refuge interpretive kiosks are found at the McClellanville boat landing, Garris Landing, Bulls Island, and Buck Hall Recreation Area. Information includes a refuge map, regulations, habitat management, and cultural and natural history. Interpretive signs with descriptions of wildlife found in refuge waters, salt marsh habitat, Intracoastal Waterway, and tides are placed on the fishing pier at Buck Hall Recreation Area. Similar interpretive signs placed at Garris Landing would enhance visitor awareness, and knowledge of and appreciation for refuge resources.

Strategies:

- Replace the interpretive kiosk at Garris Landing. Incorporate messages on wilderness and climate change.
- Place interpretive signs describing various species of fish, shorebirds, and wading birds found in the waters and on salt marsh flats of the refuge on the Garris Landing pier.
- Develop interpretive signs for resident birds, migratory songbirds, reptiles, mammals, and flora that may be seen while hiking the Middens and Turkey Walk Trails and place intermittently along the trails. Include climate change impacts to habitats.
- Develop a standardized design template for uniformity

Objective: Interpretation
Within 3 years of CCP approval, create a panel that incorporates a wildlife viewing etiquette message for the interpretive kiosk and observation towers on Bulls Island and Garris Landing.

Objective: Interpretation
Within 5 years of CCP approval, work with partners to improve exhibits at the visitor center.

Discussion: Within the center exhibit hall, six interactive exhibits depict wildlife, habitats, and conservation management. Visitors complement exhibit designs and displays; however, the exhibits have not been upgraded since the center opened in December 1996. The Cape Romain lighthouses, listed on the National Register of Historic Places, are historically and culturally significant to the refuge and surrounding communities. Adding an exhibit of the lighthouses would highlight those cultural resources and increase visitor awareness and appreciation of the human connection with the refuge. Placing panels emphasizing the significance of wilderness and climate change would promote greater awareness of Service issues and initiatives to protect and conserve natural resources. A computerized interactive screen which highlights plants, animals and habitats, and points of interest on the refuge is being restored. The refuge staff is currently working with SCDNR to add a children's oyster habitat exhibit in the hall.

Strategies:

- Refurbish the exhibits in the exhibit hall.
- Design interpretive panels for the wilderness area and for climate change and its impacts to refuge habitats.
- Restore interactive computer screen at center to include descriptive and habitat information for refuge plants and animals and refuge points of interest
- Design and construct a Lighthouse exhibit to be displayed in the Exhibit Hall, incorporating a wilderness message in the text.
- Continue to work with the SCDNR in the construction of a children's interactive oyster habitat exhibit.
- Develop historical display of lighthouses at the Sewee Visitor Center.

Objective: Interpretation
Within 1 year of CCP approval, develop and implement a Junior Refuge Ranger program for youth 8 to 12 years of age.

Strategies:

- Design an activity booklet with content focused on refuge wildlife and habitats, management, wilderness, and climate change.
- Upon completion of the booklet, reward youth with ranger badge/patch, certificate. and trip to the refuge.

Objective: Interpretation
Within 7 years of CCP approval, create cultural, historic, and resource displays at the Dominick House and open living/dining areas to weekend visitors.

Discussion: The Dominick House is a testament not only to the cultural history of Bulls Island but also to the concessionaire history of the refuge. Gayor Dominick, New York banker and broker, who had purchased the island from Francis Harrison in 1925, built the house in 1928. From the island's first private ownership by Thomas Cary in 1696 to Dominick's purchase, Bulls Island passed hands 36 times. Dominick was an avid outdoorsman and purchased the island for hunting purposes. He built the house to be used as a hunting lodge and family vacation home. In 1936, Dominick conveyed the house and its contents to the Bureau of Biological Survey (USFWS). In 1940, refuge patrolman William Hills moved into

the house with his family. His wife, Bernadine Magwood Hills, became the first Dominick House Concessionaire. For the following 29 years, five concessionaires would live on the island with their families, managing the house as a visitor concession, providing lodging and meals for those who came to the island to birdwatch, observe and photograph wildlife, participate in archery deer hunts, and conduct research. The refuge concession closed with the death of refuge biological technician Hoyt Mills. His wife Neva Mills, managed the concession business for 12 years.

The Dominick House was renovated in 2007 and is currently used by refuge staff for weekend duties and during the archery hunt. The house is also available for meetings and trainings by agency and conservation organizations. The house is not open to the public.

Currently, foamboard panels that provide interpretive history of Gayor Dominick and house concessionaires are placed in the house. There are also old framed photographs of wildlife and landscape scenes, and various animal remains (shells and bones). A powerpoint slide presentation depicting island and concessionaire history is available and is used for volunteer and concessionaire staff training. Books, photographs, other memorabilia from Gayor Dominick and concessionaire families, and natural history exhibits would enhance visitor awareness and knowledge of the island's history and its connections with local peoples and communities.

Objective: Interpretation
Provide year-round natural and cultural history interpretive programs on Bulls Island and Lighthouse Island.

Discussion: Currently, Coastal Expeditions concessions staff conduct natural history interpretive programs to scheduled school, scout, church, and family groups throughout the year. Also, guided kayak trips that focus on the salt marsh estuary and ecosystem are offered by the concession. In celebration of National Public Lands Day, the concession offers a guided walk on the island. Twice annually, in the spring and fall, the concessionaire ferry transports visitors to Lighthouse Island for a tour of the lights. A local volunteer guides the tours, conducting a historical slide presentation on the lighthouses at the Sewee Center prior to the boat trip to Lighthouse Island.

To augment current interpretive programs, the staff develops and conducts programs on wildlife and habitat management, incorporating issues and impacts of climate change on refuge resources. Also, the Dominick House is an impressive feature on the island. However, visitors do not have access to the house. Refuge staff, with access to the Dominick House, would provide cultural programs highlighting the significance and connections of the refuge to local history and families.

Strategies:

- Continue to offer two public tours to Lighthouse Island annually.
- Develop historical display of Lighthouses at the Sewee Visitor Center
- Develop interpretive tours on Bulls Island to incorporate Native American middens and Old Fort history.
- Develop interpretive tours on Bulls Island with a focus on wildlife, habitats, and habitat management practices.
- Develop an interpretive program on the history of the Dominick House concessionaires.
- Host annual events highlighting conservation celebrations such as International Migratory Bird Day, National Wildlife Refuge Week, and National Public Lands Day.

Goal: Outreach
Local communities will recognize the refuge and support its purposes.

Objective: Outreach
Within 1 year of CCP approval, promote awareness of refuge resources, management, and key issues using a variety of public media.

Discussion: The refuge and Sewee Center websites are significant outlets as outreach tools that provide a broad overview of refuge resources, management, and monthly program offerings. The Sewee Center publishes monthly events in the local news media; sends the information electronically to other local, state and federal agencies; and posts monthly events flyers at the center, town libraries, on community boards, and on information boards throughout the Francis Marion Forest.

Strategies:

- Maintain the refuge and Sewee Center websites to provide current and accurate information.
- Incorporate news releases, newsletters, and podcasts into website pages.
- Disseminate refuge news releases to local media outlets such as newspapers and news websites.
- Work with local television and radio stations to broadcast refuge events and issues.
- Utilize the latest technology to share refuge interpretive and education programs with those unable to visit.

Objective: Outreach
Within 2 years of CCP approval, develop partnerships with Saint James Santee Elementary and McClellanville Middle Schools to provide educational programming focused on refuge resources, habitat management, and climate change.

Strategies:

- Offer teacher activity guides and supplemental materials for the classroom.
- Outreach to teachers to encourage utilization of the refuge as an outdoor classroom.
- Provide field study equipment and field guides for loan to visiting schools.
- Coordinate with local elementary schools to offer at least 10 offsite programs annually.

Objective: Outreach
Refuge staff will be active participants in local civic/community/school functions and organizations.

Discussion: Currently, the refuge and Sewee Center participate in the annual Southeastern Wildlife Exposition in Charleston, for which exhibits provide refuge representation and information materials to an estimated 3,000-5,000 participants each year. The Sewee Center staff provides refuge recognition and information to approximately 2,000-3,000 participants at the annual Huntington Beach State Park “KanAm” (Canadian/American) event.

For the past 5 years, Sewee Center staff has participated in the annual “Taste of South Carolina” event for 2nd grade students at Pinckney Elementary School, conducting a requested bird adaptations program for all students, parents, and teachers. Staff also man exhibits and talk with students at annual career fairs at Lincoln High School, McClellanville, and Trident Community College, North Charleston. In 2008, staff presented a reptiles program at School of the Arts, North Charleston, for 6th – 12th grade students.

Becoming actively engaged in civic and conservation organizations and in the local township of Awendaw would greatly enhance awareness and understanding of refuge resources, management and environmental and social issues, and would forge partnerships conducive to garnering public support for refuge purposes and resource initiatives.

Working with local universities and colleges to establish a partnership with elder-hostel programs would be an avenue to create awareness and recognition not only for the local community but nationwide.

Strategies:

- Staff will become members of a local civic and/or conservation organization.
- Staff will attend Awendaw's public meetings to keep abreast of town planning and to discuss planning efforts on and adjacent to the refuge.
- Staff will continue to participate in local and state events such as the Southeastern Wildlife Exposition, Charleston Air Force Base Earth Day, and Huntington Beach State Park KanAm events.
- Staff will continue to participate in school events such as Career fairs, Science fairs, and the annual Taste of South Carolina event at Pinckney Elementary School.
- Outreach to area schools, working with teachers to present offsite programs in the classrooms.

Objective: Outreach
Within 2 years of CCP approval, hire a park ranger to oversee and expand the refuge outreach program.

Goal: Volunteers
A sufficient number of skilled and trained volunteers will be available to support the refuge in meeting its purposes and goals.

Objective: Volunteers
Within the life of the CCP, continue to increase the number of active volunteers.

Discussion: In FY 2008, 144 volunteers contributed 13,053 hours to refuge and Sewee Center programs and services. Contributions occurred in visitor services (reception, interpretation, education); resource management (turtles, wolves, invasive species, bird surveys); resource maintenance (grounds, facilities, construction projects, vehicle/boat maintenance); and administrative support (clerical, web development, volunteer newsletter, data spreadsheets). Volunteers include retirees, individuals still in the work force, high school and college interns, intern positions supported by partners and conservation organizations, and pre-trial intervention community service.

Strategies:

- Provide volunteer information on the Service's volunteer web page.
- Provide information about the refuge volunteer program on the refuge and Sewee Center web sites. Provide links to volunteer applications and job descriptions.
- Provide volunteer job descriptions for areas of responsibility.
- Recruit volunteers through media releases, local educational institutions, community organizations, and contacts.
- Distribute volunteer internship opportunities to colleges and universities nationally.

Objective: Volunteers
Recruit and train volunteers in the areas of visitor information and orientation, environmental education and interpretation, resource management and maintenance, and administrative support.

Discussion: Strive to retain existing volunteers through ongoing training and increased volunteer opportunities. Keeping volunteers updated and informed will help achieve refuge management goals and objectives.

Strategies:

- Provide in-depth initial training to refuge volunteers that will enable them to effectively and efficiently complete projects and responsibilities, matching volunteer interests with job availability.
- Provide annual refresher training (e.g., turtle program, IT security) for active volunteers.
- Provide a Volunteer Manual with information relative to the volunteer program and refuge resources and management.
- Demonstrate refuge appreciation for volunteer contributions through a Volunteer Appreciation Banquet. Present awards for service hours in accordance with Service guidelines.
- Publish an annual Volunteer Newsletter to be distributed to volunteers and refuge staff, and to be available to the public at the visitor center, refuge office, and on the refuge and center websites.
- Conduct exit interviews at the end of an individual's volunteer service to determine his/her perceived accomplishments and contributions, and to attain feedback on the refuge volunteer program

Objective: Volunteers
Within 3 years of CCP approval, improve the two work camper pads at Garris Landing.

Discussion: There are 3 work camper sites outside the maintenance compound at Garris Landing, located in a grassy area adjacent to two mobile trailers. The sites do not have cement pads. Each site has electrical, sewage, and water sources. The water at the sites is not potable. A washer/dryer, located in one of the mobile trailers, is available for camper use.

Strategies:

- Install concrete slabs at the camper pads.
- Install a potable water system at Garris Landing.

Goal: Friends Group
The Southeastern Wildlife and Environment Education Association (SEWEE) will be an advocate for the refuge, supporting all refuge goals and objectives, and providing financial and in-kind support of refuge activities.

Objective: Friends Group
Work with the SEWEE Association to strengthen the existing collaborative relationship and encourage board members to participate in refuge programs and endeavors.

Discussion: The SEWEE Association was formed as a 501(c) (3) in 1996 to serve as a friend's group for Cape Romain NWR and Francis Marion National Forest. Since its inception, SEWEE has provided volunteer and monetary support for educational and interpretive programs, including the

development and implementation of teacher workshops. The Association manages the Sewee Center book outlet with proceeds from sales supporting center educational programs. SEWEE contributes funds and volunteer services for refuge biological programs including sea turtle nest recovery, the live red wolf exhibit, invasive species, and shorebird surveys. Through donations, grants and fund-raising events, such as the Bulls Island Nature Tour with naturalist Rudy Mancke and Music and Oysters for Wildlife event, the Association works tirelessly to assist the refuge in meeting its purposes and goals.

REFUGE ADMINISTRATION

Goal: Refuge Administration
Provide adequate staff, equipment, facilities, and funding to accomplish refuge goals and objectives while encouraging cooperative efforts with other agencies, non-governmental organizations, universities, volunteers, and other partners.

Objective: Climate Change
Implement objectives contained in the Service's draft climate change strategic plan (*Rising to the Challenge: Strategic Plan for Responding to Climate Change*).

Discussion: Climate change is the most compelling conservation challenge of our time. Accelerating climate change will amplify current resource management challenges involving habitat fragmentation, degradation, and loss, as well as urbanization, invasive species, disease, parasites, and water management. As rising temperatures affect the dynamics of complex natural systems, the potential exists for mass species extinctions and disruptions. Fortunately, the Service is in a unique position to help wildlife and ecosystems adapt to a rapidly changing climate.

Facing the climate change challenge requires working on a landscape level to integrate Service efforts with those of partners such as other federal, state and tribal agencies, conservation groups, and academic institutions. Moving forward, the Service will engage partners in a dialogue about working together to apply our resources with the best science to ensure landscapes are capable of sustaining America's fish and wildlife for generations to come.

The Service developed a draft climate change strategic plan to guide the Service's climate change efforts. The draft plan emphasizes adaptation, mitigation, and engagement, and provides flexibility for resource managers to be responsive to evolving science, technology, and implementation.

Strategies

- Provide opportunities to study climate change effects by encouraging research on the refuge.
- Train staff and volunteers to identify and document any noticeable change in the wildlife and/or habitat due to climate change.
- Assume a participatory role in Service's Landscape Conservation Center (LLC) network to improve conservation delivery and to provide information that the LCC can use in planning and modeling exercises.
- Conduct spatial analysis of refuge barrier islands to identify historic, evolutional, and current configuration, acreage, habitat type, and position on landscape. Identify habitat types and map them over time. Add a GIS specialist to support this effort.

Objective: Staffing
Implement RONS Staffing Model as opportunities become available.

Discussion: Current staffing is inadequate to address refuge goals and objectives. Further cuts to this core staff would severally impact the capabilities to manage visitor services and the sea turtle recovery program, and to maintain Service facilities and assets.

Current Staffing (11 FTEs)

Position	Status	% of time on Cape Romain	% of time on SC Low Country Complex
Project Leader GS-0485 -14	FTE	25	75
Refuge Manager GS-0485 -12	FTE	100	0
Refuge Biologist GS -0401 – 11	FTE	100	0
Supervisory Park Ranger GS-0025-12	FTE	60	40
Administrative Officer GS-0341-9	FTE	75	25
Natural Resource Planner GS-0401-12	FTE	25	75
Park Ranger GS-0025-07	FTE	100	0
Law Enforcement Officer GS-0025-9	FTE	40	60
Maintenance Worker WG-4749-08	FTE	100	0
Maintenance Worker WG-4749-08	FTE	100	0
Biological Technician GS-404-05	PPT	50-95	0

RONS Staffing Model (18 FTEs)

Position	Status	% of time on Cape Romain	% of time on SC Low Country Complex
Project Leader GS-0485 -14	FTE	25	75
Refuge Manager GS-0485 -12	FTE	100	0
Refuge Biologist GS -0401– 11	FTE	100	0
Supervisory Park Ranger GS-0025-12	FTE	60	40
Administrative Officer GS-0341-09	FTE	75	25
Natural Resource Planner GS-0401-12	FTE	25	75
Park Ranger GS-0025-07	FTE	100	0
Law Enforcement Officer GS-0025-09	FTE	100	0
Maintenance Worker WG-4749-08	FTE	100	0
Maintenance Worker WG-4749-08	FTE	100	0
Biological Technician GS-404-05	PPT	50-95	0
Wildlife Refuge Specialist GS-0485-9	FTE	100	0
Refuge Biologist GS-401-07	FTE	100	0
Engineering Equipment Operator WG-5725-8	FTE	100	0
Park Ranger GS-0025-09	FTE	100	0
Supervisory Refuge Biologist GS-0486-12	FTE	25	75
Heavy Mobile Equip. Mechanic WG-5803-10	FTE	25	75
Administrative Assistant GS-303-07	FTE	100	0
GIS Specialist	FTE	25	75

Objective: Partnerships
Foster strong and effective working relationships with new and existing partners to accomplish refuge goals and objectives through a strategic habitat conservation approach.

Discussion: Partnerships will be focused on complex problems that involve a variety of stakeholders to assist in a conservation effort.

Strategic habitat conservation is an adaptive management framework for landscape conservation that informs us about where and how to deliver conservation efficiently to achieve specific biological outcomes. It is a way of thinking and of doing business that requires us to set specific biological goals, allows us to make strategic decisions about our work, and encourages us to constantly reassess and improve our actions—all critical steps in dealing with large-scale conservation challenges and the uncertainty of accelerating climate change.

Strategic habitat conservation incorporates these elements—biological planning, conservation design, delivery, monitoring, and research—in an ongoing process that changes and evolves. It builds on work the Service has accomplished by leveraging the lessons we have learned, the data we have collected, and the relationships and partnerships we have established.

Objective: Partnerships
Assemble a coalition of state and federal agencies, non-governmental organizations, conservation organizations, scientists, and other relevant stakeholders to work together at a landscape scale, build capacity for relevant research, share information, pool resources, and plan solutions for the challenges of climate change and sea level rise.

Discussion: Facing the climate change challenge requires working on a landscape level to integrate our efforts with many traditional and non-traditional partners. Our goal is to work with others to apply our resources with the best science to ensure that landscapes are capable of sustaining fish and wildlife for generations to come. A creation of a multi-disciplinary, multi-agency team is the first step toward achieving this goal.

Strategy:

- Work with scientists to fine tune and localize SLAMM modeling.

Objective: Facilities
Maintain all structures and facilities for safe operations and visitor experiences on the refuge.

Discussion: Many refuge facilities need major improvements to prevent further deterioration and to maintain a safe work environment. Public facilities such Garris landing need upgrading to prevent damage to private property and government equipment. The refuge boat basin and boat ramp at Garris Landing need to be dredged to ensure adequate depth for refuge operations, concessionaire ferry, and public boats. The boat ramp also could use a courtesy dock to make the ramp safer to get in and out of the vessel. The public boat dock on Bulls Island is in poor condition and design improvements are needed to make it more stable and accessible. The Sewee Visitor Center roof needs to be replaced and the exterior needs to be painted.

Objective: Facilities
Seek alternative energy sources for all major facilities on the refuge in order to work our way to a carbon neutral site by 2020.

Discussion: The refuge is one of the largest energy users in the Service's Southeast Region. Because much of the operation involves the use of boats and heavy equipment, it is difficult to mitigate the use of gas and diesel fuel. However, there is an opportunity to use alternative energy sources at the three main energy using facilities on the refuge: Sewee Visitor Center, administrative office, and maintenance building. The refuge will seek opportunities to use alternative energy sources to power buildings and computers.

Objective: Facilities
Bolster activities that reduce resource impacts of the refuge such as recycling, solid waste disposal, and use of hazardous materials.

Discussion: The refuge office, maintenance building, and visitor center have minimum recycling efforts. All areas of the refuge need to provide recycling bends to encourage staff and visitors to recycle as much as possible. The maintenance areas at Garris Landing and Bulls Island need updating to accommodate hazardous material storage needs and waste disposal.

Strategies:

- Construct new hazardous materials storage building at Garris Landing and on Bulls Island.
- Reduce solid waste at maintenance building by disposing of old equipment and property.
- Make recycling bins readily available at all refuge facilities

V. Plan Implementation

INTRODUCTION

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

To accomplish the purpose, vision, goals, and objectives contained in this Draft CCP/EA for Cape Romain NWR, this chapter identifies projects, funding and personnel needs, volunteers, partnership opportunities, step-down management plans, a monitoring and adaptive management plan, and plan review and revision.

PROPOSED PROJECTS

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

WILDLIFE AND HABITAT MANAGEMENT

1. Invasive plant control on Bulls Island – Controlling invasive Chinese tallow (Sapium sebiferum) on 3,000 acres on Bulls Island. These areas are adjacent to 600 acres, which have already been controlled. This will reduce reinfestation of the current treatment area and continue toward the ultimate goal of restoration of the maritime forest. Areas identified for aerial application are located in wet habitats on the island where hand treatment would be extremely difficult and time consuming. Coverage of Chinese tallow in these wetlands is estimated at greater than 60 percent of the species composition. The work will be done be a contracted party. Cost for application is approximately $200 per acre.

2. Conduct loggerhead sea turtle nest survey, monitoring, and research – Research on this threatened species is needed on Cape Island due to the extensive coastal erosion and sea level rise. Habitat is extremely limited; however, Cape Island continues to host 20 percent of the nesting northern subpopulation of loggerhead sea turtles. Biologist positions are needed to conduct this effective strategic habitat conservation objective and to protect the species.

3. Conduct marsh bird, shorebird, seabird, neotropical bird, and vegetation surveys – Monitoring of bird species is necessary to provide baseline data to tract the effects of climate change and sea level rise on the refuge. The predicted loss of salt marsh, increase of tidal flats, and changes in migration patterns would affect these species greatly. There is very little data on marsh birds and neotropical birds for the area. Shorebird surveys have been conducted for the past 6 years and the protocol and survey area needs to be expanded to have a better understanding of how these

species are using the refuge. Reestablishing a historical vegetation survey on Bulls Island would further tract changes in the maritime forest, and forest composition as we control invasive plants. An additional biologist is needed to establish these protocols and conduct the needed surveys.

RESOURCE PROTECTION

4. Water quality monitoring stations – Good water quality is essential to the resources on the refuge. Contaminant sources adjacent to the refuge have increased and much of the waters within the refuge have been listed on the state's 303d list. Water quality monitoring stations would provide much needed data for the management of migratory birds, endangered species, and a commercially important shell fish industry.

5. Construct cross dike in Jacks Creek Impoundment – Within the next 10 years, the perimeter levee around Jacks Creek is expected to erode away. A new dike set back behind the historical creek bed would provide management capability for half of Jacks Creek impoundment when the perimeter levee fails.

VISITOR SERVICES

6. Replace exhibits in Sewee Visitor Center – Within the lifespan of the CCP, we will need to replace the exhibits within the Sewee Visitor Center. The 1,500-square-foot exhibit hall is of adequate size; however, it will need to be refurbished to include engaging interactive exhibits that educate and inform visitors to the refuge.

7. Construct courtesy dock at Garris Landing – Construct courtesy dock at Garris Landing. The boat launching facility at Garris Landing provides access for the general public to the refuge and the Intracoastal Waterway. Currently, people must load passengers and equipment into their boats directly on the ramp itself. This is a safety hazard as the lower portion of the ramp gets slick with water and algae. Many people slip and fall onto the ramp or onto the oyster shells and riprap that line the sides of the ramp. The construction of a small courtesy dock alongside of the ramp would eliminate this problem. The proposed project would be to construct a floating dock on the right hand side of the boat ramp that would measure 42 feet long by 4 feet wide. A 3-foot wide by 30-foot long aluminum gangway would allow access to the dock.

8. Replace floating public dock on Bulls Island – The floating dock on Bulls Island that is available for the public to use has several cracks in the aluminum support framework and needs to be replaced. These cracks compromise the integrity of the whole dock and make it more unstable. In addition, all of the deck boards need to be replaced. Bulls Island receives 50,000 visitors annually and this dock is the only secure location for the public to tie off their boats.

9. Develop and print education materials and curriculum – The Sewee Visitor Center hosts more than 40,000 school students each year. All educational programs need to meet the South Carolina educational standards. By printing a curriculum guide that is aligned to the state standards, teachers will be able to apply these lessons to their classroom lessons in an easy and effective manner.

10. Construct recreational vehicle camper pads – Construct work-camper trailer pads at Garris Landing. Staffing levels are decreasing due to budgetary constraints and we are increasingly relying on volunteer labor to accomplish our mission. The proposed project would construct two trailer pads at Garris Landing for work-camper volunteers. We have already installed the

electrical hook-ups for the trailer pads. The only remaining construction would be to pour the cement pad itself and to connect sewer/water lines to the existing systems. We would also install a washer and dryer in the maintenance shop for the volunteers and other interns that stay at Garris Landing.

REFUGE ADMINISTRATION

11. Hire GIS specialist – A GIS specialist is needed to track changes in the barrier island ecosystem and analyze climate change impacts and to assist in land acquisition planning and conservation design modeling for species impacted by climate change.

12. Repair boardwalk at Sewee Center – Replace 300 feet of boardwalk surface and handrails with composite material. Presently, the Sewee Visitor and Environmental Education Center has three separate sections of boardwalk around the center. Two sections are in dire need of repair. The section this request would address runs from the concrete walkway that connects the parking lot to the red wolf viewing platform. The supports and streamers appear to be in good shape and should be able to be reused. However, the surface and handrails are decaying and splintering to the point that it will soon be a safety issue. This is also the section of boardwalk that receives the heaviest traffic, since the majority of users return to the center or their vehicles after viewing the wolves rather than continuing to hike around the remainder of the trail.

13. Install solar panels on Sewee Center – The project will reduce the energy needs for the Sewee Center by greater than 65 percent. It is the goal of the Service to become carbon neutral by 2020; therefore, we must seek out alternative energy sources where possible.

14. Replace roof and HVAC units at Sewee Center – a recent comprehensive condition assessment that was conducted highlighted the need to replace the roof. The design of the roof has allowed moisture to accumulate underneath the aluminum, rotting the sheathing. The HVAC units are inefficient and have evidence of mold. Replacing these units will help reduce the energy usage for the building and provide better indoor air quality.

15. Install cameras for red wolf viewing in Sewee Center – Install two fixed remote cameras and an indoor monitor to view the red wolves at the Sewee Visitor and Environmental Education Center. One camera would be located in the den and the other would be installed on the fence of the enclosure so the public can see the whole ½-acre enclosure. The monitor would be mounted inside the visitor center so people could come into the center and view the wolves in a natural state. A switch would be installed near the monitor so people could switch from one camera to the other. This would allow the public to view the wolves at all times. Additionally, interpretive panels would be installed near the monitor to provide the public with additional information about the red wolves.

16. Comply with safety policy, environmental compliance policy, and asset management – Additional staff is needed to keep better track of safety, environmental compliance, and asset management. A wildlife specialist would be hired to assist the refuge manager in complying with policies and establishing an environmental management system. This wildlife specialist would also serve as the safety officer for the refuge.

17. Hire refuge officer – The refuge has a lack of law enforcement presence. By providing an additional refuge officer, the safety of the visiting public will be increased, as well as our ability to provide much needed protection for our natural resources and facilities. Officer presence, surveillance, and visitor contacts are important to visitor safety and are critical in reducing crime on the refuge.

18. Maintain maintenance shop building – Repair roof on maintenance shop building–replace roof vents with a ridge vent system. Install insulation, replace rotten wood on fascia, replace both garage doors, replace doors and windows, and repaint and reseal structures. Replace electrical outlets with GFI, install emergency eye wash station, replace stairs, and install a reverse osmosis water system for potable water.

19. Dredge boat basin at Garris Landing – Over the past 10 years, the boat basin has become silted in and at low tide the boats and the dock are sitting on the bottom. The basin should be dredged to a depth of 6 feet below mean sea level to allow use of boats.

20. Maintain headquarters building – Replace roof, doors, and insulation. Replace and sanitize mold and mildew drywall and vinyl wall coverings and paint interior. Repair/replace all wood rot and paint exterior.

FUNDING AND PERSONNEL

Table 1. Summary of projects

PROJECT NUMBER	PROJECT TITLE	FIRST YEAR COST	RECURRING ANNUAL COST	STAFF (FTE'S)
1	**Invasive plant control**	600,000	30,000	.5
2	**Sea turtle nest survey, monitoring, research**	0	125,000	2
3	**Conduct marshbird, shorebird, neotropical bird, and vegetation surveys**	80,000	80,000	1
4	**Water quality monitoring stations**	50,000	10,000	.25
5	**Construct cross dike in Jacks Creek Impoundment**	3,000,000	0	0
6	**Visitor Center exhibits**	700,000	0	0
7	**Contruct courtesy dock at Garris Landing boat ramp launch**	100,000	0	0

PROJECT NUMBER	PROJECT TITLE	FIRST YEAR COST	RECURRING ANNUAL COST	STAFF (FTE'S)
8	**Replace Bulls Island floating dock**	80,000	0	0
9	**Develop and print education materials and curriculum designed to meet the South Carolina Educational Standards**	87,000	60,000	1
10	**Construct recreational vehicle camper pads**	20,000	0	0
11	**Hire GIS specialist**	0	125,000	1
12	**Repair boardwalk at Sewee Center**	30,000	0	0
13	**Install solar panels on Sewee Center**	$200,000	0	0
14	**Replace roof and HVAC units at Sewee Center**	$350,000	0	0
15	**Install cameras for red wolf viewing in Sewee Center**	20,000	0	0
16	**Comply with safety policy, environmental compliance policy, and asset management; hire wildlife specialist**	146,000	80,000	1
17	**Hire refuge officer**	140,000	100,000	1
18	**Maintain shop building**	200,000	0	0
19	**Dredge boat basin at Garris Landing**	250,000	0	0
20	**Maintain headquarters building**	150,000	0	0

PARTNERSHIP/VOLUNTEERS OPPORTUNITIES

A key element of this Draft CCP/EA 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 and/or enhance partnerships with the SEWEE Association; area elementary, middle and secondary schools; the Nemours Wildlife Foundation; and Audubon's Francis Beidler Forest. At regional and state levels, partnerships may be established or enhanced with organizations such as the Conservation Fund, the Audubon Society, South Carolina Wildlife Federation, the Nature Conservancy, Ducks Unlimited, South Carolina Department of Natural Resources, National Park Service, National Estuarine Research Reserve, U.S. Geological Survey, U.S. Army Corps of Engineers, and other interested state and federal agencies.

STEP-DOWN MANAGEMENT PLANS

A comprehensive conservation plan is a strategic plan that guides the direction of the refuge. A step-down management plan provides specific guidance on activities, such as habitat, fire, and visitor services. These plans (Table 2) are also developed in accordance with the National Environmental Policy Act, which requires the identification and evaluation of alternatives and public review and involvement prior to their implementation.

Table 2. Refuge step-down management plans related to the goals and objectives of the comprehensive conservation plan

Step-down Plan	Projected Completion/Revision Date
Hurricane Response Plan	2009 (annual)
Prescribed Fire Management Plan	2010 (annual)
Wilderness Management Plan	2012
Visitor Services Plan	2012
Habitat Management Plan	2011
Cultural Resources Management Plan	2015
Inventory and Monitoring Plan	2012
Visitor Center Operations Manual	2009 (annual)

MONITORING AND ADAPTIVE MANAGEMENT

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

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

PLAN REVIEW AND REVISION

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

SECTION B. ENVIRONMENTAL ASSESSMENT

I. Background

INTRODUCTION

This Environmental Assessment (EA) for Cape Romain NWR has been prepared in compliance with the National Environmental Policy Act (NEPA). It discusses the purpose and need for the CCP and provides an analysis of the environmental impacts that could be expected from each of the management proposals. This analysis assists the Service in determining if it will need to prepare an Environmental Impact Statement (EIS) or a Finding of No Significant Impact (FONSI) for the refuge's proposed CCP.

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

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

The EA evaluates a range of reasonable management alternatives. The intent is to support informed decision-making regarding future management of the refuge. Each alternative presented in this EA was generated with the potential to be developed into a final comprehensive conservation plan. The predicted biological, physical, social, and economical impacts of implementing each alternative are analyzed in this Draft CCP/EA. This analysis assists the Service in determining if the alternatives represent no significant impacts, thus requiring the preparation of a FONSI, or if the alternatives represent significant impacts, thus requiring more detailed analysis through an EIS and a Record of Decision.

The Service is the Nation's primary conservation agency concerned with the protection and long-term management of wildlife resources. The Service administers the National Wildlife Refuge System, a system of more than 540 national wildlife refuges embracing over 95 million acres, much of which is primarily managed for the enhancement of migratory bird populations and federally listed threatened and endangered fish, wildlife, and plants.

PURPOSE AND NEED FOR ACTION

The purpose of this Draft CCP/EA is to ensure that the Service adopts a CCP for Cape Romain NWR as mandated in the Improvement Act and that the refuge conserves threatened and endangered species; protects fish and wildlife resources and natural diversity; conserves wetlands to meet migratory bird treaty obligations; addresses the spread and impacts of exotic, invasive, and nuisance species; investigates the impacts of climate change on refuge resources; protects important barrier island resources; promotes appropriate and compatible wildlife-dependent public use activities; promotes awareness and appreciation of natural resources; promotes support for refuge management

activities; coordinates with a wide variety of government and non-government partners; protects and preserves archaeological and historical resources; and provides for appropriate and compatible scientific research.

This EA addresses the need to adopt a 15-year management plan for Cape Romain NWR that provides guidance for future refuge management, identifies priorities, ensures consistent and integrated management, and meets the requirements of the Improvement Act.

DECISION FRAMEWORK

Based on the assessment described in this document, the Service will select an alternative to implement the CCP for Cape Romain NWR. The CCP, when final, will include a FONSI, which is a statement explaining why the selected alternative will not have a significant effect on the quality of the human environment. This determination is based on an evaluation of the Service and Refuge System mission, the purpose(s) for which the refuge was established, and other legal mandates. Assuming no significant impact is found, implementation of the CCP will begin and will be monitored annually and revised when necessary.

PLANNING STUDY AREA

Cape Romain NWR encompasses a 22-mile segment of the southeast Atlantic coast. The refuge consists of 66,287 acres, which include an expanse of barrier islands, salt marshes, intricate coastal waterways, long sandy beaches, fresh and brackish water impoundments, and maritime forest. This EA will identify management on refuge lands, as well as those lands proposed for acquisition by the Service.

AUTHORITY, LEGAL COMPLIANCE, AND COMPATIBILITY

The Service developed the Draft CCP/EA in compliance with the Improvement Act, Part 602 of the Fish and Wildlife Service Manual (National Wildlife Refuge System Planning), and NEPA. The Service complied with NEPA through the involvement of the public and the incorporation of this EA, with a description of the alternatives considered and an analysis of the environmental consequences of the alternatives (Section B, Chapters III and IV). When fully implemented, the CCP will strive to achieve the purposes, vision, and goals of Cape Romain NWR.

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

COMPATIBILITY

The National Wildlife Refuge System Administration Act of 1966, as amended by the Improvement Act, states that national wildlife refuges must be protected from incompatible or harmful human activities to ensure that Americans can enjoy Refuge System lands and waters. Before activities or uses are allowed on a national wildlife refuge, the uses must be found to be compatible. A compatible use "...will not materially interfere with or detract from the fulfillment of the mission of the Refuge System or the purposes of the refuge." In addition, "wildlife-dependent recreational uses may be authorized on a refuge when they are compatible and not inconsistent with public safety."

An interim compatibility determination is a document that assesses the compatibility of an activity during the period of time the Service first acquires a parcel of land to the time a formal, long-term management plan for that parcel is prepared and adopted. The Service has completed an interim compatibility determination for the six priority general public uses of the Refuge System, as listed in the Improvement Act. These uses are hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation.

PUBLIC INVOLVEMENT AND THE PLANNING PROCESS

In accordance with Service guidelines and NEPA recommendations, public involvement has been a crucial factor throughout the development of the Draft CCP/EA for Cape Romain NWR. The Draft CCP/EA was written with input and assistance from interested citizens; conservation organizations; and representatives of local, state, and federal agencies. The participation of these stakeholders and their ideas has been of great value in setting the management direction for Cape Romain NWR.

The process of developing this Draft CCP/EA began in August 2004 with a comprehensive visitor services review conducted to evaluate the refuge's public use and environmental education and interpretation programs. This review involved a team of four visitor services' specialists, including two from the Service's Regional Office and two from other national wildlife refuges. In November 2004, a biological review conducted by a team of 15 biologists representing the refuge, the Service, the South Carolina Department of Natural Resources, the Atlantic Coast Joint Venture, and Ducks Unlimited. The team conducted a review of the refuge's existing biological programs and developed a set of recommendations for future desired conditions. In February 2007, a team of 11 biologists representing the refuge, the Service, SCDNR, the Nature Conservancy, and Ducks Unlimited conducted a Wetland Habitat Management Review of Bulls Island. The review team evaluated current management of the Bulls Island impoundments and provided recommendations for future management. The recommendations of the visitor services review, biological review, and wetland management review teams helped determine the alternatives, goals, objectives, and strategies that are included in this Draft CCP/EA. The participants of the visitor services review team, biological review team, and wetland management review team are identified in Section B, Chapter V.

A public scoping meeting was held on December 17, 2008, at the Sewee Visitor and Environmental Education Center in Awendaw, South Carolina. Meeting notices were published in the local newspapers; meeting notices were posted at the refuge; and invitations were mailed to approximately 65 individuals and groups. A total of 35 members of the public attended the meeting.

A complete summary of the issues and concerns is provided in Section C, Appendix D.

II. Affected Environment

For a description of the affected environment, see Section A, Chapter II, Refuge Overview.

III. Description of Alternatives

FORMULATION OF ALTERNATIVES

Alternatives are different approaches or combinations of management objectives and strategies designed to achieve the refuge's purpose and vision, and the goals identified in the Draft CCP; the priorities and goals of the Savannah–Santee–Pee Dee Ecosystem Team; the goals of the Refuge System; and the mission on the Service. Alternatives are formulated to address the significant issues, concerns, and problems identified by the Service and the public during public scoping.

The three alternatives identified and evaluated represent different approaches to provide permanent protection, restoration, and management of the refuge's fish, wildlife, plants, habitats, and other resources, as well as compatible wildlife-dependent recreation. Refuge staff assessed the biological conditions and analyzed the external relationships affecting the refuge. This information contributed to the development of refuge goals and, in turn, helped to formulate the alternatives. As a result, each alternative presents different sets of objectives for reaching refuge goals. Each alternative was evaluated based on how much progress it would make and how it would address the identified issues related to fish and wildlife populations, habitat management, resource protection and conservation, visitor services, and refuge administration.

DESCRIPTION OF ALTERNATIVES

Serving as a basis for each alternative, a number of goals and sets of objectives were developed to help achieve the refuge's purpose and the mission of the Refuge System. Objectives are desired conditions or outcomes that are grouped into sets and, for this planning effort, consolidated into three alternatives. These alternatives represent different management approaches for managing the refuge over a 15-year timeframe while still meeting the refuge's purposes and goals. The three alternatives are summarized below. A comparison of each alternative follows the general descriptions.

ALTERNATIVE A - (CURRENT MANAGEMENT - NO ACTION)

This alternative represents no change from current management of the refuge and provides a baseline. Management emphasis would continue to focus on loggerhead sea turtle recovery and maintaining existing wetland impoundments for wintering waterfowl, shorebirds, and wading birds. Primary management activities include managing wetland impoundments, managing maritime forests for neotropical migratory birds, basic species monitoring, and sea turtle nest relocation. Alternative A represents the anticipated conditions of the refuge for the next 15 years, assuming current funding, staffing, policies, programs, and activities continue. The other two alternatives are compared to this alternative in order to evaluate differences in future conditions compared to baseline management.

This alternative reflects actions that include managing habitat for resident and wintering shorebirds, waterfowl, foraging wood storks, and over-wintering piping plovers; maintaining maritime forests; managing habitat for neotropical migratory birds; and providing opportunities for wildlife-dependent recreation. Species monitoring would be limited due to staffing constraints, volunteer assistance, and limited research interest. Habitat management actions are intended to primarily benefit sea turtles, wading birds, shorebirds, and waterfowl; however, there is limited active management of other species and habitats.

Management coordination would occur between the refuge and the state. Coordination would be limited because of staffing constraints and remain focused on sea turtle and shorebird management. Hunting and fishing are allowed on the refuge provided that state regulations are followed. Wildlife-dependent uses are allowed on the refuge with all areas open to the public; some areas are only seasonally open.

The refuge would remain staffed at current levels with periodic interns. Researchers would be accommodated when projects benefit the refuge.

ALTERNATIVE B

This alternative expands on Alternative A with an increase of habitat and species management efforts. The focus of this alternative is to enhance suitable habitat under species-specific management and to increase monitoring efforts. Control of invasive exotic plant species would be more intensively managed to help increase populations of neotropical migratory birds and breeding songbirds to higher levels than under Alternative A. There would be increased effort to monitor populations of secretive marsh birds and nesting surveys of shorebirds, sea birds, and wading birds.

This alternative proposes to increase monitoring efforts to focus primarily on populations of secretive marsh birds and nesting surveys of shorebirds, sea birds, and wading birds. Under Alternative A, monitoring focuses mainly on waterfowl and general shorebird counts. Alternative B would continue waterfowl and shorebird monitoring with additional effort on monitoring marsh birds and wading birds. Monitoring efforts would occur based on available staffing, additional volunteers, and academic research.

Wildlife-dependent uses of the refuge would continue. Hunting and fishing would continue to be allowed and environmental education and interpretation enhanced with messages regarding climate change and sea level rise. Interpretive signage would be increased or added to existing nature trails. There would be restricted access to some areas of the refuge that have birds or threatened and endangered species sensitive to disturbance. Interpretation efforts would focus mostly on the primary objectives of migratory birds and threatened and endangered species.

The refuge would be staffed at current levels plus the addition of a wildlife specialist and a biologist to carry out the increased habitat management and monitoring needs. Researchers would be accommodated when projects benefit the refuge and focus mostly towards shorebirds and habitat management.

ALTERNATIVE C - (PROPOSED ALTERNATIVE)

This alternative expands on Alternative A with a greater amount of effort to manage the refuge to increase overall wildlife and habitat quality. Although sea turtles, waterfowl, threatened and endangered species, and other migratory birds would remain a focus of management, wetland habitat manipulations would also consider the needs of multiple species, such as marsh and wading birds. Management of maritime forests and fields for neotropical migratory birds would be more actively managed than under Alternative B. Landscape-level consideration of habitat management would include identifying areas of important habitat that would become critical to wildlife as sea level rises and reduces habitat currently on the refuge. Multiple species consideration would include species and habitats identified by the South Atlantic Migratory Bird Initiative and the state's Strategic Conservation Plan.

This alternative would expand the monitoring efforts of Alternative A to provide additional, active efforts to monitor and survey migratory neotropical and breeding songbirds, secretive marsh birds, and plants. Monitoring efforts would be increased with the assistance of additional staff, trained volunteers, and academic researchers. Greater effort would be made to recruit academic researchers to the refuge to study and monitor refuge resources.

Wildlife-dependent uses of the refuge would continue. Hunting and fishing would continue to be allowed. However, hunting would be managed with a greater focus to achieve biological needs of the refuge such as deer population management. Education and interpretation would be the same as Alternative A, but with additional education and outreach efforts aimed at the importance of climate change, sea level rise, and wildnerness. A significantly greater effort would be made with outreach to nearby developing urban communities and a growing human population. Existing environmental education programs such as the Earth Stewards Program, conducted in concert with the SEWEE Association (refuge friends group), would be expanded to include additional elementary schools, students, and teachers.

The refuge would be staffed at current levels plus the addition of a wildlife specialist and two biologists to carry out the increased habitat management and monitoring needs. An additional park ranger (education and outreach) would be added to enhance visitor services and environmental education programs. Greater emphasis would be placed on recruiting and training volunteers, and worker-camper opportunities would be expanded to facilitate the accomplishment of refuge maintenance programs and other refuge goals and objectives. The refuge's biological programs would actively seek funding and researchers to study primarily management-oriented research needs. Refuge staff would put greater emphasis on developing and maintaining active partnerships, including seeking grants to assist in reaching primary objectives.

FEATURES COMMON TO ALL ALTERNATIVES

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

COMPARISON OF ALTERNATIVES BY ISSUE

Each alternative is different in the type and level of land management and protection it would offer to achieve long-term wildlife and habitat goals. However, each is similar in its approach to managing the refuge. Each alternative would pursue the goals outlined in the Draft CCP; would acquire, protect, and enhance a diverse assemblage of habitat; and would pursue the recovery plans for those threatened and endangered species occurring on the refuge. Each alternative would be consistent with the purposes of the refuge and with the mission and goals of the Refuge System.

Table 3 identifies and compares the management actions under each alternative as a means of responding to the issues raised by Service managers, the public, and government partners. These management actions were summarized under the four alternatives previously described to accomplish the Refuge System mission and the purposes, vision, and goals of the refuge and to address the priority threats and issues raised by government agencies, private citizens, local businesses, and interested organizations.

COMPARISON OF THE ALTERNATIVES BY ISSUE

Table 3. Comparison of alternatives by management issues for Cape Romain NWR

Key Topics	Alternative A (Current Management – No Action Alternative)	Alternative B	Alternative C (Proposed Alternative)
WILDLIFE AND HABITAT MANAGEMENT			
ENDANGERED, THREATENED, and IMPERILED SPECIES			
Loggerhead Sea Turtle	Conduct daily nest surveys on Cape, Lighthouse, and Bulls Islands from May 1 – October 30. Surveys conducted into November, as needed. Completion of surveys dependent upon volunteers and partners. Carry out nest protection on all islands. Inventory all nests to determine hatchling success rates. Target nest predation rates are <10%. Current predation rates are less than 1%. Monitoring and targeted trapping and euthanization of nuisance animals help maintain lower predation rates. Trap Cape and Lighthouse Islands for 6 weeks each per year. Rescue cold stunned, stranded, and injured sea turtles. Assist with the Sea Turtle Stranding Network by documenting all dead sea turtle strandings on the refuge. Annually support 1 sea turtle research study on the refuge. Conduct nest survey, monitoring and relocation program on Cape, Lighthouse, and Bulls Islands.	Conduct daily nest surveys on Cape, Lighthouse, and Bulls Islands from May 1 – October 30. Surveys conducted into November, as needed. Carry out nest protection on all islands. Inventory all nests to determine hatchling success rates. Target nest predation rates are <10%. Monitoring and targeted trapping and euthanization of nuisance animals help maintain lower predation rates. Trap Cape and Lighthouse Islands for 6 weeks each per year. Establish trapping regime on Bulls Island to lower predation rates and maintain rates to less than 10%. Rescue cold stunned, stranded, and injured sea turtles. Assist with the Sea Turtle Stranding Network by documenting all dead sea turtle strandings on the refuge. Annually support 1 sea turtle research study on the refuge. Acquire funded position to help carry out all aspects of sea turtle recovery on the refuge. Conduct nest survey, monitoring and relocation program on Cape, Lighthouse, and Bulls Islands.	Expand Alternative B. Conduct regular law enforcement patrols. Conduct beach and dune restoration activities when and where appropriate. Conduct nest survey, monitoring and relocation program on Cape, Lighthouse, and Bulls Islands
Piping Plover	High tide roost surveys conducted once per month	Expand Alternative A. Analyze shorebird data for refuge to determine high use areas and adapt management as necessary, including creating closed areas.	Expand Alternative B. Conduct shorebird high tide roost surveys twice per month.

Key Topics	Alternative A (Current Management – No Action Alternative)	Alternative B	Alternative C (Proposed Alternative)
Wood Stork	Manage impoundments for multiple species, including wood storks under a featured species approach for migratory ducks. Conduct wetland surveys, monitoring, and adaptive management.	Manage all impoundments for gradual spring draw down to concentrate invertebrates and fin fish for foraging opportunities, especially Summerhouse Ponds which currently have the greatest wood stork utilization.	Conduct wetland surveys. Manage wetlands to Increase prey base. Manage 2 to 3 target impoundments for wood stork foraging by augmenting freshwater and brackish water prey and using water control structures to regulate water levels and prey availability.
Seabeach Amaranth	Survey conducted annually by Ecological Services on Cape, Lighthouse and Bulls Island	Carry out annual surveys on all potential viable habitats on the refuge.	Expand Alternative B: Reestablish reintroduction by annual plantings and adapt management as necessary including creating closed areas.
American Oystercatcher	Work with SCDNR and Clemson University to carry out 1 – 2 research studies on the refuge per year. Conduct high tide roost surveys monthly. Carry out trapping 12 weeks per year on Cape and Lighthouse Islands to minimize predation to nests.	Expand Alternative A: Conduct complete nesting surveys in the refuge annually and adapt management as necessary including creating closed areas. Create slow speed (no wake) zones in popular nesting/foraging areas.	Expand Alternative A: Conduct complete nesting surveys in the refuge annually and adapt management as necessary including creating closed beach areas as well as creating no entry buffer zones around nesting areas to minimize disturbance. Conduct shell rake or beach restoration where necessary to offset sea level rise and maximize productivity. Work with partners to determine health assessment of oysters in the refuge and carry out restoration projects as needed. Expand trapping efforts in the refuge to target mink.
Wilson's Plover	High tide roost surveys conducted monthly.	Expand Alternative A: Conduct complete nesting surveys in the refuge annually and adapt management as necessary including creating closed areas.	Expand Alternative A: Conduct complete nesting surveys in the refuge annually and adapt management as necessary including creating closed beach areas as well as creating no entry buffer zones around nesting areas to minimize disturbance. Conduct shell rake or beach restoration where necessary to offset sea level rise and maximize productivity. Expand trapping efforts in the refuge to target mink.
Red Wolf	Maintain 4 wolves at the Sewee Environmental Education Center. Two wolves are for educational viewing and two wolves paired for mating to assist the recovery effort.	Expand Alternative A: Maintain 4 wolves at the Sewee Center; both paired for mating to assist the recovery effort.	Maintain 4 wolves at the Sewee Center; 2 wolves are for educational viewing and 2 wolves paired for mating to assist the recovery effort. Reestablish the Bulls Island propagation program and maintain one

Key Topics	Alternative A (Current Management – No Action Alternative)	Alternative B	Alternative C (Proposed Alternative)
			family of wolves on Bulls Island to assist with the recovery effort.
Shortnose Sturgeon	No active management other than support endangered species recovery efforts if requested.	Seek research opportunities, continue to support recovery efforts.	Seek research opportunities, continue to support recovery efforts.
Birds			
Waterfowl	Manage approximately 700 existing acres of impounded wetlands on Bulls Island with a waterfowl management focus for wintering ducks. Recent wintering populations have averaged between 2,000 and 5,000. Conduct mid-winter refuge surveys and weekly surveys on Bulls Island.	Increase Alternative A. Replace existing ageing structures, put in new structures, and clear or create drainage ditches with directed improvements to water transfer capabilities to manage approximately 820 acres of impounded wetlands with a waterfowl management focus to potentially support over 10,000 wintering migratory ducks annually. Conduct monthly refuge surveys and weekly surveys on Bulls Island.	Increase Alternative A. Replace existing aging structures, put in new structures, and clear or create drainage ditches with directed improvements to water transfer capabilities to manage approximately 820 acres of impounded wetlands with a waterfowl management focus to potentially support over 10,000 wintering migratory ducks annually. Conduct monthly refuge winter surveys and weekly surveys on Bulls Island. Establish vegetation transects in the impoundments and conduct annual fall vegetation surveys. Conduct waterfowl banding on Bulls Island. Repair or replace wood duck boxes on Bulls Island and maintain.
Shorebirds	Conduct monthly high tide roost surveys on refuge.	Expand Alternative A: Conduct monthly high tide roost surveys on refuge. Collate previous and current survey data and create GIS map to determine high use roosting areas. Use results to adapt management to include area closure to minimize disturbance. In addition to Alternative A, manage Jacks Creek impoundment for shorebirds during migration.	Conduct bi-weekly high tide roost surveys on refuge. Collate previous and current survey data and create GIS map to determine high use roosting areas. Use results to adapt management to include land area closures as well as water buffer zones to minimize disturbance.

Key Topics	Alternative A (Current Management – No Action Alternative)	Alternative B	Alternative C (Proposed Alternative)
Wading Birds	Management for wading birds is secondary to the featured waterfowl and shorebird efforts. Protect all wading bird rookeries. Survey wading bird rookeries annually.	Survey wading bird rookeries annually. Protect all wading bird rookeries. Add structure to existing rookery on Bulls Island to increase nesting areas. Conduct monthly wading bird surveys on Bulls Island.	Survey wading bird rookeries annually. Protect all wading bird rookeries. Add structure to existing rookery on Bulls Island to increase nesting areas. Conduct monthly wading bird surveys on Bulls Island. Conduct wading bird surveys on the refuge four times annually. Conduct restoration of Marsh Island (the largest nesting rookery in the refuge) to mitigate for sea level rise.
Marsh Birds	No current management.	Survey the refuge for nesting marsh birds. Implement mink trapping in the known nesting areas to minimize predation.	Conduct winter and breeding surveys in the refuge for marsh birds. Implement mink trapping in the known nesting areas to minimize predation. Review and adapt rail hunting in accordance with survey data.
Sea Birds	Post, rope, and close all potential nesting habitat in the refuge. Conduct nesting surveys at all known nesting rookeries. Trap Cape and Lighthouse Islands for mammalian predators to minimize predation and increase productivity. Partner with SCDNR and Clemson to evaluate nesting and fledgling success in rookeries and determine causes of failure.	Post, rope, and close all potential nesting habitat in the refuge. Conduct nesting surveys at all known nesting rookeries. Trap all islands with sea bird nesting for mammalian predators to minimize predation and increase productivity. Trap marsh areas adjacent to rookeries for mink. Partner with SCDNR and Clemson to evaluate nesting and fledgling success in rookeries and determine causes of failure.	Post, rope, and close all potential nesting habitat in the refuge. Conduct nesting surveys at all known nesting rookeries. Trap all islands with sea bird nesting for mammalian predators to minimize predation and increase productivity. Trap marsh areas adjacent to rookeries for mink. Partner with SCDNR and Clemson to evaluate nesting and fledgling success in rookeries and determine causes of failure. Create water buffer zones to minimize disturbance. Conduct shell rake or beach restoration where necessary to offset sea level rise and maximize productivity

Key Topics	Alternative A (Current Management – No Action Alternative)	Alternative B	Alternative C (Proposed Alternative)
Land Birds	Use volunteers to remove Chinese tallow and use grant monies from maritime forest on Bulls Island (currently treated approximately 500 acres) to restore the native habitat for land birds.	Complete removal of Chinese tallow from 2,091 acres on Bulls Island to restore the natural maritime forest.	Complete removal of Chinese tallow from Bulls Island to restore the natural maritime forest. Establish monitoring for neotropical migratory songbirds on the refuge and adapt management for key species identified in the SAMBI and State's Comprehensive Wildlife Conservation Strategy for which the refuge is critical for those species. Initiate research as needed. Examine the spoil Islands in the refuge and use by focal species such as the painted bunting and work with the Corps of Engineers to adapt management to enhance the use of these areas if feasible.
Bald Eagle	Conduct annual mid-winter bald eagle survey within the refuge. Conduct annual nest survey of 1 nesting pair. Protect nest sites during prescribed fire or wild fire.	Conduct annual mid-winter bald eagle survey within the refuge. Conduct annual nest survey of 1 nesting pair. Protect nest sites during prescribed fire or wild fire.	Conduct annual mid-winter bald eagle survey within the refuge. Conduct annual nest survey of 1 nesting pair. Protect nest sites during prescribed fire or wild fire.
Native Wildlife Species			
Game Animals	White-tailed deer herd managed by 2-week public archery hunts on Bulls Island. Five- year recurring deer herd health study conducted in concert with UGA. Take of raccoons during the deer hunts allowed to reduce the population and minimize predation of sea turtle and sea/shore bird nests.	Expand Alternative A to include additional gun hunt of raccoons on Bulls Island to reduce the population and minimize predation of sea turtle and sea/shore bird nests.	White-tailed deer herd managed by 2- week public archery hunts on Bulls Island. Five-year recurring deer herd health study conducted in concert with UGA. Take of raccoons during the deer hunts allowed to reduce the population and minimize predation of sea turtle and sea/shore bird nests.

Key Topics	Alternative A (Current Management – No Action Alternative)	Alternative B	Alternative C (Proposed Alternative)
Non-game Animals	No active management	Coordinate with SCDNR towards the management of habitat to benefit non-game species of concern.	Expand Alternative B to include performing baseline surveys and monitoring of populations of non-game species, with management focus on species of concern.
Reptiles & Amphibians	No active management.	Expand Alternative A. Initiate monitoring programs. Conduct population study on diamondback terrapins.	Expand Alternative A. Initiate monitoring programs. Conduct population study on diamondback terrapins. Work with SCDNR to establish a no crab pot week in the waters of Cape Romain NWR. All crab pots in the water during this time will be removed to reduce mortality of diamondback terrapins from incidental take.
Exotic, Invasive and Nuisance Species			
Control of Nuisance Plants (aquatic, terrestrial)	Use volunteers to treat Chinese tallow and Phragmites and grant monies from maritime forest on Bulls Island to restore the native habitat for land birds. Currently treated approximately 500 acres using aerial and hand application of Habitat or Clearcast. Opportunist aerial treatment of the spoil islands and Cape Island for Phragmites. Mechanical or herbicide treatment of Sesbania and cattail in managed impoundments as environmental conditions and staffing permit.	Expand Alternative A: treatment of Chinese Tallow to include all of Bulls Island (approximately 2,091 acres) using both aerial and hand application. Annually treat the entire refuge for Phragmites. Map all invasives on the refuge. Mechanical or herbicide treatment of Sesbania, cattail, and California Bulrush in all managed impoundments as needed annually.	Expand Alternative B to include monitoring of treatment areas. Establish retreatment intervals to prevent reestablishment of seedlings in treated areas. Duplicate vegetation study conducted on the refuge after Hurricane Hugo to determine species composition change and effectiveness of treatments.
Control of Nuisance Animals	Twelve (12) weeks of racoon trapping on Cape and Lighthouse Islands to prevent the predation of sea turtle, sea bird, and shorebird nests.	Expand trapping efforts for raccoons to include all the refuge islands that have sea turtle, sea bird, or shorebird nesting. Initiate mink trapping around the colonial seabird nesting islands.	Expand trapping efforts for raccoons to include all the refuge islands that have sea turtle, sea bird, or shore bird nesting. Initiate mink trapping throughout the refuge to prevent the predation of sea turtle, sea bird, shorebird, and marsh bird nests.

Key Topics	Alternative A (Current Management – No Action Alternative)	Alternative B	Alternative C (Proposed Alternative)
Wildlife and Habitat Diversity			
Impoundments	Maintain the brackish impoundments on Bulls Island to include Jacks Pond (604 acres) and Upper and Lower Summerhouse Ponds (100 acres) to maximize emergent and submerged aquatic vegetation for waterfowl foraging.	Expand on Alternative A. Replace existing aging structures, put in new structures, construct cross dike, and clear or create drainage ditches with directed improvements to water transfer capabilities to manage approximately 820 acres of impounded wetlands with a waterfowl management focus. New structures and dike needed to prepare for inevitable loss of perimeter dike to erosion. Include monitoring and adaptive management for wading birds, shorebirds, and threatened and endangered species (wood stork).	Expand on Alternative A. Replace existing aging structures, put in new structures, construct cross dike, and clear or create drainage ditches with directed improvements to water transfer capabilities to manage approximately 820 acres of impounded wetlands with a waterfowl management focus. New structures and dike needed to prepare for inevitable loss of perimeter dike to erosion.
Beaches, Dunes & Sandbars	No Active Management	Conduct beach and dune restoration activities when and where appropriate to mitigate for sea level rise and provide nesting habitat for sea turtles, sea birds, and shorebirds.	Initiate discussions with Santee Cooper and the Corp of Engineers regarding loss of sediment to the refuge from the Santee River Diversion. Conduct beach and dune restoration activities when and where appropriate to mitigate for sea level rise and provide nesting habitat for sea turtles, sea birds, and shorebirds.
Maritime Forest	Use volunteers to remove Chinese tallow and grant monies from maritime forest on Bulls Island (currently treated approximately 500 acres) to restore the native habitat.	Expand treatment of Chinese Tallow to include all of Bulls Island (approximately 2,091 acres) using both aerial and hand application. Map invasives on Bulls Island.	Expand treatment of Chinese Tallow to include all of Bulls Island (approximately 2,091 acres) using both aerial and hand application. Map invasives on Bulls Island. Establish retreatment intervals to prevent reestablishment of seedlings in treated areas.

Key Topics	Alternative A (Current Management – No Action Alternative)	Alternative B	Alternative C (Proposed Alternative)
Prescribed fire	Periodically conduct prescribed burns primarily within wetland habitats. Burns conducted during dormant season.	Prescribe burn upland and wetland habitats based on fuel loads and fire personnel availability. Conduct a refuge peer review for prescribed fire. Develop a fire management plan.	Conduct prescribed burns in upland and wetland habitats based on resource requirements and habitat management needs. Coordinate burning to enhance or control preferred habitats, forest canopy cover, and vegetation control, such as the control of undesirable and exotic species. Conduct a refuge peer review for prescribed fire. Develop a fire management plan to include and emphasize resource management needs.
Air and Water Quality and Quantity			
Water Quality	Monitor salinity and PH in impoundments bi-weekly.	Expand on Alternative A to include monitoring of dissolved oxygen content in impoundments to maximize aquatic productivity. Monitor water quality in Bulls Bay.	Expand on Alternative B to include monitoring of salinity, PH, and dissolved oxygen in the creeks throughout the refuge. Monitor discharge from mainland creeks draining into the waters of the refuge for additional data such as fecal coliform. Monitor water quality in Bulls Bay.
Water Quantity	No Active Management.	Initiate discussion with Santee Cooper and the Corp of Engineers regarding loss of sediment from the Santee River diversion.	Same as Alternative B.
Air Quality	Maintain and collect weekly samples from the National Atmospheric Deposition Network (acid rain), Mercury Deposition Network (total mercury), Interagency Monitoring Of Protected Visual Environments (particulate matter), and Ammonia Sampler. Participate in mercury leaf litter study.	Maintain and collect weekly samples from the National Atmospheric Deposition Network (acid rain), Mercury Deposition Network (total mercury), Interagency Monitoring Of Protected Visual Environments (particulate matter), and Ammonia Sampler. Participate in mercury leaf litter study. Consider monitoring methyl mercury and trace metals.	Maintain and collect weekly samples from the National Atmospheric Deposition Network (acid rain), Mercury Deposition Network (total mercury), Interagency Monitoring Of Protected Visual Environments (particulate matter), and Ammonia Sampler. Participated in mercury leaf litter study.

Key Topics	Alternative A (Current Management – No Action Alternative)	Alternative B	Alternative C (Proposed Alternative)
RESOURCE PROTECTION			
Law Enforcement	Currently, refuge shares law enforcement officer with other complex refuges. Occasional patrols conducted that provide minimal law enforcement presence. Coordinate with state wildlife officers.	Add a permanent full-time law enforcement officer. Conduct regular patrols of sensitive areas to increase law enforcement presence. Coordinate with state wildlife officers. Maintain refuge boundary signage.	Same as Alternative B.
Land Acquisition (inholdings)	No active acquisitions.	Focus on lands adjacent to Jermey Island as part of 2003 Minor expansion plan.	Same as Alternative B.
Personal Watercraft	No active management.	Conduct visitor use survey for water based recreational activities. Conduct outreach to personal watercraft rental companies.	Conduct visitor use survey for water based recreational activities. Conduct outreach to personal watercraft rental companies. Work with SCDNR to identify and establish buffer zones to protect nesting birds from boat wakes.
Wilderness	Manage 29,000 acres in accordance with Wilderness Act and Service Policy	Manage 29,000 acres in accordance with Wilderness Act and Service Policy. Consider a request to remove designation for Lighthouse Island.	Same as Alternative A.
Conservation Focus Areas and Easements			
Conservation Easements	No active management other than occasional law enforcement drive-by checks.	Survey and post easement.	Same as Alternative B.

Key Topics	Alternative A (Current Management – No Action Alternative)	Alternative B	Alternative C (Proposed Alternative)
Cultural Resources			
Archaeological and Historical Resources	National Register listed/eligible lighthouses on Lighthouse Island. Old Fort (Martello tower on Bulls), ruins from old saw mill on Mill Island. Coordinate with Service archaeologist and state SHPO for guidance on management, protection, and/or restoration efforts.	Same as Alternative A.	Expand Alternative A to interpret archaeological resources for public education as they relate to landscape management pursuant to historic culture.
Lighthouses	The lighthouses are designated on the national historic registry. Two tours are provided per year with minimal trails' maintenance conducted prior to the tours. Upkeep of the structure presently does not exist. Remove exotics, maintain trails and concrete pathways, and foundations of buildings. Vegetation has covered much of the foundations and historic footpaths. Maintenance is done with non-motorized equipment as required by Wilderness Act.	Expand Alternative A. Install interpretive panels if tours continue. Work with partners to maintain the lighthouses from further degradation. Conduct a minimum tool analysis for keeping the foundations and pathways cleared of vegetation using small motorized tools and equipment on an annual basis, to preserve the National Historic Landmark.	Expand on Alternative B. Install a dock. Conduct a minimum tool analysis for keeping the foundations and pathways cleared of vegetation using small motorized tools and equipment on an annual basis, to preserve the National Historic Landmark. Preserve and repaint the lighthouses. Ensure safety of structures.
VISITOR SERVICES			
Visitor Orientation			
Visitor contact sites, kiosks, trailheads, brochures, signs, maps, internet	Provide information at the Sewee Visitor and Environmental Education Center through volunteers, exhibits, and movie. Provide refuge brochures and maps.	Expand Alternative A. Update information to incorporate climate change and sea level rise. Work with partners to update exhibit information. Actively update the web site.	Expand Alternative A. Overhaul the existing exhibits within the exhibit hall at the center to reflect the challenges related to climate change and sea level rise (e.g. habitat loss, erosion).

Key Topics	Alternative A (Current Management – No Action Alternative)	Alternative B	Alternative C (Proposed Alternative)
	Interpretive kiosks are found at the McClellanville boat landing, Garris Landing, Bulls Island, and Buck Hall Recreation Area, which is within the Francis Marion National Forest. Information includes a refuge map, and cultural and natural history with emphasis on threatened and endangered species and shorebirds.	Update information on the visitor center kiosk and Garris Landing kiosk. Replace the interpretive kiosk at Garris Landing. Incorporate messages on climate change and sea level rise.	Increase the interpretive signage at the Garris Landing pier (e.g., species such as dolphins, crabs, shorebirds). Install brochure racks at Bulls Island, McClellanville, and Garris Landing.
Boat Ramp	There are no sufficient areas to tie off a boat. There also lacks a finger pier for safe loading. The channel is extremely low at low tide limiting the size and times that people can use the launch. No overnight parking, free ramp use.	Dredge the channel to improve access and charge a user fee to maintain the launch area. Charge a ramp use fee and (free permits for commercial user) make improvements to ramp to include a courtesy dock for safe boarding. Dredge channel and boat basin.	Improve the dock area by adding a finger pier and tie off cleats for safe loading and unloading.
Floating Dock on Bulls Island	Dock is in need of repairand too small to accommodate the current demand.	Expand Alternative A. Replace the dock with an appropriate-sized dock to accommodate increasing visitor demand.	Same as Alternative B.
Garris Landing Parking	Currently there is no parking plan in place.	Create a parking plan to accommodate trailers and passenger vehicles in a segregated theme. Focus should be on the passenger vehicles that use the parking lot for tour purposes.	Same as Alternative B.
Hunting & Fishing			
White-tailed Deer	Two 6-day archery hunts are offered annually on Bulls Island. Due to logistics and safety issues, archers are permitted to camp in the picnic area. Hunters are also allowed to take unlimited raccoons.	Same as Alternative A.	Same as Alternative A.
Rail Hunting	Rail hunting for King, Clapper, Sora and Virginia rails is allowed during the state season in designated portions of the	To acquire accurate data on hunter participation, work with SCDNR to obtain the number of rail hunt licenses issued each	To acquire accurate data on hunter participation, work with SCDNR to obtain the number of rail hunt licenses issued each

Key Topics	Alternative A (Current Management – No Action Alternative)	Alternative B	Alternative C (Proposed Alternative)
	refuge. Currently, no check-in is required and hunter data is not collected.	year.	year. Require check-in with refuge to provide take data.
Fishing Opportunities	Saltwater fishing, crabbing, oystering, and shrimp baiting is allowed in accordance with state regulations. The state has jurisdiction over all the bays and creeks of the refuge. Fishing opportunities on the refuge include surf fishing off of the barrier island beaches and fishing and crabbing off of the Garris Landing pier. Freshwater fishing is allowed at the Nebo ponds located behind the visitor center, in accordance with state regulations. On occasion special fishing events occur.	Expand Alternative A. Provide monofilament collection containers at the Garris Landing pier. Provide an interpretive panel showing some of the common fish caught from the pier. Work with SCDNR to obtain numbers for shellfishing and shrimp baiting licenses.	Same as Alternative B.
Wildlife Observation & Photography			
Wildlife Viewing and Photography Opportunities	Garris Landing Pier provides easy access to viewing a variety of bird species and saltmarsh habitat. Bulls Island provides a photo blind and 16 miles of service roads and the beach offers endless viewing opportunities. The Coastal Expeditions Cncessions ferry provides viewing and photography opportunities enroute to Bulls Island from the mainland.	Expand Alternative A. Construct an observation tower overlooking Jacks Creek. Periodically conduct motorized Birding/Driving Tours on Bulls Island. Work with partners to establish an Annual Refuge Photo Contest. Install spotting scopes on the Garris Landing pier and observation tower. Install a “wolf cam” to provide remote viewing of wolves. Consider an infrared camera in the wolf den.	Same as Alternative B.

Key Topics	Alternative A (Current Management – No Action Alternative)	Alternative B	Alternative C (Proposed Alternative)
Environmental Education and Interpretation			
Environmental Education Opportunities	Programs include annual forestry and careers events, and staff-conducted classes for pre-k through 7th grades. Most school classes are held at the Center. Our Friends group sponsors a college accredited course focusing on invasive species. Coastal Expeditions Concessions offer an Island Quest marine science and maritime forest field study on Bulls Island for schools and other groups.	Expand on Alternative A. Conduct periodic tours of Bulls Islands that focus on climate change and sea level rise. Incorporate climate change effects on wildlife and habitats in education programs.	Expand on Alternative A. Conduct periodic tours of Bulls Islands that focus on climate change and sea level rise. Incorporate climate change effects on wildlife and habitats in education programs. Increase outreach to local schools for offsite environmental education. Add staff position to allow for increased outreach.
Visitor Center	A Sewee Visitor and Environmental Education Center is a partnership between the Service and the Forest Service. The center provides interactive exhibits and an orientation film. A plant garden has interpretive signs for the butterfly and other insects.	Expand Alternative A. Refurbish existing exhibits in the Exhibit Hall. Incorporate information related to climate change and sea level rise. Update the orientation film to highlight the challenges facing resource management concerning climate change and sea level rise.	Same as Alternative B.
Interpretive Programs	In FY 2008, 17,585 visitors participated in interpretive programs and activities. Programs included Exhibit Hall and red wolf tours, Saturday youth Discovery programs, Saturday Presentations for adults, guided walks and tours in the forest and on Bulls Island and, tours to Lighthouse Island. The South Carolina Birds of Prey conducts raptor programs for Earth Stewards students and other school groups at the center.	In addition to Alternative A, provide Ecology and Birding Auto Tours on Bulls (presented by staff, volunteers or Coastal employees). Develop programs with emphasis on climate change issues	In addition to Alternative B, provide interpretation at the Dominick House; open living/dining room areas to the public and provide cultural, historic, and resource displays.

Key Topics	Alternative A (Current Management – No Action Alternative)	Alternative B	Alternative C (Proposed Alternative)
Interpretive Trails	Interpretive trails include the Nebo Trail at the Sewee Center, Middens Trail at Bulls Island which has a trailhead interpretive signand Turkey Walk Trail at Bulls Island with a trailhead interpretive sign. Interpretive signage for wildlife, habitats, management and cultural/historical significance are posted along the service roads on Bulls Island.	Expand Alternative A. Place interpretive signs along Nebo, Middens, and Turkey Walk trails. Improve/add Interpretive Signs on Bulls Island trails (directional).	Same as Alternative B.
Outreach			
Local Community	Outreach is conducted by staff and partners through monthly events: local media/flyers on community boards/forest information boards/town libraries. The refuge and partners participate in the Southeast Wildlife Expo; Earth Day/Charleston Air Force Base; Taste of South Carolina/Pinckney Elementary School; Career Fairs: High School and College; Science Fairs: local area schools; Huntington Beach State Park KanAm event; Lowcountry Girl Scouts Spring Fling.	Expand on Alternative A. Provide information to the public about climate change and sea level rise. Reach out to civic organizations to discuss climate change and future habitat needs of wildlife. Attend public meetings to discuss planning efforts on and adjacent to the refuge.	Staff become members of civic/community organizations. Reach out to civic organizations to discuss climate change and future habitat needs of wildlife. Attend public meetings to discuss future planning efforts on and adjacent to the refuge.
Friends Group and Volunteers			
Volunteers	In FY 2008, 144 volunteers contributed 13,053 hours by providing visitor services, resource management, maintenance, and administrative support.	Expand on Alternative A. Improve the two existing work camper pads by adding concrete slabs at Garris Landing; install potable water system at Garris Landing.	Same as Alternative B.

Key Topics	Alternative A (Current Management – No Action Alternative)	Alternative B	Alternative C (Proposed Alternative)
SEWEE Association	Provides support to educational and interpretive programs; education teacher courses; fund-raising event; trail enhancement; financial support;and biological support - turtles, invasive species, shorebird surveys, red bay seed bank. Manages center bookstore.	Expand on Alternative A. Include climate change and sea level rise in all the relevant programs being conducted for the public.	Same as Alternative B.
Litter			
Trash, Litter, and recycling	Sewee Center: Volunteers and Staff Refuge: Staff and Volunteers Coastal Expeditions schedules a beach sweep on Bulls Island in the fall. Use volunteers and staff to clean worst areas.	In addition to Alternative A, use volunteers and staff to clean worst areas. Increase recycling success at headquarters and shop.	In addition to Alternative B, use volunteers and staff to clean worst areas. Organize periodic beach sweeps before turtle and bird nesting seasons, or in conjunction with state-wide coastal cleanup. Replace existing trash and recycling bends on Bulls Island with raccoon proof trash cans.
REFUGE ADMINISTRATION			
Refuge Management			
Administrative Facilities and signs	Visitor contact and services are provided at the Sewee Visitor Center. Kiosks at Garris Landing and on Bulls Island orient visitors to the refuge. Attempt to maintain boundary signs. Maintain visitor services signs.	Offices located at Visitor Center, and Administrative Trailer. Plumbing at both locations need to be replaced with City water when available. Buildings are in poor condition and need extensive repairs to prevent further deterioration. Erect information/direction signs on trails to provide basic trail and regulatory information.	Offices located at visitor center and administrative trailer. Plumbing at both locations need to be replaced with city water when available. Buildings are in poor condition and need extensive repairs to prevent further deterioration. Erect information/direction signs on trails to provide basic trail and regulatory information. Work with South Carolina DOT to erect Service approved informational signs on Highway 17.

Key Topics	Alternative A (Current Management – No Action Alternative)	Alternative B	Alternative C (Proposed Alternative)
Staff	Refuge: 5 full- time and 2 part- time; Complex: 5 full- time. These employees are shared with Cape Romain NWR.	Use 2008 RONS model to determine staffing needs. This model indicates that a minimum of 16 full- time employees are needed; and 2 part-time bio techs.	Same as Alternative B.
Intergovernmental Coordination			
Relationship with South Carolina DNR, DHEC	Good coordination efforts are in place for law enforcement support, sea turtle recovery, and shorebird monitoring.	Expand Alternative A. Increase coordination with an emphasis on climate change and sea level rise, changes in habitat, and targeted wildlife species most vulnerable to climate change and sea level rise.	Expand Alternative A. Establish a Lowcountry climate change working group for land managers to include multiple agencies and landowners and nonprofits to enhance partnerships for ecological programs and resource management to plan for future wildlife and habitat needs.
Relationship with other federal agencies	Good coordination efforts are in place with the USDA Forest Service for partnership with the Sewee Visitor Center. An MOU exists between the refuge and Frances Marion National Forest to assist with law enforcement function between the two agencies.	Good coordination efforts are in place with the USDA Forest Service for partnership with the Sewee Visitor Center. An MOU exists between the refuge and Frances Marion National Forest to assist with law enforcement function between the two agencies. Expand law enforcement coordination with US Coast Guard and establish a partnership with the local NOAA office to share information on climate change and accelerated coastal erosion.	Good coordination efforts are in place with the USDA Forest Service for partnership with the Sewee Visitor Center. An MOU exists between the refuge and Frances Marion National Forest to assist with law enforcement function between the two agencies. Expand law enforcement coordination with U.S. Coast Guard and establish a partnership with the local NOAA office to share information on climate change and accelerated coastal erosion. Coordinate with USGS and ACOE.
Global Issues			
Carbon Sequestration	No current program and very little opportunity within existing boundary.	Look for land acquisition opportunities that would facilitate reforestation/carbon sequestration efforts	Same as Alternative B.

IV. Environmental Consequences

OVERVIEW

The Service assessed the environmental impacts of implementing the alternatives on the biological, physical, social, economic, cultural, and historical resources of the refuge. The anticipated impacts over the 15-year life of the CCP that could result from the implementation of the actions described in Alternatives A, B, and C are discussed. Implementation of the action alternatives is anticipated to have positive impacts to area land values, related employment and income, outdoor recreation, environmental education opportunities, cultural resources, environmental justice, soils, water quality, wetlands, floodplains, aesthetics, and visitor services, as well as increased information regarding climate change to enhance management decisions.

Parks and refuges provide numerous benefits, including a sense of community, improved quality of life, shared environment in which people can connect and interact, and a channel for positive community participation by getting diverse people to work together towards a shared vision (Francis 2002), as well as provide for increased property values and municipal revenues; attraction and retention of affluent retirees; and attraction of knowledgeable workers, talent, and home buyers (Lewis 2002).

EFFECTS COMMON TO ALL ALTERNATIVES

ENVIRONMENTAL JUSTICE

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

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

CLIMATE CHANGE

The U.S. Department of the Interior requires agencies under its direction to consider potential climate change impacts as part of long-range planning. Global atmospheric concentrations of carbon dioxide, methane, and nitrous oxide have increased markedly as a result of human activities since 1750, and now far exceed pre-industrial values determined from ice cores spanning many thousands of years. The global increases in carbon dioxide concentration are due primarily to fossil fuel use and land use changes, while those of methane and nitrous oxide are primarily due to agricultural

operations (Bindoff et al. 2007). In relation to comprehensive conservation planning for national wildlife refuges, carbon sequestration constitutes an important climate change mitigation effort to be considered in planning. The U.S. Department of Energy defines carbon sequestration as "...the capture and secure storage of carbon that would otherwise be emitted to or remain in the atmosphere" (U.S. Department of Energy 1999 and 2007). The land is a tremendous force in carbon sequestration. Terrestrial biomes of all sorts (e.g., grasslands, wetlands, and forests) are effective in both preventing carbon emission and acting as a biological scrubber of atmospheric carbon monoxide. The Department of Energy report's conclusions noted that ecosystem protection is important to carbon sequestration and may reduce or prevent loss of carbon currently stored in the terrestrial biosphere.

Conserving natural habitat for wildlife is the heart of any long-range plan for national wildlife refuges. The actions proposed in this comprehensive conservation plan would conserve or restore land and water, and would thus enhance carbon sequestration. This, in turn, contributes positively to efforts to mitigate human-induced global climate changes.

OTHER MANAGEMENT

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

LAND ACQUISITION

Funding for land acquisition from willing sellers within the approved acquisition boundary of Cape Romain NWR would come from the Land and Water Conservation Fund, the Migratory Bird Conservation Fund, Army Corps of Engineers mitigation programs, or donations from conservation and private organizations. Conservation easements and leases can be used to obtain the minimum interests necessary to satisfy refuge objectives if the refuge staff can adequately manage uses of the areas for the benefit of wildlife. The Service can negotiate management agreements with local, state, and federal agencies, and accept conservation easements. Some tracts within the refuge acquisition boundary may be owned by other public or private conservation organizations. The Service would work with interested organizations to identify additional areas needing protection and provide technical assistance if needed. The acquisition of private lands is entirely contingent on the landowners and their willingness to participate.

CULTURAL RESOURCES

The Service is responsible for managing archaeological and historical sites found on refuge lands. Since cultural resource surveys on the refuge have been limited, additional surveys would be conducted prior to any new construction or excavation on refuge lands in order to fully satisfy provisions of NEPA and all applicable cultural resource laws and policies. Potentially negative impacts from construction of trails or facilities would require the review by the Service's Regional Archaeologist and consultation with the South Carolina State Historic Preservation Office. Determining whether a particular management action has the potential to affect cultural resources is an on-going process that would occur during the detailed planning stages of every project. Service acquisition of land with known or potential archaeological or historical sites provides three major types of protection for these resources – protection from private development (e.g., into single-family homes), protection from damage by federal activities, and protection from vandalism or theft. Service

policy is to preserve these resources in the public trust, avoiding impacts whenever possible. No negative impacts are anticipated for any particular cultural resources of the refuge under any of the alternatives. As a whole, positive impacts are expected to the cultural resources because of management and protection of these resources under all of the alternatives.

SOILS

All alternatives are anticipated to positively impact soil formation processes on lands the refuge acquires and manages. Some disturbances to surface soils and topography would occur at those locations selected for administrative, maintenance, and visitor facilities, as well as in areas targeted for exotic and invasive species removal and eradication. However, these limited impacts would be at discrete sites.

WATER QUALITY, WETLANDS, AND FLOOD PLAINS

All alternatives are anticipated to positively impact water quality. Positive impacts are anticipated from protecting groundwater recharge, preventing runoff, retaining sediment, and minimizing non-point source pollution in select areas. The management alternatives are not anticipated to have any adverse effects on the area's wetland and flood plains, pursuant to Executive Order 11990 and Executive Order 11988. Further, the refuge provides protection to lands and waters that would otherwise be developed into commercial and residential uses in the near future.

AESTHETICS

Each alternative would protect the aesthetic characteristics associated with natural habitats. Minor, short-term, discrete negative aesthetic impacts may result from habitat management, restoration, and facility development activities, but these are short-lived and are offset by refuge management and resultant native habitats.

VISITOR SERVICES

Under any of the alternatives, the Service would consult with local and state officials and the public during detailed planning for and construction of any new facilities. Each of the action alternatives is anticipated to positively impact visitor services.

SOCIOECONOMIC ENVIRONMENT

Each of the alternatives is anticipated to positively impact socioeconomic factors of the community. Although the refuge does occupy lands that might provide income to the local tax base, those lost tax revenues are offset by enhanced property values on adjacent lands and by improved aesthetics related to conservation lands and open space. Further, the refuge does provide Charleston County with Refuge Revenue Sharing Act payments in lieu of property tax income. And, conservation lands require less expenditure of local taxes to fund infrastructure and other services than required by developed lands.

PUBLIC HEALTH AND SAFETY

Based on the nature of each alternative, the location of the refuge, and current land use, the four alternatives are not anticipated to have any significant negative impacts on the quality of the human environment, including public health and safety.

SUMMARY OF EFFECTS BY ALTERNATIVE

Each of the action alternatives is anticipated to result in net positive environmental benefits. Impacts under each alternative are summarized under several categories: wildlife and habitat management, resource protection, visitor services, and refuge administration (Table 4).

Table 4. Summary of environmental effects by alternative, Cape Romain NWR

Key Topics	Alternative A (Current Management – No Action Alternative)	Alternative B	Alternative C (Proposed Alternative)
WILDLIFE AND HABITAT MANAGEMENT			
ENDANGERED, THREATENED, AND IMPERILED SPECIES			
Loggerhead Sea Turtle	Neutral to positive. No change to habitat. Supporting stable populations.	Positive. No change to habitat. Supporting increasing populations of sea turtles.	Same as Alternative B.
Piping Plover	Neutral. No known change in population levels.	Neutral to positive. Increased information and protection, when present.	Same as Alternative B.
Wood Stork	Neutral. No known change in population levels.	Positive. Increased monitoring of population and increased foraging areas.	Same as Alternative B.
Seabeach Amaranth	Neutral No specific management	Neutral to positive Identify potential viable habitat areas.	Positive Active management to reestablish the species.
American Oystercatcher	Neutral to positive Continue to support research, protect largest nesting areas.	Positive Nesting surveys would help guide management for best protection.	Positive Nesting surveys and habitat restoration would benefit species.

Key Topics	Alternative A (Current Management – No Action Alternative)	Alternative B	Alternative C (Proposed Alternative)
Wilson's Plover	Neutral. No known change in population levels.	Neutral to positive Nest surveys would better track population levels for management	Positive Nest surveys and increased management to reduce disturbance and habitat restoration
Red Wolf	Neutral Maintain four captive wolves.	Same as Alternative A.	Neutral to positive Maintain captive wolves and reestablish Bulls Island propagation program.
Shortnose Sturgeon	Neutral No specific management	Neutral to positive. No specific management but greater coordination with ES.	Neutral to positive. No specific management but greater coordination with ES.
Birds			
Waterfowl	Neutral Continue managing existing wetland impoundments for wintering waterfowl.	Positive Replace old water control structures and target management for migratory and wintering waterfowl.	Same as Alternative B.
Shorebirds	Neutral to negative No current management other than periodic roost surveys.	Positive Increased information and management of impoundments to increase available habitat.	Same as Alternative B.

Key Topics	Alternative A (Current Management – No Action Alternative)	Alternative B	Alternative C (Proposed Alternative)
Wading Birds	Neutral to negative No specific management. No known change in population levels.	Positive Increased information and management of impoundments to increase available habitat.	Same as Alternative B.
Marsh Birds	Negative No current management or monitoring.	Positive Implement monitoring and surveys. Increased information. Decrease nest predation.	Positive Implement monitoring and surveys. Increased information. Decrease nest predation. Protection of nesting areas.
Sea Birds	Neutral No known change in population levels.	Same as Alternative A.	Positive Increased management and acreages.
Land Birds	Neutral No known change in population levels. No change in management.	Positive Increased exotic plant control to increase useable habitat.	Positive Increased exotic plant control to increase useable habitat. Increased acreage.
Bald Eagle	Neutral. No known change in population levels.	Neutral to positive. Increased protection of nests, when discovered.	Same as Alternative B.
Native Wildlife Species			
Game Animals	Neutral Existing deer hunts and deer herd health studies support healthy white-tailed deer population.	Same as Alternative A.	Same as Alternative A.

Key Topics	Alternative A (Current Management – No Action Alternative)	Alternative B	Alternative C (Proposed Alternative)
Non-game Animals	Neutral to negative No active management.	Neutral to positive Coordination with state.	Positive Surveys and monitoring and adaptive management.
Reptiles & Amphibians	Negative No active management.	Neutral to positive Initiate monitoring and surveys.	Positive Monitoring and surveys. Coordination with state. Reduced incidental take.
Exotic, Invasive & Nuisance Species			
Control of Nuisance Plants (aquatic, terrestrial)	Negative. Management actions are not keeping pace with the spread of exotic, invasive, and nuisance plants.	Positive. Decreased spread of new infestations. Increased control of existing exotic, invasive, and nuisance plants.	Same as Alternative B.
Control of Nuisance Animals	Neutral. Continue current management efforts.	Positive. Increase management efforts to control nuisance species.	Same as Alternative B.
Wildlife & Habitat Diversity			
Impoundments	Neutral to negative. Continue to manage wetlands under continuous water management regime. Aging water control structures likely to fail.	Positive. Repair aging water control structures. Increased acreage.	Same as Alternative B.

Key Topics	Alternative A (Current Management – No Action Alternative)	Alternative B	Alternative C (Proposed Alternative)
Beaches, Dunes & Sandbars	Negative. No active management. Losses from erosion and sea level rise.	Positive. Increased information and restoration efforts.	Same as Alternative B.
Maritime Forest	Neutral. Limited control of invasive exotic plants.	Neutral to positive. Surveys and mapping of invasive exotic plants. Increased control efforts.	Positive. Surveys and mapping of invasive exotic plants. Increased control efforts to treat and retreat infested areas on continuing basis.
Prescribed fire	Neutral to negative. Burns conducted periodically primarily within wetland habitats.	Neutral to positive. Increased information; burns conducted to reduce fuel loads.	Positive. Increased information; burns conducted to target biological needs of species and reduce fuel loads.
Air and Water Quality and Quantity			
Water Quality	Neutral. Basic monitoring of pH and salinity in wetland impoundments.	Neutral to positive. Monitor dissolved oxygen in addition to pH and salinity in impoundments. Periodically monitor water quality in Bulls Bay.	Positive. Monitor dissolved oxygen, pH, salinity throughout refuge and Bulls Bay. Monitor discharge of mainland creeks.
Water Quantity	Neutral. No active management.	Neutral to positive. Initiate dialog with Santee Cooper and ACOE regarding sediment discharge of the Santee River.	Same as Alternative B.

Key Topics	Alternative A (Current Management – No Action Alternative)	Alternative B	Alternative C (Proposed Alternative)
Air Quality	Positive. Maintain and collect weekly samples from the National Atmospheric Deposition Network (acid rain), Mercury Deposition Network (total mercury), Interagency Monitoring of Protected Visual Environments (particulate matter), and Ammonia Sampler.	Same as Alternative A.	Same as Alternative A.
RESOURCE PROTECTION			
Law Enforcement (LE)	Neutral to negative. Refuge shares a single LE officer with complex.	Positive Add a permanent LE officer specifically for refuge.	Same as Alternative B.
Land Acquisition (inholdings)	Neutral. No active acquisitions.	Neutral to positive. Attempt to acquire last inholdings from willing sellers.	Same as Alternative B.
Personal Watercraft (PWC)	Neutral. No current management.	Neutral to positive. Increased information regarding disturbance of nesting birds. Communicate disturbance concerns to PWC rental companies.	Positive Increased information regarding disturbance. Communicate disturbance concerns to PWC rental companies. Coordinate with state to create buffer zones and PWC free zones to reduce disturbance to sensitive nesting areas.

Key Topics	Alternative A (Current Management – No Action Alternative)	Alternative B	Alternative C (Proposed Alternative)
Wilderness	Positive. Manage wilderness according to Service policy.	Same as Alternative A.	Same as Alternative A.
Conservation Focus Areas and Easements			
Conservation Easements	Neutral to negative. No active management. Easements not marked	Positive. Mark easement boundaries and regular LE patrol.	Same as Alternative B.
Cultural Resources			
Archaeological and Historical Resources	Neutral to positive. Increased information and some protection offered.	Same as Alternative A.	Positive. Increased information. Increased protection of archaeological and historical resources.
Lighthouses	Negative. Historic lighthouses are deteriorating and in need of repair.	Positive. Take actions necessary to repair and prevent deterioration.	Same as Alternative B.

Key Topics	Alternative A (Current Management – No Action Alternative)	Alternative B	Alternative C (Proposed Alternative)
VISITOR SERVICES			
Visitor Orientation			
Visitor contact sites, kiosks, trailheads, brochures, signs, maps, internet	Positive. Information available to visitors.	Positive. Increased awareness and understanding of climate change. Increased and improved kiosks. Improved and coordinated signs, web sites, and messages with the partners. Improved maps and information. Increased information about visitation.	Same as Alternative B.
Boat Ramp	Neutral to negative. Boat ramp lacks basic safety features such as a finger pier for launching boats.	Positive. Add finger pier to improve ramp safety.	Same as Alternative B.
Floating Dock on Bulls Island	Negative. Current dock is too small for demand and falling into disrepair.	Positive. Replace dock with a larger floating platform.	Same as Alternative B.
Garris Landing Parking	Neutral. No parking plan.	Positive. Create a parking plan to accommodate boat trailers and passenger vehicle parking.	Same as Alternative B.

Key Topics	Alternative A (Current Management – No Action Alternative)	Alternative B	Alternative C (Proposed Alternative)
Hunting and Fishing			
White-tailed Deer	Neutral. No change to existing deer hunting.	Same as Alternative A.	Same as Alternative A.
Rail Hunting	Negative. Hunting allowed but specific hunting data is unknown.	Positive. Coordinate with state to obtain rail hunting data.	Same as Alternative B.
Fishing Opportunities	Neutral to positive. Saltwater fishing is allowed on the refuge. Freshwater fishing is allowed at the visitor center ponds.	Positive. Same fishing allowed. Monofilament collection at refuge pier; interpretive signs. Obtain shell fishing data from state.	Same as Alternative B.
Wildlife Observation and Photography			
Wildlife Viewing and Photography Opportunities	Neutral. Stable opportunities and facilities for wildlife viewing and photography.	Positive. Addition of spotting scopes and observation areas.	Same as Alternative B.
Environmental Education and Interpretation			
Environmental Education (EE) Opportunities	Neutral to positive. EE programs occur throughout the year.	Positive. Continue EE programs with increased outreach to local schools and community.	Same as Alternative B.

Key Topics	Alternative A (Current Management – No Action Alternative)	Alternative B	Alternative C (Proposed Alternative)
Visitor Center	Neutral. No change to visitor center.	Positive. Refurbish exhibits. Add interpretive materials on climate change and sea level rise.	Same as Alternative B.
Interpretive Programs	Neutral to positive. Various programs throughout the year.	Positive. Add additional programs to increase quality of information.	Same as Alternative B.
Interpretive Trails	Neutral to negative. Stabilize interpretive trails but with minimal interpretive signage.	Positive. Add interpretive signs to existing trails.	Same as Alternative B.
Outreach			
Local Community	Neutral to negative. Limited outreach and potential for decreased outreach.	Positive. Increased outreach to residents.	Same as Alternative B.
Friends Group and Volunteers			
Volunteers	Neutral. Stable volunteer work force.	Positive. Expanded volunteer work force.	Same as Alternative B.
SEWEE Association	Neutral. No change in association.	Positive Association will help with climate change and sea level rise education. Increased membership.	Same as Alternative B.

Key Topics	Alternative A (Current Management – No Action Alternative)	Alternative B	Alternative C (Proposed Alternative)
Litter			
Trash, Litter, and Recycling	Neutral to negative. No change in efforts.	Positive. Actively address litter problems at worst areas. Increase visitor education about litter. Implement comprehensive recycling at shop and headquarters.	Same as Alternative B.
REFUGE ADMINISTRATION			
Refuge Management			
Administrative Facilities and signs	Neutral. No changes.	Positive. Upgrade facilities to provide better utility services. Increase maintenance of refuge information and boundary signs.	Same as Alternative B.
Staff	Neutral. No change in the levels of biological support and wildlife and habitat protection.	Positive. Increased staff in biological programs. Enhanced information and habitat management.	Positive Increased staff in all refuge programs. Enhanced information and habitat management.

Key Topics	Alternative A (Current Management – No Action Alternative)	Alternative B	Alternative C (Proposed Alternative)
Intergovernmental Coordination			
Relationship with South Carolina DNR, DHEC	Neutral. No changes.	Neutral to positive. Increased coordination.	Same as Alternative B.
Relationship with other federal agencies	Neutral. No changes.	Neutral to positive. Increased coordination.	Same as Alternative B.
Global Issues			
Carbon Sequestration	Neutral. No change.	Neutral to positive Work to acquire lands that would facilitate reforestation and sequestration efforts.	Same as Alternative B.

UNAVOIDABLE IMPACTS AND MITIGATION MEASURES

Under Alternative A, the no action alternative, there are numerous unavoidable impacts, including law enforcement, that are not adequate for protecting any significant visitor use. These include continued degradation of the biological functions of native plant communities and wildlife habitat due to the invasion of exotic plants and nuisance animals, and a probable continued decline in biodiversity. Over time, if these issues are not addressed, they will continue to impact refuge resources. There would also be adverse impacts on public uses, mostly in terms of not being able to adequately respond to rising demand for public use on the refuge. Many of the potential impacts on the refuge's environmental quality, habitat, and wildlife populations originate from human activities and development beyond the refuge's boundaries and are outside the jurisdiction of the Service.

Unavoidable adverse impacts under Alternative B would be similar to those of Alternative A, though probably less severe in scope and intensity. Alternative B aims to restore and enhance habitat primarily for waterfowl throughout the refuge. A portion of these efforts would include an intensified program to monitor and control invasive plant species that infest aquatic and upland habitats. Overall, the unavoidable adverse impacts associated with Alternative B would be less than would exist under Alternative A.

Alternative C, the proposed alternative, also has some unavoidable impacts. Generally, these impacts are expected to be minor and/or short-term in duration. However, the refuge will attempt to minimize these impacts whenever possible. As with the other two alternatives, other impacts that stem from human actions outside the refuge are beyond the ability of the Service to control.

The following sections describe the measures the refuge will employ to mitigate and minimize the potential impacts that would result from implementation of the proposed alternative.

WATER QUALITY FROM SOIL DISTURBANCE AND USE OF HERBICIDES

Soil disturbance and siltation due to water management activities; road and levee maintenance; and the construction of observation towers, boat ramps, and a headquarters and visitor center is expected to be minor and of short duration. To further reduce potential impacts, the refuge will use best management practices to minimize the erosion of soils into water bodies.

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

Long-term herbicide use for exotic plant control could result in a slight decrease in water quality in areas prone to exotic plant infestation. Through the proper application of herbicides, however, this is expected to have a minor impact on the environment, with the benefit of reducing or eliminating exotic plant infestations.

WILDLIFE DISTURBANCE

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

The known and anticipated levels of disturbance from the proposed alternative are not considered to be significant. Nevertheless, the refuge will manage public use activities to reduce impacts. Providing access for fishing opportunities allows the use of a renewable natural resource without adversely impacting other resources. Hunting will also be managed with restrictions that ensure minimal impact on other resources. General wildlife observation may result in minimal disturbance to wildlife. If the refuge determines that impacts from the expected additional visitor uses are above the levels that are anticipated, those uses will be discontinued, restricted, or rerouted to other less sensitive areas.

VEGETATION DISTURBANCE

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

Increased visitor use may increase the potential for the introduction of new exotic species into areas when visitors do not comply with boating regulations at the boat ramps and other access points, or with requests to stay on trails. The refuge will minimize this impact by enforcing the regulations for access to the refuge's water bodies, and by installing informational signs that request users to stay on the trails.

USER GROUP CONFLICTS

As public use increases, unanticipated conflicts between different user groups could occur. If this should happen, the refuge will adjust its programs, as needed, to eliminate or minimize any public use issues. The refuge will use methods that have proven to be effective in reducing or eliminating public use conflicts. These methods include establishing separate use areas, different use periods, and limits on the numbers of users in order to provide safe, quality, appropriate, and compatible wildlife-dependent recreational opportunities.

EFFECTS ON ADJACENT LANDOWNERS

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

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

LAND OWNERSHIP AND SITE DEVELOPMENT

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

Potential development of the refuge's buildings, trails, and other improvements could lead to minor short-term negative impacts on plants, soils, and some wildlife species. When building the observation towers, efforts would be made to use recycled products and environmentally sensitive treated lumber. The visitor center would be constructed to be aesthetically pleasing to the community and to avoid any additional impacts to native plant communities. All construction activities would comply with the requirements of Section 404 of the Clean Water Act; the National Historic Preservation Act; Executive Order 11988, Floodplain Management; and other applicable regulatory requirements.

CUMULATIVE IMPACTS

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

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

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

The Service is not aware of any past, present, or future planned actions that would result in a significant negative cumulative impact when added to the refuge's proposed management activities, as outlined in the proposed action. The management activities in the proposed action are intended to maintain or improve the area's biological resources, protecting the biological integrity of the refuge. Benefits are anticipated for rare, threatened, and endangered species; migratory birds; and native wildlife and habitat diversity, including the minimization of negative impacts associated with exotic, invasive, and nuisance species and the effects of litter and ocean debris on beach and marine habitats. The management activities in the proposed action are not anticipated to have significant adverse impacts on climate change. Further, the management activities in the proposed action are not expected to have significant adverse impacts to the cultural resources of the area, instead providing enhanced protection of these resources occurring on the refuge. Nor are significant adverse impacts expected from the proposed action regarding the local economy, instead the proposed management activities are anticipated to support area property values and aesthetics.

DIRECT AND INDIRECT EFFECTS OR IMPACTS

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

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

Other indirect effects that may result from implementing the proposed alternative include minor impacts from siltation due to the disturbance of soils and vegetation while expanding the water control structures, as well as expanding or creating new foot trails and providing greater visitor access through improvements to the boat ramps.

SHORT-TERM USES VERSUS LONG-TERM PRODUCTIVITY

The habitat protection and management actions outlined under the proposed action are dedicated to maintaining the long-term productivity of refuge habitats. The benefits of the proposed action for long-term productivity far outweigh any impacts from short-term actions.

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

V. Consultation and Coordination

OVERVIEW

This chapter summarizes the consultation and coordination that has occurred to date in identifying the issues, alternatives, and proposed alternative, which are presented in this Draft CCP/EA.

The Draft CCP/EA for Cape Romain NWR was written by the Planning Team (members listed below), with the participation and assistance of refuge and Service staff and the SCDNR.

In March 2004, a biological review of the refuge was completed. A team of 15 biologists conducted a comprehensive biological review of the refuge to help guide the development of the Draft CCP/EA. The participants in the biological review (listed below) were drawn primarily from the refuge, the Service, Ducks Unlimited, and the SCDNR.

A review of the refuge's visitor services program was also conducted in 2004. The members of the visitor services review team included two professionals from the Service's Visitor Services and Outreach Division, Southeast Regional Office in Atlanta, and two public use experts from other national wildlife refuges (listed below).

The information and recommendations from the reports of both the biological review team and visitor services review team provided a valuable starting point for the development of this Draft CCP/EA. Subsequently, the planning team hosted a public scoping meeting on December 17, 2008, and began an outreach campaign through various media to collect ideas and concerns from all stakeholders. Please refer to Section A, Chapter III, for more information on public scoping and the overall consultation and coordination that was involved in developing this Draft CCP/EA.

CCP PLANNING TEAM

Kevin Godsea, Refuge Manager, Cape Romain NWR
Raye Nilius, Project Leader, South Carolina Lowcountry Refuge Complex
Van Fischer, Natural Resource Planner, South Carolina Lowcountry Refuge Complex
Sarah Dawsey, Biologist, Cape Romain NWR
Ray Paterra, Supervisory Park Ranger, South Carolina Lowcountry Refuge Complex
Patricia Lynch, Park Ranger, Cape Romain NWR

BIOLOGICAL REVIEW TEAM

Walt Rhodes, Waterfowl Biologist, South Carolina Department of Natural Resources
Kenny Williams, Ducks Unlimited, South Carolina
Craig LeShack, Ducks Unlimited, Charleston, South Carolina
Felicia Sanders, Waterbird Biologist, South Carolina Department of Natural Resources
Sally Murphy, South Carolina Department of Natural Resources
Tom Murphy, Waterbird Biologist, South Carolina Department of Natural Resources
Donny Browning, Project Leader, Cape Romain Refuge Complex
Matt Connolly, Refuge Manager, Cape Romain NWR
Sarah Dawsey, Refuge Biologist, Cape Romain NWR
Craig Sasser, Refuge Manager, Waccamaw NWR
Craig Watson, FWS, Atlantic Coast Joint Venture

Sandy MacPherson, FWS, Ecological Services, Jacksonville, Florida
Chuck Hunter, FWS, Refuges, Atlanta, Georgia
Bob Noffsinger, FWS, Migratory Birds, Manteo, North Carolina (retired)
Dave Brownlie, FWS, Refuges, Tallahassee, Florida

VISITOR SERVICES REVIEW TEAM

Garry Tucker, Chief, Visitor Services and Outreach, FWS, Atlanta, Georgia
Deborah Jerome, Visitor Services and Outreach, FWS, Atlanta, Georgia
Robin Will, St. Marks NWR
Dorn Whitmore, Merritt Island NWR

OTHER CONTRIBUTORS

Richard Kanaski, Regional Archaeologist, FWS, Savannah, Georgia
Sam Chappelear, Wildlife Coordinator, South Carolina Department of Natural Resources

Appendix A. Glossary

Adaptive Management: Refers to a process in which policy decisions are implemented within a framework of scientifically driven experiments to test predictions and assumptions inherent in a management plan. Analysis of results helps managers determine whether current management should continue as is or whether it should be modified to achieve desired conditions.

Alluvial: Sediment transported and deposited in a delta or riverbed by flowing water.

Alternative: 1. A reasonable way to fix the identified problem or satisfy the stated need (40 CFR 1500.2). 2. Alternatives are different sets of objectives and strategies or means of achieving Refuge purposes and goals, helping fulfill the Refuge System mission, and resolving issues (Service Manual 602 FW 1.6B).

Anadromous: Migratory fishes that spend most of their lives in the sea and migrate to fresh water to breed.

Biological Diversity: The variety of life and its processes, including the variety of living organisms, the genetic differences among them, and the communities and ecosystems in which they occur (Service Manual 052 FW 1. 12B). The System's focus is on indigenous species, biotic communities, and ecological processes. Also referred to as biodiversity.

Carrying Capacity: The maximum population of a species able to be supported by a habitat or area.

Categorical Exclusion: A category of actions that does not individually or cumulatively have a significant effect on the human environment and have been found to have no such effect in procedures adopted by a federal agency pursuant to the National Environmental Policy Act (40 CFR 1508.4).

CFR: Code of Federal Regulations.

Compatible Use: A proposed or existing wildlife-dependent recreational use or any other use of a national wildlife Refuge that, based on sound professional judgment, will not materially interfere with or detract from the fulfillment of the National Wildlife Refuge System mission or the purpose(s) of the national wildlife Refuge [50 CFR 25.12 (a)]. A compatibility determination supports the selection of compatible uses and identifies stipulations or limits necessary to ensure compatibility.

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

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

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

National Wildlife Refuge:	A designated area of land, water, or an interest in land or water within the Refuge System.
Native Species:	Species that normally live and thrive in a particular ecosystem.
Noxious Weed:	A plant species designated by federal or state law as generally possessing one or more of the following characteristics: aggressive or difficult to manage; parasitic; a carrier or host of serious insect or disease; or non-native, new, or not common to the United States. According to the Federal Noxious Weed Act (P.L. 93-639), a noxious weed is one that causes disease or had adverse effects on man or his environment and therefore is detrimental to the agriculture and commerce of the Untied States and to the public health.
Objective:	A concise statement of what we want to achieve, how much we want to achieve, when and where we want to achieve it, and who is responsible for the work. Objectives derive from goals and provide the basis for determining strategies, monitoring Refuge accomplishments, and evaluating the success of strategies. Making objectives attainable, time-specific, and measurable (Service Manual 602 FW 1.6N).
Plant Association:	A classification of plant communities based on the similarity in dominants of all layers of vascular species in a climax community.
Plant Community:	An assemblage of plant species unique in its composition; occurs in particular locations under particular influences; a reflection or integration of the environmental influences on the site such as soils, temperature, elevation, solar radiation, slope, aspect, and rainfall; denotes a general kind of climax plant community.
Preferred Alternative:	This is the alternative determined (by the decision-maker) to best achieve the Refuge purpose, vision, and goals; contributes to the Refuge System mission, addresses the significant issues; and is consistent with principles of sound fish and wildlife management.
Prescribed Fire:	The application of fire to wildland fuels to achieve identified land use objectives (Service Manual 621 FW 1.7). May occur from natural ignition or intentional ignition.
Priority Species:	Fish and wildlife species that require protective measures and/or management guidelines to ensure their perpetuation. Priority species include the following: (1) State-listed and candidate species; (2) species or groups of animals susceptible to significant population declines within a specific area or statewide by virtue of their inclination to aggregate (e.g., seabird colonies); and (3) species of recreation, commercial, and/or tribal importance.
Public Involvement Plan:	Broad long-term guidance for involving the public in the comprehensive conservation planning process.

Public Involvement:	A process that offers impacted and interested individuals and organizations an opportunity to become informed about, and to express their opinions on Service actions and policies. In the process, these views are studied thoroughly and thoughtful consideration of public views is given in shaping decisions for Refuge management.
Public:	Individuals, organizations, and groups; officials of federal, state, and local government agencies; Indian tribes; and foreign nations. It may include anyone outside the core planning team. It includes those who may or may not have indicated an interest in service issues and those who do or do not realize that Service decisions may affect them.
Purposes of the Refuge:	"The purposes specified in or derived from the law, proclamation, executive order, agreement, public land order, donation document, or administrative memorandum establishing, authorizing, or expanding a Refuge, Refuge unit, or Refuge sub-unit." For Refuges that encompass congressionally designated wilderness, the purposes of the Wilderness Act are additional purposes of the Refuge (Service Manual 602 FW 106 S).
Recommended Wilderness:	Areas studied and found suitable for wilderness designation by both the Director of the Fish and Wildlife Service and the Secretary of the Department of the Interior, and recommended for designation by the President to Congress. These areas await only legislative action by Congress in order to become part of the Wilderness System. Such areas are also referred to as "pending in Congress" (Draft Service Manual 610 FW 1.5).
Record of Decision (ROD):	A concise public record of decision prepared by the federal agency, pursuant to NEPA, that contains a statement of the decision, identification of all alternatives considered, identification of the environmentally preferable alternative, a statement as to whether all practical means to avoid or minimize environmental harm from the alternative selected have been adopted (and if not, why they were not), and a summary of monitoring and enforcement where applicable for any mitigation (40 CFR 1505.2).
Refuge Goal:	See Goal
Refuge Purposes:	See Purposes of the Refuge
Songbirds: (Also Passerines)	A category of birds that is medium to small, perching landbirds. Most are territorial singers and migratory.
Step-down Management Plan:	A plan that provides specific guidance on management subjects (e.g., habitat, public use, fire, and safety) or groups of related subjects. It describes strategies and implementation schedules for meeting CCP goals and objectives (Service Manual 602 FW 1.6 U).

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

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

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

Wilderness: See Designated Wilderness

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

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

ACRONYMS AND ABBREVIATIONS

BCC	Birds of Conservation Concern
BRT	Biological Review Team
CCP	Comprehensive Conservation Plan
CFR	Code of Federal Regulations
cfs	cubic feet per second
DOI	Department of the Interior
DU	Ducks Unlimited
EA	Environmental Assessment
EE	environmental education
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FR	Federal Register
FTE	full-time equivalent
FY	Fiscal Year
GIS	Global Information System
NEPA	National Environmental Policy Act
NRHP	National Register of Historic Places
NWR	National Wildlife Refuge
NWRS	National Wildlife Refuge System
PFT	Permanent Full Time
RM	Refuge Manual
RNA	Research Natural Area
ROD	Record of Decision
RONS	Refuge Operating Needs System
RRP	Refuge Roads Program
FWS	U.S. Fish and Wildlife Service (also Service)
TFT	Temporary Full Time
USC	United States Code

Appendix B. References and Literature Citations

Baker, James B., and O. Gordon Langdon. (circa) 1988. *Pinus taeda*. L., Loblolly Pine. In: Silvics of Forest Trees of the United States, Volume 1, [Online]. U.S. Dept. of Agriculture, Forest Service. Available: http://www.na.fs.fed.us/spfo/pubs/silvics_manual/Volume_1/pinus/taeda.htm

Bellis, V.J., and J.R. Keough. 1995. Ecology of maritime forests of the southern Atlantic coast: a community profile. USDI National Biological Service, Biological Rep. 30. Washington, DC. 97p.

Backlund, P., A. Janetos, and D. Schimel (convening lead authors). 2008. The effects of climate change on agriculture, land resources, water resources, and biodiversity in the United States. Synthesis and Assessment Product 4.3. Report by the U.S. Climate Change Science Program and the Subcommittee on Global Change Research. U.S. Environmental Protection Agency, Washington, D.C. 362 pp.

Bratton, Susan P. 1985. The vegetation history of Fort Frederica, Saint Simons Island, South Carolina. Castanea 50(3):133-145.

Bratton, Susan P. and Kathryn Davison. 1987. Disturbance and succession in Buxton Woods, Cape Hatteras, North Carolina. Castanea 52:166-179.

Carey, Jennifer H. 1992a. *Pinus taeda*. In: Fire Effects Information System, [Online]. U.S. Dept. of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/

Carey, Jennifer H. 1992b. *Quercus virginiana*. In: Fire Effects Information System, [Online]. U.S. Dept. of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Availiable: http://www.fs.fed.us/database/feis/

Davison, Kathryn L., and Susan P. Bratton. 1988. Vegetation response and regrowth after fire on Cumberland Island National Seashore, South Carolina. Castanea. 53(1):57-65.

Dupree, A. Hunter. 1957. Science in the Federal Government: A History of Policies and Activities to 1940. Harvard University Press, Cambridge, Massachusetts. 460 pp.

Harper, Roland M. 1911. The relation of climax vegetation to islands and peninsulas. Bulletin of the Torrey Botanical Club 38:515-525.

Intergovernmental Panel on Climate Change. 2007. Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [core writing team, Pachauri, R.K. and Reisinger, A (eds.)]. IPCC, Geneva, Switzerland, 104 pp.

Landers, J. Larry. 1989. Disturbance influences on pine traits in the southeastern United States. In: Proceedings 17th Tall Timbers Fire Ecology Conference, High Intensity Fire in Wildlands: Management Challenges and Options. Tall Timbers Research Station. Pp. 61-98.

Gabrielson, Ira N. 1943. Wildlife Conservation. The Macmillan Company, New York, New York. 250 pp.

Laycock, George. 1965. The Sign of the Flying Goose: A Guide to the National Wildlife Refuges. The Natural History Press, Garden City, New York. 299 pp.

McLaughlin, J.F., J.J. Hellmann, C.L. Boggs, and P.R. Ehrlich. 2002. Climate change hastens population extinctions. Proceedings of the National Academy of Sciences 99:6070-6074.

Nelson, John B. 1986. The natural communities of South Carolina. SC Wildlife and Marine Resource Department.

New Employee Handbook. U.S. Fish and Wildlife Service.

Nicholas, N.S. and S.M. Zedaker. 1992. Assessment of visible vegetation injury and forest health at Cape Romain National Wildlife Refuge, South Carolina after Hurricane Hugo. Virginia Polytechnic Institute and State University, Blacksburg, VA. 3 p.

Hunter, W. C., L. Peoples, J. Collazo, B. Noffsinger, B. Winn, D. Allen, B. Harrington, M. Epstein and J. Saliva. 2002. Southeastern Coastal Plain-Caribbean Regional Shorebird Plan. U.S. Fish and Wildlife Service, Atlanta, GA.

Hunter, W.C., W. Golder, S. Melvin and J. Wheeler. 2006. Southeast United States Regional Waterbird Conservation Plan. U.S. Fish and Wildlife Service, Atlanta, GA.

Hunter, W. C. L. Peoples, and J. Collazo. 2001. South Atlantic Coastal Plain PIF Conservation Plan., U.S. Fish and Wildlife Service, Atlanta, GA.

SC Department of Natural Resources. 2006. Comprehensive Wildlife ConservationStrategy, Columbia, SC Available online at: http://www.dnr.sc.gov/wcp

Baker, James B., and O. Gordon Langdon. (circa) 1988. *Pinus taeda*. L., Loblolly Pine. In: Silvics of Forest Trees of the United States, Volume 1, [Online]. U.S. Dept. of Agriculture, Forest Service. Available: http://www.na.fs.fed.us/spfo/pubs/silvics_manual/Volume_1/pinus/taeda.htm

Bellis, V.J., and J.R. Keough. 1995. Ecology of maritime forests of the southern Atlantic coast: a community profile. USDI National Biological Service, Biological Rep. 30. Washington, DC. 97p.

Bratton, Susan P. 1985. The vegetation history of Fort Frederica, Saint Simons Island, South Carolina. Castanea 50(3):133-145.

Bratton, Susan P. and Kathryn Davison. 1987. Disturbance and succession in Buxton Woods, Cape Hatteras, North Carolina. Castanea 52:166-179.

Brown, P.J. 1977. Variations in South Carolina coastal morphology. Southeastern Geology. 18(4):249-264.

Carey, Jennifer H. 1992a. *Pinus taeda*. In: Fire Effects Information System, [Online]. U.S. Dept. of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/

Carey, Jennifer H. 1992b. *Quercus virginiana*. In: Fire Effects Information System, [Online]. U.S. Dept. of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Availiable: http://www.fs.fed.us/database/feis/

Daniels, R.C., White, T.W., and K. K. Chapman. 1993. Sea-level rise: Destruction of threatened and endangered species habitat in South Carolina. Environmental Management. 17(3):373-385.

Davison, Kathryn L., and Susan P. Bratton. 1988. Vegetation response and regrowth after fire on Cumberland Island National Seashore, South Carolina. Castanea. 53(1):57-65.

Francis, Mark. 2002. How Cities Use Parks for Community Engagement. City Parks Forum Briefing Papers. American Planning Association. Chicago, IL. 4 pp.

Harper, Roland M. 1911. The relation of climax vegetation to islands and peninsulas. Bulletin of the Torrey Botanical Club 38:515-525.

Hockensmith, B.L. 2004. Flow and Salinity Characteristics of the Santee River Estuary, South Carolina. SC Dept. Natural Resources. Land, Water and Conservation Division. Water Resources Report 35. 42 pp.

Kracker, L.M. and G.M. Meaburn, 2006. Spatial and Temporal Characterization of Water Quality at Cape Romain National Wildlife Refuge. NOAA Technical Memorandum NOS NCCOS 33. 36 pp.

Landers, J. Larry. 1989. Disturbance influences on pine traits in the southeastern United States. In: Proceedings 17th Tall Timbers Fire Ecology Conference, High Intensity Fire in Wildlands: Management Challenges and Options. Tall Timbers Research Station. Pp. 61-98.

Lennon, G. and W.J. Neal. 1996. Living with the South Carolina Coast. Duke University Press. 241 pp.

Lewis, Megan. 2002. How Cities Use Parks for Economic Development. City Parks Forum Briefing Papers. American Planning Association. Chicago, IL. 4 pp.

Matthews, S., R. O'Connor, L.R. Iverson, and A.M. Prasad. 2004. *Atlas of Climate Change Effects in 150 Bird Species of the Eastern United States*. Newton Square, PA: U.S. Fish and Wildlife Service, General Technical Report NE-GTR-318. http://www.usgcrp.gov/usgcrp/Library/ocp2006/ocp2006-hieco.htm

Miller, E.N. 1971. Soil Survey of Charleston County, South Carolina. Soil Conservation Service. 78 pp.

NatureServe. 2004a. Atlantic coast maritime evergreen forest. NatureServe Explorer Version 4.1, Element Occurrence Record CEGL007027. NatureServe, Arlington, VA. Available http://www.natureserve.org/explorer. (Accessed: November 17, 2004).

NatureServe. 2004b. Atlantic coastal plain central maritime forest. NatureServe Explorer Version 4.1, Element Occurrence Record CES203.261. NatureServe, Arlington, VA. Available http://www.natureserve.org/explorer. (Accessed: November 17, 2004).

NatureServe. 2004c. Atlantic coastal plain southern maritime forest. NatureServe Explorer Version 4.1, Element Occurrence Record CES203.537. NatureServe, Arlington, VA. Available http://www.natureserve.org/explorer. (Accessed: November 17, 2004).

NatureServe. 2004d. Maritime live oak hammock. NatureServe Explorer Version 4.1, Element Occurrence Record CEGL007032. NatureServe, Arlington, VA. Available http://www.natureserve.org/explorer. (Accessed: November 17, 2004).

NatureServe. 2004e. Maritime red bay shrub swamp. NatureServe Explorer Version 4.1, Element Occurrence Record CEGL004635. NatureServe, Arlington, VA. Available http://www.natureserve.org/explorer. (Accessed: November 17, 2004).

Nelson, John B. 1986. The natural communities of South Carolina. SC Wildlife and Marine Resource Department.

Nicholas, N.S. and S.M. Zedaker. 1992. Assessment of visible vegetation injury and forest health at Cape Romain National Wildlife Refuge, South Carolina after Hurricane Hugo. Virginia Polytechnic Institute and State University, Blacksburg, VA. 3 p.

Pederson, N.A., R.H. Jones, and R.R. Sharitz. 1997. Age structure and possible origins of old Pinus taeda stands in a floodplain forest. Journal of Torrey Botanical Society 124:111-123.

Pilkey, O.H. and K.L. Dixon. 1996. The Corps and the Shore. Island Press. Washington, DC.

Schafale, Michael P., and Alan S. Weakley. 1990. Classification of the natural communities of North Carolina, Third Approximation. North Carolina Natural Heritage Program, Raleigh, NC.

Scorecard, 2005. Criteria Air Pollutant Report: Charleston County, SC. http://www.scorecard.org/env-releases/cap/county.tcl?fips_county_code=45029#air_rankings

Sexton, W.J. 1995. The post-storm hurricane Hugo recovery of the undeveloped beaches along the South Carolina coast: Capers Island to the Santee Delta. Journal of Coastal Research. 11(4):1020-1025.

Smith, G.F., N.S. Nicholas, and S.M. Zedaker. 1996. Succession dynamics in a maritime forest following Hurricane Hugo and fuel reduction burns. Forest Ecology and Management 95(1997): 275-283.

Titus J.G. and C. Richman. 2001. Maps of lands vulnerable to sea-level rise: Modeled elevations along the US Atlantic and Gulf coasts. Climate Research 18:205-228.

Turner, Sally and Susan P. Bratton. 1987. The recent fire history of Cumberland Island, South Carolina. Castanea 52:300-303.

U.S. Fish and Wildlife Service. 1991. An evaluation of Cape Romain NWR Forest, Habitat and Fire Management Programs: A Post Hurricane Hugo Review, Review Team Report.

U.S. Fish and Wildlife Service. 2009. Rising to the Challenge: Strategic Plan for Responding to Accelerating Climate Change (draft).

Wood, Gene W. 1992?. Impact of Hurricane Hugo on wildlife habitats on Cape Romain National Wildlife Refuge, Phase I Final Report. [unpublished]. Clemson University, Clemson, SC. Pp. 5-6.

Wood, Gene W. 1992?. Impact of Hurricane Hugo on wildlife habitats on Cape Romain National Wildlife Refuge, Phase I Final Report. [unpublished]. Clemson University, Clemson, SC. Pp. 5-6.

Wood, Gene W., Michael T. Mengak, and Mark Murphy. 1988. Ecological importance of Feral ungulates at Shackleford Banks, North Carolina. Am. Midland Naturalist 118(2):236-244.

Appendix C. Relevant Legal Mandates and Executive Orders

STATUE	DESCRIPTION
Administrative Procedures Act (1946)	Outlines administrative procedures to be followed by federal agencies with respect to identification of information to be made public; publication of material in the Federal Register; maintenance of records; attendance and notification requirements for specific meetings and hearings; issuance of licenses; and review of agency actions.
American Antiquities Act of 1906	Provides penalties for unauthorized collection, excavation, or destruction of historic or prehistoric ruins, monuments, or objects of antiquity on lands owned or controlled by the United States. The Act authorizes the President to designate as national monuments objects or areas of historic or scientific interest on lands owned or controlled by the Unites States.
American Indian Religious Freedom Act of 1978	Protects the inherent right of Native Americans to believe, express, and exercise their traditional religions, including access to important sites, use and possession of sacred objects, and the freedom to worship through ceremonial and traditional rites.
Americans With Disabilities Act of 1990	Intended to prevent discrimination of and make American society more accessible to people with disabilities. The Act requires reasonable accommodations to be made in employment, public services, public accommodations, and telecommunications for persons with disabilities.
Anadromous Fish Conservation Act of 1965, as amended	Authorizes the Secretaries of Interior and Commerce to enter into cooperative agreements with states and other non-federal interests for conservation, development, and enhancement of anadromous fish and contribute up to 50 percent as the federal share of the cost of carrying out such agreements. Reclamation construction programs for water resource projects needed solely for such fish are also authorized.
Archaeological Resources Protection Act of 1979, as amended.	This Act strengthens and expands the protective provisions of the Antiquities Act of 1906 regarding archaeological resources. It also revised the permitting process for archaeological research.
Architectural Barriers Act of 1968	Requires that buildings and facilities designed, constructed, or altered with federal funds, or leased by a federal agency, must comply with standards for physical accessibility.

STATUE	DESCRIPTION
Bald and Golden Eagle Protection Act of 1940, as amended	Prohibits the possession, sale or transport of any bald or golden eagle, alive or dead, or part, nest, or egg except as permitted by the Secretary of the Interior for scientific or exhibition purposes, or for the religious purposes of Indians.
Bankhead-Jones Farm Tenant Act of 1937	Directs the Secretary of Agriculture to develop a program of land conservation and utilization in order to correct maladjustments in land use and thus assist in such things as control of soil erosion, reforestation, conservation of natural resources and protection of fish and wildlife. Some early Refuges and hatcheries were established under authority of this Act.
Cave Resources Protection Act of 1988	Established requirements for the management and protection of caves and their resources on federal lands, including allowing the land managing agencies to withhold the location of caves from the public, and requiring permits for any removal or collecting activities in caves on federal lands.
Clean Air Act of 1970	Regulates air emissions from area, stationary, and mobile sources. This Act and its amendments charge federal land managers with direct responsibility to protect the "air quality and related values" of land under their control. These values include fish, wildlife, and their habitats.
Clean Water Act of 1974, as amended	This Act and its amendments have as its objective the restoration and maintenance of the chemical, physical, and biological integrity of the Nation's waters. Section 401 of the Act requires that federally permitted activities comply with the Clean Water Act standards, state water quality laws, and any other appropriate state laws. Section 404 charges the U.S. Army Corps of Engineers with regulating discharge of dredge or fill materials into waters of the United States, including wetlands.
Coastal Barrier Resources Act of 1982 (CBRA)	Identifies undeveloped coastal barriers along the Atlantic and Gulf Coasts and included them in the John H. Chafee Coastal Barrier Resources System (CBRS). The objectives of the act are to minimize loss of human life, reduce wasteful federal expenditures, and minimize the damage to natural resources by restricting most federal expenditures that encourage development within the CBRS.
Coastal Barrier Improvement Act of 1990	Reauthorized the Coastal Barrier Resources Act (CBRA), expanded the CBRS to include undeveloped coastal barriers along the Great Lakes and in the Caribbean, and established "Otherwise Protected Areas (OPAs)." The Service is responsible for maintaining official maps, consulting with federal agencies that propose spending federal funds within the CBRS and OPAs, and making recommendations to Congress about proposed boundary revisions.

STATUE	DESCRIPTION
Coastal Wetlands Planning, Protection, and Restoration (1990)	Authorizes the Director of the Fish and Wildlife Service to participate in the development of a Louisiana coastal wetlands restoration program, participate in the development and oversight of a coastal wetlands conservation program, and lead in the implementation and administration of a national coastal wetlands grant program.
Coastal Zone Management Act of 1972, as amended	Established a voluntary national program within the Department of Commerce to encourage coastal states to develop and implement coastal zone management plans and requires that "any federal activity within or outside of the coastal zone that affects any land or water use or natural resource of the coastal zone" shall be "consistent to the maximum extent practicable with the enforceable policies" of a state's coastal zone management plan. The law includes an Enhancement Grants Program for protecting, restoring, or enhancing existing coastal wetlands or creating new coastal wetlands. It also established the National Estuarine Research Reserve System, guidelines for estuarine research, and financial assistance for land acquisition.
Emergency Wetlands Resources Act of 1986	This Act authorized the purchase of wetlands from Land and Water Conservation Fund moneys, removing a prior prohibition on such acquisitions. The Act requires the Secretary to establish a National Wetlands Priority Conservation Plan, required the states to include wetlands in their Comprehensive Outdoor Recreation Plans, and transfers to the Migratory Bird Conservation Fund amounts equal to import duties on arms and ammunition. It also established entrance fees at national wildlife Refuges.
Endangered Species Act of 1973, as amended	Provides for the conservation of threatened and endangered species of fish, wildlife, and plants by federal action and by encouraging the establishment of state programs. It provides for the determination and listing of threatened and endangered species and the designation of critical habitats. Section 7 requires Refuge managers to perform internal consultation before initiating projects that affect or may affect endangered species.
Environmental Education Act of 1990	This Act established the Office of Environmental Education within the U.S. Environmental Protection Agency to develop and administer a federal environmental education program in consultation with other federal natural resource management agencies, including the Fish and Wildlife Service.

STATUE	DESCRIPTION
Estuary Protection Act of 1968	Authorized the Secretary of the Interior, in cooperation with other federal agencies and the states, to study and inventory estuaries of the United States, including land and water of the Great Lakes, and to determine whether such areas should be acquired for protection. The Secretary is also required to encourage state and local governments to consider the importance of estuaries in their planning activities relative to federal natural resource grants. In approving any state grants for acquisition of estuaries, the Secretary was required to establish conditions to ensure the permanent protection of estuaries.
Estuaries and Clean Waters Act of 2000	This law creates a federal interagency council that includes the Director of the Fish and Wildlife Service, the Secretary of the Army for Civil Works, the Secretary of Agriculture, the Administrator of the Environmental Protection Agency and the Administrator for the National Oceanic and Atmospheric Administration. The council is charged with developing a national estuary habitat restoration strategy and providing grants to entities to restore and protect estuary habitat to promote the strategy.
Food Security Act of 1985, as amended (Farm Bill)	The Act contains several provisions that contribute to wetland conservation. The Swampbuster provisions state that farmers who convert wetlands for the purpose of planting after enactment of the law are ineligible for most farmer program subsidies. It also established the Wetland Reserve Program to restore and protect wetlands through easements and restoration of the functions and values of wetlands on such easement areas.
Farmland Protection Policy Act of 1981, as amended	The purpose of this law is to minimize the extent to which federal programs contribute to the unnecessary conversion of farmland to nonagricultural uses. Federal programs include construction projects and the management of federal lands.
Federal Advisory Committee Act (1972), as amended	Governs the establishment of and procedures for committees that provide advice to the federal government. Advisory committees may be established only if they will serve a necessary, nonduplicative function. Committees must be strictly advisory unless otherwise specified and meetings must be open to the public.
Federal Coal Leasing Amendment Act of 1976	Provided that nothing in the Mining Act, the Mineral Leasing Act, or the Mineral Leasing Act for Acquired Lands authorized mining coal on Refuges.

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

STATUE	DESCRIPTION
Improvement Act of 1978	This act was passed to improve the administration of fish and wildlife programs and amends several earlier laws, including the Refuge Recreation Act, the National Wildlife Refuge System Administration Act, and the Fish and Wildlife Act of 1956. It authorizes the Secretary to accept gifts and bequests of real and personal property on behalf of the United States. It also authorizes the use of volunteers on Service projects and appropriations to carry out volunteer programs.
Fishery (Magnuson) Conservation and Management Act of 1976	Established Regional Fishery Management Councils comprised of federal and state officials, including the Fish and Wildlife Service. It provides for regulation of foreign fishing and vessel fishing permits.
Freedom of Information Act, 1966	Requires all federal agencies to make available to the public for inspection and copying administrative staff manuals and staff instructions; official, published and unpublished policy statements; final orders deciding case adjudication; and other documents. Special exemptions have been reserved for nine categories of privileged material. The Act requires the party seeking the information to pay reasonable search and duplication costs.
Geothermal Steam Act of 1970, as amended	Authorizes and governs the lease of geothermal steam and related resources on public lands. Section 15 c of the Act prohibits issuing geothermal leases on virtually all Service-administrative lands.
Lacey Act of 1900, as amended	Originally designed to help states protect their native game animals and to safeguard U.S. crop production from harmful foreign species, this Act prohibits interstate and international transport and commerce of fish, wildlife or plants taken in violation of domestic or foreign laws. It regulates the introduction to America of foreign species.
Land and Water Conservation Fund Act of 1948	This Act provides funding through receipts from the sale of surplus federal land, appropriations from oil and gas receipts from the outer continental shelf, and other sources for land acquisition under several authorities. Appropriations from the fund may be used for matching grants to states for outdoor recreation projects and for land acquisition by various federal agencies, including the Fish and Wildlife Service.
Marine Mammal Protection Act of 1972, as amended	The 1972 Marine Mammal Protection Act established a federal responsibility to conserve marine mammals with management vested in the Department of the Interior for sea otter, walrus, polar bear, dugong, and manatee. The Department of Commerce is responsible for cetaceans and pinnipeds, other than the walrus. With certain specified exceptions, the Act establishes a moratorium on the taking and importation of marine mammals, as well as products taken from them.

STATUE	DESCRIPTION
Migratory Bird Conservation Act of 1929	Established a Migratory Bird Conservation Commission to approve areas recommended by the Secretary of the Interior for acquisition with Migratory Bird Conservation Funds. The role of the commission was expanded by the North American Wetland Conservation Act to include approving wetlands acquisition, restoration, and enhancement proposals recommended by the North American Wetlands Conservation Council.
Migratory Bird Hunting and Conservation Stamp Act of 1934	Also commonly referred to as the "Duck Stamp Act," requires waterfowl hunters 16 years of age or older to possess a valid federal hunting stamp. Receipts from the sale of the stamp are deposited into the Migratory Bird Conservation Fund for the acquisition of migratory bird Refuges.
Migratory Bird Treaty Act of 1918, as amended	This Act implements various treaties and conventions between the United States and Canada, Japan, Mexico, and the former Soviet Union for the protection of migratory birds. Except as allowed by special regulations, this Act makes it unlawful to pursue, hunt, kill, capture, possess, buy, sell, purchase, barter, export or import any migratory bird, part, nest, egg, or product.
Mineral Leasing Act for Acquired Lands (1947), as amended	Authorizes and governs mineral leasing on acquired public lands.
Minerals Leasing Act of 1920, as amended	Authorizes and governs leasing of public lands for development of deposits of coal, oil, gas, and other hydrocarbons; sulphur; phosphate; potassium; and sodium. Section 185 of this title contains provisions relating to granting rights-of-way over federal lands for pipelines.
Mining Act of 1872, as amended	Authorizes and governs prospecting and mining for the so-called "hardrock" minerals (i.e., gold and silver) on public lands.
National and Community Service Act of 1990	Authorizes several programs to engage citizens of the U.S. in full- and/or part-time projects designed to combat illiteracy and poverty, provide job skills, enhance educational skills, and fulfill environmental needs. Among other things, this law establishes the American Conservation and Youth Service Corps to engage young adults in approved human and natural resource projects, which will benefit the public or are carried out on federal or Indian lands.
National Environmental Policy Act of 1969	Requires analysis, public comment, and reporting for environmental impacts of federal actions. It stipulates the factors to be considered in environmental impact statements, and requires that federal agencies employ an interdisciplinary approach in related decision-making and develop means to ensure that unqualified environmental values are given appropriate consideration, along with economic and technical considerations.

STATUE	DESCRIPTION
National Historic Preservation Act of 1966, as amended	It establishes a National Register of Historic Places and a program of matching grants for preservation of significant historical features. Federal agencies are directed to take into account the effects of their actions on items or sites listed or eligible for listing in the National Register.
National Trails System Act (1968), as amended	Established the National Trails System to protect the recreational, scenic, and historic values of some important trails. National recreation trails may be established by the Secretaries of Interior or Agriculture on land wholly or partly within their jurisdiction, with the consent of the involved state(s), and other land managing agencies, if any. National scenic and national historic trails may only be designated by Congress. Several national trails cross units of the National Wildlife Refuge System.
National Wildlife Refuge System Administration Act of 1966	Prior to 1966, there was no single federal law that governed the administration of the various national wildlife Refuges that had been established. This Act defines the National Wildlife Refuge System and authorizes the Secretary of the Interior to permit any use of a Refuge provided such use is compatible with the major purposes(s) for which the Refuge was established.
National Wildlife Refuge System Improvement Act of 1997	This Act amends the National Wildlife Refuge System Administration Act of 1966. This Act defines the mission of the National Wildlife Refuge System, establishes the legitimacy and appropriateness of six priority wildlife-dependent public uses, establishes a formal process for determining compatible uses of Refuge System lands, identifies the Secretary of the Interior as responsible for managing and protecting the Refuge System, and requires the development of a comprehensive conservation plan for all Refuges outside of Alaska.
Native American Graves Protection and Repatriation Act of 1990	Requires federal agencies and museums to inventory, determine ownership of, and repatriate certain cultural items and human remains under their control or possession. The Act also addresses the repatriation of cultural items inadvertently discovered by construction activities on lands managed by the agency.
Neotropical Migratory Bird Conservation Act of 2000	Establishes a matching grant program to fund projects that promote the conservation of neotropical migratory birds in the united States, Latin America, and the Caribbean.

STATUE	DESCRIPTION
North American Wetlands Conservation Act of 1989	Provides funding and administrative direction for implementation of the North American Waterfowl Management Plan and the Tripartite Agreement on wetlands between Canada, the United States, and Mexico. The North American Wetlands Conservation Council was created to recommend projects to be funded under the Act to the Migratory Bird Conservation Commission. Available funds may be expended for up to 50 percent of the United States' share cost of wetlands conservation projects in Canada, Mexico, or the United States (or 100 percent of the cost of projects on federal lands).
Refuge Recreation Act of 1962, as amended	This Act authorizes the Secretary of the Interior to administer Refuges, hatcheries, and other conservation areas for recreational use, when such uses do not interfere with the area's primary purposes. It authorizes construction and maintenance of recreational facilities and the acquisition of land for incidental fish and wildlife-oriented recreational development or protection of natural resources. It also authorizes the charging of fees for public uses.
Partnerships for Wildlife Act of 1992	Establishes a Wildlife Conservation and Appreciation Fund to receive appropriated funds and donations from the National Fish and Wildlife Foundation and other private sources to assist the state fish and game agencies in carrying out their responsibilities for conservation of non-game species. The funding formula is no more that 1/3 federal funds, at least 1/3 foundation funds, and at least 1/3 state funds.
Refuge Revenue Sharing Act of 1935, as amended	Provided for payments to counties in lieu of taxes from areas administered by the Fish and Wildlife Service. Counties are required to pass payments along to other units of local government within the county, which suffer losses in tax revenues due to the establishment of Service areas.
Rehabilitation Act of 1973	Requires nondiscrimination in the employment practices of federal agencies of the executive branch and contractors. It also requires all federally assisted programs, services, and activities to be available to people with disabilities.
Rivers and Harbors Appropriations Act of 1899, as amended	Requires the authorization by the U.S. Army Corps of Engineers prior to any work in, on, over, or under a navigable water of the United States. The Fish and Wildlife Coordination Act provides authority for the Service to review and comment on the effects on fish and wildlife activities proposed to be undertaken or permitted by the Corps of Engineers. Service concerns include contaminated sediments associated with dredge or fill projects in navigable waters.

STATUE	DESCRIPTION
Sikes Act (1960), as amended	Provides for the cooperation by the Departments of Interior and Defense with state agencies in planning, development, and maintenance of fish and wildlife resources and outdoor recreation facilities on military reservations throughout the United States. It requires the Secretary of each military department to use trained professionals to manage the wildlife and fishery resource under his jurisdiction, and requires that federal and state fish and wildlife agencies be given priority in management of fish and wildlife activities on military reservations.
Transfer of Certain Real Property for Wildlife Conservation Purposes Act of 1948	This Act provides that upon determination by the Administrator of the General Services Administration, real property no longer needed by a federal agency can be transferred, without reimbursement, to the Secretary of the Interior if the land has particular value for migratory birds, or to a state agency for other wildlife conservation purposes.
Transportation Equity Act for the 21st Century (1998)	Established the Refuge Roads Program, requires transportation planning that includes public involvement, and provides funding for approved public use roads and trails and associated parking lots, comfort stations, and bicycle/pedestrian facilities.
Uniform Relocation and Assistance and Real Property Acquisition Policies Act (1970), as amended	Provides for uniform and equitable treatment of persons who sell their homes, businesses, or farms to the Service. The Act requires that any purchase offer be no less than the fair market value of the property.
Water Resources Planning Act of 1965	Established Water Resources Council to be composed of Cabinet representatives including the Secretary of the Interior. The Council reviews river basin plans with respect to agricultural, urban, energy, industrial, recreational and fish and wildlife needs. The act also established a grant program to assist States in participating in the development of related comprehensive water and land use plans.
Wild and Scenic Rivers Act of 1968, as amended	This Act selects certain rivers of the nation possessing remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values; preserves them in a free-flowing condition; and protects their local environments.
Wilderness Act of 1964, as amended	This Act directs the Secretary of the Interior to review every roadless area of 5,000 acres or more and every roadless island regardless of size within the National Wildlife Refuge System and to recommend suitability of each such area. The Act permits certain activities within designated wilderness areas that do not alter natural processes. Wilderness values are preserved through a “minimum tool” management approach, which requires Refuge managers to use the least intrusive methods, equipment, and facilities necessary for administering the areas.

STATUE	DESCRIPTION
Youth Conservation Corps Act of 1970	Established a permanent Youth Conservation Corps (YCC) program within the Departments of Interior and Agriculture. Within the Service, YCC participants perform many tasks on Refuges, fish hatcheries, and research stations.

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

EXECUTIVE ORDERS	DESCRIPTIONS
EO 12898, Environmental Justice (1994)	Requires federal agencies to identify and address disproportionately high and adverse effects of its programs, policies, and activities on minority and low-income populations.
EO 12906, Coordinating Geographical Data Acquisition and Access (1994), Amended by EO 13286 (2003). Amendment of EOs and other actions in connection with transfer of certain functions to Secretary of DHS.	Recommended that the executive branch develop, in cooperation with state, local, and tribal governments, and the private sector, a coordinated National Spatial Data Infrastructure to support public and private sector applications of geospatial data. Of particular importance to comprehensive conservation planning is the National Vegetation Classification System (NVCS), which is the adopted standard for vegetation mapping. Using NVCS facilitates the compilation of regional and national summaries, which in turn, can provide an ecosystem context for individual Refuges.
EO 12962, Recreational Fisheries (1995)	Federal agencies are directed to improve the quantity, function, sustainable productivity, and distribution of U.S. aquatic resources for increased recreational fishing opportunities in cooperation with states and tribes.
EO 13007, Native American Religious Practices (1996)	Provides for access to, and ceremonial use of, Indian sacred sites on federal lands used by Indian religious practitioners and direction to avoid adversely affecting the physical integrity of such sites.
EO 13061, Federal Support of Community Efforts Along American Heritage Rivers (1997)	Established the American Heritage Rivers initiative for the purpose of natural resource and environmental protection, economic revitalization, and historic and cultural preservation. The Act directs Federal agencies to preserve, protect, and restore rivers and their associated resources important to our history, culture, and natural heritage.
EO 13084, Consultation and Coordination With Indian Tribal Governments (2000)	Provides a mechanism for establishing regular and meaningful consultation and collaboration with tribal officials in the development of federal policies that have tribal implications.

EXECUTIVE ORDERS	DESCRIPTIONS
EO 13112, Invasive Species (1999)	Federal agencies are directed to prevent the introduction of invasive species, detect and respond rapidly to and control populations of such species in a cost effective and environmentally sound manner, accurately monitor invasive species, provide for restoration of native species and habitat conditions, conduct research to prevent introductions and to control invasive species, and promote public education on invasive species and the means to address them. This EO replaces and rescinds EO 11987, Exotic Organisms (1977).
EO 13186, Responsibilities of Federal Agencies to Protect Migratory Birds. (2001)	Instructs federal agencies to conserve migratory birds by several means, including the incorporation of strategies and recommendations found in Partners in Flight Bird Conservation plans, the North American Waterfowl Plan, the North American Waterbird Conservation Plan, and the United States Shorebird Conservation Plan, into agency management plans and guidance documents.

Appendix D. Public Involvement

SUMMARY OF PUBLIC SCOPING COMMENTS

A public scoping meeting was held on December 17, 2008, at the Sewee Visitor and Environmental Education Center in Awendaw, South Carolina. Meeting notices were published in the local newspapers; meeting notices were posted at the refuge; and invitations were mailed to approximately 65 individuals and groups. A total of 35 members of the public attended the meeting.

ISSUES IDENTIFIED

Internal:

- Control exotics, invasive and non-desirable plant communities on upland and wetland sites. To include developing partnerships with SCDNR, USGS, USDA, and other agencies or partnerships for funding and control of exotic species.
- Develop the refuge volunteer program to include volunteers to assist with the biological program including bird monitoring, water quality monitoring and/or other activities that volunteers could do depending on their level of expertise.
- Develop an understanding of local demographic changes with respect to how increased human population growth will impact user demand and impacts to refuge programs and resources (including prescribed fire smoke management).
- Make a determination of the condition of existing public use trails and other facilities and determine needed maintenance and improvements for safe, compatible, and appropriate uses.
- Achieve a full complement of staffing at the refuge.
- Install finger pier at Garris Landing to increase public safety while using the boat ramp.
- Define parking areas at Garris Landing parking lot to distinguish parking for passenger vehicles and vehicles with attached trailers.
- Improve the public dock at Bulls Island. Make the dock wider and eliminate the center post style.
- Implement water quality monitoring.
- Conduct periodic vegetation studies to track changes in vegetation and effectiveness of invasive exotic plant control efforts.
- Implement neotropical songbird surveys.
- Continue sea turtle monitoring and nest relocation on Cape, Lighthouse, and Bulls Islands.
- Increase number staff and/or volunteers to ensure success of biological monitoring and surveys.
- Obtain funding for sea turtle management efforts.

State:

- Sea turtle nesting program extremely important. Ensure continued funding.
- Habitat loss, fragmentation, and/or alteration.
- Human disturbance of critical bird nesting areas.
- Chemical contamination of species from pesticides and other sources.
- Non-native invasive species – both plant and animal.
- Prescribed fire to maintain fire-dependent habitats.
- Water quality.
- Air quality.
- Conversion of land uses from rural to urban due to increasing population.
- Potential for accelerated decline of vertebrate species.

- Increase baseline biological inventories with emphasis on natural history, distribution, and status of native species.
- Increase commitment by natural resource agencies, conservation organizations, and academia toward establishing effective conservations strategies.
- Funding and budgets for natural resource conservation.
- Create public-private partnerships and educational outreach programs for broad-scale conservation efforts.
- Quality hunting and fishing opportunities.

Public

- Effect of river dams on sediments replenishing beaches.
- FWS should address surrounding development and encroachment.
- Refuge should work with town of Awendaw on the Awendaw comprehensive plan.
- Refuge should participate in local and state government planning processes.
- Conduct studies regarding water quality impacts from roads and impervious surfaces.
- Perform erosion studies.
- Work closely with DHEC, DNR, and others to address erosion.
- Consider putting red wolves back on Bulls Island.
- Recruit citizens groups to help with wolf program (if re-initiated).
- Consider cross-dike at Jack's pond to prevent full-scale pond loss.
- Increase authority/jurisdiction of FWS to regulate development immediately adjacent to the refuge.
- Preserve Class I air quality.
- Develop educational materials to help residents and local governments understand the impacts of development related to the refuge and what could be done to help minimize impacts.
- Increase community outreach efforts.
- Need a plant survey of the refuge to inventory new plants and rare plants.
- Develop a list of "green jobs" on refuge to improve infrastructure.
- Identify research gaps/needs and special studies that would benefit refuge. Distribute list to agencies and universities.
- Consider future public access needs and associated management.
- Map invasive plants to identify problem areas and help target management efforts.
- Consider addressing offshore oil drilling and potential oil spills and onshore development related to drilling.
- Consider visual impacts of offshore drilling platforms.
- Seek funding for more comprehensive species monitoring.
- Increase partnerships with state agencies, parks, and management areas.
- Consider removing Bulls Island dikes to reduce costs and return to natural barrier island conditions (freshwater ponds on a barrier island is a losing proposition).
- Maintain the lighthouses to prevent destruction.
- Increase safety of Garris Landing boat ramp.
- Dredge the boat ramp channel at Garris Landing.

Appendix E. Appropriate Use Determinations

Cape Romain National Wildlife Refuge Appropriate Use Determinations

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

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

- Six wildlife-dependent recreational uses - As defined by the National Wildlife Refuge System Improvement Act of 1997, the six wildlife-dependent recreational uses (hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation) are determined to be appropriate. However, the refuge manager must still determine if these uses are compatible.

- Take of fish and wildlife under state regulations - States have regulations concerning take of wildlife that includes hunting, fishing, and trapping. The Service considers take of wildlife under such regulations appropriate. However, the refuge manager must determine if the activity is compatible before allowing it on a refuge.

Statutory Authorities for this policy:

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

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

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

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

Definitions:

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

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

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

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

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

- Promotes safety of participants, other visitors, and facilities.
- Promotes compliance with applicable laws and regulations and responsible behavior.
- Minimizes or eliminates conflicts with fish and wildlife population or habitat goals or objectives in a plan approved after 1997.
- Minimizes or eliminates conflicts with other compatible wildlife-dependent recreation.
- Minimizes conflicts with neighboring landowners.
- Promotes accessibility and availability to a broad spectrum of the American people.
- Promotes resource stewardship and conservation.

- Promotes public understanding and increases public appreciation of America's natural resources and the Service's role in managing and protecting these resources.
- Provides reliable/reasonable opportunities to experience wildlife.
- Uses facilities that are accessible and blend into the natural setting.
- Uses visitor satisfaction to help define and evaluate programs.

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

FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Cape Romain NWR

Use: Hunting

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

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

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

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

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

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

Not Appropriate_____ **Appropriate _X_**

Refuge Manager:_____ Date:_____

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

Refuge Supervisor:_____ Date:_____

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

FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Cape Romain NWR

Use: Beach Use

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

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

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

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

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

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

Not Appropriate_____ **Appropriate _X_**

Refuge Manager:_____ Date:_____

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

Refuge Supervisor:_____ Date:_____

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

FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Cape Romain NWR

Use: Environmental Education and Interpretation

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

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

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

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

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

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

Not Appropriate_____ **Appropriate _X_**

Refuge Manager:_____ Date:_____

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

Refuge Supervisor:_____ Date:_____

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

FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Cape Romain NWR

Use: Surf Fishing

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

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

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

If indicated, the refuge manager has consulted with State fish and wildlife agencies. **Yes _X_No ___**

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

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

Not Appropriate_____ **Appropriate _X_**

Refuge Manager:_____ Date:_____

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

Refuge Supervisor:_____ Date:_____

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

FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Cape Romain NWR

Use: Wildlife Observation and Photography

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

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

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

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

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

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

Not Appropriate_____ **Appropriate _X_**

Refuge Manager:_____ Date:_____

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

Refuge Supervisor:_____ Date:_____

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

FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Cape Romain NWR

Use: Bicycling

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

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

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

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

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

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

Not Appropriate_____ **Appropriate _X_**

Refuge Manager:_____ Date:_____

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

Refuge Supervisor:_____ Date:_____

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

Appendix F. Compatibility Determinations

Cape Romain National Wildlife Refuge Compatibility Determinations

Introduction: The Fish and Wildlife Service has reviewed several uses for compatibility during the process of developing the Comprehensive Conservation Plan for Cape Romain National Wildlife Refuge (NWR). The descriptions and anticipated impacts of each of these uses are addressed separately. However, the "Uses" through "Public Review and Comment" sections, the "Literature Cited" section, and the "Approval of Compatibility Determinations" section apply to each use. If one of these uses is considered outside of the Comprehensive Conservation Plan for Cape Romain NWR, then those sections become part of that compatibility determination.

Uses: The following uses were evaluated to determine their compatibility with the mission of the National Wildlife Refuge System and the purposes of the refuge: hunting, beach use, environmental education and interpretation, surf fishing, wildlife observation and photography, and bicycling.

Refuge Name: Cape Romain National Wildlife Refuge.

Date Established: 1932.

Establishing and Acquisition Authorities:

- Migratory Bird Conservation Act (16 U.S.C. 4601-4-4601-11)
- Fish and Wildlife Act of 1956 (16 U.S.C. 742a-742j, not including 742 d-l; 70 Stat. 1119)
- Refuge Recreation Act of 1962 (16 U.S.C. 406k-406k-4), as amended
- Wilderness Act of 1964, Public Law 88-577.

Refuge Purpose: Recognizing the high migratory bird benefits and recreational opportunities served by its lands and waters, Cape Romain NWR was established under the Migratory Bird Conservation Act, the Fish and Wildlife Act, and the Refuge Recreation Act, thus outlining the primary purposes of these lands and waters:

> "for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. 715d (Migratory Bird Conservation Act)
>
> "to conserve and protect migratory birds…and other species of wildlife that are listed…as endangered species or threatened species and to restore or develop adequate wildlife habitat." 16 U.S.C. 715i (Migratory Bird Conservation Act)
>
> "for the development, advancement, management, conservation, and protection of fish and wildlife resources ..." 16 U.S.C. 742f(a)(4) "... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ..." 16 U.S.C. 742f(b)(1) (Fish and Wildlife Act of 1956)

> "suitable for (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." 16 U.S.C. 406k-2 (Refuge Recreation Act (16 U.S.C. 406k-406k-4), as amended)

> "so as to provide protection of these areas…and to ensure…the preservation of their wilderness character…" (Wilderness Act of 1964, Public Law 88-577.)

National Wildlife Refuge System Mission:

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

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

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

Public Review and Comment: All compatibility determinations for Cape Romain NWR are provided for public review and comment during the Draft CCP/EA process.

Description of Use: Hunting

Bulls Island Archery Hunts

There are two 6-day archery hunts on Bulls Island held in early November and December. Each hunt runs consecutively from Monday through Saturday. The entire island is open to hunting except (1) within 100 feet of the Nature Trail; (2) within 100 feet of Beach Road; (3) in and around the camping area, service area, and residence; and (4) in posted closed areas. Legal game species during the archery hunts are white-tailed deer and raccoons. Population trends for all game species will continue to be monitored.

All state archery regulations pertaining to licensing, bag limits, weapons, and hunting hours apply. Each hunter must also sign and carry on his person the refuge hunt brochure and general permit.

A deer check station will be located next to the camping area. All deer will be checked prior to removal from the island. Biological data collected at the check station is vital to assessing the condition of the herd.

One staff member with law enforcement authority will be present on the island day and night. Law enforcement personnel will make periodic patrols in the hunt area to ensure hunters comply with federal and state regulations. All hunters are required to register at the check station prior to hunting or setting up their campsite. During registration, hunter licenses are checked, a hunter information register is kept, and information and regulations concerning the hunt are distributed. In order to ensure proper checkout, staff retain all hunter licenses.

Two refuge staff members are required to run the field operations and handle emergencies. On the Sunday prior to the hunt, three refuge staff are needed to handle the large number of hunters arriving to set up their campsites. Frequently, overtime will be required to staff the hunts.

Rail Hunt

All salt marsh areas of the refuge support clapper rails. The area open to the hunting of rails will include all of the salt marshes northeast of Venning Creek, excluding Cape Island, Lighthouse Island, and Mills Island. King, clapper, Virginia, and sora rails may be hunted. Clapper rails are the most common. Refuge staff members are needed to post the hunt area, provide hunters with hunt information, and to patrol the hunting area to ensure conformance with federal and state regulations and to assess hunting activity. The hunt area is open to the rail hunters without registering or checking out.

Availability of Resources: Operation and maintenance funds to support hunting are taken from the refuge's annual budget, which is adequate to sustain the program at the current level. Funds are needed annually to mow and fix roads, parking lots, and boat ramps; paint, repair, and replace signs; and develop and print brochures. Refuge rangers, law enforcement officers, and two maintenance personnel work on the island during the archery hunts. Their salaries are paid out of the refuge's operating budget, which is adequate to sustain the existing program.

Anticipated Impacts of the Use: The Bulls Island archery hunts or the rail hunt have not and are not expected to produce any long-term conflicts with endangered or other species. Temporary conflicts with other species in the hunting area occasionally result, but have not had any adverse effects on these species or their habitat.

Bulls Island is the major attraction for visitors to the refuge. Many outdoor recreational activities are available on the island, especially wildlife/wildlands observations, photography, and hiking. During the hunts, some visitors may not feel safe due to the use of weapons on the island. Others become upset that hunting is permitted on a refuge, which they perceive as a sanctuary for wildlife. The hunts are well publicized in local newspapers and state wildlife publications in order for hunters and non-hunters alike to plan their visits accordingly. For the safety of visitors on the island during the hunt, areas along the nature trail and Beach Road are closed to hunting. Also, non-hunters are discouraged from visiting Bulls Island during the archery hunts. No other refuge sponsored use, group public use, or interpretation activities are allowed on the island during the hunts.

The salt marshes of the refuge are relatively unused by the public. Most of the use in these areas relates to shellfish harvesting and fishing. Therefore, there has been little public use conflict during rail hunts.

Determination (check one below):

_____ Use is Not Compatible

__X__ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility: Along with appropriate federal and state regulations, certain refuge specific regulations apply for the two hunts.

- Hunters may camp in the designated camping area on Bulls Island from 9:00 a.m. on the day preceding the hunt until 12:00 p.m. of the day following the hunt.
- Hunters will be restricted to the camping area from 7:00 p.m. until 4:30 a.m.
- Each archery hunter must sign in at the registration table before setting up camp or starting to hunt, and demonstrate compliance with all state hunting requirements (i.e., valid state hunting license, hunter trainings).
- Hunting is prohibited within 100 feet of the nature trail and Beach Road.
- All deer must be checked out and does must be tagged prior to their removal from the island.
- Firearms and dogs are only permitted in the rail hunting areas.

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

NEPA Compliance for Refuge Use Description: *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:

Description of Use: Beach Use

Beach use, including activities such as swimming, sunning, and shell collecting, is a long standing traditional use on the refuge. These types of use are permitted on all refuge beaches except for Marsh Island, White Banks Island, and sections of Lighthouse and Cape Islands, which are closed to all public entry from February 15 to September 15 for nesting birds. Closed areas are posted with "Area Closed" signs. Beach use is permitted throughout the year during normal refuge hours, which is from one half hour before sunrise to one half hour after sunset.

Access to refuge beaches is provided by two boat-launching facilities; one is located at Garris Landing off Sewee Road in Awendaw, South Carolina, and the other is located at McClellanville Landing in McClellanville, South Carolina. A refuge concession shuttle boat launches from Garris Landing pier and provides access to Bulls Island for people without their own boats.

This activity gives refuge visitors the opportunity to experience relatively undisturbed oceanfront beaches. This habitat type is increasingly rare on the South Carolina coast because of widespread development.

Availability of Resources: Beach use costs very little to administer. The two boat landings are maintained for other administrative uses, and, as such, the costs are not attributed to this activity. The cost of maintaining these boat landing facilities is adequately covered at current funding levels.

Anticipated Impacts of the Use: Impacts of this use include litter and minor wildlife disturbance. Wildlife disturbance is generally limited to flushing small groups of feeding or resting shorebirds or sea birds to sites further down the beach. No impacts to air or water quality are expected. There will be little or no impacts to vegetation as the beaches are accessed by boat or by designated trails and roads. There are no long-term or cumulative impacts identified.

Determination (check one below):

_____ Use is Not Compatible

__X__ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility: Frequent patrols by refuge personnel will continue to ensure compliance with refuge regulations. Beaches will be monitored to enforce closed areas that are necessary to protect fragile habitats and limit disturbance to nesting birds. Levels of public use will be monitored to ensure that overuse does not occur. As this is predominately a qualitative rather than quantitative issue, use levels cannot be arbitrarily set. Action will be taken at such time as harmful impacts are identified.

Justification: Beach use gives refuge visitors the opportunity to experience relatively undisturbed oceanfront beach. This habitat type is rare on the South Carolina coast because of development pressures. This use is a traditional use of the refuge that began prior to refuge establishment.

NEPA Compliance for Refuge Use Description: *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:

Description of Use: Environmental Education and Interpretation

Environmental education and interpretation consist primarily of youth and adult education and interpretation of the natural resources of the refuge. Activities include onsite staff-led or teacher-led environmental education programs; offsite teacher-led classroom programs; teacher workshops; and interpretation of wildlife, habitat, other natural features, and/or management activities occurring on the refuge. These activities seek to increase the public's knowledge and understanding of wildlife and their habitats and to contribute to wildlife conservation and support of the refuge. Environmental education and interpretation have been identified in the National Wildlife Refuge System Improvement Act as priority public use activities, provided they are appropriate and compatible with the purposes for which the refuge was established.

The majority of environmental education and interpretation activities occur at the Sewee Visitor and Environmental Education Center and on Bulls Island. The center is located at 5821 Highway 17 North, in Awendaw, South Carolina. The Service and the USDA Forest Service jointly operate the center. The 9,000-square-foot facility contains hands-on exhibits, an auditorium, classrooms, and a book store. In addition, there is a red wolf enclosure and hiking trails.

Bulls Island provides an outdoor laboratory where students can see first-hand what they learned in the classroom. Schools and organizations can charter the concession boat for trips to Bulls Island or other parts of the refuge.

Availability of Resources: Environmental education programs have considerable costs associated with the programs. The Service, the USDA Forest Service, and the SEWEE Association share costs and staffing needs for education programs. The costs of administering these programs and maintaining the center is adequately covered at current funding levels.

Anticipated Impacts of the Use: Activities conducted at the center and off-site programs would not have any biological impacts on the refuge. Bulls Island programs may have minor short-term impacts on refuge resources; littering and minor wildlife disturbance are expected. There is little impact on air and water quality or other refuge resources from this activity. There are no long-term or cumulative impacts identified.

Determination (check one below):

_____ Use is Not Compatible

__X__ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility: These impacts will be minimized by limiting programs to times, seasons, or sites so as not to disturb wildlife during critical life cycle periods, limiting the number of program participants, and limiting the frequency of programs.

Justification: Environmental education is one of the wildlife-dependent priority public uses identified in the National Wildlife Refuge System Improvement Act. This activity supports one of the goals of the National Wildlife Refuge System, which is to "provide an understanding and appreciation of fish and wildlife ecology and man's role in his environment."

NEPA Compliance for Refuge Use Description: *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:

Description of Use: Surf Fishing

Angling for marine fishes from refuge beaches is permitted on refuge beaches except on Marsh Island, White Banks Island, and sections of Lighthouse Island and Cape Island, which are closed to public entry from February 15 to September 15 for nesting birds. These areas are clearly marked with "Area Closed" signs. Surf fishing is permitted year-round during normal refuge hours that are one half hour before sunrise to one half hour after sunset. All state fishing regulations apply.

Fishing has been identified as a priority wildlife-dependent activity under the National Wildlife Refuge System Improvement Act and is a traditional use at the refuge.

Availability of Resources: Surf fishing costs very little to administer and are adequately covered by the refuge's annual budget. The Garris Landing boat ramp is maintained for other administrative purposes, and, as such, the costs are not attributed to this activity.

Anticipated Impacts of the Use: Impacts of this use include litter and minor wildlife disturbance. Wildlife disturbance is generally limited to flushing small groups of feeding or resting shorebirds or sea birds to sites further down the beach. No impacts to air or water quality are expected. There will be little to no impact to vegetation as the beaches are accessed via boat or designated trails/roads. There are no long-term or cumulative impacts identified.

Determination (check one below):

_____ Use is Not Compatible

__X__ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility: Frequent patrols by refuge personnel will continue to ensure compliance with refuge regulations and state law (e.g., fishing license checks). Sensitive beach areas will be monitored to enforce closed areas that are necessary to protect fragile habitats and limit disturbance to nesting birds.

Justification: Fishing is a priority wildlife-dependent use under the National Wildlife Refuge System Improvement Act. It is a low-cost, low-impact activity that supports the refuge purpose of providing wildlife-dependent recreational opportunities.

NEPA Compliance for Refuge Use Description: *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:

Description of Use: Wildlife Observation and Photography

Wildlife observation and photography are considered simultaneously in this compatibility determination. Wildlife observation and photography have been identified in the National Wildlife Refuge System Improvement Act as priority wildlife-dependent recreational uses provided they are compatible with the purposes of the refuge.

Wildlife observation and photography may occur during daylight hours throughout all open areas of the refuge. Posted with “Closed Area” signs, certain portions of the refuge are closed to protect wildlife, such as during the migratory wintering waterfowl season. Observation areas are available on Bulls Island and provide excellent viewing opportunities. Refuge brochures and maps will provide the public with the locations of visitor facilities. Additional informational displays and maps are located at the refuge kiosk and visitor contact stations.

Availability of Resources: Operation and maintenance funds to support wildlife viewing and photography are taken from the refuge’s annual budget, which is adequate to sustain the program at the current level. Funds are needed annually to mow, grade, and repair roads open to the public; replace gravel on other public roads; repair and replace boardwalks and trails; paint, repair, and replace signs; and develop and print brochures.

Anticipated Impacts of the Use: *Short-term Impacts:* Impacts associated with wildlife observation activities can be divided into two categories, based on whether the activity occurs within or outside of a vehicle. In general, activities that occur outside of vehicles tend to increase the disturbance potential for most wildlife species (Klein 1993; Gabrielson and Smith 1995; Burger 1981; Pease et al.

2005). Wildlife observation trails and pullouts along the Jehossee Island Road have a greater potential for disturbing wildlife species. Among wetland habitats, out-of-vehicle approaches can reduce time spent foraging and can cause water birds to avoid foraging habitats adjacent to the out-of-vehicle disturbance (Klein 1993). One possible reason for this result is that vehicle activity is usually brief, while walking requires a longer period of time to cover the same distance. Similarly, walking on wildlife observation trails tends to displace birds and can cause localized declines in the richness and abundance of wildlife species (Riffell et al. 1996). Bicycling and people walking causes more disturbances to waterfowl than vehicles (Pease et al. 2005).

Wildlife photographers tend to have the largest disturbance impacts (Klein 1993; Morton 1995; Dobb 1998). While wildlife observers frequently stop their vehicles to view wildlife, wildlife photographers are much more likely to leave their vehicles and approach wildlife on foot (Klein 1993). Even a slow approach by wildlife photographers tends to have behavioral consequences to wildlife (Klein 1993). Other impacts include the potential for some photographers to remain close to wildlife for extended periods of time (Dobb 1998) and the tendency of casual photographers with low power lenses to get much closer to their subject than other activities would require (Morton 1995).

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

Determination (check one below):

_____ Use is Not Compatible

__X__ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility: By design, wildlife observation and photography should have minimal wildlife and habitat impacts. However, as use increases, wildlife impacts are more likely to occur. Evaluation of the sites and programs will be conducted annually to determine if objectives are being met, if habitat impacts are minimized, and if wildlife populations are not being adversely affected. If evidence of unacceptable impacts begins to appear, it will be necessary to change the activity or program, relocate the activity or program, or eliminate the program.

Stipulations that may be employed include:

- Establishing buffer zones that minimize disturbance around sensitive areas and establishing additional no-entry zones.
- Vegetation that effectively conceals visitors and provides cover for birds can help minimize impacts of people in busy areas.
- Impacts from wildlife viewing and photography can be reduced by providing observation blinds.

- Re-routing, modifying, or eliminating activities which have demonstrated direct wildlife impacts should also be employed.
- Education is critical for making visitors aware that their actions can have negative impacts on birds.
- Establishing well-marked trails where human use is more predictable will lessen wildlife impacts.

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

NEPA Compliance for Refuge Use Description: *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:

Description of Use: Bicycling

While not one of the six priority wildlife-dependent recreational uses listed in the National Wildlife Refuge System Administration Act, bicycling is a mode of transportation currently used to facilitate wildlife observation. As proposed, bike riding would occur only on designated roads and trails. This use occurs year-round and is only allowed on the roads on Bulls Island.

Availability of Resources: Operation and maintenance funds to support wildlife viewing are taken from the refuge's annual budget, which is adequate to sustain the program at the current level. Funds are needed annually to mow, grade, and fix roads open to the public; replace gravel on other public roads; repair, and replace boardwalks and trails; paint, repair, and replace signs; and develop and print brochures. The refuge will seek outside funding, grants, and partnerships to fund the development of bicycle paths.

Anticipated Impacts of the Use: A critical and objective evaluation of the potential effects that bicycles could have on the wildlife, habitat, and other public use activities is based on available information and best professional judgment. Although bicycling has the potential to have impacts, the focus is to minimize impacts. This is based on the impacts at the existing and projected levels of use.

Bicycling may be an appropriate form of transportation to view wildlife and has been approved in specific locations. However, bicycle riding takes several forms. For example, mountain biking, according to the International Mountain Bicycling Association (IMBA), is the sport of riding bicycles off

paved roads. It requires endurance and bike handling skills and is performed on dirt roads, fire breaks, access roads, and public trails. According to the IMBA, the sport is broken down into several categories: cross country, downhill, street, dirt jumping, and free riding. Several aspects of mountain biking are more similar to trail running than to regular bicycling (Wikipedia 2005).

Although wildlife viewing may be an incidental aspect of the mountain biking activity, it is not considered the main purpose or intent. Mountain bikers, joggers, and all-terrain vehicle riders may enjoy the outdoor setting found at the refuge, but the activity may conflict with other wildlife-dependent recreation activities, may disturb migratory birds, and is not specifically aimed at viewing wildlife. Therefore, mountain biking, along with other similar sport activities such as jogging, is not permitted.

Other forms of bike riding may be appropriate. The intent of some bike riders is wildlife viewing, and bicycle access on several refuge roads and rice field dikes is planned in the CCP. Bicycle riders are not permitted to ride on the refuge's hiking trails. This activity disturbs other trail users and will be eliminated from hiking trails or other areas where a conflict may occur.

Short-term Impacts: Wildlife disturbance relative to bicycle riding has been poorly studied with most references using other activities such as walking, hiking, and operating vehicles and their impacts on wildlife; therefore, bicycle impacts are inferred (unless noted). As noted in the wildlife observation and photography compatibility determination, the impacts associated with wildlife observation activities can be divided into two categories, based on whether the activity occurs within or outside of a vehicle. In general, activities that occur outside of vehicles (including bicycling) tend to increase the disturbance potential for most wildlife species (Klein 1993; Gabrielson and Smith 1995; Burger 1981; Pease et al. 2005). Out-of-vehicle activities along wildlife observation trails and pullouts along refuge roads and rice field dikes have the greatest potential for disturbing wildlife species. Among wetland habitats, out-of-vehicle approaches can reduce time spent foraging and can cause water birds to avoid foraging habitats adjacent to the out-of-vehicle disturbance (Klein 1993). One possible reason for this result is that the vehicle activity is usually brief, while out-of-vehicle activities, such as walking, require longer periods of time to cover the same distance. Similarly, walking on wildlife observation trails tends to displace birds and can cause localized declines in species richness and abundance (Riffell et al. 1996).

A study conducted at Back Bay National Wildlife Refuge indicated that jogging and bike riding in an open habitat, such as marshes where the activity is highly visible to wading birds, shorebirds, and waterfowl, is disruptive. As a result, marsh birds in open areas flee from joggers and bike riders (Laskowski et al. 1993). Wildlife may receive different cues from different modes of transportation, since wildlife do not flee as readily from cars, perhaps because the person is hidden in the vehicle and not perceived as a threat (Klein 1983). A 2005 study at Back Bay National Wildlife Refuge (Pease et al. 2005) compared five different human activities (e.g., motorized tram, slow-moving truck, fast-moving truck, bicyclist, and pedestrian) in relation to waterfowl disturbance. The study found that people walking and biking disturbed waterfowl more than vehicles.

Long-term Impacts: Considering the high level of use and variety of activities occurring at the refuge, appropriate solutions to minimize impacts need to be developed. For example, during the fall migration and the overwintering season, wildlife observation, wildlife photography, and environmental education and interpretation are all occurring simultaneously and are at the highest levels of the year. Refuge hunts are planned before the primary migratory waterfowl use period. Techniques to limit disturbance must be evaluated, implemented, and monitored. This stems from the hypothesis that prolonged and extensive disturbance may cause migratory birds to abandon the wetlands most disturbed by humans and winter elsewhere. Current use may not be at a level to cause this shift, but anticipated increases relative to urban expansion, human population growth, and increased visitor opportunities could result in seasonal

shifts in migratory bird use of the refuge wetland habitats. Bicycling would add to the level of disturbance, especially in wetland habitats, and strategies need to be implemented to limit wildlife impacts.

Determination (check one below):

_____ Use is Not Compatible

__X__ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility: All forms of wildlife observation should have minimal wildlife and habitat impacts. However, bicycling can cause wildlife impacts near wetland areas, can increase wildlife impacts, and can disrupt other individuals viewing wildlife. Bicycles will not be permitted on established hiking trails. Bicycling on the refuge's roads and rice field dikes has not reached a level where disturbance is occurring to wildlife or other individuals participating in wildlife observation. However, as use of the areas or other trails increase, bicycling could become a greater disruption to wildlife or other visitors. Evaluation of bike riding on roads and rice field dikes open to biking will be conducted annually to assess if objectives are being met, if habitat impacts are within a tolerable range, and if wildlife populations are not being adversely affected. If evidence of unacceptable impacts begins to appear, it may be necessary to change the activity or program, relocate the activity or program, or eliminate the program.

Stipulations that might be employed include:

- Establishing buffer zones that minimize disturbance around sensitive areas and establishing additional no-entry zones.
- Vegetation that effectively conceals visitors and provides cover for birds can help minimize impacts of people.
- Impacts from wildlife viewing can be reduced by providing observation blinds.
- The establishment of stay in your vehicle zones could further reduce disturbance on the refuge roads and dikes or provide seasonal-only access to sensitive areas.
- Techniques specific to bicycling will include re-routing, modifying, or eliminating bicycle riding activities which have demonstrated direct wildlife impacts near wetland habitats.
- Education is critical for making bicycle riders aware that their actions can have negative impacts on birds.
- Establishing well-marked bike trails (roads and dikes) where this use is allowed and contained.

Justification: Bicycling to observe wildlife facilitates priority public uses of the National Wildlife Refuge System. Providing opportunities for these activities help fulfill provisions of the National Wildlife Refuge System Improvement Act. Wildlife observation from bicycles in areas where there are few impacts to wildlife would provide an appropriate mode of transportation and promote increased awareness, understanding, and support of refuge resources and programs. The stipulations outlined above should minimize potential impacts relative to wildlife/human interactions. At the current level of visitation, bicycling does not seem to conflict with the national policy to maintain the biological diversity, integrity, and environmental health of the refuge.

NEPA Compliance for Refuge Use Description:

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

Mandatory 10-Year Re-evaluation Date:

Bauer, H.G., H. Stark, and P. Grenzel. 1992. Disturbance factors and their effects on water birds wintering in the western parts of Lake Constance. *Der Ornithologische Beobachter* 89:81-91.

Bergman, R.D. 1973. Use of southern boreal lakes by post-breeding canvasbacks and redheads. *Journal of Wildlife Management* 37:160-170.

Burger, J. 1981. The effects of human activity on birds at a coastal bay. *Biological Conservation* 21:231-241.

Burger, J. 1995. Beach recreation and nesting birds. Pages 281-295 in T.L. Knight and K.J. Gutzwiller, eds., *Wildlife and Recreationists: Coexistence through Management and Research.* Island Press, Washington, D.C. 372 pp.

Dahlgren, R.B. and C.E. Korschgen. 1992. *Human Disturbance of Waterfowl: An Annotated Bibliography.* Resource Publication 188, U.S. Fish and Wildlife Service, Washington D.C. 62 pp.

Dobb, E. 1998. Reality check: the debate behind the lens. *Audubon* Jan.-Feb. 1998.

Gabrielson, G.W. and E.N. Smith. 1995. Physiological responses of wildlife to disturbance. Pages 95-107 in R.L. Knight and K.J. Gutzwiller, eds., *Wildlife and Recreation: Coexistence through Management and Research.* Island Press, Washington, D.C. 372 pp.

Hume, R.A. 1976. Reaction of goldeneyes to boating. *British Birds* 69:178-179.

Jackson, Jeremy, B.C. Kirby, Michael Berger, H. Wolfgang and A. Bjorndal. 2001. Historical overfishing and the recent collapse of coastal ecosystems. *Science* 293: 629-638.

Jahn, L.R and R.A. Hunt. 1964. *Duck and Coot Ecology and Management in Wisconsin.* Wisconsin Conservation Department, Technical Bulletin No. 33. 211 pp.

Kahl, R. 1991. Boating disturbance of canvasbacks during migration at Lake Poygan, Wisconsin. *Wildlife Society Bulletin* 19: 242-248.

Klein, M.L. 1993. Waterbird behavior responses to human disturbances. *Wildlife Society Bulletin* 21: 31-39.

Knight, R.L. and D.N. Cole. 1995. Wildlife responses to recreationists. Pages 71-79 in R.L. Knight and K.J. Gutzwiller, eds., *Wildlife and Recreation: Coexistence thorough Management and Research.* Island Press. Washington, D.C. 372 pp.

Korschgen, C.E. and R.B. Dahlgren. 1992. *Human Disturbance of Waterfowl: Causes, Effects and Management.* U.S. Fish and Wildlife Service Leaflet 13.2.15. 7 pp.

Korschgen, C.E., L.S. George and W.L. Green. 1985. Disturbance of diving ducks by boaters on a migrational staging area. *Wildlife Society Bulletin* 13: 290-296.

Laskowski, H., T. Leger, J. Gallegos and F. James. 1993. Behavior Response of Greater Yellowlegs, Snowy Egrets and Mallards to Human Disturbance at Back Bay National Wildlife Refuge. Unpublished Report #51510-01-92. U.S. Fish and Wildlife Service, Washington, D.C. 25 pp.

Morton J.M. 1995. Management of human disturbance and its effects on waterfowl. Pages F59-F86 in W. R. Whitman, T. Strange, L. Widjeskog, R. Whittemore, P. Kehoe and L. Roberts, eds., *Waterfowl Habitat Restoration, Enhancement and Management in the Atlantic Flyway.* Third Edition. Environmental Management Committee, Atlantic Flyway Council Technical Section and Delaware Division of Fish and Wildlife, Dover, Delaware.

Pease, M.L., R.K. Rose and M.J. Butler. 2005. Effects of human disturbances on the behavior of wintering ducks. *Wildlife Society Bulletin* 33(1): 103-112.

Riffell, S.K., J. Gutzwiller and S.H. Anderson. 1996. Does repeated human intrusion cause cumulative declines in avian richness and abundance? *Ecological Applications* 6(2): 492-505.

Rodgers, J.A. Jr. and H.T. Smith. 1997. Buffer zone disturbances to protect foraging and loafing waterbirds from human disturbances in Florida. *Wildlife Society Bulletin* 25(1): 139-145.

Rodgers, J.A. Jr. and S.T. Schwikert. 2002. Buffer-zone distances to protect foraging and loafing waterbirds from disturbance by personal watercraft and outboard-powered boats. *Conservation Biology* 16(1): 216-224.

Skagen, S.K. 1980. Behavioral response of wintering bald eagles to human activity on the Skagit River, Washington. Pages 231-241 in R.L. Knight, G.T. Allen, M.V. Stalmaster and C.W. Servhenn, eds., *Proceedings of the Washington Bald Eagle Symposium.* The Nature Conservancy, Seattle, Washington.

Speight, M.C.D. 1973. *Outdoor Recreation and its Ecological Effects: A Bibliography and Review.* University College of London, London, England. Discussion Papers in Conservation 4. 35 pp.

Sterling, T. and A. Dzubin. 1967. Canada goose molt migrations to the Northwest Territories. *Transactions of the North American Research Conference* 32:367-369.

Thornburg, D.D. 1973. Diving Ducks Movement on Keokuk Pool, Mississippi River. Journal of Wildlife Management 37: 382-389.

Wikipedia. 2005. Mountain Biking. <http://en.wikipedia.org/wiki/Mountain.biking>.

Approval of Compatibility Determinations

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

Refuge Manager: _____
(Signature/Date)

Regional Compatibility Coordinator: _____
(Signature/Date)

Refuge Supervisor: _____
(Signature/Date)

Regional Chief, National Wildlife Refuge System, Southeast Region: _____
(Signature/Date)

Appendix G. Intra-Service Section 7 Biological Evaluation

Originating Person: Kevin Godsea
Telephone Number: 843-928-3264 E-Mail: Kevin_Godsea@fws.gov
Date: 10/20/09

PROJECT NAME (Grant Title/Number): Cape Romain 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:
U.S. Fish and Wildlife Service

III. Station Name:
- **Cape Romain NWR**

IV. Description of Proposed Action (attach additional pages as needed):

The proposed action would result in the implementation of the Comprehensive Conservation Plan (CCP) for Cape Romain NWR, a 66,287 acre Refuge comprised of barrier islands along the coast of South Carolina. Approval and subsequent implementation of the CCP will direct management actions on the Refuge 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[1]
Loggerhead Sea Turtle	T
West Indian Manatee	E
Wood Stork	E
Piping Plover & designated critical habitat	T
Red Wolf	E
Seabeach Amaranth	T

[1]*STATUS: E=endangered, T=threatened, PE=proposed endangered, PT=proposed threatened, CH=critical habitat, PCH=proposed critical habitat, C=candidate species*

VI. Location (attach map):

A. Ecoregion Number and Name:
Ecoregion #33 – Savannah-Santee-Pee Dee Ecosystem

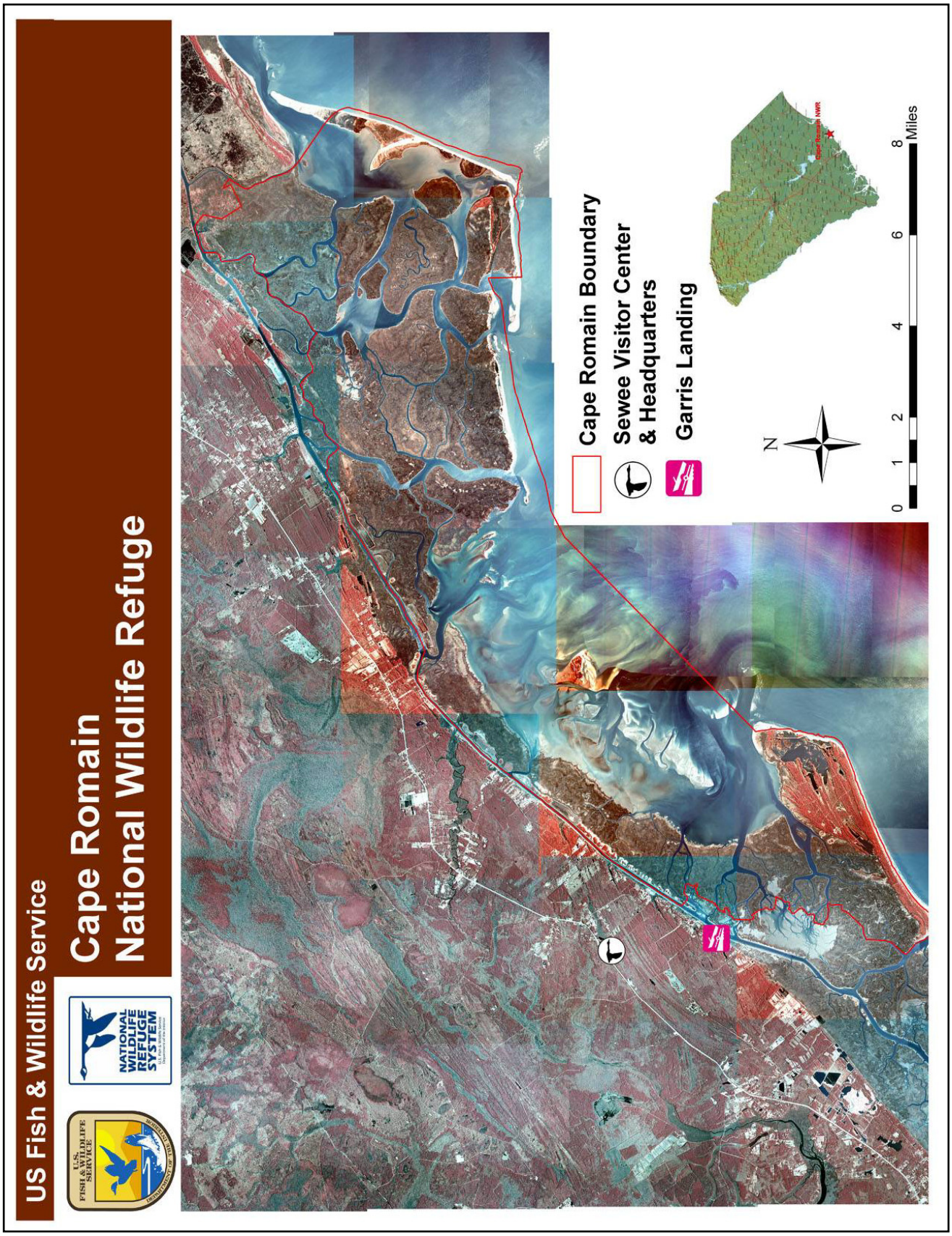
B. County and State:
Charleston County, South Carolina

C. Section, township, and range (or latitude and longitude):
32° 55' 54.5", -79° 34' 30.2"

D. Distance (miles) and direction to nearest town:
Awendaw, South Carolina, (City Hall 2 miles north). Mount Pleasant, SC, 15 miles south.

E. Species/habitat occurrence:

Loggerhead Sea Turtle – habitat and species both occur
West Indian Manatee – potential habitat present but species not known to occur
Woodstork - habitat and species both occur
Piping Plover – designated critical habitat and species both occur
Red Wolf – species in captivity occur
Seabeach Amaranth – habitat and species both occur


US Fish & Wildlife Service
Cape Romain
National Wildlife Refuge
NATIONAL WILDLIFE REFUGE SYSTEM
FISH & WILDLIFE SERVICE
Cape Romain Boundary
Sewee Visitor Center
& Headquarters
Garris Landing
N
0
1
2
4
6
8
Miles

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
Loggerhead Sea Turtle	Reduction in impacts through increased recovery efforts, habitat monitoring, education, cooperation with partners, and increased staff.
West Indian Manatee	No impacts anticipated on refuge lands; reduction in impacts through increased boating awareness, education, and cooperation with partners.
Wood Stork	No impacts anticipated on refuge lands; reduction in impacts through increased habitat monitoring, education, cooperation with partners, and increased staff.
Piping Plover	Reduction in impacts through increased recovery efforts, education, cooperation with partners, and increased staff.
Red Wolf	No impacts anticipated on refuge lands; reduction in impacts through increased habitat monitoring and protection, education, cooperation with partners, and increased staff.
Seabeach Amaranth	Reduction in impacts through increased habitat monitoring, education, cooperation with partners, and increased staff.

B. Explanation of actions to be implemented to reduce adverse effects:

SPECIES/ CRITICAL HABITAT	ACTIONS TO MITIGATE/MINIMIZE IMPACTS
Loggerhead Sea Turtle	Additional staff to conduct surveys and increase law enforcement efforts. Increased outreach for education.
West Indian Manatee	Additional monitoring efforts and law enforcement.
Wood Stork	Increased water quality monitoring efforts; additional staff to conduct surveys and increase law enforcement efforts.
Piping Plover	Additional staff to conduct surveys and increased law enforcement. Increased outreach for education
Red Wolf	Continuation of captive breeding program. Increased outreach for education.
Seabeach Amaranth	Additional staff to conduct surveys and increase law enforcement efforts. Increased outreach for education.

VIII. Effect Determination and Response Requested:

SPECIES/ CRITICAL HABITAT	DETERMINATION[1]			RESPONSE[1] REQUESTED
	NE	NA NANA	AA AA	
Loggerhead Sea Turtle		X		
West Indian Manatee		X		
Wood Stork		X		
Piping Plover		X		
Red Wolf		X		
Seabeach Amaranth		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".

_____ _____
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):

_____ _____
Signature **Date**

_____ _____
Title **Office**

Appendix H. Wilderness Review

The Wilderness Act of 1964 defines a wilderness area as an area of federal land that retains its primeval character and influence, without permanent improvements or human inhabitation, and is managed so as to preserve its natural conditions and which:

1. generally appears to have been influenced primarily by the forces of nature, with the imprint of man's work substantially unnoticeable;

2. has outstanding opportunities for solitude or primitive and unconfined types of recreation;

3. has at least 5,000 contiguous roadless acres or is of sufficient size to make practicable its preservation and use in an unimpeded condition; or is a roadless island, regardless of size;

4. does not substantially exhibit the effects of logging, farming, grazing, or other extensive development or alteration of the landscape, or its wilderness character could be restored through appropriate management at the time of review; and

5. may contain ecological, geological, or other features of scientific, educational, scenic, or historic value.

The lands within Cape Romain NWR were reviewed for their suitability in meeting the criteria for wilderness, as defined by the Wilderness Act of 1964.

The wilderness review identified Jeremy Island (acquired in 2004) as meeting the basic requirements for wilderness—namely a "roadless island of any size." However, this island could not be practicably managed as wilderness because of its location in close proximity to the town of McClellanville and very active boat traffic. Further, a substantial commercial shrimping industry operates out of the marina with heavy shrimp boat activity. This heavy public use adjacent to the island prevents opportunities for individuals to enjoy solitude or a primitive and unconfined recreational experience. Jeremy Island is also an ideal location to place water quality, tide, and air quality monitoring stations that will be important for monitoring changes to the Refuge environment related to climate change and sea level rise.

Cape Romain NWR currently manages approximately 28,220 acres of designated wilderness.

Congressionally Designated Wilderness

The National Wilderness Preservation System is a network of federally owned areas designated by Congress as wilderness and managed by one of four federal agencies: the Service, Bureau of Land Management, National Park Service, or the USDA Forest Service. More than 70 designated wilderness areas, totaling 20.7 million acres, are currently found on 63 national wildlife refuges. This represents approximately 22 percent of the National Wilderness Preservation System.

The Service administers wilderness areas within the Refuge System consistent with refuge purposes and in accordance with the Wilderness Act (16 U.S.C. 1131-1136), and the specific legislation designating a particular wilderness area. The purposes of the Wilderness Act are to: secure an enduring resource of wilderness; protect and preserve the wilderness character of areas within the National Wilderness Preservation System; and administer areas for the use and enjoyment of the

American people in a way that will leave these areas unimpaired for future use and enjoyment as wilderness. Wilderness purposes are “within and supplemental” to refuge establishing purposes. They become additional purposes of the area within the refuge designated as wilderness.

Preserving wilderness character is a primary criterion for judging the appropriateness of proposed refuge management activities and refuge uses, including public use and enjoyment in wilderness. Preserving wilderness character requires that we maintain both the tangible and intangible aspects of wilderness.

Section 4(c) of the Wilderness Act prohibits commercial enterprises and permanent roads within wilderness. Commercial services, such as outfitter and guide services, are permitted only when they are “necessary for activities which are proper for realizing the recreational or other wilderness purposes of the areas.” We may allow commercial services where they are necessary to accomplish the purposes of the refuge, including Wilderness Act purposes.

Section 4(c) of the Wilderness Act also lists a number of "generally prohibited uses" in wilderness: temporary roads, use of motor vehicles, use of motorized equipment or motorboats, landing of aircraft, other forms of mechanical transport, and structures or installations. We do not authorize generally prohibited uses in refuge wilderness except when the use is: allowed under the terms of the area-specific wilderness legislation and the Wilderness Act; the minimum requirement for administering the area as wilderness and necessary to accomplish the purposes of the refuge, including Wilderness Act purposes; or an emergency involving the health and safety of persons within the area.

The Service conducts and documents a "minimum requirement analysis" for all proposed refuge management activities whether or not the activity involves a generally prohibited use. The minimum requirement analysis clarifies the need for and impacts of a proposed action. The Service authorizes an activity only if it is demonstrated that the activity is necessary to meet the minimum requirement for administering the area as wilderness and necessary to accomplish the purposes of the refuge, including Wilderness Act purposes. The management alternative that has the least impact upon all of the area’s wilderness values and character, including intangible aspects of wilderness character, and accomplishes refuge purposes, including wilderness purposes, constitutes the minimum requirement. The Service does not use cost or convenience as the main factor in determining the minimum requirement or minimum tool. Furthermore, the Service will attempt to use primitive tools when possible.

Appendix I. Refuge Biota

BIRDS

Common Name	Scientific Name
LOONS	
Common Loon	Gavia immer
GREBES	
Pied-billed Grebe	Podilymbus podiceps
PELICANS AND ALLIES	
Double-crested Cormorant	Phalacrocorax auritus
Anhinga	Anhinga anhinga
Brown Pelican	Pelecanus occidentalis
HERONS, EGRETS AND ALLIES	
American Bittern	Botaurus lentiginosus
Least Bittern	Ixobrychus exilis
Great Blue Heron	Ardea herodias
Great Egret	Ardea alba
Snowy Egret	Egretta thula
Little Blue Heron	Egretta caerulea
Tricolored Heron	Egretta tricolor
Cattle Egret	Bubulcus ibis
Green-backed Heron	Butorides striatus
Black-crowned Night-Heron	Nycticorax nycticorax
Yellow-crowned Night-Heron	Nycticorax violaceus
IBISES, SPOONBILL, STORK	
Glossy Ibis	Plegadis falcinellus
White Ibis	Eudocimus albus
Wood Stork	Mycteria americana

WATERFOWL

Fulvous Whistling-Duck	Dendrocygna bicolor
Tundra Swan	Cygnus columbianus
Snow Goose	Chen caerulescens
Canada Goose	Branta canadensis
Wood Duck	Aix sponsa
Green-winged Teal	Anas crecca
American Black Duck	Anas rubripes
Mottled Duck	Anas fulvigula
Mallard	Anas platyrhynvchos
Northern Pintail	Anas acuta
Blue-winged Teal	Anas discors
Northern Shoveler	Anas clypeata
Gadwall	Anas strepera
American Wigeon	Anas americana
Canvasback	Aytha valisineria
Redhead	Aythya americana
Ring-necked Duck	Aythya collaris
Greater Scaup	Aythya marila
Lesser Scaup	Aythya affinis
Common Goldeneye	Bucephala clangula
Bufflehead	Bucephala albeola
Hooded Merganser	Lophodytes cucullatus
Common Merganser	Mergus merganser
Red-breasted Merganser	Mergus serrator
Ruddy Duck	Oxyura jamaicensis

VULTURES, HAWKS AND ALLIES

Black Vulture	Coragyps atratus
Turkey Vulture	Cathartes aura
Osprey	Pandion haliaetus
American Swallow-tailed Kite	Elanoides forficatus
Mississippi Kite	Ictinia mississippiensis
Bald Eagle	Haliaeetus leucocephalus
Northern Harrier	Circus cyaneus
Sharp-shinned Hawk	Accipiter striatus
Cooper's Hawk	Accipiter cooperii
Red-shouldered Hawk	Buteo lineatus
Broad-winged Hawk	Buteo platypterus
Red-tailed Hawk	Buteo jamaicensis
American Kestrel	Falco sparverius
Merlin	Falco columbarius
Peregrine Falcon	Falco peregrinus

GALLINACEOUS BIRDS

Wild Turkey	Meleagris gallopavo
Northern Bobwhite	Colinus virginianus

RAILS, GALLINULES, COOTS AND CRANES	
Clapper Rail	Rallus longirostris
Black Rail	Laterallus jamaicensis
King Rail	Rallus elegans
Virginia Rail	Rallus limicola
Sora	Porzana carolina
Purple Gallinule	Porphyrio martinica
Common Moorhen	Gallinula chloropus
American Coot	Fulica americana

SHOREBIRDS AND GULLS	
Killdeer	Charadrius vociferous
Greater Yellowlegs	Tringa melanoleuca
Lesser Yellowlegs	Tringa flavipes
Spotted Sandpiper	Actitis macularia
Common Snipe	Gallinago gallinago
American Woodcock	Scolopax minor
Laughing Gull	Larus atricilla
Ring-billed Gull	Larus delawarensis
Herring Gull	Larus argentatus
Caspian Tern	Sterna caspia
Royal Tern	Sterna maxima
Sandwich Tern	Sterna sandvicensis
Forster's Tern	Sterna forsteri
Least Tern	Sternula antillarum

PIGEONS, DOVES	
Rock Dove	Columba livia
Mourning Dove	Zenaida macroura
Common Ground-Dove	Columbina passerina

CUCKOOS	
Yellow-billed Cuckoo	Coccyzus americanus

OWLS	
Barn Owl	Tyto alba
Eastern Screech-Owl	Megascops asio
Great Horned Owl	Bubo virginianus
Barred Owl	Strix varia

GOATSUCKERS	
Common Nighthawk	Chordeiles minor
Chuck-will's-widow	Caprimulgus carolinensis
Whip-poor-will	Caprimulgus vociferus

SWIFTS, HUMMINGBIRDS	
Chimney Swift	Chaetura pelagica
Ruby-throated Hummingbird	Archilochus colubris
KINGFISHERS	
Belted Kingfisher	Megaceryle alcyon
WOODPECKERS	
Red-headed Woodpecker	Melanerpes erythrocephalus
Red-bellied Woodpecker	Melanerpes carolinus
Yellow-bellied Sapsucker	Sphyrapicus varius
Downy Woodpecker	Picoides pubescens
Hairy Woodpecker	Picoides villosus
Red-cockaded Woodpecker	Picoides borealis
Northern Flicker	Colaptes auratus
Pileated Woodpecker	Dryocopus pileatus
FLYCATCHERS	
Eastern Wood-Pewee	Contopus virens
Acadian Flycatcher	Empidonax virescens
Eastern Phoebe	Sayornis phoebe
Great Crested Flycatcher	Myiarchus crinitus
Eastern Kingbird	Tyrannus tyrannus
MARTINS AND SWALLOWS	
Purple Martin	Progne subis
Tree Swallow	Tachycineta bicolor
Northern Rough-winged Swallow	Stelgidopteryx serripennis
Barn Swallow	Hirundo rustica
JAYS AND CROWS	
Blue Jay	Cyanocitta cristata
American Crow	Corvus brachyrhynchos
Fish Crow	Corvus ossifragus
CHICKADEES AND TITMICE	
Carolina Chickadee	Parus carolinensis
Tufted Titmouse	Parus bicolor
NUTHATCHES	
White-breasted Nuthatch	Sitta carolinensis
Brown-headed Nuthatch	Sitta pusilla

WRENS	
Carolina Wren	Thryothorus ludovicianus
House Wren	Troglodytes aedon
Sedge Wren	Cistothorus platensis
Marsh Wren	Cistothorus palustris
KINGLETS AND GNATCATCHERS	
Golden-crowned Kinglet	Regulus satrapa
Ruby-crowned Kinglet	Regulus calendula
Blue-gray Gnatcatcher	Polioptila caerulea
BLUEBIRDS, THRUSHES AND ROBIN	
Eastern Bluebird	Sialia sialis
Veery	Catharus fuscescens
Swainson's Thrush	Catharus ustulatus
Hermit Thrush	Catharus guttatus
Wood Thrush	Hylocichla mustelina
American Robin	Turdus migratorius
THRASHERS	
Gray Catbird	Dumetella carolinensis
Northern Mockingbird	Mimus polyglottos
Brown Thrasher	Toxostoma rufum
PIPITS	
American Pipit	Anthus rubescens
WAXWINGS	
Cedar Waxwing	Bombycilla cedrorum
STARLINGS	
European Starling	Sturnus vulgaris
SHRIKES	
Loggerhead Shrike	Lanius ludovicianus
VIREOS	
White-eyed Vireo	Vireo griseus
Solitary Vireo	Vireo solitarius
Philadelphia Vireo	Vireo philadelphicus
Red-eyed Vireo	Vireo olivaceus

WARBLERS	
Northern Parula	Parula americana
Black-throated Blue Warbler	Dendroica caerulescens
Black-throated Green Warbler	Dendroica virens
Yellow-rumped Warbler	Dendroica coronata
Black-throated Gray Warbler	Dendroica nigrescens
Yellow-throated Warbler	Dendroica dominica
Pine Warbler	Dendroica pinus
Prairie Warbler	Dendroica discolor
Palm Warbler	Dendroica palmarum
Black-and-white Warbler	Mniotilta varia
American Redstart	Setophaga ruticilla
Prothonotary Warbler	Protonotaria citrea
Swainson's Warbler	Limnothlypis swainsonii
Ovenbird	Seiurus aurocapilla
Northern Waterthrush	Seiurus noveboracensis
Kentucky Warbler	Oporornis formosus
Common Yellowthroat	Geothlypos trichas
Hooded Warbler	Wilsonia citrine
Yellow-breasted Chat	Icteria virens

TANAGERS	
Summer Tanager	Piranga rubra
Scarlet Tanager	Piranga olivacea

NEW WORLD FINCHES	
Northern Cardinal	Cardinalis cardinalis
Blue Grosbeak	Passerina caerulea
Indigo Bunting	Passerina cyanea

SPARROWS	
Rufous-sided Towhee	Pipilo erythrophthalmus
Chipping Sparrow	Spizella passerine
Field Sparrow	Spizella pusilla
Henslow's Sparrow	Ammodramus henslowii
Vesper Sparrow	Pooecetes gramineus
Savannah Sparrow	Passerculus sandwichensis
Sharp-tailed Sparrow	Ammodramus caudacutus
Seaside Sparrow	Ammodramus maritimus
Song Sparrow	Melospiza melodia
Swamp Sparrow	Melospiza georgiana
White-throated Sparrow	Zonotrichia albicollis

BLACKBIRDS, GRACKLES, COWBIRDS AND ORIOLES	
Bobolink	Dolichonyx oryzivorus
Red-winged Blackbird	Agelais phoeniceus
Eastern Meadowlark	Sturnella magna
Rusty Blackbird	Euphagus carolinus
Boat-tailed Grackle	Quiscalus major
Common Grackle	Quiscalus quiscula
Brown-headed Cowbird	Molothrus ater
Orchard Oriole	Icterus spurious

OLD WORLD FINCHES	
Purple Finch	Carpodacus purpureus
American Goldfinch	Carduelis tristis

WEAVER FINCHES	
House Sparrow	Passer domesticus

MAMMALS

Big Brown Bat	Eptesicus fuscus
Red Bat	Lasiurus borealis
Seminole Bat	Lasiurus seminolus
Hoary Bat	Lasiurus cinereus
Evening Bat	Nycticeius humeralis
Silver-haired Bat	Lasionycteris noctivagans
Eastern Pipistrel	Pipistrellus subfiavus
Rafinesque's Big-eared Bat	Plecotus rafinesquii
Southeastern Myotis	Myotis austroriparius
Whitetail Deer	Odocoileus virginianus
Bobcat	Lynx rufus
Raccoon	Procyon lotor
Opossum	Didelphis marsupalis
Eastern Cottontail	Sylvilagus floridanus
Marsh Rabbit	Sylvilagus palustris
River Otter	Lutra canadensis
Mink	Mustela vison
Longtail Weasel	Mustela frenata
Beaver	Castor canadensis
Gray Fox	Urocyon cinereoargenteus
Southern Flying Squirrel	Glaucomys volans
Eastern Gray Squirrel	Sciurus carolinensis
Eastern Fox Squirrel	Sciurus niger
Golden Mouse	Peromyscus nuttalli
Eastern Woodrat	Neotoma floridana

Rice Rat	Oryzomys palustris
Hispid Cotton Rat	Sigmodon hispidus
Meadow Vole	Microtus pennsylvanicus
Pine Vole	Pitymys pinetorum
Norway Rat	Rattus norvegicus
Black Rat	Rattus rattus
Shorttail Shrew	Blarina brevicauda
Eastern Mole	Scalopus aquaticus
Black Bear	Ursus americanus

AMPHIBIANS AND REPTILES

American Alligator	Alligator mississippiensis
Common Snapping Turtle	Chelydra serpentina serpentina
Common Musk Turtle (Stinkpot)	Sternotherus odoratus
Striped Mud Turtle	Kinosternon bauri
Eastern Mud Turtle	Kinosternon subrubrum
Carolina Diamondback Terrapin	Malaclemys terrapin centrata
Spotted Turtle	Clemmys guttata
Eastern Chicken Turtle	Deirochelys reticularia reticularia
Florida Cooter	Chrysemys floridana
Yellowbelly Slider	Trachemys scripta scripta
Eastern Box Turtle	Terrapene carolina carolina
Gulf Coast Spiny Softshell	Trionyx spiniferus asperus
Green Anole	Anolis carolinensis
Southern Fence Lizard	Sceloporus undulates undulatus
Ground Skink	Scincella lateralis
Five-lined Skink	Eumeces fasciatus
Broadhead Skink	Eumeces laticeps
Southeastern Five-lined Skink	Eumeces inexpectatus
Six-lined Racerunner	Cnemidophrus sexlineatus sexlineatus
Eastern Glass Lizard	Ophisaurus ventralis
Eastern Slender Glass Lizard	Ophisaurus attenuatus longicaudus
Banded Water Snake	Natrix fasciata fasciata
Redbelly Water Snake	Natrix erythrogaster erythrogaster
Brown Water Snake	Natrix taxispilota
Glossy Crayfish Snake	Regina rigida
Carolina Black Swamp Snake	Seminatrix pygaea paludis
Eastern Garter Snake	Thamnophis sirtalis sirtalis
Eastern Ribbon Snake	Thamnophis sauritus. sauritus
Pine Wood Snake	Rhadinaea flavilata
Midland Brown Snake	Storeria dekayi
Florida Redbelly Snake	Storeria occipitomaculata
Rough Earth Snake	Virginia striatula
Eastern Earth Snake	Virginia valeriae valeriae
Southern Ringneck Snake	Diadophis punctatus punctatus
Southern Hognose Snake	Heterodon simus
Eastern Hognose Snake	Heterodon platyrhinos
Eastern Worm Snake	Carphophis amoenus amoenus
Northern Scarlett Snake	Cemophora copei copei

Rough Green Snake	Opheodrys aestivus
Rainbow Snake	Farancia erytrogramma erytrogramma
Eastern Mud Snake	Farancia abacura abacura
Southern Black Racer	Coluber priapus priapus
Eastern Coachwhip	Masticophis flagellum flagellum
Northern Pine Snake	Pituophis melanoleucus
Yellow Rat Snake	Elaphe obsoleta quadrivittata
Corn Snake	Elaphe guttata guttata
Eastern Kingsnake	Lampropeltis getulus getulus
Mole Kingsnake	Lampropeltis calligaster rhombomaculata
Scarlet Kingsnake	Lampropeltis traingulum elapsoides
Southeastern Crowned Snake	Tantilla coronata
Eastern Cottonmouth	Agkistrodon piscivorus piscivorus
Southern Copperhead	Agkistrodon contortrix
Eastern Coral Snake	Micrurus fulvius fulvius
Carolina Pygmy Rattlesnake	Sistrurus miliarius miliarius
Timber Rattlesnake	Crotalus horridus
Eastern Diamondback Rattlesnake	Crotalus adamanteus
Greater Siren	Siren lacertina
Eastern Lesser Siren	Siren intermedia intermedia
Broad-striped Dwarf Siren	Pseudobranchus striatus striatus
Two-toed Amphiuma	Amphiuma means
Dwarf Waterdog	Necturus punctatus
Broken-striped Newt	Notophthalmus viridescens dorsalis
Mole Salamander	Ambystoma talpoideum
Mabees Salamander	Ambystoma mabeei
Flatwoods Salamander	Ambystoma cingulatum
Eastern Tiger Salamander	Ambystoma tigrinum
Spotted Salamander	Ambystoma maculatum
Marbled Salamander	Ambystoma opacum
Southern Dusky Salamander	Desmognathus auriculatus
Eastern Mud Salamander	Pseudotriton montanus montanus
Many-lined Salamander	Stereocheilus marginatus
South Carolina slimy Salamander	Plethodon variolatus
Southern Two-lined Salamander	Eurycea cirrigera
Three-lined Salamander	Eurycea longicauda guttolineata
Dwarf Salamander	Eurycea quadridigitata
Eastern Spadefoot	Scaphiopus holbrookii holbrookii
Eastern Narrowmouth Toad	Gastrophryne carolinensis
Southern Toad	Bufo terrestris
Oak Toad	Bufo quercicus
Green Treefrog	Hyla cinerea
Pine Woods Treefrog	Hyla femoralis
Barking Treefrog	Hyla gratiosa
Squirrel Treefrog	Hyla squirella
Gray Treefrog	Hyla chrysoscelis
Northern Spring Peeper	Pseudacris crucifer crucifer
Brimleys Chorus Frog	Pseudacris brimleyi
Southern Chorus Frog	Pseudacris nigrita nigrita
Little Grass Frog	Pseudacris ocularis
Ornate Chorus Frog	Pseudacris ornata

Southern Cricket Frog	Acris gryllus gryllus
Pig Frog	Rana grylio
River Frog	Rana heckscheri
Carpenter Frog	Rana virgatipes
Bronze Frog	Rana clamitans clamitans
Bull Frog	Rana catesbeiana
Southern Leopard Frog	Rana utricularia
Carolina Gopher Frog	Rana capito capito
Pickerel Frog	Rana palustris

FISHES

Alewife	Alosa pseudoharengus
American Eel	Anguilla rostrata
American Shad	Alosa sapidissima
Atlantic Sturgeon	Acipenser oxyrhynchus
Banded Killfish	Fundulus diaphanous
Banded Pygmy Sunfish	Elassoma zonatum
Banded Sunfish	Enneacanthus obesus
Black Crappie	Pomoxis nigromaculatus
Blackbanded Sunfish	Enneacanthtus chaetodon
Blueback Herring	Alosa aestivalis
Bluegill	Lepomis macrochirus
Bluespotted Sunfish	Enneacanthus gloriosus
Bowfin	Amia calva
Broadtail Madtom	Noturus n sp.
Brook Silverside	Labidethes sicculus
Brown Bullhead	Ameiurus nebulosus
Carp	Cyprinus carpio
Carolina Pygmy Sunfish	Elassoma boehlkei
Chain Pickeral	Esox niger
Channel Catfish	Ictalurus punctatus
Coastal Shiner	Notropis petersoni
Creek Chubsucker	Erimyzon oblongus
Dollar Sunfish	Lepomis marginatus
Dusky Shiner	Notropis cummingsae
Eastern Mosquitofish	Gambusia holbrooki
Eastern Mudminnow	Umbra pygmaea
Everglades Pygmy Sunfish	Elassoma evergladei
Flat Bullhead	Ameiurus platycephalus
Flathead Catfish	Pylodictis olivaris
Flier	Centrarchus macropterus
Freshwater Goby	Gobionedllus schufeldti
Gizzard Shad	Dorosoma cepedianum
Golden Shiner	Notemigonus crysoleucas
Golden Topminnow	Fundulus chrysotus
Goldfish	Carassius auratus
Hickory Shad	Alosa mediocris
Hogchoker	Trinectes maculates
Ironcolor Shiner	Notropis chalybaeus

Lake Chubsucker	Erimyzon sucetta
Largemouth Bass	Micropterus salmoides
Least Killifish	Heterandria formosa
Lined Topminnow	Fundulus lineolatus
Longnose Gar	Lepisosteus osseus
Margined Madtom	Noturus insignis
Mud Sunfish	Acantharchus pomotis
Pirate Perch	Aphredoderus sayanus
Pumpkinseed	Lepomis gibbosus
Rainwater Killifish	Lucania parva
Red Drum	Sciaenops ocellatus
Redbreast Sunfish	Lepomis auritus
Redear Sunfish	Lepomis microlophus
Redfin Pickerel	Esox americanus americanus
Sawcheek Darter	Etheostoma serriferum
Shortnose Sturgeon	Acipenser brevirostrum
Silvery Minnow	Hybognathus nuchalis
Snail Bullhead	Ameiurus brunneus
Southern Flounder	Paralichthys lethostigma
Spottail Shiner	Notropis hudsonius
Spotted Sucker	Minytrema melanops
Spotted Sunfish	Lepomis punctatus
Striped Bass	Morone saxatilis
Striped Mullet	Mugil cephalus
Summer Flounder	Paralichthys dentatus
Swamp Darter	Etheostoma fusiforme fusiforme
Swamp Darter	Etheostoma fusiforme barratti
Swampfish	Chologaster cornuta
Tadpole Madtom	Noturus gyrinus
Taillight Shiner	Notropis maculates
Tarpon	Megalops atlanticus
Tessellated Darter	Etheostoma olmstedi
Threadfin Shad	Dorosoma petenense
V-lip Redhorse	Moxostoma papillosum
Warmouth	Lepomis gulosus
White Catfish	Ameiurus catus
White Perch	Morone americana
Yellow Bullhead	Ameiurus natalis
Yellow Perch	Perca flavescens

Appendix J. Budget Requests

(TO BE INCLUDED IN FINAL CCP)

Appendix K. List of Preparers

Kevin Godsea,
Refuge Manager, Cape Romain NWR

Raye Nilius,
Project Leader, South Carolina Lowcountry Refuge Complex

Van Fischer,
Natural Resource Planner, South Carolina Lowcountry Refuge Complex

Sarah Dawsey,
Wildlife Biologist, Cape Romain NWR

Ray Paterra,
Supervisory Park Ranger, South Carolina Lowcountry Refuge Complex

Patricia Lynch,
Park Ranger, Cape Romain NWR