DRAFT COMPREHENSIVE CONSERVATION PLAN AND ENVIRONMENTAL ASSESSMENT

WOLF ISLAND NATIONAL WILDLIFE REFUGE

McIntosh County, Georgia

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

Southeast Region

Atlanta, Georgia

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SECTION A. DRAFT COMPREHENSIVE CONSERVATION PLAN

I. Background

INTRODUCTION

The U.S. Fish and Wildlife Service (Service) has developed this Draft Comprehensive Conservation Plan and Environmental Assessment to provide a foundation for the management and use of Wolf Island National Wildlife Refuge in McIntosh County, Georgia. The plan is intended to serve as a working guide for the refuge's management programs and actions over the next 15 years. Fish and wildlife conservation will receive first priority in refuge management; wildlife-dependent recreational activities will be allowed and encouraged as long as they are compatible with, and do not detract from, the mission of the refuge or the purposes for which it was established.

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

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

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

PURPOSE AND NEED FOR THE PLAN

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

Specifically, the plan is needed to:

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

The plan also addresses the purposes for which the refuge was established:

- Provide protection and habitat for migratory birds.
- Provide protection and habitat for endangered and threatened species.
- Maintain the refuge as an undisturbed national wilderness area and Class I Airshed.

U.S. FISH AND WILDLIFE SERVICE

The U.S. Fish and Wildlife Service traces its roots to 1871 with 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 in the Department of Commerce and Labor in 1903.

The Service also traces its origins to 1886 through 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's Bureau of Fisheries was combined with the Department of Agriculture's Bureau of Biological Survey on June 30, 1940, and transferred to the Department of 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 U.S. Fish and Wildlife Service in 1974.

The Service is responsible for conserving, enhancing, and protecting fish and wildlife and their habitats for the continuing benefit of people through federal programs relating to wild birds, endangered species, certain marine mammals, inland sport fisheries, and specific fishery and wildlife research activities.

As part of its mission, the Service manages more than 540 national wildlife refuges covering more than 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, are 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, as defined by the National Wildlife Refuge System Improvement Act of 1997, is:

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

The National Wildlife Refuge System Improvement Act of 1997 established, for the first time, a clear legislative mission of wildlife conservation for the National Wildlife 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 this Act, approved plans will serve as guidelines for refuge management for the next 15 years. The Act states that each refuge shall be managed to:

- fulfill the mission of the National Wildlife Refuge System;
- fulfill the individual purposes of each refuge;
- consider the needs of wildlife first;
- fulfill the requirement of developing a comprehensive conservation plan for each unit of the Refuge System, and fully involve the public in the preparation of these plans;
- maintain the biological integrity, diversity, and environmental health of the Refuge System;
- 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
- retain the authority of refuge managers to determine compatible public uses.

The following describes a few examples of the Service's 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 overhunting, competition with cattle, and natural disasters decimated the once-abundant herds. The drought conditions of the Dust Bowl during the 1930s severely depleted breeding populations of ducks and geese. Refuges established during the Depression focused on waterfowl production areas, such as those that protected 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 began 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, the local communities receive significant economic benefits. In 2001, 82 million people 16 years and older either fished, hunted, or observed wildlife, generating $108 billion. In a study completed in 2002 on 15 refuges, visitation had grown 36 percent in 7 years. At the same time, the number of jobs generated in the surrounding communities grew to 120 per refuge, up from 87 jobs in 1995, pouring more than $2.2 million into the local economies. The 15 refuges in the 2002 study were Chincoteague (Virginia); National Elk (Wyoming); Crab Orchard (Illinois); Eufaula (Alabama); Charles M. Russell (Montana); Umatilla (Oregon); Quivira (Kansas); Mattamuskeet (North Carolina); Upper Souris (North Dakota); San Francisco Bay (California); Laguna Atacosa (Texas); Horicon (Wisconsin); Las Vegas (Nevada); Tule Lake (California); and Tensas River (Louisiana), the same refuges identified for the 1995 study. Other findings also validate the belief that communities near refuges benefit economically. Expenditures on food, lodging, and transportation grew to $6.8 million per refuge, up 31 percent from $5.2 million in 1995. For each federal dollar spent on the Refuge System, surrounding communities benefited with $4.43 in recreation expenditures and $1.42 in job-related income (Caudill and Laughland 2003).

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

All lands of the 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 plans will be consistent with sound resource management principles, practices, and legal mandates, including the Service's compatibility standards and other Service policies, guidelines, and planning documents.

LEGAL 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 National Wildlife Refuge System, congressional legislation, presidential executive orders, and international treaties. Policies for management options of refuges are further refined by administrative guidelines established by the Secretary of the Interior and by policy guidelines established by the Director of the Fish and Wildlife Service. The treaties and laws relevant to the administration of the Refuge System and management of national wildlife refuges are summarized in Appendix C.

These 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; and research and recreation on refuge lands. They also provide a framework for cooperation between Wolf Island National Wildlife Refuge and other partners, such as the Western Hemisphere Shorebird Reserve Network, private landowners, etc.

National Wildlife Refuge System lands are closed to public use unless specifically and legally opened. Wolf Island National Wildlife Refuge is one example of a refuge that is closed to public access. 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 the mandates of the National Wildlife Refuge System Improvement Act, including those that:

- contribute to ecosystem goals, as well as the purposes and goals for the refuge;
- conserve, manage, and restore fish, wildlife, and plant resources and their habitats;
- monitor the trends of fish, wildlife, and plants;
- manage and ensure appropriate wildlife-dependent visitor uses as those uses which benefit the conservation of fish and wildlife resources and which contribute to the enjoyment of the public; and
- ensure that visitor activities are compatible with refuge purposes.

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

BIOLOGICAL INTEGRITY, DIVERSITY, AND ENVIRONMENTAL HEALTH POLICY

The National Wildlife Refuge System Improvement Act directs the Service to ensure that the biological integrity, diversity, and environmental health of the refuges are maintained for the benefit of present and future generations of Americans. This policy is an additional directive for refuge managers to follow while achieving the purposes of the refuge and the mission of the System. It provides for the consideration and protection of the broad spectrum of fish, wildlife, and habitat resources found on the refuges and their 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; the refuge's role 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

Because many issues affecting the protection and management of natural resources transcend geopolitical boundaries, multiple partnerships have been developed among government and private entities to address the environmental problems affecting regions. A large amount of conservation and protection information defines the role of the refuge at the local, national, international, and ecosystem levels. Conservation initiatives include broad-scale planning and cooperation between affected parties to address the declining trends of natural, physical, social, and economic environments. The conservation plans and initiatives listed below, along with issues, problems, and trends, were reviewed and integrated where appropriate into this Draft Comprehensive Conservation Plan for Wolf Island National Wildlife Refuge.

Partners in Flight Bird Conservation Plan. Managed as part of the Partners in Flight Plan, the South Atlantic Coastal Plain physiographic area (in which Wolf Island is located) represents a scientifically based landbird conservation planning effort that ensures long-term maintenance of healthy populations of native landbirds, primarily nongame landbirds. Nongame landbirds have been vastly underrepresented in conservation efforts, and many are exhibiting significant declines. This plan is voluntary and nonregulatory, and focuses on relatively common species in areas where conservation actions can be most effective rather than the frequent local emphasis on rare and peripheral populations.

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

Western Hemisphere Shorebird Reserve Network. The Western Hemisphere Shorebird Reserve Network is a voluntary, nonregulatory coalition that identifies and promotes the conservation of crucial sites for shorebirds regardless of whether they are used during the breeding, migratory, or winter seasons. It was created in 1985 as an ambitious and visionary approach to addressing shorebird conservation needs. On October 9, 1999, the organization recognized the Altamaha River Delta in Glynn and McIntosh counties, Georgia, as the 40th major reserve for shorebirds. This designation highlights its importance as a stopover site for migratory and wintering birds traveling between the Artic and South America. The Georgia Department of Natural Resources estimates that this area supports at least 55,000 seabirds and shorebirds annually, and states, "There are very few places as valuable to such a large and diverse number of coastal birds in all the southeast United States."

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 that works to ensure the long-term health of North America's native bird populations. It fosters 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.

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

Northern American Waterbird Conservation Plan. The North American Waterbird Conservation Plan provides a framework for the conservation and management of 210 species of waterbirds in 29 nations. Threats to waterbird populations include destruction of inland and coastal wetlands; the introduction of 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.

National Wetlands Priority Conservation Plan. The objective of the National Wetlands Priority Conservation Plan (NWPCP) is to assist agencies in focusing their acquisition efforts on the more important, scarce and vulnerable wetlands in the Nation. The NWPCP was prepared by the Secretary of the Interior in consultation with the Administrator of the Environmental Protection Agency, the Secretary of Commerce, the Secretary of Agriculture, and the chief executive officer of each state in accordance with Section 301 of the Emergency Wetlands Resources Act. Section 301 mandates that the Secretary of the Interior shall establish, and periodically review and revise, a national wetlands priority conservation plan which shall specify, on a region-by-region basis or other basis considered appropriate by the Secretary, the types of wetlands and interests in wetlands which should be given priority with respect to federal and state acquisition.

Waterbird Conservation for the Americas. The Waterbird Conservation for the Americas (*Conservación de las Aves Acuáticas de las Américas*) is an independent partnership of individuals and institutions having an interest and responsibility for the conservation of waterbirds and their habitats in the

Americas. The partnership was created to support a vision in which the distribution, diversity, and abundance of populations and habitats of breeding, migratory, and nonbreeding waterbirds are sustained or restored throughout the lands and waters of North America, Central America, and the Caribbean. In 2004, the Waterbird Conservation for the Americas initiated a project to gather and assess information in order to strategically advance conservation for critically threatened waterbird species and sites in Central America, the Caribbean and South America. This information will be used to raise awareness among decision-makers and representatives from key governments and nongovernmental agencies of the increasing threats to waterbirds and their habitats, and to inform future monitoring and management of these resources throughout the entire Western Hemisphere.

RELATIONSHIP TO STATE WILDLIFE AGENCY

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

The Georgia Department of Natural Resources' Wildlife Resources Division (WRD) is a state-partnering agency with the Service. The WRD is charged with enforcement responsibilities for migratory birds and endangered species, as well as managing the state's natural resources and wildlife management areas. The WRD coordinates the state's wildlife conservation program and provides public recreation opportunities on state wildlife management areas. The WRD'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 Georgia. An essential part of the comprehensive planning process is the integration of common mission objectives between the Service and the State of Georgia, where appropriate.

In December 2002, the WRD began a process to develop a Comprehensive Wildlife Conservation Strategy (CWCS) for Georgia. Through its Wildlife Conservation and Reinvestment Program, the WRD made a commitment to develop and begin implementation of this CWCS by October 1, 2005. Funding for this planning effort came from a federal grant to WRD through the State Wildlife Grant Program, with matching funds provided through Georgia's Nongame Wildlife Conservation Fund. The goal of the CWCS is to conserve Georgia's animals, plants, and natural habitats through proactive measures emphasizing voluntary and incentive-based programs on private lands; habitat restoration and management by public agencies and private conservation organizations; rare species survey and recovery efforts; and environmental education and public outreach activities. Components of this planning effort include:

1. Development of databases on rare species and natural communities;
2. Identification of high priority species and habitats;
3. Identification of high priority research and biological inventory needs;
4. Surveys for rare species on public and private lands;
5. Development of databases of conservation lands and high priority watersheds and landscapes;
6. Prioritization of conservation, education, and habitat protection needs;
7. Collaboration with state and federal agencies on habitat protection/restoration plans;
8. Technical assistance to private conservation organizations and local governments;
9. Review of existing conservation laws, rules, and policies; and
10. Public input and educational outreach.

The following goals represent important themes in the CWCS:

- Maintain known viable populations of all high-priority species and functional examples of all high priority habitats through voluntary land protection and incentive-based habitat management programs on private lands, and habitat restoration and management on public lands.
- Increase public awareness of high priority species and habitats by developing educational messages and lesson plans for use in environmental education facilities, local schools, and other facilities.
- Facilitate restoration of important wildlife habitats through reintroduction of prescribed fire, hydrologic enhancements, and vegetation restoration.
- Conduct statewide assessments of rare natural communities and habitats that support species of conservation concern.
- Improve efforts to protect vulnerable and ecologically important habitats such as isolated wetlands, headwater streams, and caves.
- Combat the spread of invasive and noxious species in high priority natural habitats by identifying problem areas; providing technical and financial assistance; developing specific educational messages; and managing invasive/noxious species populations on public lands.
- Minimize impacts from development and other activities on high priority species and habitats by improving environmental review procedures and facilitating training for and compliance with best management practices.
- Update the state's protected species list and work with conservation partners to improve management of these species and their habitats.
- Conduct targeted field inventories of neglected taxonomic groups, including invertebrates and nonvascular plants.
- Continue efforts to recover federally listed species through implementation of recovery plans, and restore populations of other high priority species.
- Establish a consistent source of state funding for land protection to support wildlife conservation, and increase availability and use of federal funds for land acquisition and management.
- Continue efforts to monitor land use changes statewide and in each ecoregion, and use predictive models to assess impacts to high-priority species and habitats.

This comprehensive conservation plan for Wolf Island National Wildlife Refuge was developed with the cooperation of the WRD, and incorporates many elements of the Georgia CWCS.

II. Refuge Overview

INTRODUCTION

Wolf Island National Wildlife Refuge is a barrier island located off the Georgia coast, 12 miles east of Darien (by boat) in McIntosh County (Figure 1). The refuge was established by Executive Order No. 5316 on April 3, 1930, as a migratory bird sanctuary. It includes Egg Island and Little Egg Island, and encompasses a total of 5,126 acres.

This three-island wildlife refuge at the mouth of the Altamaha River consists mainly of salt marsh and provides critical sanctuary for rare migrating birds and nursery habitat for sea turtles. Wolf Island, the largest island in the refuge, covers 4,519 acres. Its boundaries are defined by the South River to the north; Little Mud River to the west; Altamaha Sound to the south; and the Atlantic Ocean to the east. The island has only 300 acres of dune and beach along its narrow, four-mile-long eastern shoreline. It fronts the sea in the Altamaha River Delta and forms a physical barrier between Doboy Sound to the north and Altamaha Sound to the south. Tucked into the mouth of Altamaha Sound and directly south of Wolf Island are Egg and Little Egg islands. They are 593 and 14 acres in size, respectively, and support extensive salt marsh with only 70 acres of upland (Figure 2).

REFUGE HISTORY AND PURPOSE

Wolf Island's recorded history began on March 7, 1769, when King George III of England granted Christopher DeBrake title to 150 acres (the upland portion) of Wolf Island. Early diaries record that locals used the island for hunting. Additionally, the island also served as quarantine area for sailors who were sick with yellow fever, as it was “a solitary spot washed by the waves of the Atlantic and miles from any human habitation.” In 1828, part of the island (538 acres) was conveyed to the U.S. Government.

The strategic location of Wolf Island made it an important identification point on early navigational charts, and the U.S. Coast Guard erected a lighthouse at the northern end. This old Coast Guard lighthouse, which stood on the northern tip of Wolf Island, has long since disappeared into the ocean. Today, no navigational lights or other structures now exist anywhere on the refuge.

In 1819, the Georgia legislature ceded jurisdiction of Wolf Island to the United States for the purpose of building a 55-foot-high beacon light to complement the lighthouse across Doboy Sound on Sapelo Island. Along with a light keeper’s house, the structure was built and was in operation by the summer of 1822. The beacon light was pounded by periodic hurricanes and blown up during the Civil War by Confederate soldiers who did not want the light to aid the Union Navy. After the Civil War, a larger, grander structure was built. The beacon light was 38 feet tall with a sixth-order light that could be seen 11.5 miles away. This lighthouse had several keepers over the years until it was destroyed by the terrible hurricane of 1898, which killed several people on Wolf Island. The light beacon was deactivated and the remaining structures were moved to the Sapelo Lighthouse.

In 1891, a group of hunters named the Wolf Island Club built a clubhouse on the southern end of the island. The 1898 hurricane also swept this clubhouse away and killed a caretaker. An account of the storm in the *Darien Gazette* said that the Wolf Island light keeper, Mr. James Cromley, “had a terrible time of it and says that in the future the high land will be good enough for him.”

Figure 1. Location of Wolf Island National Wildlife Refuge.

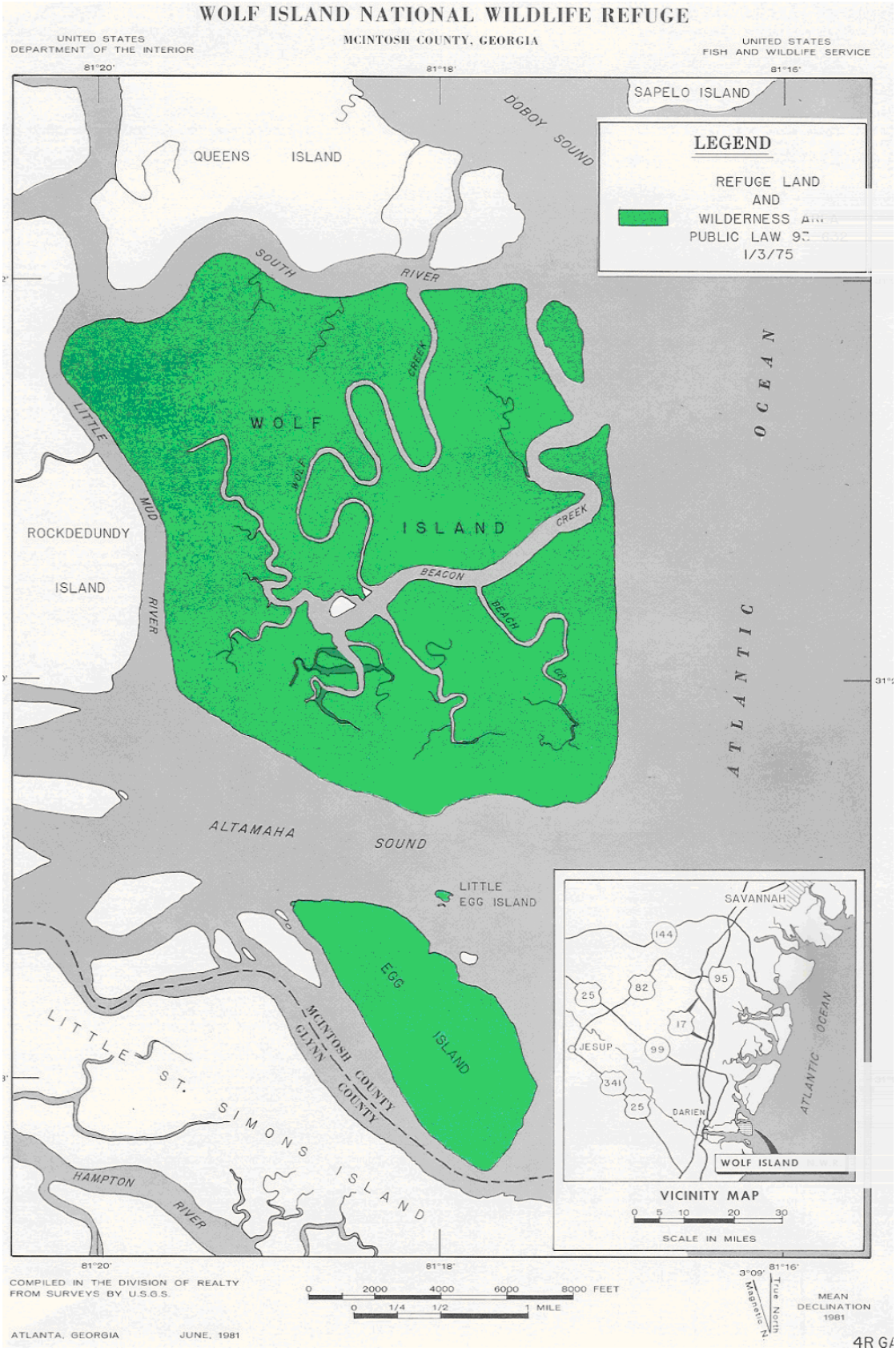


Figure 2: Aerial photo of Wolf Island National Wildlife Refuge with acreages.

The refuge was established by Executive Order No. 5316 on April 3, 1930, when the 538 acres already in government ownership were set aside as a sanctuary for migratory birds. In 1969, the protection of Wolf, Egg, and Little Egg islands became the goal of Jane Hurt Yarn, a prominent Atlanta environmentalist with The Nature Conservancy in the 1970s. She bought an option on Egg Island in 1969, which was followed by the purchase of Wolf and Little Egg. Her purchase of Egg Island was one of the first actions taken by an environmentalist to protect the coast.

On October 3, 1972, the United States bought an additional 4,071 acres from The Nature Conservancy for inclusion in the Wolf Island National Wildlife Refuge. The rest of the refuge (517 acres) was added on December 8, 1972, by a Declaration of Taking determined by The U.S. District Court, Southern District of Georgia (Civil No. B/1147). The refuge was closed to the hunting of migratory birds on April 17, 1973. In addition, Congress designated the refuge as a national wilderness area on January 3, 1975. The refuge consists of a long narrow strip of oceanfront beach backed by a broad band of salt marsh. Over 75% of the refuge's 5,126 acres are composed of saltwater marshes.

As a designated national wilderness area, Wolf Island National Wildlife Refuge is maintained as such with its primary purpose being to provide protection for migratory birds and endangered and threatened species such as the loggerhead sea turtle and piping plover. Because of its status as a wilderness area, no public use facilities exist or are planned on the refuge. Although the salt waters surrounding the refuge are open to a variety of recreational activities, all of the refuge's beach, marsh, and upland areas are closed to the public. Visitors must make their own arrangements to reach the saltwater areas that surround the refuge. Marinas in the Darien, Georgia, area may offer transportation to the waters offshore of the refuge.

Wolf Island is one of seven refuges administered by the Savannah Coastal Refuges Complex. This chain of national wildlife refuges extends from Pinckney Island NWR near Hilton Head Island, South Carolina, to Wolf Island NWR near Darien, Georgia. Between these lie Savannah National Wildlife Refuge, the largest unit in the complex, and the Wassaw, Tybee, Harris Neck, and Blackbeard Island national wildlife refuges. Together they span a 100-mile coastline that encompasses a total of more than 56,000 acres. The Savannah Coastal Refuges Complex is administered from a headquarters office located in Savannah, Georgia.

SPECIAL DESIGNATIONS

WILDERNESS

As noted above, the entire refuge is a designated wilderness area. Therefore, the refuge's resource values are maintained by natural processes. The refuge is monitored to ensure that these values have not been compromised. Law enforcement, education, and interpretation are the primary management tools used to relay these values.

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 to preserve its natural conditions and which:

- generally appears to have been influenced primarily by the forces of nature, with the imprint of man's work substantially unnoticeable;

- has outstanding opportunities for solitude or primitive and unconfined types of recreation;

- has at least 5,000 contiguous roadless acres or is of sufficient size to make practicable its preservation and use in an unimpeded condition; or is a roadless island, regardless of size;

- does not substantially exhibit the effects of logging, farming, grazing, or other extensive development or alteration of the landscape, or its wilderness character could be restored through appropriate management at the time of review; and

- may contain ecological, geological, or other features of scientific, educational, scenic, or historic value.

The Wilderness Act of 1964 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 the suitability of each such area for wilderness designation. 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.

CLASS I AIR QUALITY AREA

Wolf Island National Wildlife Refuge is also designated as a Class I Airshed under the provisions of the Clean Air Act. In 1970, Congress passed the Clean Air Act, establishing a national policy toward protecting and enhancing air quality. Amendments passed in 1977 and 1990 strengthened the Act, making it a more effective tool for protecting air quality in national parks and national wilderness areas. Sections of the Act established a Prevention of Significant Deterioration of Air Quality permitting process. As a result, Wolf Island (one of 21 refuges designated throughout the entire Refuge System) was selected as and remains a Class I Air Quality Area, as defined by the criteria of the Act. This means that the U.S. Environmental Protection Agency (EPA) or the state permitting authority must notify the federal land manager if emissions from a proposed project may impact the air quality of a Class I area, which includes all major facilities located or proposing to locate within 100 kilometers (62 miles) of the refuge.

ECOSYSTEM CONTEXT

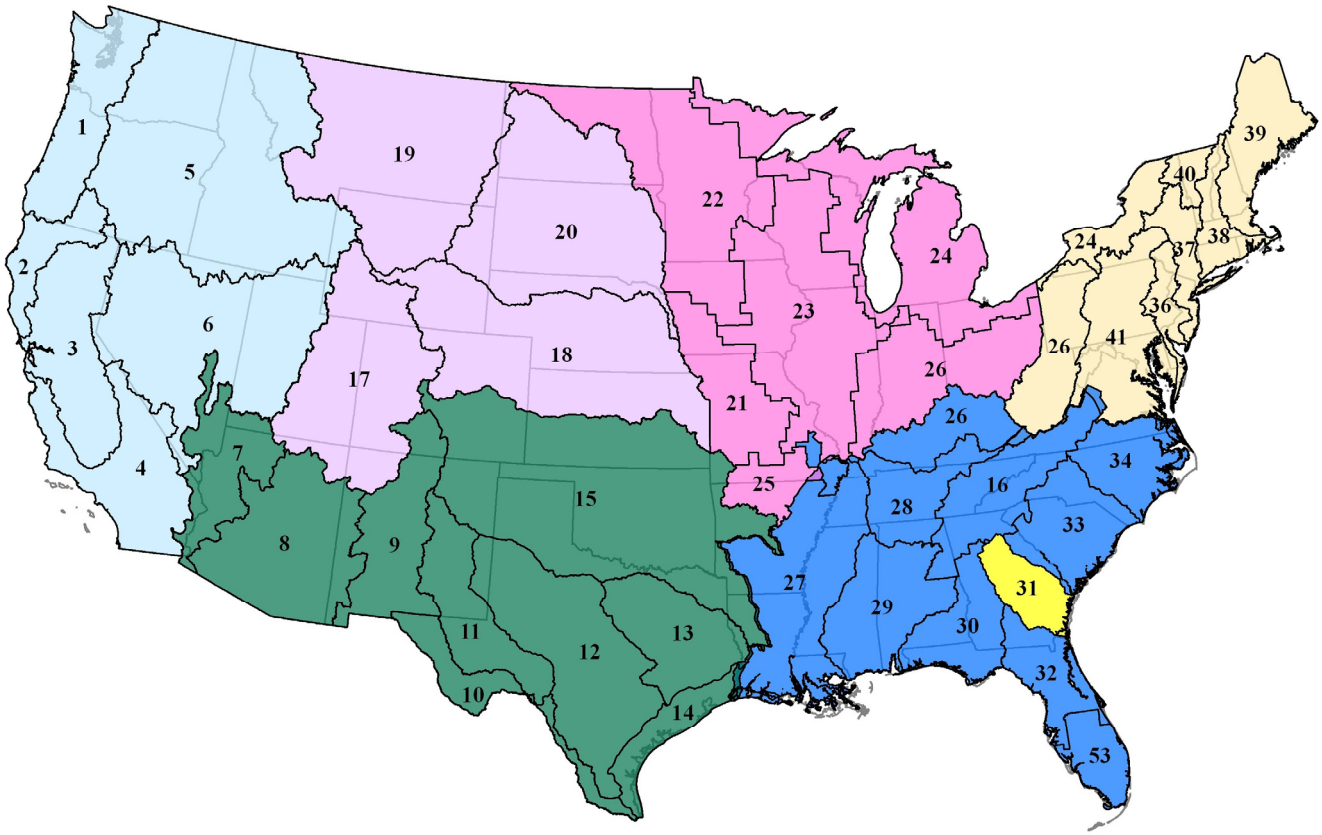
An ecosystem is a geographic area that includes all living organisms (people, plants, animals, and microorganisms), their physical surroundings (such as soil, water, and air), and the natural cycles that sustain them. All of these elements are interconnected. Managing any one resource affects the others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

In approaching its mission to conserve wildlife and their habitats throughout the country, the U.S. Fish and Wildlife Service has found it useful to divide the entire United States into 53 distinct ecosystems, drawn primarily along watershed boundaries. Wolf Island National Wildlife Refuge lies at the southeastern boundary of the Altamaha Watershed Ecosystem (No. 31), which includes the Altamaha River and its associated watershed tributaries in central and eastern Georgia (Figure 3).

Expanding human populations and resulting habitat alterations are the biggest threat to natural systems and biodiversity. Protecting land is one of the most effective ways to safeguard native habitats, fish, wildlife, and plants. Wolf Island National Wildlife Refuge is located off the Georgia coast, away from the mainland which has dramatically changed through historical land use practices (primarily agriculture), and more recently, residential and industrial development. As a federally

designated national wilderness area, the refuge is important in a regional ecosystem context because it contains a large area of protected natural habitats. Together with other federal and state lands along the Georgia coast, such a network of conservation lands can help mitigate the effects of habitat fragmentation and provide protected areas for the benefit of many species of fish and wildlife.

Figure 3. U.S. Fish and Wildlife Service-designated ecosystems in the conterminous U.S. The Altamaha Watershed Ecosystem is no. 31.



REGIONAL CONSERVATION PLANS AND INITIATIVES

INITIATIVE FOR WATERSHED EXCELLENCE: UPPER ALTAMAHA PILOT PROJECT

The Initiative for Watershed Excellence: Upper Altamaha Pilot Project, managed by the River Basin Center (http://www.rivercenter.uga.edu/service/iwe/iwe.htm) under the Eugene P. Odum School of Ecology, University of Georgia, is working to serve as a model for developing watershed support centers across the country. Funding is being provided by the U.S. Environmental Protection Agency and the Georgia Environmental Protection Division through Section 319 of the Clean Water Act. The initiative is bringing together a multidisciplinary consortium of faculty, staff, and students from several colleges and universities in the Upper Altamaha basin to provide technical, organizational, and legal assistance to stakeholder groups to increase their capacity to enhance and protect water quality.

The Upper Altamaha watershed was selected as the location for this pilot project for many reasons. A wide spectrum of land uses ranging from urban development to agriculture and silviculture occur within the watershed. Because of these diverse uses, a variety of best management practices is being explored to protect and restore the basin's water quality. The lessons learned from this project are likely to be applicable to many different watersheds.

ECOLOGICAL THREATS AND PROBLEMS

In order to prepare a comprehensive conservation plan (CCP) that will establish goals and objectives on how to manage the Wolf Island Refuge over the next 15 years, a number of planning steps were followed. One of those steps was an internal review of known ecological threats and problems that may hinder the ability of refuge personnel to fulfill the objectives of the refuge. This review developed the following list of concerns:

- Beach erosion and accretion;
- Control of nuisance wildlife and invasive plants; and
- Protection of the natural functions of the Altamaha River System.

BEACH EROSION AND ACCRETION

Coastal Georgia is home to about one-third of the viable salt marsh left on the Atlantic coast. The public owns 10 of the 18 major islands on the Atlantic coast. Unlike many other areas along the eastern Atlantic coast, two-thirds of Georgia's islands are parks, refuges, or preserves. The population of coastal Georgia is growing at approximately 20% per decade. This rapid population growth is intensifying the pressure to develop environmentally sensitive areas such as wetlands, floodplains, and barrier islands. The South Carolina-Georgia Coastal Erosion Study is a collaborative effort among researchers from the U.S. Geological Survey, Coastal Carolina University, University of South Carolina, College of Charleston, and the South Carolina Sea Grant Consortium aimed at understanding the processes of coastal erosion and the factors that affect erosion rates along the South Carolina and Georgia coasts.

Georgia meets the Atlantic Ocean along the beaches of the offshore islands, which are popularly known as the Sea Islands or the Golden Isles. The Georgia islands are several miles offshore and are separated from the mainland by extensive marshlands, tidewater streams, and sounds. Other islands, in addition to the barrier islands, are scattered throughout the estuarine systems. These islands are of various origins. Some of the hammock (forested) islands are remnants of old barrier islands formed in the past during periods of higher sea level (Hoyt and Henry 1964). The beaches and dunes are constantly being shaped by the action of waves, currents, and wind, which interact to keep the beaches and dunes in a dynamic state.

Refuge concerns regarding erosion and accretion will require input from the U.S. Army Corps of Engineers to evaluate the long-term impact to the refuge of nearby sea sand diversion and nourishment programs, such as the one at Savannah Harbor.

CONTROL OF NUISANCE WILDLIFE

Ghost crabs, feral hogs, and raccoons are the principal natural nest predators of sea turtle eggs, as well as the eggs and chicks of ground-nesting birds in Georgia and many other areas (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1991). All have an uncanny ability to locate sea turtle nests. Usually, ghost crabs are the first to arrive at a nest. They normally dig small holes down into the nest cavity and bring several eggs to the surface. The eggs are then eaten at the nest or transported to the nearby burrow of the crab.

Raccoons are the most common natural vertebrate predators of sea turtle nests. They are common even on the most isolated of the barrier beaches. Raccoons patrol the beaches during the nesting season singly or in family groups to hunt for sea turtle eggs. However, most raccoons utilize food sources other than sea turtle eggs. For the relatively few raccoons that prey on sea turtle eggs, it has been found that they consume all the eggs they can find.

Feral hogs are an introduced (nonnative) species. They have the ability to destroy 100% of sea turtle nests on barrier islands. Screening of nests, as used to prevent predation from raccoons and ghost crabs, is not effective in protecting the nests from feral hogs. Feral hog populations must be controlled or extirpated from an island to prevent predation.

Ghost crabs and raccoons are native inhabitants of the islands of the refuge and efforts to control their populations may seem at odds with the character of a wilderness area. On the other hand, many sea turtles are threatened and need active management protection. The resolution of management conflicts such as these are a part of the CCP process.

PROTECTION OF THE NATURAL FUNCTIONS OF THE ALTAMAHA RIVER SYSTEM

The name Altamaha is from an immigrant Yamassee Indian group, who were descended from an interior chiefdom, which were originally known as the Altamaha or Tama (Worth 1995). They were located on the Oconee River just below Milledgeville, Georgia. The Spanish explorer Hernando de Soto visited this area in 1540. It is also known as Georgia's Little Amazon.

The Altamaha has been declared the seventh most endangered river in the United States due to the loss of water flow that has resulted from reservoirs and power plants along its banks. The river is 137 miles long and runs from central Georgia to the southern coast of the state. The Altamaha watershed drains about one-fourth of the state of Georgia, which makes it one of the three largest river basins on the Atlantic Seaboard.

While no dams currently exist along the river, five proposed dams will have severe environmental effects including loss of important habitat areas, reduced populations of aquatic species, increased pollutant concentrations, and reduced recreational opportunities. The continued growth of Atlanta puts a strain on the amount of freshwater demanded and extracted from the river. Each day, approximately three million gallons of water are taken from the Altamaha River for the public sector alone. Chemical seepage of many contaminants (including mercury) from the LCP Chemicals-Georgia, Inc., building for 15 years has placed the site and its surroundings on the Federal Superfund List. The Altamaha River basin has approximately 19 rivers and streams listed on the 2002 303(d) federal list as waters not meeting designated uses.

What comes out of the Altamaha River (the amount and quality of water) has an effect on the refuge. Lower water discharges will have yet to be determined impacts on the beach erosion and accretion concerns noted above. Contaminated waters will impact the habitat quality on the refuge.

PHYSICAL RESOURCES

CLIMATE

The coastal region of Georgia has a relatively moderate climate. Average temperatures of the islands are slightly lower than on the mainland. Sea breezes offer relief from intense summer heat. Daily maximum temperatures in July and August (the warmest months) are usually in the 80s and low 90s. The islands are the only part of the state south of Atlanta that has mean daily maximum temperatures

below 90° Fahrenheit (F) in July and August (Carter 1967). Winters are relatively mild and short. The average minimum temperature for December and January (the coldest months) is about 43°F. On the average, there are 305 freeze-free days at Brunswick and 267 at Savannah (Carter 1970).

The coastal islands have an average annual rainfall of about 53 inches. Rain is most abundant in the summer and early fall, with half of the annual precipitation occurring between June and September. The driest period is November through February (Carter 1967). Most precipitation in late fall and winter is of the frontal type, but most rain in the spring and summer comes as afternoon thundershowers. Heavy rainfall in September is commonly associated with hurricane conditions.

The first recorded hurricane to cause significant damage to the Georgia coast struck the Charleston, South Carolina area on September 15, 1752 (Carter 1970). Since that time, numerous hurricanes have passed along the Georgia coast, but surprisingly few have caused serious damage. Hurricanes off the eastern Atlantic coast tend to follow the path of warm, lighter air above the Gulf Stream, which is flanked on both sides with heavier, cooler air. Brunswick, Georgia is farther (80 miles) from the Gulf Stream and the accompanying warm air than any other place on the southeastern coast. Consequently, the Georgia coastal area is less exposed to hurricanes than areas farther north or south (Gibson 1948).

GEOLOGY AND TOPOGRAPHY

The mainland rivers that flow into the Atlantic Ocean along the Georgia coast drain three major physiographic provinces: the Blue Ridge Mountains, the Piedmont Plateau, and the Atlantic Coastal Plain. The geology of these provinces greatly influences the amount and characteristics of surface water, groundwater, and sediments transported to the marshes, estuaries, and continental shelf.

Many sedimentary strata tilted toward the sea overlie the Coastal Plain. These deposits were formed during the many changes in sea level associated with glaciation during the Tertiary and Quaternary periods. The thickest deposits are in the coastal area, tapering to a thin edge where the oldest (Cretaceous) sediments are exposed. Progressively more recent strata occur at the surface toward the coast, but relict coastal features, such as barrier islands and lagoons, are still evident in many places.

The region is generally one of low seismic activity. However, a major earthquake occurred in 1886, which had its epicenter at Charleston, South Carolina. This earthquake, registering 10 on the Richter scale, caused 150 human deaths and damaged buildings in the Savannah area.

The elevations on the barrier islands typically range from sea level to about 25 feet above mean sea level, although individual dunes may be higher. Broad, nearly level areas interspersed with low, gently sloping ridges typically characterize topography of the islands. On beaches in other areas, there are major seasonal changes in beach profiles. During the summer when wave energies are lowest, many sand grains are not moved out with the backwash, and there is a net movement of sand landward. This results in the gradual buildup of sand on the backshore. A horizontal bed of sand (a berm) extends from the foot of the dunes to a pronounced beach ridge at the high-tide mark. The berm area serves as a source of sand for replenishment and growth of the dunes. In the fall and winter, wave energy is greater, the berm erodes, and there is a net movement of sand from the beach to the breaker zone, where it is deposited as an offshore bar.

SOILS

The soils of the Blue Ridge and Piedmont provinces are derived from crystalline rocks dating to pre-Cambrian time. The two major river systems of the Atlantic drainage in Georgia have their origins in these provinces. The headwaters of the Savannah River are in the Blue Ridge province, and the Altamaha River originates in the Piedmont.

Upland soils are mostly porous sands derived from recently deposited marine sediments that are resistant to weathering (Regosols). These soils have a distinct "A" horizon (surface layer) with significant accumulations of organic matter that accounts for most of the exchange capacity (Byrd et al. 1961). They are subject to moderate to severe leaching, and many are excessively drained. Principal soil series include Blanton, Galestown, Klej, Lakeland, and Palm Beach (Byrd et al. 1961). Lower, poorly drained sites are characterized by intrazonal soils of the following series: Leon, Ona, Plummer, Rutlege, and St. Johns (Byrd et al. 1961). Most of these soil series are characteristically very acidic, but locally on the islands they may be neutral to slightly alkaline due to the presence of oyster shells in the profile. Dunes along Georgia beaches contain relatively few shell fragments.

The principal sources of heavy minerals and sands on the Georgia coast are (1) the Altamaha and Savannah watersheds, which originate in the Piedmont and mountain areas of the state; (2) the smaller Coastal Plain watersheds that are of more recent origin; and (3) suspended material from the continental shelf.

Heavy minerals of the beaches and dunes more closely resemble assemblages from the Piedmont rivers than they do assemblages from Coastal Plain rivers (Giles 1966). This suggests that Coastal Plain rivers are not important contributors to present beach sediments (Giles 1966). There is also an apparent relationship between the composition of beach sands and the mineralogy of the adjacent continental shelf, and continental shelf material is another important sediment source (Giles and Pilkey 1965; Giles 1966; Levy 1968).

HYDROLOGY

The Georgia beaches occur in a region of moderate wave energy, which is the lowest recorded along the southeastern Atlantic coast (Tanner 1960). The average height of breaking waves on the Georgia coast is 9–12 inches (Helle 1958).

Limestones of Tertiary and Quaternary age underlying the Coastal Plain form one of the most productive aquifer systems in the country. The Tertiary limestone is several thousand feet thick and ranges in age from Paleocene to Pliocene. The hydrologic unit of this limestone, deposited in the period from the mid-Eocene to the mid-Miocene, is the principal artesian or Coastal Plain aquifer. It slopes gently to the coast and appears on the continental slope as freshwater springs in the ocean.

Low areas between dune ridges on the islands commonly form sloughs containing fresh or slightly brackish water. These ponds and sloughs play a major role in maintaining some of the more interesting wildlife of the islands, notably alligators and wading birds.

The sloughs vary considerably in size and depth. Some dry up completely in the summer; others contain water throughout the year. The water is usually acidic and stained so that light penetrates only 2 or 3 feet below the surface. Consequently, if the sloughs are deep, there may be relatively little growth of submersed aquatics and an abundance of emergent plants, rooted plants with floating leaves, and unrooted floating plants.

AIR QUALITY

In 1970, Congress passed the Clean Air Act, which established a national policy toward protecting and enhancing air quality. Amendments passed in 1977 and 1990 strengthened the Act, making it a more effective tool for protecting air quality in national parks and national wilderness areas. Sections of the Act established a Prevention of Significant Deterioration of Air Quality permitting process. As a result, Wolf Island (one of 21 refuges designated throughout the entire Refuge System) was selected and remains a Class I Air Quality Area as defined by the criteria of the Act. This means that the EPA or the state permitting authority must notify the federal land manager if emissions from a proposed project may impact the air quality of a Class I area, which includes all major facilities located or proposing to locate within 100 kilometers (62 miles) of the refuge.

WATER QUALITY AND QUANTITY

Please refer to the section "Protection of the Natural Functions of the Altamaha River System" above for information on this topic.

BIOLOGICAL RESOURCES

HABITAT

Dunes form as a result of windblown sand piling up behind minor obstacles. Once started, the dune itself becomes an obstacle to windblown sand, and the lodgment of more sand causes the dune to grow. Dunes and dune ridges along the Georgia Coast normally grow to 10 or 12 feet in height (occasionally much higher) and acquire a distinct morphology characterized by gentle windward and steeper leeward slopes. Surface ripples parallel the dune ridge at right angles to the wind.

Vegetation plays an important part in the formation and stabilization of dunes. Salt-resistant beach plants trap windblown sand, forming little mounds of sand or dunelets that grow as the plants respond with increased growth and trap more sand. These foredune plants must have the ability to withstand salt spray, roots that will endure exposure, and stems that will withstand burial by shifting sands. They must be perennials able to keep above the sand, spread laterally, and withstand drought (Cowles 1899).

Few species of vascular plants can survive the extremely harsh physical environment of the beaches and dunes. In order to inhabit this area, plants must possess characteristics that enable them to withstand the combined effects of salt spray, constant wind, full light intensity, high evaporation, and high temperatures. They must be capable of becoming established in and keeping above the shifting sands. Distance from the surf and location relative to dunes or protective vegetation on the seaward side will determine the exposure of a site to these limiting factors. Thus, there is a gradient or a zonation of vegetation from mean high tide toward the interior of the island, which is commonly a result of the modifying effect of the dunes.

Plants occurring on the beach include sea rocket, beach hogwort, beach sandspur, salt meadow cordgrass, salt wort, sea-purslane, beach-spurge, and seashore-elder. Principal plants of the foredunes include sea oats, sea beach panic grass, railroad vine, beach pennywort, and Spanish-bayonet, as well as some of the plants of the beach (e.g., seashore elder, beach spurge, and sea rocket). Annuals such as camphorweed may temporarily colonize dunes until killed out by salt spray. The foreslope and the crest of the foredunes are subject to the greatest intensity of salt spray (Boyce 1951). Little salt is deposited on the lee slope of the foredunes or in the interdune area. In addition to some of the species previously mentioned, principal species in these areas include little bluestem, prickly pear, seaside goldenrod, beach primrose, juniper, yaupon, wax myrtle, and live oak. Bluestem

occupies the drier sites. Low, flat areas behind breaks in the foredunes that are periodically inundated by unusually high tides may be occupied by stands of salt meadow cordgrass (Oosting and Billings 1942; Oosting 1945).

Salt spray, after passing over the interdune area, next contacts the windward slope of the rear dunes and is deposited on the vegetation that occurs there. Consequently, sea oats and other salt-tolerant plants of the windward slope of the foredunes are also dominant there. Behind the crest of the rear dunes, sites are more protected and vegetation is more diverse. Shrubs and trees may dominate this area. Trees and shrubs most commonly occurring in this zone are live oak, red bay, wax myrtle, juniper, yaupon, cabbage palm, saw palmetto, and groundselbush.

Shrubs and trees are commonly pruned by the wind and salt spray, producing a sloping, sheared appearance. Studies by Boyce (1954) have shed light on the mechanism by which the salt spray produces this effect. Salt enters the leaves through abrasions caused by the lashing of wind action. High chloride ion concentration produces necrosis and death of exposed leaves and branches. They are not translocated to the leeward side of the tree in injurious quantities, so only the windward sides of the plants are killed. This produces an asymmetrical form. Pruning stimulates vigorous sprouting. This results in the rapid formation of a dense canopy that reduces the efficiency of deposition on the plant and on the individual stems. Most dune plants have a uniformly closed crown.

Wolf Island contains 300 acres of uplands (6.6%), including a long, narrow four-mile strip of oceanfront beach and several small (less than 20 acres) spoil sites along the Little Mud River. The highest elevation recorded on the island is 10.57 feet above mean low water and is located on one of the spoil sites. The remainder of the island (4,219 acres) is salt marsh, small marsh hammocks, and tidal creeks that flood daily with lunar tides of five to nine feet. Tidal action constantly influences the physical shape of the island. Each high tide flows across low-lying portions of the northern dunes and has resulted in a wide mud flat through the central marsh. High spring and flood tides inundate most of the refuge.

The vegetation on the upland portions of Wolf Island consists of sea oats, sand spurs, and other beach-dune perennials. The only woody growth consists of wax myrtle and cedars on the highest elevations. The salt marsh is dominated by salt marsh cord grass, sea ox-eye, needle grass, and grasswort in a narrow band around the spoil sites and higher elevations.

Egg Island contains 200 acres of uplands (33.7%) ranging from six to ten feet above mean low water. Approximately 70 acres of this island are above nine feet. This acreage has a dense growth of cedar, greenbrier, and blackberry plus a small number of oak and pine. The remaining upland acres are dominated by wax myrtle except for a long narrow stretch (one and one-half miles) of ocean front beach, which is dominated by sea oats, sand spurs, and other beach-dune perennials. The rest of the island (393 acres) is salt marsh dominated by salt marsh cord grass.

Little Egg Island (14 acres) is a low salt marsh dominated by salt marsh cord grass. This island is completely inundated during high tides with only the tops of the tallest grasses exposed.

WILDLIFE

Brown pelicans, least terns, piping plovers, red knots, loggerhead sea turtles, and diamondback terrapins are significant species that utilize the refuge. Loggerhead sea turtles occasionally nest on the beaches but rarely are successful due to tidal inundation or predation. Diamondback terrapins use the higher dunes for nesting. Raccoon predation of turtle nests is heavy along the entire

southeast coast. Shorebirds and marsh birds utilize the refuge extensively. Migratory waterfowl winter on the refuge and its surrounding waters. Scaup, scoters, black ducks, mergansers, and buffleheads are the most common species.

Saltwater fishing and crabbing are popular activities during the summer and fall along the creeks that intertwine through the refuge.

CULTURAL RESOURCES

Section 106 of the National Historic Preservation Act (NHPA) provides the framework for federal review and consideration of cultural resources during federal project planning and execution. The implementing regulations for the Section 106 process (36 CFR Part 800) have been promulgated by the Advisory Council on Historic Preservation. The Secretary of the Interior maintains the National Register of Historic Places (NRHP) and sets forth significant criteria (36 CFR Part 60) for inclusion in the register.

Cultural resources may be considered "historic properties" for the purpose of consideration by a federal undertaking if they meet NRHP criteria. The implementing regulations at 36 CFR 800.16(v) define an undertaking as "a project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a federal agency, including those carried out by or on behalf of a federal agency; those carried out with federal financial assistance; those requiring a federal permit, license or approval; and those subject to state or local regulation administered pursuant to a delegation or approval by a federal agency." Historic properties are those that are formally placed in the NRHP by the Secretary of the Interior and those that meet the criteria and are determined eligible for inclusion.

Like all federal agencies, the Service must abide by Section 106 of the NHPA. Cultural resources management in the Service is the responsibility of the Regional Director, but is not delegated for the Section 106 process when historic properties could be affected by Service undertakings, for issuing archeological permits, and for Indian tribal involvement. The Service's Regional Historic Preservation Officer (RHPO) advises the Regional Director about procedures, compliance, and implementation of the several cultural resources laws. The Refuge Manager assists the RHPO by informing the RHPO (early in the process) about Service undertakings; by protecting archeological sites and historic properties on Service-managed and administered lands; by monitoring archeological investigations by contractors and permittees; and by reporting violations.

Wolf Island NWR follows these procedures to protect the public's interest in preserving any cultural legacy that may potentially occur on the refuge. Because this refuge is designated as a wilderness area, no construction activity is expected and certainly none requiring any excavation with heavy earth-moving equipment such as tractors, graders, and bulldozers. If, for any reason, such activity were required in the future, the refuge would contract with a qualified archaeologist/cultural resources expert to conduct an archaeological survey of the subject property prior to such activity. The results of this survey would be submitted to the RHPO as well as the Georgia State Historic Preservation Officer (SHPO). The SHPO would review such surveys and determine whether cultural resources will be impacted. In other words, the SHPO will determine whether any properties listed in or eligible for listing in the NRHP will be affected. If cultural resources are actually encountered during construction activities, the refuge must notify the SHPO immediately. To date, two properties on the refuge have been identified as possibly eligible for the NRHP: the remains of an old lighthouse and old canoe pieces.

SOCIOECONOMIC ENVIRONMENT

Agricultural development of the Altamaha Delta began soon after the founding of the Georgia Colony in 1733. About 25 plantations were located on the low-lying islands and shores by the 19th century.

These plantations took advantage of the rich alluvial flow and annual inundation of water required by some crops. The first major crop was indigo. When the demand for indigo faded, rice and cotton took its place. A major storm in 1824 destroyed much of the town of Darien and put many of the islands under 20 feet of water. The Civil War ended the plantation system, and many of the island plantations disappeared under heavy brush and new growth of pine forests.

Today, in McIntosh County, retail trade is the largest employment sector providing 37.7% of the jobs. The other predominant employment sectors are services and government. The service industry is the largest employment sector for the state, contributing 25.6% of the state's jobs. In the year 2000, the average weekly wage for all the employment sectors in McIntosh County was $334. This amount was less than the statewide average of $622. The county's per capita personal income in 1999 was $16,450, as compared with $27,324 for Georgia and $28,546 for the United States. McIntosh County's median household income in 1997 was $24,357. This amount was less than the state's median household income of $36,372 in that same year. Nationally, the median household income in 1999 was $37,005.

According to the 2000 Census, 61.3% of the residents in McIntosh County were white and 36.8% were black. Hispanics, who could be identified as either white or black in the Census data, made up 0.9% of the county's population. In Georgia, 65.1% of residents were white, 28.7% were black, and 5.3% were Hispanic. In McIntosh County, 28.0% of the county's residents were age 18 or younger, and 11.8% were age 65 or older. In Georgia, 26.5% were age 18 or younger and 9.6% were age 65 or older.

The Census reports 7.8% of McIntosh County's households were headed by females with children under 18 years of age, compared with 9.0% statewide. Total households with children under 18 comprised 31.0% of all households in the county and 35.0% of those in the state. Between 1996 and 2000, McIntosh County School System reported an average high school dropout rate of 10.1%, for students in grades 9 to 12. Statewide, this rate is 6.8% for the same period of time. Between 1996 and 2000, McIntosh County's annual unemployment rate was higher than the state's rate, averaging 5.6% compared with the state's average of 4.2%. Nationally, the unemployment rate for the same period averaged 4.8%. During 1997, 22.2% of the county's population lived below the poverty level, compared with Georgia's rate of 14.7% and the national rate of 13.3%. In addition, 35.1% of the children under the age of 18 lived below the poverty level in McIntosh County. Nationally, 19.9% of the population under the age of 18 years lived below the level of poverty.

Data provided by the latest National Survey of Fishing, Hunting, and Wildlife-Associated Recreation (USDI 2003) show that for the year 2001, 1.2 million people participated in fishing, hunting, and wildlife-watching activities in Georgia. This group was comprised of 1.1 million anglers (88% of all outdoor sports enthusiasts) and 417,000 hunters (34%). The percentage is greater than 100% because many participated in both activities.

Anglers spent $544 million on fishing expenses in Georgia in 2001. Trip-related expenditures including food and lodging, transportation, and other related expenses totaled approximately $246 million (45% of all their fishing expenditures). Anglers spent $106 million on food and lodging and $71 million on transportation. Other trip related expenses such as equipment rental, bait, and cooking fuel totaled $70 million. Each angler spent an average of $236 on trip-related costs in 2001. Anglers spent approximately $262 million on equipment in Georgia in 2001, which was 48% of all fishing expenditures. Fishing equipment (rods, reels, line, etc.) totaled approximately $105 million (40% of the equipment total). Auxiliary equipment expenditures (tents, fishing gear, etc.) and special equipment expenditures (boats, pickups, etc.) amounted to $156 million, 60% of the equipment total. The purchase of other items such as magazines, membership dues, license, permits, stamps, and land leasing and ownership amounted to $35 million (6% of all fishing expenditures).

Hunters spent $504 million on hunting expenses in Georgia in 2001. Trip-related expenditures including food and lodging, transportation, and other related expenses totaled $192 million (38% of all their hunting expenditures). They spent $93 million on food and lodging and $45 million on transportation. Other trip-related expenses such as equipment rental, bait, and cooking fuel totaled $54 million. Each hunter spent an average of $459 on trip-related costs in 2001. Hunters spent approximately $200 million on equipment in Georgia in 2001, 40% of all hunting expenditures. Hunting equipment (guns, ammunition, etc.) totaled $146 million (73% of the equipment total). Auxiliary equipment expenditures (tents, hunting gear, etc.) and special equipment expenditures (boats, pickups, etc.) amounted to 27% of the total equipment expenditure for hunting. The purchase of other items such as magazines, membership dues, licenses, permits, stamps, and land leasing and ownership amounted to approximately $112 million (22% of all hunting expenditures).

REFUGE ADMINISTRATION AND MANAGEMENT

LAND PROTECTION AND CONSERVATION

The refuge consists of the three islands: Wolf, Egg, and Little Egg. There are no current plans for refuge expansion. However, additional islands in the near vicinity may be considered for acquisition at some future date.

VISITOR SERVICES

Due to its status as a wilderness area, no public use facilities are planned on the refuge. Although the refuge's salt waters are open to a variety of recreational activities such as fishing and crabbing, all beach, marsh, and upland areas are closed to the public. Wildlife observation and photography are possible from boats.

PERSONNEL, OPERATIONS, AND MAINTENANCE

Because Wolf Island National Wildlife Refuge is a designated wilderness area, little active management is pursued. Natural processes are allowed to take their course in maintaining the refuge and its habitat and wildlife. The only significant management tool used is law enforcement, which is required to keep the public off the island.

III. Plan Development

OVERVIEW

The comprehensive planning process has allowed the Service, governmental and nongovernmental partners, and the public the opportunity to take a detailed look at Wolf Island National Wildlife Refuge and its management, resources, and future. The Service's comprehensive planning process provides for public involvement in developing a plan for the future management of a refuge. Comprehensive conservation plans (CCPs) are revised every 15 years or earlier, if monitoring and evaluation determine that significant changes are needed to achieve the refuge's purposes, vision, goals, and/or objectives. The basic steps of the CCP planning process involve the gathering of information; scoping for public input; developing the draft plan; gathering public input on the draft plan; developing the final plan; and implementing and monitoring the actions identified in the final plan.

PUBLIC INVOLVEMENT AND THE PLANNING PROCESS

In accordance with Service guidelines and National Environmental Policy Act recommendations, public involvement has been an important factor in developing the Draft Comprehensive Conservation Plan and Environmental Assessment (Draft CCP/EA) for Wolf Island National Wildlife Refuge. The plan has been written with input and assistance from interested citizens, conservation organizations, and other federal, state, and local agencies. The participation of these stakeholders and their ideas has been of great value in setting the refuge's management direction. The Service as a whole, and the refuge staff, in particular, are grateful to each individual who has contributed time, expertise, and ideas to the planning process.

Scoping refers to the process by which the planning team gathers input from a variety of internal and external sources on the key issues, concerns, and opportunities that need to be addressed in the comprehensive conservation plan. Sources of internal scoping include the refuge staff itself and other Service biologists and professionals. External scoping sources include representatives of state and local agencies; nongovernmental conservation organizations; research and educational institutions; refuge neighbors; and citizens of the local community. These various interests are referred to collectively as "stakeholders," that is, those individuals and groups that have a stake in how the refuge is managed. In developing this comprehensive conservation plan for Wolf Island National Wildlife Refuge, the planning team conducted both internal and external scoping.

The planning process began in May 2006 with various data-gathering sessions. As part of this process, the Service established a biological review team to conduct a wildlife and habitat management review of the refuge. The members of this biological review team included several Service biologists and one representative from the Georgia Department of Natural Resources. In addition, the Service established a CCP planning team in June 2006 that obtained input from the biological review team, expert contributors, and the public. The participants on the biological review team and other contributors are identified in Chapter V, Consultation and Coordination, in the Environmental Assessment (Section B).

The biological review took place during the week of May 2–4, 2006. It involved onsite evaluations to help the refuge meet its purpose and determine the role(s) the refuge could play regarding wildlife needs and objectives at various geographic scales (local, ecosystem, regional, and national). The approach was to take a holistic look at achieving refuge and landscape-level conservation needs, while still giving priority to accomplishing the original purposes for which the refuge was established.

The team produced a biological review report with recommendations to the refuge staff and CCP planning team. In keeping with the terminology and expected outcomes of the CCP process, these recommendations were presented in the form of goals, objectives, and strategies for management of the refuge's biological resources. These preliminary goals, objectives, and strategies were studied by the CCP planning team and modified and adapted for this Draft CCP.

Although no public access is allowed on Wolf Island National Wildlife Refuge, a brief visitor services review was also incorporated as part of the biological review. This visitor services review assessed the types of public uses that could be provided, considering the restricted nature of the refuge. Two public use managers from the Service contributed comments and recommendations on the refuge's visitor services, environmental education, and interpretation programs.

The CCP planning team met for the first time on June 21, 2006. The team consisted of four staff members from the Service and a contracted consultant from the Mangi Environmental Group. This team was the primary decision-making team for the CCP. 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:

- Jane Griess, Project Leader, Savannah Coastal Refuges Complex, USFWS
- W. Shaw Davis, Deputy Project Leader, Savannah Coastal Refuges Complex, USFWS
- John Robinette, Biologist, Savannah Coastal Refuges Complex, USFWS
- Debra Barnard, Biologist, Harris Neck National Wildlife Refuge, USFWS
- Randy Williams, Consultant, Mangi Environmental Group (Service contractor)

The planning team reviewed the recommendations of the biological review team and visitor services experts, 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 October 30, 2006.

The planning team then held an open house and public scoping meeting on January 24, 2007, at The Nature Conservancy's Georgia Conservation Office on U.S. Highway 17 south of Darien, Georgia, on Butler Island adjacent to the Altamaha Waterfowl Management Area headquarters. The meeting was publicized in advance in several ways. Information packets including a letter and invitation to attend, a public comment form, and a mailing list request form were mailed to approximately 100 individuals representing different federal and state agencies, nongovernmental organizations, state and federal congressional offices, private citizens, and other interested parties. News releases announcing the public scoping meeting were also sent to local newspapers, and a public service announcement was sent to local radio stations. Five citizens attended the open house and scoping meeting. The attendees were able to meet and interact with the refuge staff, ask questions, view the exhibits and maps on hand, and provide comments.

The meeting began with brief overviews of the refuge and the comprehensive planning process, followed by a facilitated open-floor question and comment period. The attendees were given the opportunity to ask questions and voice their thoughts about the refuge and how it should be managed in the future. In addition, a public comment form was distributed for the attendees and other interested parties to submit written comments. The written comments could be submitted either at the meeting or subsequently by mail or e-mail.

Two citizens offered their comments at the public scoping meeting. No public comment forms were received. One citizen submitted comments by e-mail. These comments were considered and evaluated in the preparation of the draft comprehensive conservation plan. Appendix D, Public Involvement, provides a summary of the public scoping comments.

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

SUMMARY OF ISSUES, CONCERNS, AND OPPORTUNITIES

The planning team identified a number of issues, concerns, and opportunities related to fish and wildlife population management; habitat management; resource protection; land acquisition; visitor services; and refuge administration. 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 through this planning process, and has developed a plan that attempts to balance the competing opinions regarding important issues. The team identified those issues that, in its best professional judgment, are the most significant to the refuge. The significant issues are summarized below.

FISH AND WILDLIFE POPULATION MANAGEMENT

Threatened and Endangered Species

Atlantic Loggerhead Sea Turtle and Other Sea Turtles

Four species of sea turtles inhabit the waters around Wolf Island National Wildlife Refuge (NWR) and in the Altamaha River basin. These include the loggerhead, Kemp's ridley, leatherback, and green sea turtles. The most common sea turtle, the loggerhead, is protected under the Endangered Species Act (ESA) and is listed as threatened. The other three species are listed as endangered. The loggerhead is the primary turtle nesting in Georgia waters (approximately 1,200 nests per year). Throughout all of the Georgia coast, all other species combined account for five to ten nests per year (Johnson et al. 1974).

The waters adjacent to the refuge are an important feeding ground for all of the sea turtle species stated above except for the leatherback, which is typically found in an open oceanic environment feeding on jelly-like organisms. Loggerheads and ridleys prefer horseshoe crabs and other crabs, whelks, and other food in which they have the ability to catch and ingest (Caldwell 1959). Green sea turtles are vegetarians and prefer sea grass beds and seaweed. In addition, juvenile turtles use the waters adjacent to the refuge as a safe haven from large ocean-dwelling predators such as sharks.

West Indian Manatee

One breeding group of West Indian manatees exists behind Wolf Island. The refuge has an interest in maintaining high water quality, but beyond that, no additional objectives are identified for this species.

Piping Plover

Piping plovers occur in three distinct nesting populations: (1) the Atlantic population, which includes North Carolina to Maine in the United States and the Canadian maritime provinces (about 1,700 pairs); (2) the Great Lakes group (less than 50 pairs); and (3) the Plains population, including the plains states in the United States and Alberta and Saskatchewan in Canada (about 1,400 pairs). The Great Lakes population is federally listed as endangered. The populations that nest in the rest of the country are listed as threatened. Individuals from all three populations migrate through or winter along the Atlantic coast, with critical habitat specifically designated for the endangered Great Lakes population.

In Georgia, the Altamaha Delta is an important site for wintering piping plovers. It is the most important wintering area for the endangered Great Lakes population, with numbers that vary from year-to-year but are consistently high relative to other wintering sites. Therefore, much of the Altamaha Delta has been established as "Critical Habitat" for piping plovers, including Wolf Island, Egg Island Bar, Little St. Simons Island, and Pelican Spit. Because the over-winter survival of young may be the most critical conservation issue for this species, the availability of high quality winter roosting and foraging habitat may be crucial for the recovery of piping plovers. Wolf Island NWR contributes to the recovery of this species by providing critical habitat for wintering piping plovers.

Other Protected Species and Species of Concern (Wood Stork and Bald Eagle)

The endangered wood stork feeds in the marshes and tidal creeks within the refuge. Although wood storks do not nest on the refuge, the refuge is within the feeding range of 12 coastal Georgia wood stork colonies. The Altamaha River system is relatively unaltered by human actions as compared to other river systems within the United States. Therefore, this river system is still comparatively healthy and very productive, as demonstrated by the fish and wildlife populations supported within the system. It produces a very rich feeding ground for wood storks and other wading birds within the Altamaha Delta. Wood storks are tactile feeders and require a very concentrated food source. Severe tidal amplitudes, combined with the refuge's extremely productive marsh and aquatic habitats, provide the concentrations of small fish needed to produce an exceptionally high quality feeding area for wood storks.

Bald eagles nest on Blackbeard Island NWR, 10 miles north of Wolf Island NWR. Bald eagles are frequently seen on Wolf Island NWR, either perched in the trees on Egg Island or on the beach on Wolf Island. They feed on the abundant fish and birds utilizing the refuge. Bald eagles can cause disturbance to nesting and feeding shorebirds and wading birds, but they create far less impacts to the avian resources than other predators such as raccoons.

Nesting Waterbirds, Wading Birds, Marshbirds, and Sparrows

Nesting and Foraging Colonial Beach Nesting Waterbirds

Wolf Island NWR does not presently support high levels of beach-nesting colonial waterbirds. However, large colonies of brown pelicans, royal terns, black skimmers, and small numbers of sandwich and gull-billed terns exist at nearby Egg Island Bar directly south of the refuge. The royal tern colony represents the largest one (9,000 pairs) on the Atlantic coast. The pelican colony on Egg Island Bar is currently the largest colony on the Atlantic coast. The beaches of the refuge provide important roosting habitat for nesting and post-fledging birds from the Egg Island Bar colony. In addition, these birds use the waters within and around the refuge for foraging. The Altamaha Delta is a very important region in 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 Wolf Island NWR and the surrounding area provide important foraging habitat for long-legged wading birds. A small freshwater wetland on Egg Island supports a breeding colony of 30 pairs, including great blue herons, great egrets, snowy egrets, white ibis, and tri-colored herons. This wetland potentially could become a nesting site for the roseate spoonbill and wood stork. A variety of wading birds uses the entire Altamaha Delta and its associated wetlands to forage on small fish and estuarine invertebrates. Notably, an increasing number of post-breeding reddish egrets have been observed in the area. These are primarily dark-plumaged adults, and although no nesting has been documented in the state, this species has been expanding its range northward in Florida. It is reasonable to expect that nesting may occur in the Delta some time in the near future.

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

Wintering and Breeding Marshbirds and Sparrows

Nearly 5,000 acres of wetlands are inside the boundary of Wolf Island 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 habitat. During winter (August through May), coastal cordgrass marsh is critically important for the saltmarsh sharp-tailed sparrow and Nelson's sharp-tailed sparrow. These two 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 the seaside sparrow and clapper rail utilize the refuge's salt marshes for nesting. Black rails have been identified as a species of very high concern in the regional waterbird conservation plan. A small amount of habitat for black rails may be available on Wolf and Egg islands.

A specific monitoring protocol has been developed for secretive marshbirds as part of the National Marshbird Monitoring Program. This program is designed to (1) field-test marshbird monitoring protocols for eventual use in a continent-wide survey effort; (2) evaluate the effectiveness of call broadcasts in increasing the detection probability of certain species; (3) provide estimates of population trends of marshbirds on lands managed by program participants; and (4) evaluate the effects of wetland management practices on marshbirds. The program also has a centralized database where the survey results are compiled and stored.

Migratory Birds

Wolf Island NWR was established with the explicit purpose of providing habitat for migratory birds. As part of the surrounding state and private lands and waters in the Altamaha Delta, the refuge represents the most important habitat for beach-dependent migratory birds in the entire state of Georgia. On April 28, 2000, the entire Altamaha Delta was designated as a Western Hemisphere Shorebird Reserve Network (WHSHRN) site of regional importance. The WHSHRN site extends from Nannygoat Beach on Sapelo Island to Little St. Simons Island. It includes all of Wolf Island NWR. The only other designated WHSRN site on the Atlantic coast is at Cape Romain, South Carolina, which is of international importance.

Nesting Shorebirds

Because of its importance for nesting shorebird and colonial beach nesting birds, the American Bird Conservancy has listed the refuge and the adjacent Altamaha River Delta as one of the top 500 Important Bird Areas. The refuge provides nesting habitat for Wilson's plovers, American oystercatchers, and willets. 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). 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. Predators such as raccoons are present on Wolf, Egg, and Little Egg islands but are not considered to be a conservation issue for these shorebirds. Wilson's plover nests appear to be less susceptible to raccoon predation than American oystercatchers, because they are located in less exposed areas near vegetation. Ghost crabs have been documented as a key predator of Wilson's plover nests in North Carolina, but do not seem to be an issue for nesting plovers at the refuge. The highest density of American oystercatchers and willets in Georgia can also be found on Egg Island Bar, which has as many as 24 pairs of American oystercatchers and approximately 35 pairs of willets.

Nonbreeding, Migrating, and Overwintering Shorebirds

Wolf Island NWR and the surrounding Altamaha Delta provide important stopover habitat for a variety of shorebirds that are of conservation concern. This area represents the largest roosting site for American oystercatchers during their southbound migration and supports individuals that have been color-banded from every nesting population on the Atlantic coast. American oystercatchers are listed as an Extremely High Priority Species in the regional shorebird conservation plan (Hunter et al. 2000).

The Altamaha Delta is one of two locations in Georgia that has been identified as important during winter for marbled godwits. Every year, 300–500 individuals arrive in August–September, presumably from the declining South James Bay population. These birds spend the winter either in the Delta or in St. Catherine's Sound. They show high wintering site fidelity. Marbled godwits are identified as a species of High Priority for conservation in the regional shorebird conservation plan (Hunter et al. 2000).

Approximately 6,000 red knots annually stop off in the Altamaha Delta during September to forage on surf clams and other bivalves. On the northbound migration, red knots from different breeding populations are found in the Delta and other sites in Georgia. In April to mid-May, birds from the southeastern U.S. wintering population are present foraging primarily on bivalves, especially *Donax* and surf clams. During mid- to late May, birds from the Tierra Del Fuego (TDF) wintering population arrive to take advantage of the availability of horseshoe crab eggs during the spawning season. The number of red knots varies on the northbound route; it can be thousands in some years and hundreds in other years. The subspecies *rufa*, which winters in TDF and potentially on the southeastern U.S. coast, 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 that use the refuge during migration include the long-billed curlew, short-billed dowitcher, and whimbrel. These species use the refuge's beaches for roosting, and forage in the shallow waters surrounding the refuge as well as on 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).

Waterfowl and Other Open Waterbird Species

Wolf Island NWR provides limited habitat for waterfowl and other open water species. Some use of the tidal creeks by red-breasted mergansers, hooded mergansers, lesser scaup, bufflehead, horned grebe, and red-throated loons has been documented during the nonbreeding season. The red-throated loon and horned grebe are both identified as species of concern requiring immediate management and management attention, respectively, in the regional waterbird conservation plan. Their status is primarily due to habitat loss and interactions with fishing gear (i.e., fishing line). Lesser scaup populations have been declining, and this species is also of concern. The refuge is closed to waterfowl hunting; however, the navigable waters around and through the refuge are under state jurisdiction. Some hunting occurs in the large tidal creek through Wolf Island, but it is not considered to be a conservation issue.

Breeding, Wintering, and Migrating Landbird Species

Upland habitat, excluding dunes and beaches, is limited to the small strip of maritime forest on Egg Island (200 acres) and the dredge spoil deposition areas on the back side of Wolf Island (approximately 20 acres). The maritime forest is dominated by oaks, cedar, pine, and shrub species. The dredge spoil deposition areas are primarily covered with wax myrtle and cedar. These areas provide limited habitat for landbirds during winter, migration, and breeding. The area has not been monitored for landbird use, but it is likely that several pairs of painted buntings are nesting annually in the maritime forest of Egg Island.

Other Species

Altamaha River - Interjurisdictional and Anadromous Fisheries

Prior to 1980, the Altamaha River held a large healthy population of striped bass and supported a sustainable fishery. The Georgia state record striped bass was caught in the Oconee River (a tributary of the Altamaha River) in 1957 and weighed 63 pounds. Today, the striped bass population is depressed, and the Georgia Department of Natural Resources (DNR) has begun a restoration effort. Fish numbers are too low to obtain a population estimate using standard recapture methods. Stocking began in 2003, and from 2003–2005, 15,000 fish were stocked annually. The Georgia DNR believes these efforts may make it possible to raise striped bass numbers sufficiently to obtain a population estimate and age class structure, and definitively establish the cause(s) of the declining population.

South Atlantic populations of striped bass are riverine and not truly anadromous as are the north Atlantic populations. In the southern range of this species, summertime water temperatures can be lethal, especially to fish five years and older. Therefore, a thermal refuge is required during the summer months to allow survival of older mature fish. The prime suspect in the decline of the striped bass population in the Altamaha River is water withdrawal from the Floridian aquifer. This reduces and/or eliminates groundwater discharge into the bed of the river. In addition, the fish are extremely concentrated during summer months around areas of groundwater discharge and thus become very susceptible to harvest by fishermen. Another potential source of excessive harvest is by shad fishermen using set nets. However, the number of shad fishermen on the Altamaha River has declined in recent years, and this by-catch of striped bass may not now be a significant cause of mortality.

The Altamaha River contains a healthy population of American shad and sustains a commercial fishery. The American shad population was estimated at 122,000 adult fish in 2005. Approximately 20% of this population was harvested by fishermen. The population is increasing at present, and it is presumed this may be due to the reduced number of fishermen in recent years.

Dams on many of the river systems that empty into the Atlantic Ocean have restricted or eliminated the passage of American shad to their traditional spawning areas. The Altamaha River has no dams in the downstream portion of the river and shad migrations are not restricted. American shad spawn in the Altamaha River from January through March. The juvenile shad begin their migration from October through November and spend the next four to six years in the Bay of Fundy. The males are four to five years of age and the females five to six years old when they return to the Altamaha River to spawn. The southern population of American shad dies following spawning, while the northern populations can spawn for several years.

Reptiles and Amphibians

Very little is known about the herpetofauna on the refuge. With the complete inundation of Little Egg Island, reptiles are probably nonexistent there. Wolf Island has a few hammocks of shrub-scrub habitat, and reptiles may be present but probably in low numbers. Egg Island (with its presence of a small maritime forest) is said to have a high number of eastern diamondback rattlesnakes, but the density is unknown. Since rattlesnakes are present, the refuge staff suspects that other species of snakes and lizards may also be there. Nothing is known about the presence or absence of amphibians.

Diamondback terrapins are abundant in the waters adjacent to the refuge, and the refuge staff suspects high numbers are nesting on Egg and Wolf islands. Presently, the two largest threats to the species in the Altamaha River basin are depredation of nests by raccoons and drowning in crab pots. 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, MAREX personnel examined five excluder devices in the St. Simons and St. Andrew estuaries during the summers of 2003 and 2004. A serious problem could occur to the diamondback terrapin population if a commercial crab fishery was initiated, such as the one that occurred in the Chesapeake Bay years ago, which almost caused a total loss of the local terrapin population.

HABITAT MANAGEMENT

Estuarine Emergent Wetlands

Wolf and Egg islands are both primarily (75%) 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 pools.

The wide variety of organisms supported by estuarine marshes is linked to the range of salinities that occur there. When rain falls in the Altamaha River drainage, it flows downstream and discharges into the estuaries surrounding Wolf and Egg islands. This freshwater temporarily lowers the salinity in the estuaries, which makes 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 that are intolerant of the high salinities migrate upstream into the river system.

The diversity and abundance of fish and aquatic invertebrates in the estuary are very important for shorebirds and fish-eating waterbirds. Terns, gulls, and skimmers forage along the top of the water column—from the surface to one meter deep—of tidal creeks and wetland edges, looking for small

fish 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. The constantly changing environment of the Altamaha Delta and its associated wetlands represents one of the most productive habitat types in the world.

Beaches, Dunes, and Sand Bars

Because of dredging operations up the coast in the Savannah River Delta, the barrier islands in the Altamaha Delta are sand-starved. Littoral drift occurs from north to south. Therefore, sand that historically came out of the Savannah harbor drifted south to deposit along the barrier islands including Wolf Island. This sand is now dredged from the river and deposited on upland disposal sites, which robs the system of its sand supply. Wolf Island has been eroding for the past 70–80 years, as evidenced by its change in size and shape.

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 the red knot, short-billed dowitcher, marbled godwit, ruddy turnstone, and American oystercatcher. In addition, burrowing benthic organisms such as *Donax* spp., surf clam *Mulina*, angelwing, arc, and other small bivalves are eaten, which provide additional critically important food resources. Crustaceans including fiddler crabs, ghost shrimp, and other small shrimp are utilized by the Wilson's plover, gull-billed tern, whimbrel, marbled godwit, long-billed curlew, and American oystercatcher.

Maritime Forest

Wolf Island NWR contains 200 acres of maritime forest located on Egg Island. The 593 acres of Egg Island contain a freshwater depression (pond) surrounded by maritime forest. This maritime forest is bounded by tidal salt marsh on three sides and a thin strip of beach on the eastern end of the island. The maritime forest is dominated by live oak, southern magnolia, and cabbage palm. The dominant understory species are red bay, yaupon, American holly, wax myrtle, and saw palmetto. Loblolly pines and slash pines are interspersed throughout and on the fringes (younger portion) of Egg Island. A disruptive event (such as a severe storm or wildfire) 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 the winter months to reduce the fuel loads and foster a far less severe wildfire potential. However, the remoteness of the island, the difficulty of accessing the forest, and the small size of this forest community would not make prescribed fire economically feasible.

Maritime Shrub-Scrub (Dredge Spoil)

Spoil was deposited on the west and south sides of Wolf Island from dredging operations associated with the construction and maintenance of the Intracoastal Waterway. Through an agreement with the U.S. Army Corps of Engineers, the dredge material is no longer placed on the refuge. The established vegetation is wax myrtle, yaupon, eastern baccharis, and saw palmetto with sea lavender and sea ox-eye along the fringes. In addition, there is some shrub-scrub habitat on the margins and within the maritime forest of Egg Island. It expected that neotropical migratory birds and resident songbirds utilize this shrub-scrub habitat. This habitat also provides excellent nesting habitat for painted buntings.

RESOURCE PROTECTION

Wilderness

As a national wilderness area, Wolf Island is closed to public use, and no active management is currently conducted on the refuge. Nevertheless, some need for active management may occur in the future to control invasive species or, if necessary, to restore heavily eroded beaches. The primary needs related to wilderness (as well as for endangered species and other priority fauna and flora) would be to ensure high water quality and Class I Air Quality standards.

Invasive Species Management

No control of invasive species is considered necessary at this time. However, saltcedar and Chinese tallow stands are nearby and may spread to the refuge in the near future.

Beach Restoration Activities

Other than trying to change the standard operating procedures conducted by the Corps of Engineers that could reverse present beach erosion rates, there are no plans for beach restoration at this time. However, the beach is presently highly erodible. If the severity of the erosion increases, then this position may need to be reevaluated in the future.

Air Quality

Recent threats of increasing industrial and/or utility air emissions near Wolf Island NWR highlight the need to maintain high air quality. The region where the refuge is located is designated as a Class I Air Quality Area, and this designation affords some legal protection and enforcement to preserve the refuge's air quality. However, actual monitoring of Wolf Island would be very difficult to conduct consistently. Present monitoring from Okefenokee NWR or future monitoring from Blackbeard Island NWR may be more appropriate. Regardless, the aerial deposition of mercury should be checked, especially in and around Wolf Island.

LAND ACQUISITION

Wolf Island Bar

Another important focus of the biological review team was the legal status of the emerging "Wolf Island Bar." Based on a memorandum dated June 26, 2006, from John Beasley (the Service's Southeast Regional Land Surveyor) to Chuck Hunter, his interpretation is that Wolf Island Bar may currently be considered part of refuge lands based on its connection to Wolf Island proper at mean low tide. The deed transferring Wolf Island to the Service states that everything above mean low tide was included in the refuge. However, there is a need to discuss this status officially with the State of Georgia to seek concurrence with this interpretation. Regardless of its status within the National Wildlife Refuge System, the Wolf Island Wilderness Boundary would not extend to Wolf Island Bar.

VISITOR SERVICES

Posting Wolf Island as Closed

Much concern was expressed over the likely increase in public use to Wolf Island in the next few years. The biological review team recommended that the most critical need is to clearly post Wolf Island as closed to public access. At least three large signs (designating "Wilderness" and "Area Closed") are needed at likely access points. Coordination with the Georgia DNR is possible for making the appropriate "Closed Area" signs and getting these signs into place (such as at the Egg Island Bar).

All refuge boundary signs are faded and in need of replacement. In addition, there are currently no signs that identify the refuge as a wilderness area. Although the refuge is closed to the public, no "Closed Area" signs are posted on the refuge boundary. The public is currently accessing Wolf Island at two points: on the north and south ends of the beach. Large "Closed Area" signs should be placed at these access points, and the signs should have large enough lettering to be read from a minimum distance of 40 yards. Additional information could be placed on the signs in smaller lettering to explain the basis for closure.

Environmental Education

Associated in general with the Savannah Coastal Refuges Complex program, those responsible for the refuge should participate with the Georgia DNR and their efforts to promote environmental awareness of the important natural heritage of the Altamaha Delta.

Public Wildlife Viewing

Wildlife observation may be allowed from boats at recommended distances from foraging and nesting birds. These wildlife observation points can be marked by buoys off the islands under a state lease agreement. Such a program could be promoted along with public education on the wilderness area and why Wolf Island is closed to public access.

Compatible Recreational Uses

The increasing recreational pressures on the refuge should be addressed at this time. There is a need to clearly indicate that the entire island is closed and not just the area behind the Fish and Wildlife Service's "blue goose" sign on the dune line. Posting is necessary now before a clientele becomes established.

REFUGE ADMINISTRATION

State Relationships and Coordination

The relationship between the refuge and the Georgia DNR has been excellent. The establishment of the Altamaha Delta as a part of the Western Hemisphere Shorebird Reserve Program was possible only through the cooperative efforts of personnel from the refuge and the Georgia DNR. The need to engage in cooperative management and protective efforts for the Delta stems from the diversity of ownerships within the area, including a national wildlife refuge, a state natural area, and a privately owned island. These cooperative efforts and positive working relationships should be maintained through time as personnel change within all organizations.

Increase in Law Enforcement Effectiveness

There is a need for additional protection efforts for the refuge. Currently, one law enforcement officer is working for three refuges and the Wolf Island Refuge is the most difficult to access. For this reason, it has been very difficult to provide the protection the refuge needs. Past problems have included the attempted removal of federally protected cultural artifacts (including a dugout canoe), trespass in a closed area, and collecting of snakes. All current signs need to be replaced. In addition, "Closed Area" signs need to be placed in key locations in coordination with the Georgia DNR.

Staffing and Budget

Wolf Island NWR is unstaffed and unfunded. The nearest staff and equipment is stationed at Harris Neck NWR, which also staffs Blackbeard Island NWR. However, in addition to the need for a greater law enforcement presence, there is a need for at least one additional biological technician (optimally two) that would also have duties associated with the Harris Neck and Blackbeard Island national wildlife refuges. In addition, baseline funding is needed to support boats, fuel, signage, and associated labor for maintenance.

Wilderness Review

The Service's planning policy requires a wilderness review as part of the comprehensive conservation planning process for all refuges. 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. However, this review is not needed for Wolf Island National Wildlife Refuge because it already meets the criteria for wilderness as defined in the National Wilderness Act of 1964. In accordance with the criteria required by this Act, Congress designated the refuge as a national wilderness area on January 3, 1975.

Additional information on the National Wilderness Act of 1964 and the refuge's wilderness designation is provided in Chapter II, Refuge Overview, in the Special Designations section.

IV. Management Direction

INTRODUCTION

The U.S. Service (Service) manages fish and wildlife habitats considering the needs of all resources in decision-making. However, first and foremost, fish and wildlife conservation assumes priority in refuge management. A requirement of the National Wildlife Refuge System Improvement Act of 1997 is for the Service to maintain the ecological health, diversity, and integrity of refuges. Public uses are allowed only if they are appropriate and compatible with wildlife and habitat conservation. Because of the limited upland areas of Wolf Island National Wildlife Refuge and the various species that depend on this habitat for breeding, nesting, and feeding, "No Public Access" was determined as necessary to assure their continued protection. However, wildlife observation, wildlife photography, and environmental education and interpretation under a Special Use Permit or from watercraft at a safe distance from the refuge's shorelines should be considered appropriate and compatible.

Described below is the proposed Comprehensive Conservation Plan (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 Direction (No Action)
- Alternative B: Intensive Biological Resource Management
- Alternative C: Ecosystem Management (Proposed Alternative)

Each of these alternatives is described in Chapter III of the Environmental Assessment (Section B). The Service chose Alternative C, Ecosystem Management, as the proposed action alternative.

Implementing the proposed alternative will result in the recognition of the ecological role of Wolf Island National Wildlife Refuge (NWR) within the interrelated Altamaha River basin and coastal barrier island ecosystem. Human activities and natural processes within these ecosystems influence Wolf Island NWR in a variety of ways. Alternative C explicitly commits the Service to acknowledge these influences and cooperate with other stakeholders in ways that will ensure the continued protection and enhancement of the ecosystem's natural resources.

As with Alternative B, the refuge would strive to optimize its biological program while recognizing that there may be tradeoffs and opportunity costs between the various elements of the biological programs envisioned. In other words, it might not be possible to equally pursue and achieve all objectives simultaneously because of budgetary and staffing constraints or because of intrinsic conflicts between objectives. Hence, Alternative C emphasizes a broader ecosystem approach than Alternative B, which is narrowly focused on the refuge.

The refuge would conduct baseline inventories and monitoring programs with several partners to investigate threats and opportunities within the ecosystem as they may impact refuge goals and objectives. The Service and its partners would continue to furnish benefits to the ecosystem's native flora and fauna under Alternative C. The refuge would also continue to furnish benefits to federally listed threatened and endangered species such as the loggerhead sea turtle and piping plover.

Under Alternative C, consideration of land acquisition and efforts at resource protection within the ecosystem would be intensified. Control of invasive species would increase and efforts would be made to reduce beach erosion. Service staff would work with partners to manage and improve habitats within the ecosystem. The staff would also explore opportunities with partners to expand land and habitat protection efforts.

VISION

Based on sound science and wilderness values, the Wolf Island NWR will protect, manage and, where appropriate, restore the Atlantic Coastal Barrier Island System to provide for wildlife, plants, and threatened and endangered species as well as their habitats for the benefit of present and future generations.

GOALS, OBJECTIVES, AND STRATEGIES

The goals, objectives, and strategies for Wolf Island NWR— presented here in a hierarchical format— are the Service's responses to the issues, concerns, and needs expressed by the public, partners, refuge staff, and the planning team. 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 National Wildlife Refuge System Improvement Act of 1997; the mission of the National Wildlife Refuge System; and the purposes and vision of Wolf Island NWR. With adequate staffing and resources as outlined in Chapter V, Plan Implementation, the Service intends to accomplish these goals, objectives, and strategies within the next 15 years.

Periodic reviews of the progress made toward accomplishing these goals (and possible modifications) will be conducted as advances are made in scientific knowledge affecting the management of fish and wildlife resources on the refuge and within the affected ecosystem. Wolf Island NWR plays a key role in a number of regional, national, and system-wide conservation plans that are referenced in this comprehensive conservation plan. Fulfillment of the following goals, objectives, and strategies will contribute significantly to those plans. Some of the following recommendations may conflict with ongoing refuge work or with other recommendations. It must always be remembered that whenever a management conflict arises, the conflict shall be resolved in a manner that first protects the purpose of the refuge and, to the extent practicable, that also achieves the mission of the National Wildlife Refuge System.

FISH AND WILDLIFE POPULATION MANAGEMENT

Goal A. Fish and Wildlife Population Management: Maintain healthy and diverse populations of native fish and wildlife with a focus on threatened and endangered species and species of concern.

Discussion: In Georgia, the Altamaha Delta (Delta) is an important site for wintering piping plovers, and the most important wintering area for the endangered Great Lakes population with numbers varying from year-to-year but consistently high relative to other wintering sites. Four species of sea turtles inhabit the waters around Wolf Island NWR and in the Altamaha River basin. The Altamaha River drainage contains the largest population of the endangered shortnose sturgeon within the South Atlantic. This population is the third largest population in U.S. waters. On April 28, 2000, the entire Delta was designated as a Western Hemisphere Shorebird Reserve Network (WHSHRN) site of regional importance.

Fish and Wildlife Population Management Objective A-1. Atlantic Loggerhead Sea Turtle and other Sea Turtles: Protect and monitor the environment adjacent to the refuge and throughout the ecosystem for the protection of sea turtles.

Discussion: From aerial overflights conducted by the Georgia Department of Natural Resources (DNR), Wolf Island NWR has four to six nests per year with most, if not all, nests destroyed from tidal inundation or depredation by predators such as raccoons. Nest protection would not be feasible because of the low numbers of nests and the logistical problems associated with the location of the refuge.

The waters adjacent to the refuge are an important feeding ground for all sea turtles stated above except for the leatherback, which is typically found in an open oceanic environment feeding on jelly-like organisms. Loggerheads and ridleys prefer horseshoe crabs and other crabs, whelks, and other food they have the ability to catch and ingest. Green sea turtles are vegetarians and prefer sea grass beds and seaweed.

Strategies:

- Monitor water quality for pollutants such as toxic discharge from industry, oil spills, and debris that could harm and/or kill turtles.

- Protect the waters from overfishing and overharvesting food items important to sea turtles.

- Work with partners to limit or eliminate fishing gear that would cause entanglement and drowning of turtles.

- Work with partners to monitor and control coastal development, which can lead to degradation of foraging habitats and increase the numbers of watercraft in the area, potentially causing more injuries or deaths from boat strikes.

- Channel dredging, especially by hopper dredges, can lead to high turtle mortalities and habitat destruction. Many dredges are now required to carry turtle observers on board and report any turtle/dredge incidents to the proper authorities. If dredging should occur near the Wolf Island NWR, refuge and Georgia DNR personnel should work with the U.S. Army Corps of Engineers to ensure turtle observers are required.

Fish and Wildlife Population Management Objective A-2. West Indian Manatee: Cooperate with partners to maintain habitat quality for any manatees that occur in waters adjacent to the refuge and the ecosystem of the refuge.

Discussion: The refuge has an interest in maintaining high water quality, but beyond that, no additional objectives are identified for this species.

Strategies:

- Initiate water quality sampling in refuge and adjacent waters.

- Coordinate water quality sampling efforts with the University of Georgia and the Georgia DNR to ensure that critical parameters are tested and these efforts are added to the existing databases.

- Coordinate with the Georgia DNR and other federal agencies to strengthen the Service's position for preserving and protecting the Altamaha River System.

Fish and Wildlife Population Management Objective A-3. Piping Plover: Continue to contribute to the recovery of the piping plover by providing undisturbed high quality foraging and roosting habitat.

Discussion: As discussed in Chapter 3, piping plovers occur in three distinct nesting populations. The population nesting in the Great Lakes is federally listed as an endangered species, and the populations nesting in the rest of the country are listed as threatened. Individuals from all three populations migrate through or winter along the Atlantic Coast with Critical Habitat specifically designated with respect to the endangered Great Lakes population. Therefore, much of the Delta has been established as Critical Habitat for piping plovers, including Wolf Island, Egg Island Bar, Little St. Simons Island, and Pelican Spit. Because over-winter survival of young may be the most critical conservation issue for this species, the availability of high quality winter roosting and foraging habitat may be crucial for recovery of piping plovers. Wolf Island NWR contributes to the recovery of this species by providing critical habitat for wintering piping plovers.

Strategies:

- Minimize disturbance to foraging and roosting birds by posting signs readable from offshore at three key landing points on Wolf Island NWR to deter human use.

- Monitor use of the refuge by over-wintering piping plovers by instituting monthly surveys from July through April. Coordinate with the Georgia DNR to augment surveys currently being conducted. Surveys should occur at a minimum in September, February, and April.

- Evaluate distribution and abundance of food resources for piping plovers by initiating benthic invertebrate and water quality sampling.

Fish and Wildlife Population Management Objective A-4. Other Protected Species (Wood Stork and Bald Eagle): Continue to protect habitat for these species, and within 5 years of CCP approval, coordinate with partners to increase monitoring efforts within the ecosystem.

Discussion: The endangered wood stork feeds in the marshes and tidal creeks within the refuge. Although wood storks do not nest on the refuge, the refuge is within feeding range of 12 coastal Georgia wood stork colonies. The Altamaha River System is relatively unaltered by human actions as compared to other river systems within the U.S. Therefore, this river system is still comparatively healthy and very productive as demonstrated by the fish and wildlife populations supported within the system. This produces a very rich feeding ground for wood storks and other wading birds within the Delta.

Bald eagles nest on Blackbeard Island NWR, 10 miles north of Wolf Island NWR. Bald eagles can frequently be seen on Wolf Island NWR either perched in the trees on Egg Island or on the beach on Wolf Island. They feed on the abundant fish and birds utilizing the refuge.

Strategies:

- Work with other federal and state agencies and conservation groups to preserve the pristine nature of the Altamaha River System that the refuge is dependant on.

- Conduct water quality sampling.

- Conduct surveys of wood stork feeding activities in breeding and post-breeding seasons.

Fish and Wildlife Population Management Objective A-5. Shorebirds: Continue to provide habitat for current populations of shorebirds, support Georgia DNR research of shorebirds, increase protection and monitoring efforts, and enhance ecosystem habitats for shorebirds.

Discussion: The refuge and the adjacent Altamaha Delta are listed as one of the top 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, and willets. 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). Willets are listed as Moderate Priority in the regional shorebird conservation plan (Hunter et al. 2000) but are still worthy of consideration. Predators such as raccoons are present on Wolf, Egg, and Little Egg islands but are not considered to be a conservation issue.

Strategies:

- Minimize disturbance to nesting shorebirds by posting signs at key locations.

- Monitor predation of shorebird nests by raccoons to determine if predator control measures are necessary.

- Monitor nesting shorebird use of the refuge by implementing nesting season surveys of appropriate habitat.

- Coordinate with the Georgia DNR to complement existing surveys.

Fish and Wildlife Population Management Objective A-6. Wintering and Breeding Marshbirds and Songbirds: Provide habitat for marshbirds and songbirds and survey and monitor habitat enhancement on the refuge while working with partners throughout the ecosystem to increase monitoring and habitat enhancement efforts.

Discussion: Upland habitat, excluding dunes and beaches, is limited to the small strip of maritime forest on Egg Island and the dredge spoil deposition areas on the back side of Wolf Island. The maritime forest is dominated by oaks, cedar, pine, and shrub species. Dredge spoil deposition areas are primarily covered with wax myrtle and cedar. These areas provide limited habitat for landbirds during winter, migration, and breeding. The area has not been monitored for landbird use, but it is likely several pairs of painted buntings are nesting annually in the maritime forest of Egg Island.

There are nearly 5,000 acres of wetlands inside the boundary of Wolf Island 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 habitat. During winter, coastal cordgrass marsh is critically important for saltmarsh sharp-tailed and Nelson's sharp-tailed sparrows. A small amount of habitat for black rails is available on Wolf and Egg islands. 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.

Strategy:

- Monitor marshbird use of salt marshes by implementing winter and breeding surveys at Wolf, Egg, and Little Egg Islands.

Fish and Wildlife Population Management Objective A-7. Reptiles and Amphibians: Continue to provide habitat for reptiles and amphibians, and within 5 years of CCP approval, begin to monitor presence and conduct habitat management for reptiles and amphibians on the refuge while working with partners throughout the ecosystem to increase monitoring and habitat enhancement efforts.

Discussion: Very little is known about the herpetofauna on the refuge. With the complete inundation of Little Egg Island, reptiles are probably non-existent there. Wolf Island has a few hammocks of shrub-scrub habitat, and reptiles may be present but probably in low numbers. Egg Island (with its presence of a small maritime forest) is said to have a high number of eastern diamondback rattlesnakes, but no inventories or surveys have been done. If rattlesnakes are present, we suspect other species of snakes and lizards would also be there. Nothing is known about the presence or absence of amphibians.

Strategies:

- Initiate an inventory of the herpetofauna, especially for diamondback terrapin nests on the refuge.

- Reduce the raccoon population on the refuge.

- Encourage the implementation of the Georgia DNR proposal to list terrapins as “Unusual” species on their protected species list.

- Encourage the Georgia DNR to require the most efficient excluder device on all crab traps in the Altamaha Basin.

HABITAT MANAGEMENT

Goal B. Habitat Management: Manage, protect, enhance, and, as needed, restore a structurally diverse coastal island habitat.

Discussion: Wolf Island is closed to public use, and there is currently no active management conducted on the refuge. Nevertheless, some need for active management may occur in the future to control invasive species or, if necessary, restore heavily eroded beaches. Primary needs related to wilderness as well as for endangered species and other priority fauna would be to ensure high water quality and Class I Air Quality standards.

Habitat Management Objective B-1. Salt Marsh: Within 5 years of CCP approval, map, protect, and maintain salt marsh on the refuge and enhance habitat quality while working with partners within ecosystem to eliminate threats to salt marsh.

Discussion: Wolf and Egg islands are both primarily (75%) 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. They are 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 pools. 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 Altamaha River drainage, it flows downstream and discharges into the estuaries surrounding Wolf and Egg islands. This fresh water temporarily lowers the salinity in the estuaries, which makes them habitable for organisms that prefer lower salinity 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.

Strategy:

- Implement a water quality (including salinity) monitoring project.

Habitat Management Objective B-2. Beaches, Dunes, and Sand Bars: Within 5 years of CCP approval, map, protect, maintain, and enhance these habitats on the refuge while working with partners within the ecosystem to eliminate threats to these habitats.

Discussion: Because of dredging operations up the coast in the Savannah River Delta, the barrier islands in the Altamaha Delta are sand-starved. Littoral drift occurs from north to south. Therefore, sand that historically came out of the Savannah harbor drifted south to deposit along the barrier islands including Wolf Island. This sand is now dredged from the river and deposited on upland disposal sites, which robs the system of its sand supply. Wolf Island has been eroding for the past 70–80 years, which is evident by its change in size and shape.

Strategies:

- Work with partners to influence the U.S. Army Corps of Engineers to change deposition sites from confined disposal areas and offshore ocean sites to nearshore sites in order to increase the amount of sand traveling down the coast.

- Study the possibility of erosion control measures to keep sand from leaving Wolf Island.

- Initiate studies of distribution, abundance, and limiting factors for benthic invertebrates.

Habitat Management Objective B-3. Maritime Forest and Shrub-Scrub: Within 5 years of CCP approval, map, protect, and maintain these habitats on the refuge, and enhance habitat quality while working with partners within the ecosystem to eliminate threats to these habitats.

Discussion: This maritime forest provides habitat of superior quality for many species of wildlife. Due to the remoteness of Egg Island and difficulty in gaining access to the higher elevations on the island, the maritime forest provides sanctuary particularly for species that are sensitive to human disturbance or are pursued by the public. Wading birds nest undisturbed around the small pond within the forest, and many species of neotropical birds utilize the resources of the maritime forest during migration and nesting. Egg Island has a local reputation as one of the few remaining areas where large diamondback rattlesnakes can be found. Refuge law enforcement officers have received reports of snakes being removed from the refuge for the purpose of entering local rattlesnake roundups.

Strategies:

- Maintain the maritime forest in a natural state, excluding the use of prescribed fire.
- Conduct annual inspections of the forest community for the presence of noxious or invasive species, e.g., feral hogs, tallow trees, etc.
- Coordinate with the Georgia DNR to document the activity of the wading bird nesting colonies annually.
- Add an additional refuge law enforcement officer, obtain needed equipment, and increase patrols to protect the wildlife and maritime forest habitat.
- Conduct call recognition surveys for nesting birds during May–June on maritime forest and shrub-scrub habitats of Egg Island.

RESOURCE PROTECTION

Goal C. Resource Protection: As a designated wilderness area, work with private landowners, agencies, and other partners to restore eroded beach habitat, provide law enforcement, protect cultural resources, and continue to protect wildlife and habitat using a variety of land protection efforts including easements and acquisitions.

Discussion: Resource protection through easements and acquisitions is often a consideration in refuge management, and to that end, there have been discussions about protecting Queen Island and gaining a determination regarding the legal status of the emerging “Wolf Island Bar.” Another important aspect of resource protection for the Wolf Island NWR complex is beach protection and restoration.

Resource Protection Objective C-1. Invasive Species Management: Within 3 years of CCP approval, conduct a survey of invasive species to begin control while working with partners within the ecosystem to abate threats.

Discussion: No control is considered necessary at this time. However, saltcedar and Chinese tallow stands are present on nearby islands and may spread to the refuge.

Strategy:

- Conduct periodic surveys of the refuge to determine if the noted invasives appear.

Resource Protection Objective C-2. Beach Restoration Activities: Coordinate efforts with other partners in the ecosystem and with the U.S. Army Corps of Engineers to change current dredge deposition procedures in the Savannah area in order to reverse the present beach erosion rates in coastal Georgia.

Discussion: Besides trying to change standard operating procedures conducted by the Corps of Engineers that could reverse present beach erosion rates, there are no plans for beach restoration at this time. However, the beach is presently highly erodible, and if severity increases, then this position may need to be reevaluated.

Resource Protection Objective C-3. Contaminants/Water Quality: Within 5 years of CCP approval, in cooperation with partners, collect sediment and water samples for the Altamaha Delta and examine contaminants associated with potential upstream discharges.

Discussion: Developmental pressure has been impacting and will continue to impact the Altamaha Delta in a variety of ways. One of the most significant is water quality (as discussed more fully in Chapter III, Plan Development).

Strategies:

- Collect sediment and water samples for the Altamaha Delta.

- Obtain potential list of contaminants from the Service's Ecological Services office in Brunswick.

Resource Protection Objective C-4. Air Quality: Continue to utilize air quality monitoring data for Class I Air Quality from Okefenokee NWR to characterize the air quality status of the Wolf Island NWR Wilderness Area. Continue commenting on new permit applications and changes to existing air quality permits that could impact Class I Air Quality standards while working with the Georgia DNR to characterize Wolf Island NWR's air quality by utilizing data from the Sapelo Island NADP (National Atmospheric Deposition Program) site.

Discussion: Very recent threats of increasing emissions near Wolf Island highlight the need to maintain high air quality with the designation of Class I Air Quality (Highest Pollution Threat). However, actual monitoring of Wolf Island would be very difficult to conduct consistently. Present monitoring from Okefenokee NWR or from the Sapelo Wildlife Management Area may be more appropriate. Regardless, the aerial deposition of mercury should be checked, especially in and around Wolf Island.

Strategies:

- Utilize monitoring data from Okefenokee NWR or from the Sapelo Wildlife Management Area. Consider establishing a monitoring station on Blackbeard Island NWR.

- Aerial deposition of mercury should be checked in and around Wolf Island.

Resource Protection Objective C-5. Land Acquisition and Protection: Seek to augment protected land area by expanding the refuge's authorized acquisition boundary and work with partners to increase the area of protected lands within the ecosystem.

Discussion: As mentioned in Chapter III, Plan Development, there was, and continues to be, discussion regarding protection of Queen Island. In addition, the deed transferring Wolf Island to the Service states that everything above mean low tide was included in the refuge, and this may impact the status of Wolf Island Bar. Regardless of its status within the National Wildlife Refuge System, the Wolf Island Wilderness Area boundary would not extend to Wolf Island Bar.

Strategies:

- Determine the feasibility and desirability of protecting Queen Island through easement, fee title, etc.

- Initiate discussions with the State of Georgia to seek concurrence that Wolf Island Bar is a part of the refuge.

Resource Protection Objective C-6. Restricting Public Access: Within 5 years of CCP approval, replace existing boundary signs; install authorized "Wilderness Area" signs and three large "Area Closed" signs; increase law enforcement presence to an average of two additional patrols per week during the nesting and beach seasons; and increase cooperation with the Georgia DNR on patrols and offsite education.

Discussion: Much concern was expressed over the likely increase in public use to Wolf Island in the next few years. The biological review team recommended as the most critical need clearly posting Wolf Island as closed to public access.

All refuge boundary signs are faded and in need of replacement. In addition, there are no signs that currently identify the refuge as a wilderness area. Although the refuge is closed to the public, no "Closed Area" signs are posted on the refuge boundary. The public is currently accessing Wolf Island at two points, which are on the north and south ends of the beach. Large "Closed Area" signs should be placed at these access points, and the signs should have large enough lettering to be read from a minimum distance of 40 yards. Additional information could be placed on the signs in smaller lettering to explain the basis for closure.

Strategies:

- Replace all existing refuge boundary signs with new signs, and investigate the possibility of getting better quality, fade-resistant signs.

- Add "Wilderness Area" signs on the same posts that refuge boundary signs are placed.

- Contract the construction of three large "Island Closed" signs, and install these at the north and south ends of Wolf Island.

VISITOR SERVICES

Goal D. Visitor Services: Develop and implement (within the parameters of the refuge's wilderness designation and the need for no public access) a quality and compatible wildlife-dependent public use program that leads to a greater understanding and appreciation of fish and wildlife values.

Discussion: Wolf Island is coming under increasing recreational pressures. The role of wilderness areas and the rationale for no public access need to be explained to the public. Posting is necessary now before a clientele becomes established.

Visitor Services Objective D-1. Environmental Education: Continue educational efforts including participation in the Georgia Coastal Education Group; the posting of information on the Wolf Island NWR's website; and distribution of educational pamphlets. Initiate outreach programming and development of offsite interpretive exhibits while working with nongovernmental conservation organizations and local civic organizations and governments throughout the ecosystem to raise public awareness of the wilderness values and the role the refuge plays in the ecosystem. Facilitate partnerships with educational institutions and organizations to provide limited onsite field study programs.

Discussion: Public outreach about the importance of wilderness areas and the rationale for no public access on Wolf Island can go a long way toward developing public awareness of the refuge and the techniques necessary for its protection.

Strategies:

- Explain why the refuge is closed to the public.

- Work with the state to incorporate a message on wilderness areas and no public access to Wolf Island, with future outreach efforts coordinated with the planned Darien Interpretative Center within the Altamaha Wildlife Management Area.

Visitor Services Objective D-2. Wildlife Observation and Photography: Continue to allow visitors to view and photograph the refuge and its wildlife from a safe distance.

Discussion: Wildlife observation and photography can be allowed from boats at recommended distances (marked by buoys off the islands under a state lease agreement) from foraging and nesting birds, while still maintaining the viability and importance of the need for no public access.

Strategy:

- Incorporate message with the future planned Darien Interpretative Center within the Altamaha Wildlife Management Area.

REFUGE ADMINISTRATION

Goal E. Refuge Administration: Secure and enhance staffing, resources, and facilities to manage the integrity of habitats and wildlife resources on Wolf Island NWR and fulfill the refuge purposes.

Discussion: Wolf Island NWR is unstaffed and unfunded. The nearest staff and equipment is stationed at Harris Neck NWR, which also staffs Blackbeard Island NWR. However, in addition to the need for a greater law enforcement presence, there is a need for at least one additional biological technician that would also have duties associated with the Harris Neck and Blackbeard Island national wildlife refuges.

Refuge Administration Objective E-1. State Relationships and Coordination: Over the life of the CCP, continue the positive working relationship between the refuge and the Georgia DNR; ensure that this relationship is maintained through time as personnel change within all organizations; and develop a Memorandum of Agreement (MOA) for resource management within 3 years of CCP approval that covers the entire ecosystem.

Discussion: The relationship between the refuge and the Georgia DNR has been excellent. The establishment of the Altamaha Delta as a part of the Western Hemisphere Shorebird Reserve Program was possible only through the cooperative efforts of personnel from the refuge, the Georgia DNR, and Little St. Simons Island. These cooperative efforts and positive working relationships should be maintained through time as personnel change within all organizations.

Strategies:

- Work with all parties to accomplish common goals, e.g., water quality monitoring, fisheries assessment, migratory bird assessment, research and protection, etc.

- Conduct an annual meeting to establish priority needs and strategies for related projects.

Refuge Administration Objective E-2. Staffing and Budget: Add one full-time equivalent (FTE) law enforcement officer and one FTE biological technician and associated support resources.

Discussion: As noted above, Wolf Island National Wildlife Refuge is unstaffed and unfunded.

Strategies:

- Add an additional law enforcement position (that would also serve the Harris Neck and Blackbeard Island national wildlife refuges).

- Add at least one biological technician position (that would also serve the Harris Neck and Blackbeard Island national wildlife refuges).

- Baseline resources should be established to support boats, fuel, signage, and the associated labor necessary to do at least the minimum necessary to protect resources at Wolf Island.

Refuge Administration Objective E-3. Volunteers and Friends: Within 5 years of CCP approval and staffing, develop a volunteer corps and share these volunteers with ecosystem partners.

Discussion: Active public participation in promoting the refuge's wilderness values can be greatly enhanced through volunteer and friends programs.

V. Plan Implementation

INTRODUCTION

Refuge lands are managed as defined under the National Wildlife Refuge System Improvement Act of 1997. Congress has distinguished a clear legislative mission of wildlife conservation for all national wildlife refuges. National wildlife refuges, unlike other public lands, are dedicated to the conservation of the nation's fish and wildlife resources and wildlife-dependent recreational uses. Priority projects emphasize the protection and enhancement of fish and wildlife 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 Comprehensive Conservation Plan (CCP) for Wolf Island National Wildlife Refuge, this chapter identifies the projects; resource 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 Refuge Operating Needs (RONS) costs for fish and wildlife population management, habitat management, resource protection, visitor services, and refuge administration over the next 15 years. This list reflects the priority needs identified by the public, the planning team, and the refuge staff based upon available information. These projects were generated for the purpose of achieving the refuge's objectives and strategies. The primary linkages of these projects to those planning elements are identified in each summary.

FISH AND WILDLIFE POPULATION MANAGEMENT

The overall goal for fish and wildlife population management at Wolf Island NWR is to maintain healthy and diverse populations of native fish and wildlife, with a focus on threatened and endangered species and species of concern.

Refuge personnel plan to partner with state agencies and local universities in a variety of monitoring programs. Examples include the overfishing of adjacent waters and water quality monitoring for pollutants such as toxic discharges from industry and coastal development.

Because Wolf Island NWR has been designated as a national wilderness area that also prohibits public access, efforts will be made to reduce human disturbance on the refuge. This will be accomplished through projects such as the posting of signs (readable from offshore) to inform the public that no public access is allowed, and other projects that work with state agencies and conservation groups to preserve the pristine nature of the Altamaha River System in which the refuge is dependent on.

In order to monitor the success of protecting the health of the refuge's fauna, refuge personnel (as resources and staffing levels will allow) will initiate specific species monitoring programs to:

- monitor use of the refuge by piping plovers and evaluate the distribution and abundance of food resources for the piping plover;

- conduct surveys of wood stork feeding activities;
- monitor predation of shorebird and sea turtle nests by raccoons;
- monitor marshbird use of refuge salt marshes; and
- initiate an inventory of refuge herpetofauna (especially the diamondback terrapin).

Atlantic Loggerhead Sea Turtle and Other Sea Turtles: Monitoring efforts indicate that Wolf Island NWR averages five sea turtle nests per year, with most, if not all, of the nests destroyed from tidal inundation or depredation by predators. Nest protection is currently not practical because of the low number of nests and the logistical problems associated with the location of the refuge. However, working in partnership with state and federal agencies, refuge personnel can and will work to protect water quality in waters adjacent to the refuge. This is an important role in the protection of sea turtles, because these waters are an important feeding ground for many sea turtle species. Another important aspect in water quality and associated habitat protection is the reduction and/or elimination of fishing gear (nets, fishing lines, etc.) that could cause entanglement and drowning of sea turtles.

RONS Recurring Costs: $30.0K Special Project Cost:

West Indian Manatee: Refuge personnel will cooperate with partners to maintain habitat quality for any manatees that occur in waters adjacent to the refuge. As above, this activity will focus on adjacent refuge water quality. Refuge personnel will coordinate the collection of water quality data with the University of Georgia and Georgia Department of Natural Resources (DNR) to ensure that critical parameters are tested. This effort will strengthen the Service's position on preserving and protecting the environmental quality of the Altamaha River System.

RONS Recurring Costs: $30.0K Special Project Cost:

Piping Plover: Overwintering of piping plover is one of the most critical conservation issues for this species. Piping plover migrate through and/or winter along the Atlantic coast, making the Altamaha Delta a designated critical habitat for this species. Refuge personnel will monitor use of the refuge by overwintering piping plover and minimize disturbance to foraging and roosting birds by posting signs that are readable from offshore at key landing points on Wolf Island to deter human use.

RONS Recurring Costs: $30.0K Special Project Cost:

Wood Stork, Bald Eagle, and Other Protected Species: The endangered wood stork feeds in the refuge's marshes and tidal creeks. Although these storks do not nest on the refuge, the refuge is within the feeding range of several coastal Georgia wood stork colonies. Bald eagles nest on Blackbeard Island NWR, 10 miles north of Wolf Island, and can be seen perched in the trees of Egg Island or on the beach at Wolf Island.

The Altamaha River System is relatively unaltered by human actions as compared to other river systems within the U.S. and is still comparatively healthy and productive as a feeding ground for wood storks, other wading birds, and species such as the bald eagle. The refuge will work with other federal and state agencies and conservation groups to preserve the pristine nature of the Altamaha River System that the refuge is dependent on.

RONS Recurring Costs: $15.0K Special Project Cost:

Shorebirds: The refuge and the adjacent Altamaha Delta are listed as one of the top 500 Important Bird Areas by the American Bird Conservancy due to their importance for nesting shorebird and

colonial beach nesting birds. The refuge will work to continue this legacy by minimizing disturbances to nesting shorebirds; monitor raccoon predation of shorebird and sea turtle nests; monitor nesting shorebird use of the refuge; and coordinate with the Georgia DNR to complement existing surveys.

RONS Recurring Costs: $15.0K Special Project Cost:

Wintering and Breeding Marshbirds and Songbirds: Upland habitat, excluding dunes and beaches, is limited to a small strip of maritime forest on Egg Island and dredge spoil areas on the leeward side of Wolf Island. These areas provide limited habitat for landbirds during winter, migration, and breeding seasons. The estuarine marshes at Wolf Island NWR provide critical habitat for the salt marsh sharp-tailed sparrow and Nelson's sharp-tailed sparrow. Monitoring marshbird use of salt marshes on the refuge will help determine the habitat health for these species. A specific monitoring protocol has been developed for secretive marshbirds as part of the National Marshbird Monitoring Program and will be implemented.

RONS Recurring Costs: $15.0K Special Project Cost:

Reptiles and Amphibians: Very little is known about the herpetofauna on the refuge. With the complete inundation of Little Egg Island, reptiles are probably nonexistent there. Wolf Island has a few hammocks of shrub-scrub habitat that may provide habitat for reptiles. Egg Island, with its small maritime forest, is said to have a high number of rattlesnakes. Nothing is known about the presence or absence of amphibians.

Science-based inventories and monitoring of these populations will serve as the basis for developing habitat management plans and will influence refuge management activities. A systematic inventory and monitoring program will enable the refuge to make informed management decisions and valuable long-term contributions to national and regional objectives for waterfowl, shorebirds, forest-breeding birds, and wintering forest and scrub-shrub birds, as well as reptiles and amphibians.

RONS Recurring Costs: $30.0K Special Project Cost:

HABITAT MANAGEMENT

The overall goal for habitat management at Wolf Island NWR is to manage, protect, enhance, and, as needed, restore a structurally diverse coastal island habitat. To achieve this goal, refuge personnel will map, protect, and maintain the refuge's salt marsh and maritime forest ecosystems. This protection will include annual inspections of the forest community for the presence of invasive species. Another important project necessary to assure conformance with this goal is to work in partnership with the U.S. Army Corps of Engineers to encourage studies and modeling to determine if current dredge deposition procedures in the Savannah area should be changed, in order to reverse the present beach erosion rates on Wolf Island.

Salt Marsh: Wolf and Egg islands are both primarily composed of estuarine, emergent wetlands dominated by smooth cordgrass. 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; this, in turn, provides excellent foraging opportunities for birds. Water quality is critical for such habitats, and an important effort by refuge personnel will be to monitor water quality to identify changes in water quality that may require refuge management action.

RONS Recurring Costs: $15.0K Special Project Cost:

Beaches, Dunes, and Sand Bars: Because of dredging operations up the coast in the Savannah River Delta, the barrier islands in the Altamaha Delta are sand-starved. Littoral drift occurs from north to south. Therefore, sand that historically came out of the Savannah River harbor drifted south to deposit along the barrier islands including Wolf Island. This sand is now dredged from the river and deposited on upland disposal sites, which robs the system of its sand supply. Part of the future plans for the refuge requires partnering within the ecosystem to eliminate threats to refuge habitats. This will include discussions and studies with the Corps of Engineers to determine what can be done to reverse the trend in erosion at the refuge.

RONS Recurring Costs: $10.0K Special Project Cost:

Maritime Forest and Shrub-Scrub: The maritime forest on Egg Island provides habitat of superior quality for many species needing sanctuary from human disturbance. The small shrub-scrub habitat provided by the refuge is an important habitat for a variety of species. Maintaining, protecting, and enhancing these habitats is an important objective for the refuge.

RONS Recurring Costs: $10.0K Special Project Cost:

RESOURCE PROTECTION

As a designated wilderness area, the goal of this refuge in the category of resource protection is to work with private landowners, agencies, and other partners to restore eroded beach habitat; provide law enforcement; protect cultural resources; and continue to protect wildlife and habitat using a variety of land protection efforts, including easements and acquisitions.

In order to protect the resource, studies are needed to determine if such things as water quality inputs are impacting the Altamaha Delta. One study will be to collect sediment samples in order to examine potential contaminants associated with upstream discharges. Air quality is another important resource, and refuge personnel plan to work with the Georgia DNR to characterize the Wolf Island NWR's air quality by utilizing data from the Sapelo Island National Atmospheric Deposition Program sample site.

Beyond the resource protection activities noted above, another planned program is to augment the protected land area by expanding the refuge's authorized acquisition boundary. Another way to protect the refuge from disturbance will be to increase law enforcement presence to an average of two additional patrols per week during nesting and beach seasons.

Key to the protection of refuge resources to date has been the positive working relationship between refuge personnel and the Georgia DNR. One planned long-term activity is to ensure that this relationship is maintained through time as personnel change within all organizations.

Invasive Species Management: While no control is considered necessary at this time, saltcedar and Chinese tallow stands are nearby and may spread to the refuge. Therefore, within three years of CCP approval, refuge personnel will conduct surveys of invasive species and, if necessary, begin controls to abate such ecosystem threats.

RONS Recurring Costs: $60.0K Special Project Cost:

Beach Restoration Activities: As noted elsewhere in this CCP, beach erosion was changing the geography of the three islands that make up the refuge long before the refuge was created. Attention is currently directed to dredge activities by the Corps of Engineers as an aggravating impact to that

erosion rate, and also as a possible method to reverse this erosion trend. Over the life of this CCP, the refuge will coordinate efforts with other partners in the ecosystem and with the Corps to change the current dredge deposition procedures in the Savannah area, in order to reverse the present beach erosion rates in coastal Georgia.

RONS Recurring Costs: $10.0K Special Project Cost:

Contaminants/Water Quality: Developmental pressure has been impacting and will continue to impact the Altamaha Delta in a variety of ways, one of which is water quality. One of the refuge's objectives is to work with partners to collect sediment and water samples to examine contaminants associated with potential upstream discharges.

RONS Recurring Costs: $10.0K Special Project Cost:

Air Quality: Wolf Island NWR is classified as a Class I Air Quality Area requiring additional levels of compliance from activities that may impact air quality. Recent threats of increasing emissions near Wolf Island highlight the need to assure enforcement of air quality regulations. Over the life of this CCP, the refuge will continue to utilize air quality monitoring data for Class I Air Quality from Okefenokee NWR to characterize the status of air quality on Wolf Island. The refuge staff will continue to review and comment on new air quality permit applications and proposed changes to existing air quality permits that could impact the refuge.

RONS Recurring Costs: $0.0 Special Project Cost:

Land Acquisition and Protection: There continues to be discussion regarding the protection of Queen Island, possibly as an expansion of the refuge's protected land area. The refuge will continue efforts to augment protected land areas by expanding the authorized refuge boundary and work with partners to increase protected land areas within the Altamaha Delta Ecosystem.

RONS Recurring Costs: $15.0K Special Project Cost:

Restricting Public Access: As a designated wilderness area that does not allow public access, human disturbances of the refuge must be minimized. Currently, all refuge boundary signs are faded and in need of replacement. In addition, no "Closed Area" signs are posted on the refuge boundaries. It is the intent of refuge personnel to replace the existing signs, install "Wilderness Area" signs, install "Area Closed" signs, and increase law enforcement presence in order to reduce human disturbance.

RONS Recurring Costs: $30.0K Special Project Cost:

VISITOR SERVICES

Due to its status as a wilderness area, no public use facilities are planned on the refuge. Although the salt waters surrounding the refuge are open to a variety of recreational activities such as fishing and crabbing, all beach, marsh, and upland areas are closed to the public. Wildlife observation and photography are possible from boats.

Environmental Education: Wolf Island NWR is coming under increasing recreational pressures. The role of a wilderness area and the rationale for no public access need to be explained, and these require public outreach. The refuge will continue its educational efforts by participating in the Georgia Coastal Education Group; posting information on the Wolf Island Refuge's website; and distributing educational pamphlets. Further, Service personnel at the Savannah Coastal Refuges Complex will

participate in the initiation of outreach programming and development of offsite interpretive exhibits while working with nongovernmental conservation organizations, local civic organizations, and other governments throughout the ecosystem. These efforts will raise public awareness of the wilderness values and the role the refuge plays in the ecosystem. On a limited basis, the refuge will make efforts to partner with educational institutions and organizations to support onsite field study programs.

RONS Recurring Costs: $15.0K Special Project Cost:

Wildlife Observation and Photography: Wildlife observation and photography can be done from boats at recommended distances from foraging and nesting birds while still maintaining the viability and importance of the need for no public access. Therefore, the refuge will continue to allow visitors to view and photograph the refuge and its wildlife from a safe distance that is marked with buoys offshore.

RONS Recurring Costs: $10.0K Special Project Cost:

REFUGE ADMINISTRATION

Wolf Island NWR is one of seven refuges administered by the Savannah Coastal Refuges Complex. This chain of national wildlife refuges extends from Pinckney Island NWR near Hilton Head, South Carolina, to Wolf Island NWR near Darien, Georgia. Within this chain lies the Savannah NWR (the largest unit in the complex) and the Wassaw, Tybee, Harris Neck, and Blackbeard Island national wildlife refuges. Together they span a 100-mile coastline and total over 56,000 acres. The Savannah Coastal Refuges are administered from a headquarters office located in Savannah, Georgia.

State Relationships and Coordination: Key to the current success in maintaining the ecosystem habitat of the refuge has been the positive working relationship between refuge personnel and the Georgia DNR. The refuge will make every effort to ensure that this relationship is maintained through time as personnel change within all organizations.

RONS Recurring Costs: $15.0K Special Project Cost:

Staffing and Budget: This refuge is unstaffed and unfunded (i.e., no base budget). In order to implement refuge changes over time and restrict wildlife disturbance, there is a need for one full-time equivalent (FTE) law enforcement officer and one FTE biological technician and associated support resources. Securing these refuge needs is an important target for the future of the refuge.

RONS Recurring Costs: $300.0K Special Project Cost:

Volunteers and Friends: Active public participation in promoting the refuge's wilderness values can be greatly enhanced through volunteer and friends programs. Therefore, within 5 years of CCP approval and staffing, the refuge will develop a volunteer corps and share these volunteers with its ecosystem partners.

RONS Recurring Costs: $30.0K Special Project Cost:

FUNDING AND PERSONNEL

Table 1 lists the proposed projects and their associated costs and staffing.

Table 1. Summary of projects and their associated costs and staffing needs.

PROJECT NUMBER	PROJECT TITLE	FIRST YEAR COST	RECURRING ANNUAL COST	STAFF (FTE'S)
	WATER QUALITY MONITORING	$0	$10.0K	
	AIR QUALITY MONITORING	$0	$0	
	WILDLIFE INVENTORY SURVEY	$15.0K	$15.0K	
	MONITOR REFUGE USE BY WILDLIFE	$15.0K	$15.0K	
	MONITOR NEST PREDATION	$0	$0	
	STUDY DREDGE DEPOSITION	$10.0K	$10.0K	
	INVASIVE SPECIES CONTROL	$5.0K	$5.0K	
	LAND ACQUISITION	$0	$0	
	RESTRICTING PUBLIC ACCESS	$7.5K	$7.5K	
	MOA WITH GEORGIA DNR	$5.0K	$5.0K	
	STAFFING AND BUDGET	$300.0K	$300.0K	
	PUBLIC OUTREACH	$10.0K	$25.0K	
	DEVELOP VOLUNTEER AND FRIENDS PROGRAMS	$15.0K	$30.0K	

PARTNERSHIP AND VOLUNTEER OPPORTUNITIES

A key element of this Comprehensive Conservation Plan (CCP) is to establish partnerships with local volunteers, landowners, private organizations, and state and federal natural resource agencies. In the immediate vicinity of the refuge, opportunities exist to establish partnerships with sporting clubs, elementary and secondary schools, universities, and community organizations. At regional and state levels, partnerships may be established or enhanced with organizations such as the Georgia DNR, Ducks Unlimited, The Nature Conservancy, Audubon Society, etc. The goals and objectives outlined in this CCP need the support and partnerships of federal, state, and local agencies; nongovernmental organizations; and private citizens. This broad-based approach to managing the refuge's fish and wildlife resources extends beyond social and political boundaries and requires a foundation of support from many stakeholders. The refuge will continue to seek creative partnership opportunities to achieve its vision for the future.

STEP-DOWN MANAGEMENT PLANS

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

Table 2. Step-down management plans, Wolf Island National Wildlife Refuge.

Step-down Plan	Completion Date
Biological Inventory and Monitoring Plan	2012
Law Enforcement Plan	2015
Sign Plan	2012
Animal Control Plan	2011
Invasives Management Plan	2011
Habitat Management Plan	2012
Visitor Services Management Plan	2012
Master Plan	N/A
Public Outreach Plan	2012
Water Quality Monitoring Plan	2012
Air Quality Monitoring Plan	2012
Beach Erosion Plan	2011

MONITORING AND ADAPTIVE MANAGEMENT

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

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

PLAN REVIEW AND REVISION

This CCP will be reviewed annually in development of the refuge's annual work plans and budget. It will also be reviewed to determine the need for revision. A revision will occur if and when conditions change or significant information becomes available, such as a change in ecological conditions or a major refuge expansion. The final plan will be augmented by detailed step-down management plans to address the completion of specific strategies in support of the refuge's goals and objectives. Revisions to the CCP and the step-down management plans will be made available for public review and comment, in accordance with the requirements National Environmental Policy Act.

SECTION B. ENVIRONMENTAL ASSESSMENT

I. Background

INTRODUCTION

The Service has prepared this Environmental Assessment (EA) for Wolf Island National Wildlife Refuge in compliance with the National Environmental Policy Act (NEPA) and the National Wildlife Refuge System Improvement Act of 1997 (Act). The Act requires the development of comprehensive conservation plans (CCPs) for all refuges. Following a public review and comment period on the Draft CCP/EA, a final decision will be made by the Service that will guide the management direction of Wolf Island NWR over the next 15 years; provide public understanding about the refuge and its management activities; and incorporate information and suggestions from the public and refuge partners.

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

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

This CCP is needed to address current management issues, provide long-term management direction for the refuge, and satisfy the legislative mandates of the Act, which requires the preparation of a CCP for all national wildlife refuges.

PURPOSE AND NEED FOR ACTION

The purpose of the Draft CCP/EA is to establish and implement management direction for Wolf Island NWR for the next 15 years.

The EA is needed to set forth and evaluate a range of reasonable management alternatives for the refuge. Each alternative was generated with the potential to be fully developed into a final CCP and to describe the predicted biological, physical, social, and economic impacts of implementing each alternative. The Service will select an alternative to be fully developed for this refuge.

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

There is no current plan that identifies priorities and ensures consistent and integrated management of the refuge, thus necessitating the need for this plan. The National Wildlife Refuge System Improvement Act of 1997 requires that all national wildlife refuges have a CCP in place within 15 years.

DECISION FRAMEWORK

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

PLANNING STUDY AREA

Wolf Island National Wildlife Refuge consists of a long narrow strip of oceanfront beach backed by a broad band of salt marsh. Over 75% of the refuge's 5,126 acres are composed of saltwater marshes (see Figure 1). It is located in McIntosh County, Georgia, 12 miles east of Darien.

This EA will identify management on refuge lands as well as those lands proposed for protection by the Service.

AUTHORITY, LEGAL COMPLIANCE, AND COMPATIBILITY

The Service has developed this plan in compliance with the National Wildlife Refuge System Improvement Act of 1997 and National Wildlife Refuge System Planning (Part 602) of the Fish and Wildlife Service Manual. The actions described within this plan also meet the requirements of the NEPA. The refuge staff achieved compliance with NEPA through the involvement of the public and the incorporation of an EA in this document. The EA describes the alternatives that were considered and analyzes the environmental consequences each alternative (Chapters III and IV in this section). When fully implemented, the plan will strive to achieve the vision and purposes of Wolf Island NWR.

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

COMPATIBILITY

The National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997 (Act), states that national wildlife refuges must be protected from incompatible or harmful human activities to ensure that Americans can enjoy refuge lands and waters. Before activities or uses are allowed on a national wildlife refuge, the uses must be found to

be compatible. The Act defines a compatible use as one that "... will not materially interfere with or detract from the fulfillment of the mission of the Refuge System or the purposes of the refuge." In addition, "wildlife-dependent recreational uses may be authorized on a refuge when they are compatible and not inconsistent with public safety."

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 Act. These uses are hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation. However, as noted within this Draft CCP/EA, Wolf Island NWR is a designated wilderness area with no public access, and as such, there will be limited compatible uses.

PUBLIC INVOLVEMENT AND THE PLANNING PROCESS

In accordance with Service guidelines and National Environmental Policy Act recommendations, public involvement has been an important factor throughout the development of the Draft CCP for Wolf Island National Wildlife Refuge. The plan has been written with input and assistance from interested citizens, conservation organizations, and representatives of other federal, state, and local agencies. The participation of these stakeholders and their ideas has been of great value in setting the management direction for Wolf Island National Wildlife Refuge.

Preplanning activities began in May 2006 with the formation of a biological review team, which conducted a wildlife and habitat management review of the refuge. A brief visitor services review was also included as part of the biological review. In June 2006 the CCP planning team reviewed the recommendations of the biological review team and visitor services experts, and conducted a comprehensive review of the refuge's habitats, fish and wildlife resources, 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 comprehensive conservation plan for the refuge was published in the *Federal Register* on October 30, 2006.

The planning team then held an open house and public scoping meeting on January 24, 2007, at The Nature Conservancy's Georgia Conservation Office near Darien, Georgia. Five citizens attended this meeting. Two of the attendees submitted their comments at the meeting, and one additional comment was received through e-mail. These public scoping comments are summarized in Appendix D, Public Involvement.

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

Summaries of these issues and concerns, as well as more detailed information about the planning process and the identification of issues, are provided in Chapter III, Plan Development, in the Draft Comprehensive Conservation Plan (Section A).

II. Affected Environment

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

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 comprehensive conservation plan (CCP), the goals of the National Wildlife Refuge System, and the mission of the U.S. Fish and Wildlife Service (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 here represent different approaches to provide permanent protection, restoration, and management of the refuge's fish, wildlife, plants, habitats, and other resources. Refuge staff assessed the biological conditions and analyzed the external relationships affecting the refuge. This information contributed to the development of the refuge's 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. A summary of the three alternatives is provided in Table 3.

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 NWRS. Goals 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 time frame while still meeting the refuge purposes and goals. The three alternatives are summarized below. A comparison of alternatives follows the general description.

ALTERNATIVE A: CURRENT MANAGEMENT (NO ACTION)

Wolf Island NWR is part of the Altamaha River ecosystem and is an important part of the Western Hemisphere Shorebird Reserve Network. As such, the refuge is of significant importance to migrating and wintering shorebirds and has been designated as part of the critical habitat for the Great Lakes population of the endangered piping plover. Under Alternative A, the "No Action" alternative, present management of the refuge would continue at its current level of participation in these initiatives throughout the 15-year duration of the CCP. Current approaches to managing wildlife and habitats, to protecting resources, and disallowing public use would remain unchanged.

Wolf Island NWR, as a designated national wilderness area, provides protection for endangered and threatened species including the loggerhead sea turtle and piping plover. Due to its status as a wilderness area, no public use facilities exist or are planned on the refuge. Although the waters surrounding the refuge are open to a variety of recreational activities, all beach, marsh, and upland areas are closed to the public. Under this alternative, none of the above would change. The refuge's current management practices, which are primarily custodial in nature, would continue to be pursued over the 15-year life of the CCP.

ALTERNATIVE B: INTENSIVE BIOLOGICAL RESOURCE MANAGEMENT

Under Alternative B, the refuge would strive to optimize its biological program, recognizing that there may be tradeoffs and opportunity costs between the various elements of the biological programs envisioned. In other words, it might not be possible to equally pursue and achieve all objectives simultaneously because of budgetary and staffing constraints or because of intrinsic conflicts between certain objectives. Hence, Alternative B stresses the principle of optimization rather than maximization of wildlife and habitat outputs.

The refuge would conduct baseline inventories and monitoring programs with several partners to provide a solid foundation of the current condition of refuge habitat and wildlife. The refuge would continue to furnish benefits to migratory birds and resident wildlife species. The Service would aim to increase the refuge's knowledge base about shorebirds by developing and implementing monitoring programs while continuing to provide habitats for the benefit of migratory birds. The refuge would also continue to furnish benefits to federally listed threatened and endangered species, such as the loggerhead sea turtle and piping plover.

Land acquisition and resource protection efforts at Wolf Island NWR would be intensified. Efforts to control invasive species would commence and efforts would be made to reduce beach erosion. In the Service's Private Lands Program, the refuge staff would work with private landowners of adjacent properties to manage and improve habitats. The staff would also explore opportunities with partners to expand land and habitat protection efforts.

The refuge would develop and begin to implement a Cultural Resources Management Plan (CRMP). Until the time the CRMP is completed and implemented, the refuge would follow the Service's standard protocol and procedures in conducting cultural resource surveys by qualified professionals, in consultation with the Service's Regional Historic Preservation Officer (RHPO) and Georgia's State Historic Preservation Officer (SHPO).

ALTERNATIVE C: ECOSYSTEM MANAGEMENT (PROPOSED ALTERNATIVE)

Under Alternative C, the proposed action alternative, the refuge would practice ecosystem management, recognizing the ecological role of Wolf Island NWR within the interrelated Altamaha River basin and coastal barrier island ecosystem. Human activities and natural processes within these ecosystems influence Wolf Island NWR in a variety of ways. Alternative C explicitly commits the Service to acknowledge these influences and cooperate with other stakeholders in ways that will ensure the continued protection and enhancement of the ecosystem's natural resources.

As with Alternative B, the refuge would strive to optimize its biological program, recognizing that there may be tradeoffs and opportunity costs between the various elements of the biological programs envisioned. In other words, it might not be possible to equally pursue and achieve all objectives simultaneously because of budgetary and staffing constraints or because of intrinsic conflicts between certain objectives. However, Alternative C emphasizes a broader ecosystem approach than Alternative B, which is narrowly focused on the refuge.

The refuge would conduct baseline inventories and monitoring programs with several partners to investigate threats and opportunities within the ecosystem as they may impact refuge goals and objectives. The Service and its partners would continue to furnish benefits to the ecosystem's native flora and fauna under Alternative C. The refuge would also continue to furnish benefits to federally listed threatened and endangered species such as the loggerhead sea turtle and piping plover.

Under Alternative C, land acquisition and resource protection within the ecosystem would be intensified. Control of invasive species would commence and efforts would be made to reduce beach erosion. Service staff would work with partners to manage and improve habitats within the ecosystem. The staff would also explore opportunities with partners to expand land and habitat protection efforts.

The refuge would develop and begin to implement a Cultural Resources Management Plan (CRMP). Until the time the CRMP is completed and implemented, the refuge would follow the Service's standard protocol and procedures in conducting cultural resource surveys by qualified professionals, in consultation with the Service's Regional Historic Preservation Officer (RHPO) and Georgia's State Historic Preservation Officer (SHPO).

FEATURES COMMON TO ALL ALTERNATIVES

Although the three alternatives differ in many ways, there are similarities among them as well. Each of the three alternatives have the following features in common:

- Public access to the refuge would be excluded under all three alternatives.
- Water quality and air quality monitoring would be utilized as a tool to determine refuge health.
- The excellent working relationship with the Georgia Department of Natural Resources (DNR) would be maintained.

As a result of input from the public, internal scoping, and the experience of the review team for this Draft CCP/EA, five focus goals were established for Wolf Island NWR. Each of these focus areas was given a goal statement, as follows:

Fish and Wildlife Population Management (Goal A): Maintain healthy and diverse populations of fish and wildlife endemic to the Georgia coastal barrier islands.

Habitat Management (Goal B): Manage, protect, enhance, and, as needed, restore a structurally diverse coastal island habitat that also provides a refuge for migratory birds as a part of the Western Hemisphere Shorebird Reserve Network.

Resource Protection (Goal C): As a designated wilderness area, Service personnel will work with agencies and other partners to restore eroded beach habitat, protect cultural resources, and continue to protect wildlife and habitat using a variety of land protection efforts including easements and acquisitions. In addition, the Service would work to provide law enforcement.

Visitor Services (Goal D): In cooperation with partners, develop and implement a quality and compatible wildlife-dependent public education and interpretive program that leads to a greater public understanding and appreciation of the refuge's designated wilderness, the National Wilderness System, and fish and wildlife values.

Refuge Administration (Goal E): As a part of the Savannah Coastal Refuges Complex, secure and enhance staffing, resources, and facilities to fulfill refuge goals and manage habitats and wildlife resources on Wolf Island NWR.

COMPARISON OF ALTERNATIVES

Within each focus area, objectives were established to fulfill the above-noted goals. A comparison was made between the three alternatives to determine how they would address the objectives of each goal. This comparison is provided in Table 3.

Table 3. Comparison of alternatives by management issues for Wolf Island National Wildlife Refuge.

Issues	Alternative A: Current Management ("No Action" Alternative)	Alternative B: Intensive Biological Resource Management	Alternative C: Ecosystem Management (Proposed Alternative)
Fish and Wildlife Population Management (Goal A) – Maintain healthy and diverse populations of native fish and wildlife, with a focus on threatened and endangered species and species of concern.			
Atlantic Loggerhead Sea Turtle and Other Sea Turtles	Continue to rely on Georgia DNR for inventory of nesting with aerial overflights.	Protect and monitor the environment of the refuge for the protection of sea turtles.	Protect and monitor the environment adjacent to the refuge and throughout the ecosystem for the protection of sea turtles.
West Indian Manatee	Continue to report sightings of manatees on or near the refuge and continue to collaborate with Georgia DNR on outreach and educational programs.	Cooperate with partners to maintain habitat quality for any manatees that occur in waters adjacent to the refuge.	Cooperate with partners to maintain habitat quality for any manatees that occur in waters adjacent to the refuge and the ecosystem of the refuge.
Piping Plover	Continue to contribute to the recovery of the piping plover by providing undisturbed high quality foraging and roosting habitat.	Build on Alternative A with the addition of a monitoring program to quantify help in the recovery.	Build on Alternative B with the addition of monitoring water quality and its impacts on food sources for piping plover.
Wood Stork, Bald Eagle, and Other Protected Species	Continue to protect habitat for these species.	Continue to protect habitat for these species, and within 5 years of CCP approval, begin monitoring efforts within the refuge.	Continue to protect habitat for these species, and within 5 years of CCP approval, coordinate with partners to increase monitoring efforts within the ecosystem.

Issues	Alternative A: Current Management ("No Action" Alternative)	Alternative B: Intensive Biological Resource Management	Alternative C: Ecosystem Management (Proposed Alternative)
Shorebirds	Continue to provide habitat for current populations of shorebirds, and support Georgia DNR's research and monitoring of shorebirds.	In addition to the efforts of Alternative A, increase protection and monitoring efforts, and enhance habitat for shorebirds.	In addition to the efforts of Alternative B, initiate water quality monitoring and coordinate all monitoring efforts with partners.
Wintering and Breeding Marshbirds and Songbirds	Provide habitat for marshbirds and songbirds.	In addition to efforts in Alternative A, begin surveying, monitoring, and habitat enhancement.	In addition to Alternative B, work with partners to increase monitoring and habitat enhancement efforts.
Reptiles and Amphibians	Continue to provide habitat for reptiles and amphibians.	In addition to efforts in Alternative A, within 5 years of CCP approval, begin to monitor presence and conduct habitat management for reptiles and amphibians.	In addition to efforts in Alternative B, work with partners to increase monitoring and habitat enhancement efforts.

Issues	Alternative A: Current Management ("No Action" Alternative)	Alternative B: Intensive Biological Resource Management	Alternative C: Ecosystem Management (Proposed Alternative)
Habitat Management (Goal B) – Manage, protect, enhance, and, as needed, restore a structurally diverse coastal island habitat.			
Salt Marshes	Continue with passive management of this habitat.	Within 5 years of CCP approval, map, protect, and maintain salt marshes and enhance habitat quality.	In addition to steps in Alternative B, work with partners to eliminate threats to salt marshes.
Beaches, Dunes, and Sand Bars	Continue with passive management of this habitat.	Within 5 years of CCP approval, map, protect, and maintain these habitats and enhance habitat quality.	In addition to steps in Alternative B, work with partners to eliminate threats to these habitats.
Maritime Forest and Shrub-Scrub	Continue with passive management of this habitat.	Within 5 years of CCP approval, map, protect, and maintain these habitats and enhance habitat quality.	In addition to steps in Alternative B, work with partners to eliminate threats to these habitats.

Issues	Alternative A: Current Management ("No Action" Alternative)	Alternative B: Intensive Biological Resource Management	Alternative C: Ecosystem Management (Proposed Alternative)
Resource Protection (Goal C) – As a designated wilderness area, work with agencies and other partners to restore eroded beach habitat, protect cultural resources, and continue to protect wildlife and habitat using a variety of land protection efforts including easements and acquisitions. In addition, provide law enforcement.			
Invasive Species Management	Continue no active management of invasive species.	Within 3 years of CCP approval, conduct survey of invasive species to begin control.	In addition to steps in Alternative B, work with partners to abate threats from invasive species
Beach Restoration Activities	Continue negotiations with the U.S. Army Corps of Engineers (Corps) to change current dredge deposition procedures in the Savannah area in order to reverse present beach erosion rates.	Cooperate with the Corps to encourage studies and modeling to determine if current dredge deposition procedures in the Savannah area should be changed in order to reverse present beach erosion rates on Wolf Island.	Over the life of the CCP, coordinate efforts with other partners in the ecosystem and with the Corps to change current dredge deposition procedures in the Savannah area in order to reverse present beach erosion rates in coastal Georgia.
Contaminants/Water Quality	Continue no active efforts at assessing or reducing contaminants and protecting water quality in waters near the refuge.	Within 5 years of CCP approval, in cooperation with partners, collect sediment and water samples for the Altamaha Delta, and examine contaminants associated with potential upstream discharges in order to assure enforcement of environmental laws and regulations.	Same as Alternative B.
Air Quality	Continue to utilize air quality monitoring data for Class I Air Quality from Okefenokee NWR to characterize air	In addition to Alternative A, work with Georgia DNR to characterize Wolf Island NWR air quality	Same as Alternative B.

Issues	Alternative A: Current Management ("No Action" Alternative)	Alternative B: Intensive Biological Resource Management	Alternative C: Ecosystem Management (Proposed Alternative)
	quality status of Wolf Island NWR Wilderness Area, and continue commenting on new permit applications and changes to existing air quality permits that could impact Class I Air Quality.	by utilizing data from Sapelo Island NADP (National Atmospheric Deposition Program) to assure enforcement of environmental laws and regulations.	
Land Acquisition and Protection	Continue to maintain existing land base.	Seek to augment protected land area by expanding authorized refuge acquisition boundary.	In addition to steps in Alternative B, work with partners to increase area of protected lands within the Altamaha ecosystem.
Restricting Public Access	Continue minimum boundary posting and occasional law enforcement patrols.	Within five years of CCP approval, replace existing boundary signs, install authorized "Wilderness Area" signs, and three large "Area Closed" signs, and increase law enforcement presence to an average of two additional patrols per week during the nesting and beach seasons.	In addition to steps in Alternative B and increase cooperation with Georgia DNR on patrols and off-site education.
State Relationships and Coordination	Continue the positive working relationship between refuge personnel and the Georgia DNR and ensure that this is maintained through time as personnel change within all organizations.	Expand on Alternative A by developing an MOA for resource management on the refuge within three years of CCP approval.	Expand on Alternative B by developing this MOA to cover the entire ecosystem.

Issues	Alternative A: Current Management ("No Action" Alternative)	Alternative B: Intensive Biological Resource Management	Alternative C: Ecosystem Management (Proposed Alternative)
Visitor Services (Goal D) – Develop and implement (within the parameters of a Wilderness Designation and No Public Access) a quality and compatible wildlife-dependant public use program that leads to a greater understanding and appreciation of fish and wildlife values.			
Environmental Education	Continue educational efforts including participation in the Georgia Coastal Education Group, Wolf Island website, and distribution of educational pamphlets.	Expanding on Alternative A, in partnership with state agencies, initiate outreach programming and development of off-site interpretive exhibits.	In addition to Alternative B, work with non-governmental conservation organizations, local civic organizations, and governments throughout the ecosystem to raise public awareness of the wilderness values and the role the refuge plays in the ecosystem.
Wildlife Observation and Photography	Continue to allow for visitors to view and photograph the refuge and its wildlife from a safe distance.	Same as Alternative A.	Same as Alternative A.

Issues	Alternative A: Current Management ("No Action" Alternative)	Alternative B: Intensive Biological Resource Management	Alternative C: Ecosystem Management (Proposed Alternative)
Refuge Administration (Goal E) – Secure and enhance staffing, resources, and facilities to manage the integrity of habitats and wildlife resources on Wolf Island National Wildlife Refuge and fulfill the purposes.			
Staffing and Budget	Continue custodial management using Savannah Coastal Refuges Complex staff and budget.	Add one full-time (FTE) law enforcement officer and one FTE biological technician and associated support resources.	Same as Alternative B.
Volunteers and Friends	Continue to operate without any dedicated volunteers or Friends group.	Within 5 years of CCP approval and staffing, develop volunteer corps.	In addition to Alternative B, share volunteers with ecosystem partners.

ALTERNATIVES CONSIDERED BUT ELIMINATED FROM FURTHER ANALYSIS

The alternative development process under the National Environmental Policy Act (NEPA) and the National Wildlife Refuge System Improvement Act of 1997 is designed to allow consideration of the widest possible range of issues and potential management approaches. During the alternative development process for Wolf island NWR, many different solutions were considered. The following alternative was considered, but was not selected for detailed study in this Draft CCP/EA due to the reasons described.

ALLOW PUBLIC ACCESS

Maximizing public use over other mandates deviates from Service policy. The fundamental mission of the National Wildlife Refuge System is wildlife conservation. Thus, wildlife must come first in the management of refuges. The Service will allow and provide for public use of a refuge—to the extent possible—as long as these uses are compatible with the Service's mission and the purposes for which the refuge was established. In the development of public use opportunities, appropriate and compatible wildlife-dependent recreational uses will be emphasized. However, public use must be at a level where wildlife populations and habitat are unharmed. After a careful review of the potential environmental impacts of public access to the many species of concern that utilize the refuge, it was determined that the potential of this alternative for environmental harm outweighs any general public benefits.

IV. Environmental Consequences

OVERVIEW

This chapter analyzes and discusses the potential environmental effects or consequences that can be reasonably expected by the implementation of each of the three alternatives. For each alternative, the expected outcomes are portrayed through the 15-year life of the comprehensive conservation plan (CCP).

EFFECTS COMMON TO ALL ALTERNATIVES

A few potential effects will be the same under each alternative and are summarized under seven categories: environmental justice, climate change, other management, land acquisition, cultural resources, refuge revenue-sharing, and other effects.

ENVIRONMENTAL JUSTICE

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

None of the management alternatives described in this EA 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 issued an order in January 2001 requiring federal agencies with land management responsibilities under its direction to consider the potential impacts of climate change as part of their long-range planning endeavors.

The expected rise in the sea level (resulting from the melting of polar ice), combined with the effects of storm surges, will have a profound effect on coastal systems, with the most dramatic being wetland loss, loss of productivity in the estuaries, changes to the barrier islands, and increased vulnerability to coastal erosion and flooding. The possible increase in the intensity of coastal storms would increase this vulnerability along the Gulf and South Atlantic coastal margins. Independently or combined, sea level rise and more intense storms foreshadow extensive changes.

Tidal marshes such as those found on Wolf Island NWR are among the most susceptible ecosystems to climate change, especially accelerated sea level rise. The sea level is predicted to increase by 30 to 100 centimeters by the year 2100, based on the International Panel on Climate Change's Special

Report on Emissions Scenarios (Meehl et al. 2007). Rising sea level may result in tidal marsh submergence (Moorhead and Brinson 1995) and habitat migration as the salt marshes transgress landward and replace tidal freshwater and brackish marsh (Park et al. 1991).

Sea level rise will have several negative effects on these fragile systems, including changes in salinity throughout the estuaries, altered flushing rates, changes to the natural hydrology of the estuaries, and wetland loss. Coastal wetlands (such as those along the coast that are inundated by water during high tide and exposed to the air during low tide) are a particularly vulnerable component of the estuaries. As the sea level rises, some coastal wetlands are being "drowned in place," because the constant submersion does not allow for the below-water/above-water cycle (associated with tidal changes) that is necessary for wetland development. Without this wet/dry cycle, the characteristic plants and animals that inhabit the areas die off. While some wetlands naturally maintain suitable bottom elevation through the deposition of sands and sediments, many others do not.

Coastal wetlands are critical to the health of marine wetland-dependent species, including numerous endangered species. For example, the loss of intertidal breeding areas has a negative effect on breeding populations of horseshoe crabs. Consequently, species such as the redknot (a biological indicator bird species) that depend on the horseshoe crabs will also decline. Coastal wetlands also serve as strong defenses against coastal flooding and damage associated with coastal storms. As learned from Hurricane Katrina, the loss of these defenses will jeopardize our Nation's infrastructure.

The projected rise in sea level would have a direct impact to Wolf Island NWR and other sensitive habitats throughout the Atlantic coast. Projecting the amount of sea level rise is beyond the scope of this CCP. However, the potential environmental and socioeconomic impacts could be profound. Breeding and nesting habitats for many sensitive species would be impacted. In addition, many areas immediately inland of the barrier islands are under heavy development pressure. These manmade developments are susceptible to damage from sea level rise. All of these issues must be addressed through intergovernmental cooperation, as well as input from a variety of stakeholders.

Climate change presents significant new challenges for coastal refuge personnel that must make complex management decisions, often with uncertain or incomplete information. While climate change experts have predicted global increases in temperature, sea level, storm intensity and frequency, and changes in regional precipitation patterns, in most cases they have not scaled these predictions down to a level usable by the U.S. Fish and Wildlife Service for making specific, local resource-management decisions. In addition, as climate predictions continue to be refined, the Service's management decisions will need to adapt to the new information and analyses.

Resource management decisions made at the Savannah Coastal Refuges Complex rely heavily on a mix of scientific, historic, economic, cultural, and human preference information. With the changing climate, the Service will find that, in many instances, the historic record associated with many of these factors is less reliable and in some cases invalid. Resource managers will need to rely instead on predictions of sea level, temperature, moisture, and the human and biotic responses to those new climate conditions and to management responses. As the effects of climate change progress, the uncertainties of managing in changing conditions will require a new decision model or framework for refuge managers to use when making decisions.

OTHER MANAGEMENT

All management activities that could affect the refuge's natural resources, including subsurface mineral resources; 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.

LAND ACQUISITION

Funding for land acquisition from willing sellers within the approved acquisition boundary of Wolf Island National Wildlife Refuge would come from the Land and Water Conservation Fund, the Migratory Bird Conservation Fund, the U.S. Army Corps of Engineers' mitigation programs, and/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 other 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. Thus, land acquisition would be handled the same under each of the alternatives.

CULTURAL RESOURCES

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

Service acquisition of land with known or potential archaeological or historical sites provides two major types of protection for these resources: protection from damage by federal activity and protection from vandalism or theft. The National Historic Preservation Act requires that any actions by a federal agency which may affect archaeological or historical resources be reviewed by the State Historic Preservation Office and that the identified effects must be avoided or mitigated. The Service's policy is to preserve these cultural, historic, and archaeological resources in the public trust and avoid any adverse effects whenever possible.

Land acquisition by the Service, within the current acquisition boundary, would provide some degree of protection to significant cultural and historic resources. If acquisition of private lands does not occur and these lands remain under private ownership, the landowner would be responsible for protecting and preserving cultural resources. Development of off-refuge lands has the potential to destroy archaeological artifacts and other historical resources, thereby decreasing opportunities for cultural resource interpretation and research.

REFUGE REVENUE-SHARING

Annual refuge revenue-sharing payments to McIntosh County, Georgia, would continue at the same rates under each alternative. If lands are acquired and added to the refuge, the payments would increase accordingly.

OTHER EFFECTS

Each of the alternatives would have similar effects or minimal to negligible effects on the soils; water quality and quantity; noise; transportation; human health and safety; children; hazardous materials; waste management; aesthetics and visual resources; and utilities and public services. This is due to the fact that under each alternative, the refuge's wilderness status would be maintained, as well as the decision to not allow public access.

SUMMARY OF EFFECTS BY ALTERNATIVE

The following sections describe the environmental consequences of adopting each refuge management alternative. Table 4 summarizes and addresses the likely outcomes for the specific issues and is organized by broad issue categories.

FISH AND WILDLIFE POPULATION MANAGEMENT

Under Alternative A, current management practices would remain in place. The refuge will continue to be an integral part of the Western Hemispheric Shorebird Reserve Network. It will remain as a critical habitat for the Great Lakes population of the endangered piping plover. Alternative A would continue to rely on passive population management and denial of public access in reducing disturbance stress to wildlife populations. There would be little in the way of active population management and continued species monitoring at current levels. Reaction to any new population stresses would require some delay in marshalling personnel and material to address any specific management need.

Alternative B would strive to optimize the refuge's biological program within the constraints of budget and staffing. Baseline inventories and monitoring programs would be implemented with several partners to provide a solid foundation upon which to manage refuge wildlife. With increased monitoring activity, any new environmental stresses to wildlife populations would be more quickly identified and response to those stresses would be initiated in a more timely fashion.

Alternative C would expand on Alternative B by taking a broader approach to wildlife population management. This approach recognizes that many environmental stresses to the refuge come from outside refuge boundaries. This ecosystem approach requires monitoring of environmental parameters throughout the Altamaha Delta to gauge impacts to the refuge.

HABITAT

Under Alternative A, current levels of custodial habitat management would continue. Efforts would be made to identify negative habitat impacts, such as human disturbance and encroachment of invasive species.

Alternative B would use data from baseline inventories and monitoring programs to determine ways to improve habitat and then implement programs to affect these habitat improvements.

Alternative C would expand on Alternative B by working with partners to promote programs that strive to address environmental inputs outside the refuge boundaries that might negatively impact refuge habitat.

RESOURCE PROTECTION

Under Alternative A, current management practices in resource protection (that are primarily custodial in nature) would continue.

Alternative B would approach resource protection in a proactive fashion with efforts at expanding inventories, surveys, and land acquisition within the existing refuge boundary.

Alternative C would expand on Alternative B through research and cooperation with the U.S. Army Corps of Engineers to determine how to best address the lack of beach sand replenishment that is slowly eroding the beaches of the refuge, and to investigate other possible influences affecting the refuge from outside the refuge boundary.

VISITOR SERVICES

Under all three alternatives, access on the refuge by the general public would not be allowed. This is necessary to protect habitat and reduce the disturbance of sensitive species that use the refuge.

Alternative B would be proactive in addressing increasing pressures by the public accessing the island. This would be done through increased signage and increased law enforcement patrols.

Alternative C would expand on Alternative B by increasing public outreach on the importance of protecting the pristine nature of the refuge.

REFUGE ADMINISTRATION

Under Alternative A, the current level of custodial refuge management and administration would continue.

Both Alternatives B and C would implement more active refuge administration with the addition of two full-time equivalent (FTE) positions (one biological technician and one law enforcement officer).

CUMULATIVE IMPACTS

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

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 and partially cancel 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, are affecting it in the present, or will affect it in the reasonably foreseeable future. Thus, any assessment of a specific action's effects must 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 primary concern from cumulative impacts will come from increased regional developmental pressures on the Altamaha Watershed. Any upstream negative environmental inputs to the region's natural resources will have negative impacts downstream on the refuge's overall environmental quality (i.e., its water quality, air quality, etc.); therefore, negative cumulative impacts to the refuge can be expected to occur.

BIOLOGICAL RESOURCES

All of the alternatives are intended to maintain and/or improve the refuge's biological resources. The biological integrity of the refuge would be protected under the proposed alternative and the refuge purpose would be achieved. The combination of the Service's management actions with those of other organizations could result in significant, beneficial cumulative effects by (1) increasing protection and management for federal- and state-listed threatened or endangered species; (2) protecting habitats that are regionally declining; and (3) reducing habitat disturbance from increasing recreational pressures.

CULTURAL RESOURCES

The Service expects none of the alternatives to have significant adverse cumulative impacts on the cultural resources in Georgia. Beneficial impacts would accrue at various levels, depending on the alternative, because of the refuge's proposed environmental education and interpretation programs and increased field surveys to identify and protect any sites discovered.

Under all of the alternatives, management practices on the refuge would consider potential historical resources. Because of its designation as a wilderness area, projects requiring excavation are not anticipated. However, should such activities be planned, site inspections of the affected area would occur before work begins.

Table 4. Summary of environmental effects by alternative, Wolf Island National Wildlife Refuge.

Issues	Alternative A: Current Management (No Action)	Alternative B: Intensive Biological Resource Management	Alternative C: Ecosystem Management (Proposed Alternative)
Atlantic Loggerhead Sea Turtle and Other Sea Turtles	• Continue to rely on "No Public Access" and custodial management to protect these sea turtles.	• Monitor refuge water quality for pollutants that might harm sea turtles. • Protect refuge waters from over-fishing and harvesting of food items important to sea turtles.	In addition to Alternative B: • Expand water quality monitoring throughout the Altamaha Ecosystem to look for pollutants such as toxic discharge from industry, oil spills, and debris that could harm and/or kill turtles. • Work with partners to limit or eliminate fishing gear that could harm turtles. • Work with partners to monitor and control coastal development. • Because channel dredging can lead to high turtle mortalities and habitat destruction, ensure turtle observers are required on dredges operating near the refuge.

Issues	Alternative A: Current Management (No Action)	Alternative B: Intensive Biological Resource Management	Alternative C: Ecosystem Management (Proposed Alternative)
West Indian Manatee	• Continue to report sightings of manatees on or near the refuge and continue to collaborate with Georgia DNR on outreach and educational programs for this species.	In addition to Alternative A: • Cooperate with partners to maintain habitat quality for any manatees that occur in waters adjacent to the refuge.	In addition to Alternative B: • Expand the cooperation and partnerships to assist in maintaining habitat quality throughout the Altamaha Ecosystem. • Coordinate water quality sampling efforts with University of Georgia and Georgia Department of Natural Resources (DNR) to ensure efforts add to existing database and critical parameters are tested. • Coordinate with Georgia DNR and other federal agencies to strengthen position for preserving and protecting the Altamaha River System.

Issues	Alternative A: Current Management (No Action)	Alternative B: Intensive Biological Resource Management	Alternative C: Ecosystem Management (Proposed Alternative)
Piping Plover	• Continue to contribute to the recovery of the piping plover by providing undisturbed high quality foraging and roosting habitat. • Look for banded piping plovers among the wintering population.	In addition to Alternative A: • Minimize disturbance to foraging and roosting birds by posting signs readable from offshore at three key landing points on Wolf Island to deter human use.	In addition to Alternative B: • Monitor use of the refuge by piping plovers by instituting monthly surveys from July through April. • Coordinate with Georgia DNR to augment surveys currently being conducted. • Evaluate distribution and abundance of food resources for piping plovers by initiating benthic invertebrate and water quality sampling.
Wood Storks, Bald Eagles, and Other Protected Species	• Continue to protect habitat for these species.	In addition to Alternative A: • Within 5 years of CCP approval, begin monitoring efforts within the refuge.	In addition to Alternative B: • Coordinate with partners to increase monitoring efforts beyond the refuge to include the surrounding ecosystem. • Work with other federal and state agencies and conservation groups to preserve the pristine nature of the Altamaha River System upon which the refuge is dependant. • Conduct surveys of wood stork feeding activities during breeding and post-breeding seasons.

Issues	Alternative A: Current Management (No Action)	Alternative B: Intensive Biological Resource Management	Alternative C: Ecosystem Management (Proposed Alternative)
Shorebirds	• Continue to provide habitat for current populations of shorebirds, and support Georgia DNR research and monitoring of shorebirds.	In addition to Alternative A: • Increase protection and monitoring efforts and enhance refuge habitat for shorebirds. • Minimize disturbance to nesting shorebirds by posting signs at key locations. • Monitor predation of shorebird nests by raccoons and implement predator control measures if necessary. • Monitor nesting shorebird use of the refuge by implementing nesting season surveys of appropriate habitat. • Coordinate with Georgia DNR to complement existing surveys. • Increase law enforcement patrols during the critical nesting period.	In addition to Alternative B: • Increase protection and monitoring efforts, and enhance ecosystem habitats for shorebirds. • Coordinate with partners to monitor water quality within the Altamaha River System as it relates to shorebirds and their food resources. • Coordinate with partners and monitor species diversity and density of shorebird food resources.

Issues	Alternative A: Current Management (No Action)	Alternative B: Intensive Biological Resource Management	Alternative C: Ecosystem Management (Proposed Alternative)
Wintering and Breeding Marshbirds and Songbirds	• Relying primarily on custodial management, and continue to provide habitat for marshbirds and songbirds.	• Begin surveying, monitoring, and habitat enhancement on the refuge for these birds.	In addition to Alternative B: • Work with partners throughout the ecosystem to increase monitoring and habitat enhancement efforts. • Monitor marshbird use of salt marshes by implementing winter and breeding surveys at Wolf, Egg, and Little Egg Islands.
Reptiles and Amphibians	• Continue to provide habitat for reptiles and amphibians.	In addition to Alternative A: • Begin to monitor presence, and conduct habitat management for reptiles and amphibians on the refuge.	In addition to Alternative B: • Work with partners throughout the ecosystem to increase monitoring and habitat enhancement efforts. • Reduce the raccoon population on the refuge. • Encourage the implementation of the Georgia DNR proposal to list terrapins as “Unusual” species on their protected species list. • Encourage Georgia DNR to require the most efficient excluder device on all crab traps in the Altamaha Basin.

Issues	Alternative A: Current Management (No Action)	Alternative B: Intensive Biological Resource Management	Alternative C: Ecosystem Management (Proposed Alternative)
Salt Marsh	• Continue with passive management of this habitat.	• Map, protect, and maintain salt marsh on the refuge, and enhance habitat quality.	In addition to Alternative B: • Work with partners within ecosystem to eliminate threats to salt marsh. • Implement water quality (including salinity) monitoring project.
Beaches, Dunes, and Sand Bars	• Continue with passive management of this habitat.	• Map, protect, and maintain beaches, dunes, and sand bars on the refuge, and enhance habitat quality.	In addition to Alternative B: • Work with partners within ecosystem to eliminate threats to beaches, dunes, and sand bars. • Work with partners to influence the Corps to change deposition sites from confined disposal areas and ocean disposal sites to near shore areas in order to increase the amount of sand traveling down the coast. • Initiate studies of distribution, abundance, and limiting factors for benthic invertebrates.

Issues	Alternative A: Current Management (No Action)	Alternative B: Intensive Biological Resource Management	Alternative C: Ecosystem Management (Proposed Alternative)
Maritime Forest and Shrub-Scrub	• Continue with passive management of this habitat.	• Map, protect, and maintain maritime forest and shrub-scrub habitat on the refuge and enhance habitat quality.	In addition to Alternative B: • Work with partners within ecosystem to eliminate threats to these habitats. • Maintain the maritime forest in a natural state, excluding the use of prescribed fire. • Conduct annual inspections of the forest community for the presence of invasive species, e.g., feral hogs, tallow trees, etc. and control as appropriate. • Add an additional refuge law enforcement officer and needed equipment, and increase patrols to protect the wildlife and maritime forest habitat. • Conduct call recognition surveys for nesting birds during May-June on maritime forest and shrub-scrub habitats of Egg Island.
Invasive Species Management	• There will be no active management of invasive species on the refuge under this alternative.	• Conduct surveys of invasive species, and begin control as needed.	In addition to Alternative B: • Work with partners within the ecosystem to abate threats.

Issues	Alternative A: Current Management (No Action)	Alternative B: Intensive Biological Resource Management	Alternative C: Ecosystem Management (Proposed Alternative)
Beach Restoration Activities	• Continue negotiations with the Corps to change current dredge deposition procedures in the Savannah area in order to reverse present beach erosion rates.	• Cooperate with the Corps to encourage studies and modeling to determine if current dredge deposition procedures in the Savannah area should be changed in order to reverse present beach erosion rates on Wolf Island.	• Coordinate efforts with other partners in the ecosystem and with the Corps to change current dredge deposition procedures in the Savannah area in order to reverse present beach erosion rates in coastal Georgia.
Contaminants/Water Quality	• Under this alternative, there will be no active efforts at assessing or reducing contaminants and protecting water quality in waters near the refuge.	• In cooperation with partners, collect sediment and water samples for the Altamaha Delta, and examine contaminants associated with potential upstream discharges in order to determine possible impacts.	In addition to Alternative B: • Obtain potential list of contaminants from ES Brunswick in order to develop a list of contaminants to test for.
Air Quality	• Continue to utilize air quality monitoring data for Class I Air Quality from Okefenokee NWR to characterize air quality status of Wolf Island NWR Wilderness. • Continue commenting on new permit applications and changes to existing air quality permits that could impact Class I Air Quality.	In addition to Alternative A: • Work with Georgia DNR to characterize Wolf Island NWR air quality by utilizing data from Sapelo Island NADP (National Atmospheric Deposition Program).	In addition to Alternative B: • Utilize monitoring data from Okefenokee and/or Blackbeard Island National Wildlife Refuges. • Aerial deposition of mercury should be checked for in and around Wolf Island to determine possible impacts to a Class I area.

Issues	Alternative A: Current Management (No Action)	Alternative B: Intensive Biological Resource Management	Alternative C: Ecosystem Management (Proposed Alternative)
Land Acquisition and Protection	• Continue to maintain existing land base.	In addition to Alternative A: • Seek to augment protected land area by expanding authorized refuge acquisition boundary.	In addition to Alternative B: • Work with partners to increase area of protected lands within the ecosystem. • Determine the feasibility and desirability of acquiring Queen Island. • Initiate discussions with the State of Georgia to seek concurrence that Wolf Island Bar is a part of the refuge.
Restricting Public Access	• Continue minimum boundary posting and occasional law enforcement patrols.	• Replace existing boundary signs, install authorized “Wilderness Area” signs and three large “Area Closed” signs. • Increase law enforcement presence to an average of two additional patrols per week during the nesting and beach seasons.	In addition to Alternative B: • Increase cooperation with Georgia DNR on patrols and off-site education. • Replace all existing refuge boundary signs with new signs, and investigate the possibility of getting better quality, fade resistant signs. • Add “Wilderness Area” signs to all posts marking refuge boundary. • Contract the construction and instillation of two large island closed signs, and install these at the north and south ends of Wolf Island.

Issues	Alternative A: Current Management (No Action)	Alternative B: Intensive Biological Resource Management	Alternative C: Ecosystem Management (Proposed Alternative)
State Relationships and Coordination	• Continue the positive working relationship between refuge personnel and the Georgia DNR, and ensure that this relationship is maintained through time as personnel change within all organizations.	• Expand on Alternative A by developing a Memorandum of Agreement (MOA) for resource management on the refuge within 3 years of CCP approval.	• Expand on Alternative B by developing this MOA to cover the entire ecosystem. • Work with all parties to accomplish common goals, e.g., water quality monitoring, fisheries assessment, migratory bird assessment, research and protection, etc. • Conduct an annual meeting to establish priority needs and strategies for related projects.
Environmental Education	• Continue educational efforts, including participation in the Georgia Coastal Education Group, Wolf Island website, and distribution of educational materials.	• Expand on Alternative A, through partnerships with state agencies, to initiate outreach programming and development of off-site interpretive exhibits. • Develop off-site presentation programs that explain why the refuge is closed to the public.	• In addition to Alternative B, work with non-governmental conservation organizations, local civic organizations, and governments throughout the ecosystem to raise public awareness of the wilderness values and the role the refuge plays in the ecosystem. • Partner with state and private educational entities to conduct limited on-site ecology and environmental studies.

Issues	Alternative A: Current Management (No Action)	Alternative B: Intensive Biological Resource Management	Alternative C: Ecosystem Management (Proposed Alternative)
Wildlife Observation and Photography	• Continue to allow visitors to view and photograph the refuge and its wildlife from a safe distance.	• Same as Alternative A.	• Same as Alternative A.
Staffing and Budget	• Continue custodial management using Savannah Coastal Refuges Complex staff and budget.	• Add one FTE law enforcement officer and one FTE biological technician and associated support resources.	In addition to Alternative B: • Add an additional law enforcement position (also serving Harris Neck and Blackbeard Island NWRs). • Add at least one biological technician position (also serving Harris Neck and Blackbeard Island NWRs). • Baseline resources should be established to support boats, fuel, signage, and associated labor necessary to do at least the minimum necessary to protect resources at Wolf Island.
Volunteers and Friends	• Continue to operate without any dedicated volunteers or Friends group.	• Within 5 years of CCP approval and staffing, develop volunteer corps.	In addition to Alternative B: • Share volunteers with ecosystem partners. • Include Wolf Island NWR in a Friends group for the Savannah Coastal Refuges.

HUMAN RESOURCES

As a designated wilderness area with no public access allowed, direct human impacts are not expected to have any direct cumulative impacts on the refuge. As stated above, the concern for cumulative human impacts will come from developmental pressures throughout the Altamaha ecosystem. Industrial, commercial, and increased residential discharges to the region's air and water will have a cumulative adverse impact. Refuge efforts to mitigate such regional ecosystem impacts will come from monitoring the developmental activities and assuring enforcement of environmental regulations.

RELATIONSHIP BETWEEN SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

This section evaluates the relationship between local, short-term uses of the environment and the maintenance of long-term productivity of the environment. "Long-term" means the impact would extend beyond the 15-year planning horizon of this Draft CCP/EA. "Short-term" means the impact would occur in less than 15 years.

All of the alternatives strive to maintain or enhance the long-term productivity and sustainability of the refuge's natural resources. To varying degrees, they propose actions that promote watershed- or ecosystem-wide partnerships aimed at identifying and protecting important maritime forest and coastal wetland habitats. The alternatives strive to protect the Service's federal trust species and the habitats they depend on, evidenced by the exclusion of public access to the refuge. Environmental education and interpretation are priorities in each alternative in order to develop an understanding in the community for the need to deny public access and the reasoning for this important technique in environmental stewardship.

All of the alternatives propose stepped-up outreach and enforcement to prevent inappropriate and incompatible uses. Their purpose is to reduce the impacts on wildlife and habitats and enhance the long-term productivity of those sites. While the intent is the same for all alternative management strategies outlined in this CCP/EA, Alternatives A and B would not provide the staffing or resource levels to ensure that those incompatible uses can be eliminated.

UNAVOIDABLE IMPACTS AND MITIGATION MEASURES

WATER QUALITY

Passive management of the refuge will dominate refuge management techniques under all alternatives. As a wilderness area, the intent is to allow natural processes to be the determinant in maintaining the natural resources of the refuge. None of the alternatives propose any strategies that would have unavoidable negative impacts to the refuge. The more proactive alternatives (B and C) could potentially have a positive impact on the two major water quality issues affecting the refuge: regional developmental pressure with its attendant discharges to the Altamaha River system, and the lack of upstream sediment necessary to replenish beach erosion. Regardless of the alternative chosen, the refuge cannot positively address these negative impacts without regional help through partnerships and cooperation.

WILDLIFE DISTURBANCE

Disturbance to wildlife is an unavoidable consequence of any public use of the refuge, regardless of the activity involved. While some activities such as wildlife observation and photography 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.

No public access on the refuge will be allowed due to the sensitive nature of the refuge habitats; however, for environmental education purposes, limited field study visits may be authorized by permit. General, offshore wildlife observation and photography may result in minimal disturbance to wildlife. If refuge personnel determine that impacts from the expected additional visitor uses are above the levels that are acceptable, those uses will be discontinued, restricted, or rerouted to other less sensitive areas.

VEGETATION DISTURBANCE

Again, with passive management of the refuge, natural processes will control any refuge management decision. One exception is the control of invasive species. All alternatives call for monitoring the refuge for invasive plant species. Alternatives B and C both call for proactive control of invasives if their appearance on the refuges poses a threat to native habitat.

USER GROUP CONFLICTS

On a permit basis, limited field study visits by educational entities may be authorized; otherwise, no public access to the refuge is allowed under any of the alternatives. Because of this, no user group conflicts are expected. If for any unforeseen reason a conflict should occur, programs will be altered to eliminate or minimize any public use issues.

EFFECTS ON ADJACENT LANDOWNERS

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

However, some negative impacts that may occur include a higher frequency of trespass onto adjacent lands due to increased enforcement of the refuge's "No Public Access" policy. To minimize this potential impact, the refuge will provide informational signs that clearly mark refuge boundaries, use law enforcement, and provide increased educational efforts in the region.

LAND OWNERSHIP AND SITE DEVELOPMENT

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

POTENTIAL IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Except perhaps in the extreme long term or under unpredictable circumstances, irreversible commitments of resources cannot be undone. One example is an action that contributes to the extinction of a species. Once a species becomes extinct, it can never be replaced.

By comparison, irretrievable commitments of resources can be reversed, given sufficient time and resources. However, they represent a loss in production or use for a period of time. One example is

the maintenance of forest and shrub lands as open fields and grasslands. If for some reason grasslands no longer were an objective, they would gradually revert to shrub land and forest, or plantings could expedite that process.

None of the alternatives propose any actions on the core refuge area that would irreversibly commit resources. The refuge's wilderness area designation will be maintained, as will the decision not to allow public access on the refuge. With this designation and management decision in place, any refuge management action would be designed to protect the natural character of the refuge.

One potential refuge action, land acquisition or protection, could cause a long-term commitment of area resources. Alternatives A, B, and C all call for a study into the potential to acquire or protect additional land adjacent to the refuge. If these lands were to become part of the refuge, their reversion to private ownership is unlikely. However, once placed in public ownership in the National Wildlife Refuge System or in a protected status through a partner, they would provide a new set of benefits to a much broader group of people. Those benefits include watershed protection, wildlife conservation, the preservation of the natural character of the coast, and the expansion of wildlife-dependent recreational uses.

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 are reasonably foreseeable.

No negative direct and/or indirect effects or impacts are anticipated from the proposed alternative. One potential effect would be the active control of raccoons on the refuge to reduce nest predation. In such a case, the obvious direct effect would be a reduction in the refuge's population of raccoons, with an anticipated indirect effect of an increase in survival of young that utilize ground nests.

SHORT-TERM USES VERSUS LONG-TERM PRODUCTIVITY

The habitat protection and management actions proposed under the proposed alternative are dedicated to maintaining the long-term productivity of refuge habitats. The benefits of this plan for long-term productivity far outweigh any impacts from short-term actions. The key to protecting and ensuring the refuge's long-term productivity is to find the threshold where public uses do not degrade or interfere with the refuge's natural resources. The plans proposed under the proposed alternative have been carefully conceived to achieve that threshold. Therefore, implementing the proposed alternative 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 Comprehensive Conservation Plan and Environmental Assessment (Draft CCP/EA).

The Draft CCP/EA for Wolf Island National Wildlife Refuge was written with the participation and assistance of refuge and Service staff, a contracted consultant from the Mangi Environmental Group, a representative from The Nature Conservancy's Georgia Conservation Office, and the Georgia Department of Natural Resources. The comprehensive planning process began in June 2006 with the formation of a refuge planning team. A Notice of Intent to prepare a CCP for the refuge was published in the *Federal Register* on October 30, 2006.

In May 2006, in preparation for the CCP process, the Service established a team of biologists to conduct a comprehensive review of the refuge's wildlife and habitat management programs. A brief visitor services review was also incorporated as part of this biological review. The members of the biological review team were drawn from the refuge and the Service as well as the Georgia Department of Natural Resources. Subsequently, the refuge hosted an open house and public scoping meeting on January 24, 2007 in Darien, Georgia, and began an outreach campaign through various media to collect ideas, comments, and concerns from all stakeholders. Please refer to Chapter III, Plan Development, of the Draft CCP (Section A) for more information on the public scoping process.

CCP PLANNING TEAM

The CCP Planning Team for Wolf Island National Wildlife Refuge consisted of the following members:

- Jane Griess, Project Leader, Savannah Coastal Refuges Complex, U.S. Fish and Wildlife Service
- W. Shaw Davis, Deputy Project Leader, Savannah Coastal Refuges Complex, U.S. Fish and Wildlife Service
- John Robinette, Biologist, Savannah Coastal Refuges Complex, U.S. Fish and Wildlife Service
- Debra Barnard, Biologist, Savannah Coastal Refuges Complex, U.S. Fish and Wildlife Service
- Randy Williams, Consultant, Mangi Environmental Group (Service contractor)

BIOLOGICAL REVIEW TEAM

Several individuals supported the planning process through their participation on the biological review team and other special topic discussions. Their comments and suggestions were useful in developing the wildlife and habitat management objectives found in this plan. Some members internal to the Service provided additional policy guidance in developing the plan, as well.

- Chuck Hunter, U.S. Fish and Wildlife Service, Division of Planning and Resource Management Southeast Regional Office, Atlanta Georgia

- Stefani Melvin, U.S. Fish and Wildlife Service, Division of Migratory Birds, Southeast Regional Office, Atlanta, Georgia
- Brad Winn, Georgia Department of Natural Resources, Brunswick, Georgia
- Debra Barnard, U.S. Fish and Wildlife Service, Savannah Coastal Refuges, Harris Neck National Wildlife Refuge, Townsend, Georgia
- John Robinette, U.S. Fish and Wildlife Service, Savannah Coastal Refuges Complex, Savannah, Georgia

VISITOR SERVICES REVIEW CONTRIBUTORS

Two individuals with expertise in the Service's public use and outreach programs contributed comments and recommendations on the refuge's visitor services program.

- Pat Metz, Visitor Services Manager, Savannah Coastal Refuges Complex, U.S. Fish and Wildlife Service, Savannah, Georgia
- Garry Tucker, Chief, Visitor Services and Outreach Division, U.S. Fish and Wildlife Service, Southeast Regional Office, Atlanta, Georgia

OTHER CONTRIBUTORS

In addition to the above-listed CCP planning team, biological review team, and visitor services experts, other individuals and groups contributed to the plan. These included local citizens and agencies as well as nongovernmental organizations like The Nature Conservancy. These contributors participated in the scoping meeting or provided input at various stages of the planning process.

- Richard Kanaski, Southeast Regional Archeologist, U.S. Fish and Wildlife Service, Savannah, Georgia
- Fred Hay, Sapelo Island Research Manager, Georgia Department of Natural Resources, Darien, Georgia
- Aimee Gaddis, Stewardship Coordinator, Sapelo Island National Estuarine Research Reserve, Darien, Georgia
- Jeff Spratt, The Nature Conservancy, Georgia Conservation Office, Darien, Georgia
- Scott Gilje, Refuge Operations Specialist, U.S. Fish and Wildlife Service, Harris Neck National Wildlife Refuge, Townsend, Georgia
- Robert Brooks, Biologist, U.S. Fish and Wildlife Service, Georgia Ecological Services Office, Brunswick, Georgia

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 management plan. Analysis of results help managers determine whether current management should continue as is or whether it should be modified to achieve desired conditions.

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 freshwater to breed.

Best Management Practices: A practice or combination of practices that industry generally accepts as the most effective and advanced means to maintain a superior level of environmental performance and which advances environmental leadership.

Biological Diversity: The variety of life and its processes including the variety of living organisms, the genetic differences among them, and the communities and ecosystems in which they occur (USFWS Manual 052 FW 1.12B). The System's focus is on indigenous species, biotic communities, and ecological processes. Also referred to as Biodiversity.

Class 1 Airshed These areas include all international areas and National Parks greater than 6000 acres, and national wildernesses greater than 5000 acres, that existed on August 7, 1977. This class provides the most protection to pristine lands by severely limiting the amount of additional man-made air pollution, which can be added to these areas.

Climax community: The final stage of plant succession, in which vegetation reaches a state of equilibrium with the environment. The community is self-perpetuating, except that changes may occur very slowly and over a time-scale that is extensive compared with the rapid and dramatic changes during the early stages of succession.

Compatible Use:	A proposed or existing wildlife-dependent recreational use or any other use of a National Wildlife Refuge that, based on sound professional judgment, will not materially interfere with or detract from the fulfillment of the National Wildlife Refuge System mission or the purpose(s) of the National Wildlife Refuge (50 CFR 25.12 (a)). A compatibility determination supports the selection of compatible uses and identifies stipulations or limits necessary to ensure compatibility.
Comprehensive Conservation Plan (CCP):	A document that describes the desired future conditions of a refuge or planning unit and provides long-range guidance and management direction to achieve the purposes of the refuge; helps fulfill the mission of the Refuge System; maintains and, where appropriate, restores the ecological integrity of each refuge and the Refuge System; helps achieve the goals of the National Wilderness Preservation System; and meets other mandates (Service Manual 602 FW 1.6 E).
Concern:	See Issue.
Cultural Resources:	The remains of sites, structures, or objects used by people in the past.
Critical habitat:	A specific geographic area(s) that contains features essential for the conservation of a threatened or endangered species and that may require special management and protection. Critical habitat may include an area that is not currently occupied by the species but that will be needed for its recovery.
Designated Wilderness Area:	An area designated by the United States Congress to be managed as part of the National Wilderness Preservation System (Draft Service Manual 610 FW 1.5).
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.

Endemic:	A species, disease, etc. that is only found within a specific geographic region.
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 the 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. It analyzes 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.
Herpetofauna:	Reptiles and amphibians.
Improvement Act (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.
Invasive species:	A species, not endemic to an area, that is introduced to that new area and causes environment or economic harm or harm to human health.

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

National Wildlife Refuge:	A designated area of land, water, or an interest in land or water within the System.
Native Species:	Species that normally live and thrive in a particular ecosystem.
Notice of Intent (NOI):	A notice that an Environmental Impact Statement will be prepared and considered (40 CFR 1508.22). Published in the Federal Register.
Noxious Weed:	A plant species designated by federal or state law as generally possessing one or more of the following characteristics: aggressive or difficult to manage; parasitic; a carrier or host of serious insect or disease; or non-native, new, or not common to the United States. According to the Federal Noxious Weed Act (PL 93-639), a noxious weed is one that causes disease or had adverse effects on man or his environment and therefore is detrimental to the agriculture and commerce of the United 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. Make objectives attainable, time-specific, and measurable (Service Manual 602 FW 1.6N).
Opportunity costs:	The loss of time, resources, and/or opportunity (timing) of doing one activity or decision over another.
Pelagic:	Open ocean.
Plant Association:	A classification of plant communities based on the similarity in dominants of all layers of vascular species in a climax community.
Preferred (or Proposed) Alternative:	This is the alternative determined [by the decision-maker] to best achieve the refuge purpose, vision, and goals; contributes to the National Wildlife 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). They may be from natural ignition or intentional ignition.
Priority Species:	Fish and wildlife species that the Georgia Department of Natural Resources believes require protective measures and/or management guidelines to ensure their perpetuation.

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).
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 are medium to small, perching landbirds. Most are territorial singers and migratory.
Scoping:	Determining the sum total of all of a project's products and their requirements and features.
Sound/best professional judgment:	Sound professional judgment incorporates field experience, knowledge of refuge resources, refuge's role within an ecosystem, applicable laws, and best available science including consultation with others both inside and outside the Service.
Step-down Management Plan:	A plan that provides specific guidance on management subjects (e.g., habitat, public use, fire, safety) or groups of related subjects. It describes strategies and implementation schedules for meeting CCP goals and objectives (Service Manual 602 FW 1.6 U).

Strategy: A specific action, tool, technique, or combination of actions, tools, and techniques used to meet unit objectives (Service Manual 602 FW 1.6 U).

Study Area: The area reviewed in detail for wildlife, habitat, and public use potential. For purposes of this CCP/EA, 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.

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, 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 1.6Z).

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

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

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 ABBRIEVIATIONS

USACE	U.S. Army Corps of Engineers
ACHP	Advisory Council on Historic Preservation
CCP	Comprehensive Conservation Plan
CFR	Code of Federal Regulations
CRMP	Cultural Resources Management Plan
CWCS	Comprehensive Wildlife Conservation Strategy
Delta	Altamaha River Delta
DNR	Department of Natural Resources
DOE	Department of Energy
EA	Environmental Assessment
EIS	Environmental Impact Statement
EO	Executive Order
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FONSI	Finding of No Significant Impact
FTE	full-time equivalent
GA	Georgia
MAREX	Marine Extension Service
MOA	Memorandum of Agreement
NABCI	North American Bird Conservation Initiative
NADP	National Atmospheric Deposition Program
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NRHP	National Register of Historic Places
NWR	National Wildlife Refuge
NWRS	National Wildlife Refuge System (also Refuge System)
PL	Public Law
RHPO	Regional Historic Preservation Officer
ROD	Record of Decision
RONS	Refuge Operating Needs System
RRP	Refuge Roads Program
SC	South Carolina
Service	U.S. Fish and Wildlife Service (also, USFWS)
SHPO	State Historic Preservation Officer
TDF	Tierra Del Fuego
USC	United States Code
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WHSHRN	Western Hemisphere Shorebird Reserve Network
WMA	Wilderness Management Area
WRD	Wildlife Resources Division

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Appendix C. Relevant Legal Mandates and Executive Orders

STATUE	DESCRIPTION
Administrative Procedures Act (1946)	Outlines administrative procedures to be followed by federal agencies with respect to identification of information to be made public; publication of material in the Federal Register; maintenance of records; attendance and notification requirements for specific meetings and hearings; issuance of licenses; and review of agency actions.
American Antiquities Act of 1906	Provides penalties for unauthorized collection, excavation, or destruction of historic or prehistoric ruins as well as 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 Secretary of the Interior and Commerce to enter into cooperative agreements with states and other non-federal interest 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.
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.

STATUE	DESCRIPTION
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, preservation 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 CBRA, expanded the CBRS to include undeveloped coastal barriers along the Great Lakes and in the Caribbean and established "Otherwise Protected Areas" (OPAs). The Service is responsible for maintaining official maps, consulting with federal agencies that propose spending federal funds within the CBRS and OPAs, and making recommendations to Congress about proposed boundary revisions.
Coastal Wetlands Planning, Protection, and Restoration Act (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.

STATUE	DESCRIPTION
Coastal Zone Management Act of 1972, as amended	Established a voluntary national program within the Department of Commerce to encourage coastal states to develop and implement coastal zone management plans and requires that "any federal activity within or outside of the coastal zone that affects any land or water use or natural resource of the coastal zone" shall be "consistent to the maximum extent practicable with the enforceable policies" of a state's coastal zone management plan. The law includes an Enhancement Grants Program for protecting, restoring, or enhancing existing coastal wetlands or creating new coastal wetlands. It also established the National Estuarine Reserve Research System, guidelines for estuarine research, and financial assistance for land acquisition.
Emergency Wetlands Resources Act of 1986	This Act authorized the purchase of wetlands from Land and Water Conservation Fund moneys, removing a prior prohibition on such acquisitions. The Act requires the Secretary to establish a National Wetlands Priority Conservation Plan, required the states to include wetlands in their Comprehensive Outdoor Recreation Plans, and transfers to the Migratory Bird Conservation Fund amounts equal to import duties on arms and ammunition. It also established entrance fees at National Wildlife Refuges.
Endangered Species Act of 1973, as amended	Provides for the conservation of threatened and endangered species of fish, wildlife, and plants by federal action and by encouraging the establishment of state programs. It provides for the determination and listing of endangered and threatened species and the designation of critical habitats. Section 7 requires refuge managers to perform internal consultation before initiating projects that affect or may affect endangered species.
Environmental Education Act of 1990	This Act established the Office of Environmental Education within the Environmental Protection Agency to develop and administer a federal environmental education program in consultation with other federal natural resource management agencies, including the Fish and Wildlife Service.
Estuary Protection Act of 1968	Authorized the Secretary of the Interior, in cooperation with other federal agencies and the states, to study and inventory estuaries of the United States, including land and water of the Great Lakes, and to determine whether such areas should be acquired for protection. The Secretary is also required to encourage state and local governments to consider the importance of estuaries in their planning activities relates to federal natural resource grants. In approving any state grants for acquisition of estuaries, the Secretary was required to establish conditions to ensure the permanent protection of estuaries..

STATUE	DESCRIPTION
Estuaries and Clean Waters Act of 2000	This Act 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 Act 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.
Federal-aid Highways Act of 1968	Established requirements for approval of federal highways through wildlife refuges and other designated areas to preserve the natural beauty of such areas. The Secretary of Transportation is directed to consult with the Secretary of the Interior and other federal agencies before approving any program or project requiring the use of land under their jurisdiction.
Federal Noxious Weed Act of 1990, as amended	The Secretary of Agriculture was given the authority to designate plants as noxious weeds and to cooperate with other federal, state, and local agencies; farmers associations; and private individuals in measures to control, eradicate, prevent, or retard the spread of such weeds. The Act requires each federal land-managing agency including the Fish and Wildlife Service to designate an office or person to coordinate a program to control such plants on the agency's land and implement cooperative agreements with the states including integrated management systems to control undesirable plants.

STATUE	DESCRIPTION
Fish and Wildlife Act of 1956	Establishes a comprehensive national fish, shellfish, and wildlife resources policy with emphasis on the commercial fishing industry; 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-game bird 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.
Fish and Wildlife Improvement Act of 1978	This Act was passed to improve the administration of fish and wildlife programs and amends several earlier laws including the Refuge Recreation Act, the National Wildlife Refuge Administration Act, and the Fish and Wildlife Act of 1956. It authorizes the Secretary to accept gifts and bequests of real and personal property on behalf of the United States. It also authorizes the use of volunteers on Service projects and appropriations to carry out volunteer programs.
Fish and Wildlife Programs Improvement and National Wildlife Refuge System Centennial Act of 2000	Recognizes the vital importance of the Refuge System and the fact that the System will celebrate its centennial anniversary in the year 2003. Established the National Wildlife Refuge System Centennial Commission to prepare a plan to commemorate the 100th anniversary of the System, coordinate activities to celebrate that event, and host a conference on the National Wildlife Refuge System. The commission is also responsible for developing a long-term plan to meet the priority operations; maintenance and construction needs for the System, and improve public use programs and facilities.
Fishery (Magnuson) Conservation and Management Act of 1976	Established Regional Fishery Management Councils comprised of federal and state officials including the Fish and Wildlife Service. It provides for regulation of foreign fishing and vessel fishing permits.

STATUE	DESCRIPTION
Freedom of Information Act, 1966	Requires all federal agencies to make available to the public for inspection and copying administrative staff manuals and staff instructions, official, published and unpublished policy statements, final orders deciding case adjudication, and other documents. Special exemptions have been reserved for nine categories of privileged material. The Act requires the party seeking the information to pay reasonable search and duplication costs.
Geothermal Steam Act of 1970, as amended	Authorizes and governs the lease of geothermal steam and related resources on public lands. Section 15c 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 plant taken in violation of domestic or foreign laws. It regulates the introduction to America of foreign species into new locations.
Land and Water Conservation Fund Act of 1948	This Act provides funding through receipts from the sale of surplus federal land, appropriations from oil and gas receipts from the outer continental shelf, and other sources for land acquisition under several authorities. Appropriations from the fund may be used for matching grants to states for outdoor recreation projects and for land acquisition by various federal agencies including the Fish and Wildlife Service.
Marine Mammal Protection Act of 1972, as amended	The 1972 Marine Mammal Protection Act established a federal responsibility to conserve marine mammals with management vested in the Department of Interior for sea otter, walrus, polar bear, dugong, and manatee. The Department of Commerce is responsible for cetaceans and pinnipeds, other than the walrus. With certain specified exceptions, the Act establishes a moratorium on the taking and importation of marine mammals as well as products taken from them.
Migratory Bird Conservation Act of 1929	Established a Migratory Bird Conservation Commission to approve areas recommended by the Secretary of the Interior for acquisition with Migratory Bird Conservation Funds. The role of the Commission was expanded by the North American Wetland Conservation Act to include approving wetlands acquisition, restoration, and enhancement proposals recommended by the North American Wetlands Conservation Council.
Migratory Bird Hunting and Conservation Stamp Act of 1934	Also commonly referred to as the “Duck Stamp Act,” requires waterfowl hunters 16 years of age or older to possess a valid federal hunting stamp. Receipts from the sale of the stamp are deposited into the Migratory Bird Conservation Fund for the acquisition of migratory bird refuges.

STATUE	DESCRIPTION
Migratory Bird Treaty Act of 1918, as amended	This Act implements various treaties and conventions between the U.S. and Canada, Japan, Mexico, and the former Soviet Union for the protection of migratory birds. Except as allowed by special regulations, this Act makes it unlawful to pursue, hunt, kill, capture, possess, buy, sell, purchase, barter, export, or import any migratory bird, part, nest, egg or product.
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-ways over federal lands for pipelines.
Mining Act of 1872, as amended	Authorizes and governs prospecting and mining for the so-called "hardrock" minerals (such as 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 Act 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 environmental values are given appropriate consideration along with economic and technical considerations.
National Historic Preservation Act of 1966, as amended	It establishes a National Register of Historic Places and a program of matching grants for preservation of significant historical features. Federal agencies are directed to take into account the effects of their actions on items or sites listed or eligible for listing in the National Register.
National Trails System Act (1968), as amended	Established the National Trails System to protect the recreational, scenic, and historic values of some important trails. National Recreation Trails may be established by the Secretaries of Interior or Agriculture on land wholly or partly within their jurisdiction, with the consent of the involved state(s), and other land managing agencies, if any. National Scenic and National Historic Trails may only be designated by an Act of Congress. Several National Trails cross units of the National Wildlife Refuge System.

STATUE	DESCRIPTION
National Wildlife Refuge System Administration Act of 1966	Prior to 1966, there was no single federal law that governed the administration of the various wildlife refuges that had been established. This Act defines the National Wildlife Refuge System and authorizes the Secretary of the Interior to permit any use of an area provided such use is compatible with the major purposes(s) for which the area was established.
National Wildlife Refuge System Improvement Act of 1997	This Act amends the National Wildlife Refuge System Administration Act of 1966. This Act defines the mission of the National Wildlife Refuge System, establishes the legitimacy and appropriateness of six priority "wildlife-dependent" public uses, establishes a formal process for determining "compatible uses" of System lands, identifies the Secretary of the Interior as responsible for managing and protecting the System, and requires the development of a CCP for all refuges outside of Alaska.
Native American Graves Protection and Repatriation Act of 1990	Requires federal agencies and museums to inventory, determine ownership of, and repatriate certain cultural items and human remains under their control or possession. The Act also addresses the repatriation of cultural items inadvertently discovered by construction activities on lands managed by the agency.
Neotropical Migratory Bird Conservation Act of 2000	Establishes a matching grants program to fund projects that promote the conservation of neotropical migratory birds in the United States, Latin America, and the Caribbean.
North American Wetlands Conservation Act of 1989	Provides funding and administrative direction for implementation of the North American Waterfowl Management Plan and the Tripartite Agreement on wetlands between Canada, U.S., and Mexico. North American Wetlands Conservation Council is created to recommend projects to be funded under the Act to the Migratory Bird Conservation Commission. Available funds may be expended for up to 50 percent of the United States share cost of wetlands conservation projects in Canada, Mexico, or the United States (or 100 percent of the cost of projects on federal lands).
Refuge Recreation Act of 1962, as amended	This Act authorizes the Secretary of the Interior to administer refuges, hatcheries, and other conservation areas for recreational use when such uses do not interfere with the area's primary purposes. It authorizes construction and maintenance of recreational facilities and the acquisition of land for incidental fish and wildlife oriented recreational development or protection of natural resources. It also authorizes the charging fees for public uses.

STATUE	DESCRIPTION
Partnerships for Wildlife Act of 1992	Establishes a Wildlife Conservation and Appreciation Fund to receive appropriated funds and donations from the National Fish and Wildlife Foundation and other private sources to assist the state fish and game agencies in carrying out their responsibilities for conservation of non-game species. The funding formula is no more 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. Service concerns include contaminated sediments associated with dredge or fill projects in navigable waters.
Sikes Act (1960), as amended	Provides for the cooperation by the Department of the Interior and Defense with state agencies in planning, development, and maintenance of fish and wildlife resources and outdoor recreation facilities on military reservations throughout the U.S. It requires the secretary of each military department to use trained professionals to manage the wildlife and fishery resource under his jurisdiction, and requires federal and state fish and wildlife agencies be given priority in management of fish and wildlife activities on military reservations.
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.

STATUE	DESCRIPTION
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	The Wilderness Act of 1964 directs the Secretary of the Interior to review every roadless area of 5,000 acres or more and every roadless island regardless of size within the National Wildlife Refuge System and to recommend suitability of each such area. The Act permits certain activities within designated wilderness areas that do not alter natural processes. Wilderness values are preserved through a “minimum tool” management approach, which requires refuge managers to use the least intrusive methods, equipment, and facilities necessary for administering the areas.
Youth Conservation Corps Act of 1970	Established a permanent Youth Conservation Corps (YCC) programs within the Department of Interior and Agriculture. Within the Service, YCC participants perform many tasks on refuges, fish hatcheries, and research stations.

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

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

EXECUTIVE ORDERS	DESCRIPTIONS
EO 13186, Responsibilities of Federal Agencies to Protect Migratory Birds (2001)	Instructs federal agencies to conserve migratory birds by several means including the incorporation of strategies and recommendations found in the 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

An open house and public scoping meeting was held on January 24, 2007, at The Nature Conservancy's Georgia Conservation Office near Darien, Georgia, to solicit comments from the public regarding the development of the comprehensive conservation plan for Wolf Island National Wildlife Refuge. The meeting provided information about the refuge's current management programs and the comprehensive conservation planning process. Five citizens attended the meeting.

Comment forms were made available at the public scoping meeting and at the refuge headquarters. In addition, periodic refuge planning updates were posted on the Wolf island NWR website to provide the public with information on the progress of the plan and upcoming milestones. Individuals could also sign their names for inclusion on the refuge's mailing list in order to obtain information via regular mail.

A total of three public comments were received, two from the public scoping meeting and one that was submitted after the meeting by e-mail. These public comments are summarized below. All comments were supportive of the refuge and its management actions.

- There should be controlled access to the refuge for the public for environmental education purposes.

- The U.S. Army Corps of Engineers' dredge material should be used to replenish beach erosion.

- The refuge should remain a sanctuary and not be opened to hunting.

The public comments, along with the comments collected through internal scoping, were used by the planning team to help guide the development of the refuge's goals, objectives, and strategies, which are found in Chapter IV, Management Direction, of the Draft Comprehensive Conservation Plan (Section A).

Appendix E. Appropriate Use Determinations

Wolf Island 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 and 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. We consider 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 the refuge's ability to provide quality, wildlife-dependent recreational uses.

Refuge Recreation Act of 1962, 16 U.S.C. 460k. This law authorizes the Secretary of the Interior to " … administer such areas [of the System] or parts thereof for public recreation when in his judgment public recreation can be an appropriate incidental or secondary use." While this law authorizes the refuge manager to allow public recreation in areas of the Refuge System when the use is an "appropriate incidental or secondary use," the Improvement Act provides the Refuge System mission and includes specific directives and a clear hierarchy of public uses on the Refuge System.

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

Definitions:

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

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

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

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

Wolf Island National Wildlife Refuge – Special Designations

Wolf Island NWR has been designated as a wilderness area and further designated as a refuge with no public access. Due to these two designations, there are no appropriate uses that would allow access to the island other than essential wildlife and habitat management activities.

Of the six wildlife-dependent recreational uses (as defined by the National Wildlife Refuge System Improvement Act of 1997), only two may be allowed in the waters near the refuge: fishing and wildlife observation/photography. Another wildlife-dependent recreational use, environmental education and interpretation, may be done offsite.

Two uses were determined to be compatible with the special designations described above, and access to the refuge for these two uses will be allowed:

- Scientific research, studies, and surveys
- Invasive and nuisance species control

FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Wolf Island NWR

Use: Scientific Research, Studies, and Surveys

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: Wolf Island NWR

Use: Invasive and Nuisance Species Control

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

WOLF ISLAND NATIONAL WILDLIFE REFUGE COMPATIBILITY DETERMINATIONS

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

Uses: The following uses were evaluated and found to be compatible with the mission of the National Wildlife Refuge System and the purposes of the refuge: (1) scientific research, studies, and surveys; (2) invasive species control; (3) wildlife observation and photography (offsite); (4) environmental education and interpretation (offsite); and (5) fishing.

Refuge Name: Wolf Island National Wildlife Refuge.

Date Established: April, 3, 1930.

Establishing and Acquisition Authority(ies): Executive Order No. 5316.

Refuge Purpose: The refuge was established as a sanctuary for migratory birds.

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

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

Public Review and Comment:

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

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

Description of Use: *Scientific Research, Studies, and Surveys*

Lack of refuge staffing may not permit conducting all the surveys, studies, and research that would be desirable. Permitting qualified groups and individuals to conduct scientific research, studies, and surveys on the refuge that would increase the knowledge base of species, systems, and processes on, around, and affecting the refuge and its animals, habitats, and activities would be a benefit.

Availability of Resources:

Resources involved in the administration and management of the use: Routine administrative activities to implement, document, and monitor and permit these various activities.

Special equipment, facilities, or improvements necessary to support the use: None

Maintenance costs: Normal routine maintenance of any refuge equipment used.

Monitoring costs: Routine administrative activities associated with refuge-permitted activities and the permitting processes.

Offsetting revenues: None

Anticipated Impacts of the Use:

Short-term impacts: With refuge control of the timing and extent of any approved surveys, animal disturbance would be minimal and any impacts would be short-term. Permitting qualified groups and individuals to conduct scientific research, studies, and surveys on the refuge that would increase the knowledge base of species, systems, and processes on, around, and affecting the refuge. This knowledge base would be expected to benefit refuge decision-making.

Long-term impacts: Any long-term impacts would be benificial in nature because a better knowledge base of systems affecting the refuge and its surrounding ecosystem would provide information that would benefit long-term decision-making.

Cumulative impacts: The cumulative impacts expected from acting on an increased knowledge base can be expected to improve overall ecosystem management and thereby improve habitat conditions on the refuge.

Determination (check one below):

____ Use is Not Compatible

__X__ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility: Memorandums of Understanding with the researchers that their activities will be performed under the direction and or approval of the Refuge Manager and the research supports the long-term goals of the refuge.

Justification: The activity supports the refuge's goals and objectives.

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- or 15-year Re-evaluation Date: _____

Description of Use: *Invasive Species Control*

Control of invasive species such as Chinese tallow tree by application of chemical pesticides. All chemicals used will be approved through normal U.S. Fish and Wildlife Service procedures.

This use will be implemented throughout the refuge as needed and throughout the year or as indicated on label information. To augment force account application, contract applicators would be hired to apply pesticides according to chemical label instructions.

Availability of Resources:

Resources involved in the administration and management of the use: Preparation of pesticide use proposal documentation required by the Service. Contract documentation as needed. Chemicals and equipment would be refuge-owned for force account work and contractor-supplied, unless stipulated otherwise in the contract agreement.

Special equipment, facilities, or improvements necessary to support the use: Refuge has necessary equipment. Chemicals are purchased as needed.

Maintenance costs: Normal maintenence on equipment.

Monitoring costs: Monitoring costs would be incidental to other field tasks.

Offsetting revenues: None

Anticipated Impacts of the Use:

Short-term impacts: The station's Pesticide Use Proposals would describe use and impacts.

Long-term impacts: Control invasive species to protect native habitats.

Cumulative impacts: Control invasive species to protect native habitats.

Determination (check one below):

____ Use is Not Compatible

__X__ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility: All control methods are approved by the Refuge Manager and any pesticide/herbicide use is compatible with the protection of the refuge environment.

Justification: The activity supports the refuge's goals and objectives.

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- or 15-year Re-evaluation Date: _____

Description of Use: *Wildlife Observation and Photography*

Wildlife observation and photography are identified in the National Wildlife Refuge System Improvement Act of 1997 as priority wildlife-dependent recreational uses, provided they are compatible with the purpose(s) for which the refuge was established.

Wildlife photography, including other image-capturing activities such as videography, has occurred at the refuge since its inception. Wildlife observation and photography can occur anywhere on the refuge from watercraft at an appropriate distance offshore.

Availability of Resources:

Resources involved in the administration and management of the use: Minor amount of personnel time associated with administration, management, and law enforcement.

Special equipment, facilities, or improvements necessary to support the use: None

Maintenance costs: None

Monitoring costs: Some staff time in administrating this program would be required.

Offsetting revenues: None

Anticipated Impacts of the Use:

Short-term impacts: The refuge provides habitat for resident and migratory wildlife. As a result of these activities, individual animals may be disturbed by human contact to varying degrees. Examples of potential disturbance include flushing of birds from feeding, resting, or nesting areas. Disturbances to trust species are expected to be minimal.

Long-term impacts: Current utilization of these uses is incidental to overall refuge programs and no long-term adverse impacts have been experienced.

Cumulative impacts: No cumulative impacts are anticipated.

Determination (check one below):

____ Use is Not Compatible

__X__ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility: Visitors are required to abide by all refuge regulations which limit impacts on plant and wildlife populations by only allowing this activity offshore.

Justification: Visitors have the opportunity to view and photograph many species of wildlife with relative ease by boat.

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- or 15-year Re-evaluation Date: _____

Description of Use: *Environmental Education and Interpretation (both onsite and offsite)*

Environmental education and interpretation are identified in the National Wildlife Refuge System Improvement Act of 1997 as priority public uses provided they are compatible with the purposes for which the refuge was established. Environmental education and interpretation are used to encourage understanding in citizens of all ages to develop land ethics, foster public support, increase visibility, and improve the image of the Service.

The refuge would participate in regional environmental education and interpretation programs to inform the public as to why the refuge is off-limits to public access. In partnership with institutes of higher learning, onsite field studies may be conducted on a permit basis.

Availability of Resources:

Resources involved in the administration and management of the use: Minor amount of personnel time.

Special equipment, facilities, or improvements necessary to support the use: None

Maintenance costs: None

Monitoring costs: None

Offsetting revenues: None

Anticipated Impacts of the Use:

Short-term impacts: There would be no direct impacts to the refuge because all interpretive and most environmental education activities would be conducted offsite. Periodically, onsite educational programs would be permitted, but impacts would be negligible due to the controls delineated during the permit process. Access points and times would be limited, as would the number of program participants.

Minor impacts to vegetation from foot traffic could be expected, but the short duration of field studies, under closely supervised conditions, would assure minimal disturbance to flora and fauna.

Long-term impacts: There would be no direct impacts to the refuge because all interpretive and most environmental education activities would be conducted offsite.

Cumulative impacts: Increased public education can be expected to reduce the incidence of unintended public access to the refuge, and this will reduce wildlife disturbance.

Determination (check one below):

____ Use is Not Compatible

__X__ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility: None

Justification: Environmental education is an important activity in assuring long-term positive public awareness of the Refuge System.

NEPA Compliance for Refuge Use Description:

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

Mandatory 10- or 15-year Re-evaluation Date: _____

Description of Use: *Fishing*

Fishing was a traditional recreational use of the waters in and around the refuge prior to its inclusion into the National Wildlife Refuge System. Fishing continues to be a recreational pursuit with the public. Fish populations currently support a sustainable harvest under a regulated fishing program.

Fishing is identified in the National Wildlife Refuge System Improvement Act of 1997 as a priority wildlife-dependent use, provided it is compatible with the purpose(s) for which the refuge was established.

Fishing, as well as shell fishing, is permitted in the waters within the refuge. The use is conducted year-round. Fishing is conducted subject to regulations established by the Georgia Department of Natural Resources. Fishing is further restricted on the refuge by regulations which prohibit commercial fishing on the refuge and prohibit the use of certain fishing methods.

Availability of Resources:

Resources involved in the administration and management of the use: Personnel time associated with administration, management, and law enforcement are required to control and administer fishing on the refuge.

Special equipment, facilities, or improvements necessary to support the use: None

Maintenance costs: None

Monitoring costs: Some law enforcement time.

Offsetting revenues: None

Anticipated Impacts of the Use:

Short-term impacts: Minor impacts such as litter and gasoline contamination could occur but not at a level that would cause serious concern. There may be some erosion from powered boat wakes.

Long-term impacts: Fishing, as regulated, should not have any long-term negative impacts on the refuge.

Cumulative impacts: No cumulative impacts are known to occur.

Determination (check one below):

____ Use is Not Compatible

__X__ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility: Commercial fishing is prohibited. Recreational fishing using commercial gear is allowed by obtaining a permit from the state. Shell fishing is also allowed, with approved equipment.

Justification: Fishing is probably one of the most popular forms of outdoor recreation in the state. The refuge has the opportunity to provide limited fishing to the public, which is a priority use. Certain

state and refuge regulations limit the impacts to wildlife and fish populations on the refuge while providing a safe and rewarding experience for the refuge visitor.

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- or 15-year Re-evaluation Date: _____

APPROVAL OF COMPATIBILITY DETERMINATIONS

The signature of approval is for all compatibility determinations considered within the Comprehensive Conservation Plan for Wolf Island 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

SOUTHEAST REGION
INTRA-SERVICE SECTION 7
BIOLOGICAL EVALUATION FORM
[Federally endangered, threatened, and candidate species]

[Note: This form provides the outline of information needed for intra-Service consultation. If additional space is needed, attach additional sheets, or set up this form to accommodate your responses.]

Originating Person: ____John Robinette_____
Telephone Number: __912/652-4415_____ E-Mail: __john_robinette@fws.gov___
Date: __November 30, 2007_____

PROJECT NAME (Grant Title/Number): Wolf Island 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:

III. Station Name: Savannah Coastal Refuges/Wolf Island National Wildlife Refuge (NWR)

IV. Description of Proposed Action (attach additional pages as needed): Implementation of the Comprehensive Conservation Plan (CCP) for Wolf Island NWR; CCP Attached.

V. Pertinent Species and Habitat:
A. Include species/habitat occurrence map:
B. Complete the following table:

Table 1. Listed/proposed species/critical habitat that occur or may occur within the project area:

SPECIES/CRITICAL HABITAT	STATUS[1]
Loggerhead Sea Turtle	T
West Indian Manatee	E
Wood Stork	E
Piping Plover	E
Designated Critical Habitat for Piping Plover	

[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: Altamaha

B. County and State: McIntosh, Georgia

C. Section, township, and range (or latitude and longitude):
31^0 21' N x 81^0 18' W

D. Distance (miles) and direction to nearest town:
12 miles west to Darien, Georgia

E. Species/habitat occurrence:

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):

Table 2. Project impacts to listed/proposed species/critical habitat.

SPECIES/ CRITICAL HABITAT	IMPACTS TO SPECIES/CRITICAL HABITAT
Loggerhead Sea Turtle	Reduction in impacts through increased habitat monitoring, public education, cooperation with partners and increased staff.
West Indian Manatee	Reduction in impacts through increased habitat monitoring, public education, cooperation with partners and increased staff.
Wood Stork	Reduction in impacts through increased habitat monitoring, public education, cooperation with partners and increased staff.
Piping Plover	Reduction in impacts through increased habitat monitoring, public education, cooperation with partners and increased staff.
Designated Critical Habitat for Piping Plover	Reduction in impacts through increased habitat monitoring, public education, cooperation with partners and increased staff.

B. Explanation of actions to be implemented to reduce adverse effects:

Table 3. Conservation measures proposed to minimize or eliminate adverse impacts to proposed/listed species, critical habitat.

SPECIES/ CRITICAL HABITAT	ACTIONS TO MINIMIZE IMPACTS
Loggerhead Sea Turtle	Increased water quality monitoring efforts; addition of large closed area signs at three locations; cooperation with partners to have dredge material from savannah harbor placed near shore on the south of the channel where it can nourish down drift barrier island beaches, including Wolf Island and to protect sea turtles and their feeding habitat from over fishing or use of gear that would cause entanglement of sea turtles; additional staff to conduct surveys and increase law enforcement efforts.
West Indian Manatee	Increased water quality monitoring efforts; cooperation with partners to protect manatees from use of gear that would cause entanglement; additional staff to conduct surveys and increase

SPECIES/ CRITICAL HABITAT	ACTIONS TO MINIMIZE IMPACTS
	law enforcement efforts.
Wood Stork	Increased water quality monitoring efforts; additional staff to conduct surveys and increase law enforcement efforts.
Piping Plover	Increased water quality monitoring efforts; addition of large closed area signs at three locations; cooperation with partners to have dredge material from savannah harbor placed near shore on the south of the channel where it can nourish down drift barrier island beaches, including Wolf Island; additional staff to conduct surveys and increase law enforcement efforts.
Designated Critical Habitat for Piping Plover	Increased water quality monitoring efforts; addition of large closed area signs at three locations; cooperation with partners to have dredge material from savannah harbor placed near shore on the south of the channel where it can nourish down drift barrier island beaches, including Wolf Island; additional staff to conduct surveys and increase law enforcement efforts.

VIII. Effect Determination and Response Requested:

Table 4. The effect determination and response requested for impacts to each proposed/listed species/critical habitat.

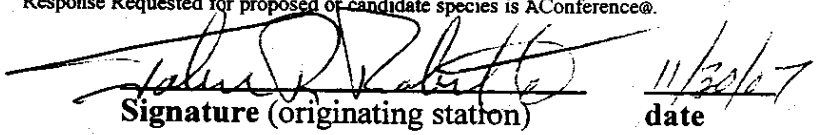
SPECIES/ CRITICAL HABITAT	DETERMINATION[1]			RESPONSE[1] REQUESTED
	NE	NA	AA	
Loggerhead Sea Turtle		x		
West Indian Manatee		x		
Wood Stork		x		
Piping Plover		x		
Designated Critical Habitat for Piping Plover		x		

[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 AConcurrence@ 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 AConcurrence@.

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 AFormal Consultation@. Response Requested for proposed or candidate species is AConference@.



Signature (originating station) **date**

Refuge Biologist

Title

If the project description changes or incidental take exceeds that which has been exempted under section 9 of the Act, then the Ecological Services Field Office must be contacted.

IX. Reviewing Ecological Services Office Evaluation:

A. Concurrence __√__ **Non-concurrence** _____

B. Formal consultation required _____

C. Conference required _____

D. Informal conference required _____

E. Remarks (attach additional pages as needed):

Stuart Coldwell — November 30, 2007
Signature **date**

Coastal Georgia Supervisor — Georgia Ecological Services
Title **office**

Appendix H. Refuge Biota

BIRDS

This list contains those species of birds thought to occur on lands owned by the Wolf Island NWR according to various literature sources, surveys, and observations.

Loons

Common Loon (*Gavia immer*)
Red-throated Loon (*Gavia stellata*)

Grebes

Red-necked Grebe (*Podiceps grisegena*)
Pied-billed Grebe (*Podilymbus podiceps*)

Shearwaters and Petrels

Greater Shearwater (*Puffinus gravis*)
Sooty Shearwater (*Puffinus griseus*)
Audubon's Shearwater (*Puffinus iherminieri*)
Wilson's Petrel (*Oceanites oceanicus*)

Pelicans, Cormorants, and Related Species

American White Pelican (*Pelecanus erythrorhynchos*)
Brown Pelican (*Pelecanus occidentalis*)
Double-crested Cormorant (*Phalacrocorax auritus*)
Anhinga (*Anhinga anhinga*)
Gannet (*Morus bassanus*)
Magnificent Frigate-bird (*Fregata magnificens*)

Bitterns, Herons, and Egrets

American Bittern (*Botaurus lentiginosus*)
Least Bittern (*Ixobrychus exilis*)
Great Blue Heron (*Ardea herodias*)
Green Heron (*Butoroides virescens*)
Little Blue Heron (*Efretta caerulea*)
Louisiana Heron (*Hydranassa tricolor*)
Black-crowned Night-heron (*Nycticorax nycticorax*)
Yellow-crowned Night-heron (*Nyctanassa violacea*)
Cattle Egret (*Bubulcus ibis*)
Reddish Egret (*Dichronranassa rufrscens*)
Snowy Egret (*Egretta thula*)
Common Egret (*Casmerodius albus*)

Ibises and Spoonbills

Wood Ibis (*Mycteria americana*)
White Ibis (*Eudocimis albus*)
Glossy Ibis (*Plegadis falcinellus*)
Roseate Spoonbill (*Ajaia ajaia*)

Waterfowl and Related Species

Whistling Swan (*Olor columbianus*)
Blue Goose (*Chen caerulescens*)
Snow Goose (*Chen caerulescens*)
Canada Goose (*Branta canadensis*)
Brant (*Branta bernicla*)
Fulvous Tree Duck (*Dendroocygna bicolor*)
Gadwall (*Anus strepera*)
American Black Duck (*Anus rubripes*)
Mallard (*Anus platyrhynchos*)
Mottled Duck (*Anys fulvigula*)
Blue-winged Teal (*Anus discors*)
Northern Shoveler (*Anus clypeata*)
Northern Pintail (*Anus acuta*)
Green-winged Teal (*Anus crecca*)
European Widgeon (*Mareca penelope*)
American Widgeon (*Mareca americana*)
Wood Duck (*Aix sponsa*)
Canvasback (*Aythya valisineria*)
Redhead (*Aythya americana*)
Ring-necked Duck (*Aythya collaris*)
Greater Scaup (*Aythya marila*)
Lesser Scaup (*Aythya affinis*)
Bufflehead (*Bucephala albeola*)
Common Goldeneye (*Bucephala clangula*)
Oldsquaw (*Clangula hyemalis*)
King Eider (*Somateria spectabilis*)
White-winged Scoter (*Melanitta deglandi*)
Surf Scoter (*Melanitta perspicillata*)
Common Scoter (*Oidemia nigra*)
Hooded Merganser (*Lophodytes cucullatus*)
Common Merganser (*Mergus merganser*)
Red-breasted Merganser (*Mergus serrator*)
Ruddy Duck (*Oxyura jamaicensis*)

Hawks, Eagles, Kites, and Related Species

Marsh Hawk (*Circus cyaneus*)
Broad-winged Hawk (*Buteo platypterus*)
Cooper's Hawk (*Accipiter cooperii*)
Red-shouldered Hawk (*Buteo lineatus*)
Rough-legged Hawk (*Buteo lagopus*)
Red-tailed Hawk (*Buteo jamaicensis*)
Sharp-shinned Hawk (*Accipiter striatus*)
Bald Eagle (*Haliaeetus leucocephalus*)
Golden Eagle (*Aquila chrysaetos*)
Osprey (*Pandion haliaetus*)
Swallow-tailed Kite (*Elanoides forficatus*)
Mississippi Kite (*Ictinia mississippiensis*)
Turkey Vulture (*Cathartes aura*)
Black Vulture (*Coragyps atratus*)

True Falcons

Pigeon Hawk (*Falco columbanius*)
American Kestrel (*Falco sparverius*)
Peregrine Falcon (*Falco peregrinus*)

Gallineaceous Birds (Quail, Turkey, and Allies)

Northern Bobwhite (*Colinus virginianus*)
Wild Turley (*Meleagris gallopava*)
Chachalaca (*Ortalis vetula*)

Rails, Gallinules, Coots, and Cranes

King Rail (*Rallus elegans*)
Virginia Rail (*Rallus limicola*)
Sora Rail (*Porzana carolina*)
Clapper Rail (*Rallus longirostris*)
Yellow Rail (*Coturnicops noveboracensis*)
Black Rail (*Laterallus jamaicensis*)
Purple Gallinule (*Porphyrula martinica*)
American Coot (*Fulica americana*)
Common Moorhen (*Gallinula chloropus*)
Whooping Crane (*Gnus americana*)
Limpkin (*Aramus guarauna*)

Plovers, Oystercatchers, and Related Species

American Golden-plover (*Pluvialis dominica*)
Black-bellied Plover (*Pluvialis squatarola*)
Semipalmated Plover (*Charadrius semipalmatus*)
Piping Plover (*Charadrius melodus*)
Snowy Plover (*Charadrius alexandrinus*)
Black-bellied Plover (*Squatarola squatarola*)
Upland Plover (*Bartramia longicauda*)
American Oystercatcher (*Haematopus palliates*)
Ruddy Turnstone (*Arenaria interpres*)
Killdeer (*Charadrius vociferous*)
Common Snipe (*Capella gallinago*)
Long-billed Curlew (*Numenius americanus*)
Whimbrel (*Numenius phaeopus*)

Avocets, Sandpipers, and Related Species

American Avocet (*Recurvirostra americana*)
Black-necked Stilt (*Himantopus mexicanus*)
Greater Yellowlegs (*Tringa melanoleuca*)
Lesser Yellowlegs (*Tringa flavipes*)
Solitary Sandpiper (*Tringa solitaria*)
Spotted Sandpiper (*Actitis macularia*)
Upland Sandpiper (*Bartramia longicauda*)
Semipalmated Sandpiper (*Caladris pusilla*)
Western Sandpiper (*Caladris mauri*)
Least Sandpiper (*Caladris minutilla*)
Pectoral Sandpiper (*Caladris melanotos*)
Stilt Sandpiper (*Calidris himantopus*)

Purple Sandpiper (*Erolia maritime*)
White-rumped Sandpiper (*Erolia fuscicollis*)
Buff-breasted Sandpiper (*Tryngites subruficollis*)
Willet (*Catoptrophorus semipalmatus*)
Dunlin (*Caladris alpine*)
Wilson's Phalarope (*Phalaropus tricolor*)
Red Phalarope (*Phalaropus fulicarius*)
Northern Phalarope (*Lobipes lobatus*)
Short-billed Dowitcher (*Limnodromus griseus*)
Long-billed Dowitcher (*Limnodromus scolopaceus*)
Marbled Godwit (*Limosa fedoa*)
Sanderling (*Crocethia alba*)
Knot (*Calidris canutus*)
Parasitic Jaeger (*Stercorarius parasiticus*)
Pomarine Jaeger (*Stercorarius pomarinus*)

Gulls, Terns, and Skimmers

Glaucous Gull (*Larus hyperboreus*)
Iceland Gull (*Larus glaucoides*)
Great Black-backed Gull (*Larus marinus*)
Laughing Gull (*Larus atricilla*)
Bonaparte's Gull (*Larus philadelphia*)
Ring-billed Gull (*Larus delawarensis*)
Herring Gull (*Larus argentatus*)
Sabine's Gull (*Xema sabini*)
Caspian Tern (*Hydroprogne caspia*)
Forster's Tern (*Sterna forsteri*)
Least Tern (*Sterna antillarum*)
Common Tern (*Sterna hirundo*)
Sooty Tern (*Sterna fuscata*)
Bridled Tern (*Sterna anaethetus*)
Gull-billed Tern (*Gelochelidon nilotica*)
Royal Tern (*Thalasseus maximus*)
Sandwich Tern (*Thalasseus sandvicensis*)
Noddy Tern (*Anous stolidus*)
Black Skimmer (*Rhynchops nigra*)

Pigeons and Doves

Rock Dove (*Columbia livia*)
Mourning Dove (*Zenaida macroura*)
White-winged Dove (*Zenaida asiatica*)
Common Ground Dove (*Columbina passerine*)

Cuckoos

Black-billed Cuckoo (*Coccyzus erthropthalmus*)
Yellow-billed Cuckoo (*Coccyzus americanus*)

Owls

Barn Owl (*Tyto alba*)
Eastern Screech-Owl (*Otus asio*)
Great Horned Owl (*Bubo virginianus*)
Barred Owl (*Strix varia*)
Short-eared Owl (*Asio flammeus*)
Snowy Owl (*Nyctea scandiaca*)

Swifts and Hummingbirds

Chimney Swift (*Chaeura pelagica*)
Ruby-throated hummingbird (*Archilochus colubris*)

Nightjars

Common Nighthawk (*Chordeiles minor*)
Chuck-will's-widow (*Caprimulgus carolinensis*)
Whip-poor-will (*Caprimulgus vociferous*)

Kingfishers

Belted Kingfisher (*Ceryle alcyon*)

Woodpeckers, Flickers, and Sapsuckers

Downy Woodpecker (*Picoides pubescens*)
Hairy Woodpecker (*Picoides villosus*)
Pileated Woodpecker (*Dryocopus pileatus*)
Red-headed Woodpecker (*Melanerpes erthrocephalus*)
Red-bellied Woodpecker (*Melanerpes carolinus*)
Yellow-bellied Sapsucker (*Sphyrapicus varius*)
Northern Flicker (*Colaptes auratus*)

Kingbirds, Flycatchers, and Related Species

Eastern Kingbird (*Tyrannus tyrannus*)
Gray Kingbird (*Tyrannus dominicensis*)
Western Kingbird (*Tyrannus verticalis*)
Scissor-tailed Flycatcher (*Muscivora forficata*)
Great Crested Flycatcher (*Myiarchus crinitus*)
Yellow-bellied Flycatcher (*Empidonax flaviventris*)
Vermilion Flycatcher (*Pyrocephalus rubinus*)
Acadian Flycatcher (*Empidonax virescens*)
Eastern Phoebe (*Sayornis phoebe*)
Eastern Wood Peewee (*Contopus virens*)

Shrikes

Loggerhead Shrike (*Lanius ludovicianus*)

Vireos

White-eyed Vireo (*Vireo griseus*)
Yellow-throated Vireo (*Vireo flavifrons*)
Blue-headed Vireo (*Vireo solitarius*)
Philadelphia Vireo (*Vireo phidelphicus*)
Red-eyed Vireo (*Vireo olivaceus*)

Jays and Crows

Blue Jay (*Cyanocitta cristata*)
American Crow (*Corvus brachyrhynchos*)
Fish Crow (*Corvus ossigragus*)

Martins and Swallows

Purple Martin (*Progne subis*)
Bank Swallow (*Riparia riparia*)
Barn Swallow (*Hirundia rustica*)
Northern Rough-winged Swallow (*Stelgidopteryx serripennis*)
Tree Swallow (*Tachycineta bicolor*)
Cliff Swallow (*Petrochelidon pyrrhonota*)

Chickadees

Carolina Chickadee (*Poecile carolinensis*)

Nuthatches

Red-breasted Nuthatch (*Sitta canadensis*)
White-breasted Nuthatch (*Sita carolinensis*)
Brown-headed Nuthatch (*Sitta pusilla*)

Creepers

Brown Creeper (*Certhia americana*)

Wrens

Carolina Wren (*Thryothorus ludovicianus*)
House Wren (*Troglodytes aedon*)
Long-billed Marsh Wren (*Telmatodytes palustris*)
Short-billed Marsh Wren (*Cistothorus platensis*)
Winter Wren (*Troglodytes troglodytes*)

Kinglets and Gnatcatchers

Golden-crowned Kinglet (*Regulus satrapa*)
Ruby-crowned Kinglet (*Regulus calendula*)
Blue-gray Gnatcatcher (*Polioptila caerulea*)

Thrushes

Gray-cheeked Thrush (*Catharus minimus*)
Swainson's Thrush (*Catharus ustulatus*)
Hermit Thrush (*Catharus guttatus*)
Wood Thrush (*Hylocichia mustelina*)
Robin (*Turdus migratorius*)
Eastern Bluebird (*Sialia sialis*)
Veery (*Catharus fuscescens*)

Mockingbirds and Thrashers

Northern Mockingbird (*Minus polyglottos*)
Gray Catbird (*Dumetella carolinensis*)
Brown Thrasher (*Toxostoma rufum*)

Starlings

European Starling (*Sturnus vulgaris*)

Pipits

Water Pipit (*Anthus spinoletta*)
Sprague's Pipit (*Anthus spragueii*)

Waxwings

Cedar Waxwing (*Bombycilla garrulous*)

Tanagers

Summer Tanager (*Piranga rubra*)
Scarlet Tanager (*Piranga olivacea*)

Blackbirds, Orioles, and Related Species

Baltimore Oriole (*Icterus galbula*)
Brown-headed Cowbird (*Molothrus ater*)
Boat-tailed Grackle (*Cassidix mexicanus*)
Yellow-headed Blackbird (*Xanthocephalus xanthocephalus*)
Common Grackle (*Quiscalus quiscula*)
Eastern Meadowlark (*Sturnella magnus*)
Orchard Oriole (*Icterus spurious*)
Red-winged Blackbird (*Agelaius phoeniceus*)
Rusty Blackbird (*Euphagus carolinus*)
Bobolink (*Dolichonyx oryzivorus*)

Warblers

Blue-winged Warbler (*Vermivora pinus*)
Golden-winged Warbler (*Vermivora chrysoptera*)
Orange crowned Warbler (*Vermivora celata*)
Tennessee Warbler (*Vermivora peregrine*)
Bachman's Warbler (*Vermivora bachmanii*)
Blackburnian Warbler (*Dendroica fusca*)
Blackpoll Warbler (*Dendroica striata*)
Black-throated Blue Warbler (*Dendroica caerulescens*)
Black-throated Green Warbler (*Dendroica virens*)
Chestnut-sided Warbler (*Dendroica pensylvanica*)
Magnolia Warbler (*Dendroica magnolia*)
Palm Warbler (*Dendroica palmarum*)
Pine Warbler (*Dendroica pinus*)
Prairie Warbler (*Dendroica discolor*)
Yellow-throated Warbler (*Dendroica dominica*)
Yellow Warbler (*Dendroica petechia*)
Cape May Warbler (*Dendroica tigrina*)
Myrtle Warbler (*Dendroica coronata*)
Kirtland's Warbler (*Dendroica kirtlandii*)
Black-and White Warbler (*Mniotilta varia*)
American Redstart (*Setophaga ruticilla*)
Prothonotory Warbler (*Protonotaria citrea*)
Worm-eating Warbler(*Helmitheros vermivorus*)
Swainson’s Warbler (*Limnothlypis swainsonii*)

Louisiana Waterthrush (*Seiurus motacilla*)
Ovenbird (*Seiurus aurocapillus*)
Northern Waterthrush (*Seiurus noveboracensis*)
Kentucky Warbler (*Oporornis formosus*)
Connecticut Warbler (*Oporornis agilis*)
Canada Warbler (*Wilsonia canadensis*)
Hooded Warbler (*Wilsonia citrine*)
Northern Parula (*Parula americana*)
Yellow-breasted Chat (*Icteria virens*)

New World Finches

Northern Cardinal (*Cardinalis cardinalis*)
Blue Grosbeak (*Passerina caerulea*)
Indigo Bunting (*Passerina cyanea*)
Painted Bunting (*Passerina ciris*)

Old World Finches

Purple Finch (*Carpodacus purpureus*)
American Goldfinch (*Carduelis tristis*)
Pine Siskin (*Carduelis pinus*)
Evening Grosbeak (*Coccothraustes vespertinus*)

Sparrows and Related Species

Rufous-sided Towhee (*Pipilo erythrophthalmus*)
Chipping Sparrow (*Spizella passerine*)
Field Sparrow (*Spizella pusilla*)
Vesper Sparrow (*Pooecetes gramineus*)
Lark Sparrow (*Chondestes grammacus*)
Savannah Sparrow (*Passerculus sandwichensis*)
Grasshopper Sparrow (*Ammodramus savannarum*)
Le Conte's Sparrow (*Passerherbulus caudacutus*)
Henslow's Sparrow (*Ammodramus henslowii*)
Fox Sparrow (*Passerella iliaca*)
Lincoln's Sparrow (*Melospiza lincolnii*)
Song Sparrow (*Melospiza melodia*)
Swamp Sparrow (*Melospiza georgiana*)
Sharp-tailed Sparrow (*Ammospiza caudacuta*)
Seaside Sparrow (*Ammospiza maritima*)
White-crowned Sparrow (*Zonotrichia leucophrys*)
White-throated Sparrow (*Zonotrichia albicollis*)
Slate-colored Junco (*Junco hyemalis*)
Lapland Longspur (*Calcarius lapponicus*)
Lark Bunting (*Calamospiza melanocorys*)

MAMMALS

This list contains those species of mammals thought to occur on lands owned by the Wolf Island NWR according to various literature sources, surveys, and observations.

Opossums
- Opossum (*Dedelphis marsupialis*)

Shrews
- Least Shrew (*Cryptotis parva*)
- Short-tailed Shrew (*Blarina brevicauda*)

Moles
- Eastern Mole (*Scalopus aquaticus*)

Bats
- Red Bat (*Lasiurus borealis*)
- Seminole Bat (*Lasiurus seminolus*)
- Yellow bat (*Lasiurus intermedius*)
- Big Brown Bat (*Eptesicus fuscus*)
- Southern Myotis (*Myotis austroriparius*)
- Eastern Pipistrel (*Pipistrellus subflavus*)

Rabbits
- Eastern Cottontail (*Sylvilagus floridanus*)
- Marsh Rabbit (*Sylvilagus palustrus*)

Squirrels
- Eastern Gray Squirrel (*Sciurus carolinensis*)
- Fox Squirrel (*Sciurus niger*)
- Southern Flying Squirrel (*Glaucomys volans*)

Pocket Gophers
- Cumberland Island pocket gopher (*Geomys cumberlandius*)

Old World Rats and Mice
- Roof Rat (*Rattus rattus*)
- Norway Rat (*Rattus norvegicus*)
- House Mouse (*Mus musculus*)

Mice, Rats, Voles
- Eastern harvest mouse (*Reithrodontomys humulis*)
- Old Field Mouse (*Peromyscus polionotus*)
- Cotton Mouse (*Peromyscus gossypinus*)
- Hispid Cotton Mouse (*Sigmodon hispidus*)
- White-footed Mouse (*Peromyscus luecopus*)
- Eastern Woodrat (*Neotoma floridana*)
- Marsh Rice Rat (*Oryzomys palustris*)
- Pine Vole (*Pitymys pinetorum*)

Nutria

Nutria (*Myocactor coypus*)

Foxes

Gray Fox (*Urocyon cinereoargenteus*)

Raccoons

Raccoon (*Procyon lotor*)

Weasels, Skunks

Mink (*Mustela vison*)
River Otter (*Lutra canadensis*)
Striped Skunk (*Mephitis mephitis*)

Cats

Bobcat (*Lynx rufus*)

Deer

White-tailed Deer (*Odocoileus virginianus*)

REPTILES AND AMPHIBIANS

This list contains those species of reptiles and amphibians thought to occur on lands owned by the Wolf Island NWR according to various literature sources, surveys, and observations.

Alligators
- American Alligator (*Alligator mississippiensis*)

Snapping Turtles
- Common Snapping Turtle (*Chelydra serpentina*)

Mud Turtles
- Mud Turtle (*Kinosternon subrubrum*)

Box and Water Turtles
- Eastern Box Turtle (*Terrapene carolina*)
- Diamondback Terrapin (*Malaclemys terrapin*)
- Yellow-bellied Turtle (*Pseudemys scripta*)
- Gopher Tortoise (*Gopherus polyphemus*)
- Chicken Turtle (*Deirochelys reticularia*)

Sea Turtles
- Loggerhead Sea Turtle (*Caretta caretta*)
- Ridley Turtle (*Lepidochelys kempi*)
- Green Turtle (*Chelonia mydas*)

Anoles and Fence Lizards
- Green Anole (*Anolis carolinensis*)
- Northern Fence Lizard (*Sceloporus undulates hyacinthinus*)

Racerunners
- Six-lined Racerunner (*Cnemidophorus sexlineatus sexlineatus*)

Skinks
- Ground Skink (*Scincella lateralis*)
- Broadhead Skink (*Eumeces laticeps*)
- Five-lined Skink (*Eumeces fasciatus*)
- Southeastern Five-lined Skink (*Eumeces inexpectatus*)

Glass Lizards
- Eastern Glass Lizard (*Ophisaurus ventralis*)
- Island Glass Lizard (*Ophisaurus compressus*)

Snakes
- Banded Water Snake (*Natrix fasciata*)
- Black Racer (*Coluber constrictor*)
- Garter Snake (*Thamnophis sirtalis*)
- Ribbon Snake (*Thamnophis sauritus*)
- Greenish Rat Snake (*Elaphe obsoleta quadrivittata*)
- Corn Snake (*Elaphe guttata*)
- King Snake (*Lampropeltis getulus*)

Coachwhip (*Masticophis flagellum*)
Scarlet Snake (*Cemophora coccinea*)
Rough Green Snake (*Opheodrys aestivus*)

Vipers
Cottonmouth (*Agkistrodon piscivorus*)
Diamondback Rattlesnake (*Crotalus adamanteus*)

Amphiumas
Two-toed Amphiuma (*Amphiuma means*)

Newts
Newt (*Notophthalmus viridescens*)

Toads
Eastern Spadefoot toad (*Scaphiopus holbrooki*)
Oak Toad (*Bufo quercicus*)
Southern Toad (*Bufo terrestris*)

Treefrogs and Peepers
Grass Frog (*Limnaoedus ocularis*)
Southern Chorus Frog (*Pseudacris nigrita*)
Pine Woods Tree Frog (*Hyla femoralis*)
Green Treefrog (*Hyla cinerea*)
Squirrel Treefrog (*Hyla squirella*)

Narrowmouth Toads
Eastern Narrowmouth Toad (*Gastrophryne carolinensis*)

True Frogs
Pig Frog (*Rana grylio*)
Southern Leopard Frog (*Rana sphenocephala*)

FISH

This list contains those species of fish thought to occur in waters on and down to a depth of 10 meters near the Wolf Island NWR according to various literature sources, surveys, and observations.

Jawless Fishes
Sea Lamprey (*Petromyzon marinus*)

Sharks
Sand Shark (*Odontaspis taurus*)
White Shark (*Carcharodon carcharius*)
Basking Shark (*Cetorhinus maximus*)
Thresher Shark (*Alopias vulpinus*)
Nurse Shark (*Ginglymostoma cirratum*)
Finetooth Shark (*Aprionodon isodon*)
Blacknose Shark (*Carcharhinus acronotus*)
Bull Shark (*Carcharhinus leucus*)

Small Blacktip Shark (*Carcharhinus limbatus*)
Sandbar Shark (*Carcharhinus milberti*)
Tiger Shark (*Galeocerdo cuvieri*)
Smooth Dogfish (*Mustelis canis*)
Lemon Shark (*Negaprion brevirostris*)
Atlantic Sharpnose Shark (*Rhizoprionodon terraenovae*)
Scalloped Hammerhead Shark (*Sphyrna lewini*)
Bonnet Shark (*Sphyrna tiburo*)
Smooth Hammerhead Shark (*Sphyrna zygaena*)
Spiny Dogfish (*Squalus acanthias*)

Skates and Rays

Smalltooth Sawfish (*Pristis pectinata*)
Atlantic Guitarfish (*Rhinobatos lentiginosus*)
Clearnose Skate (*Raja eglanteria*)
Southern Stingray (*Dasyatis americana*)
Roughtail Stingray (*Dasyatis centroura*)
Stingaree (*Dasyatis sabina*)
Bluntnose Stingray (*Dasyatis sayi*)
Smooth Butterfly Ray (*Gymnura micrura*)
Spotted Eagle Ray (*Aetobatus narinari*)
Eagle Ray (*Myliobatis freminvillei*)
Cownose Ray (*Rhinoptera bonasus*)
Atlantic Manta (*Manta birostris*)

Sturgeons

Shortnose Sturgeon (*Acipenser brevirostrum*)
Atlantic Sturgeon (*Acipenser oxyrhynchus*)

Gars

Longnose Gar (*Lepisosteus osseus*)
Florida Gar (*Lepisosteus platyrhincus*)

Tarpons

Ladyfish (*Elops saurus*)
Tarpon (*Megalops atlantica*)
Bonefish (*Albula vulpes*)

Eels

American eel (*Anguilla rostrata*)
Conger eel (*Conger oceanicus*)
Speckled Worm eel (*Myrophis punctatus*)
Shrimp eel (*Ophichthus gomesi*)
Spotted Snake eel (*Ophichthus ocellatus*)
Striped Cusk-eel (*Rissola marginata*)

Herrings, Shads and Related Species

Blueback Herring (*Alose aestivalis*)
Hickory Shad (*Alosa mediocris*)
American Shad (*Alosa sapidissima*)
Yellowfin Menhaden (*Brevoortia smithi*)
Atlantic Menhaden (*Brevoortia tyrannus*)

Gizzard Shad (*Dorosoma cepedianum*)
Threadfin Shad (*Dorosoma petenense*)
Scaled Sardine (*Harengula pensacolae*)
Atlantic Thread Herring (*Opisthonema oglinum*)
Spanish Sardine (*Sardinella anchovia*)

Anchovies
Cuban Anchovy (*Anchoa cubana*)
Striped Anchovy (*Anchoa hepsetus*)
Dusky Anchovy (*Anchoa lyolepis*)
Bay Anchovy (*Anchoa mitchilli*)

Lizardfish
Inshore Lizardfish (*Synodus foetens*)

Catfish
White Catfish (*Ictalurus catus*)
Gafftop Sail Catfish (*Bagre marinus*)
Sea Catfish (*Arius fells*)

Toadfish
Oyster Toadfish (*Opsanus tau*)

Clingfish
Skilletfish (*Gobiesox strumosus*)

Frogfish
Singlespot frogfish (*Antennarius radiosus*)
Sargassumfish (*Histrio histrio*)

Batfish
Longnose Batfish (*Ogcocephalus vespertilio*)

Hakes
Southern Hake (*Urophycis floridanus*)
Spotted Hake (*Urophycis regius*)

Needlefish
Flat Needlefish (*Ablennes hians*)
Northern Needlefish (*Strongylura marina*)
Houndfish (*Tylosurus crocodilus*)

Killifish
Sheepshead Killifish (*Cyprinodon variegatus*)
Golden Topminnow (*Fundulus chrysotus*)
Marsh Killifish (*Fundulus confluentus*)
Mummichog (*Fundulus heteroclitus*)
Striped killifish (*Fundulus majalis*)

Livebearers

Mosquitofish (*Gambusia affinis*)
Least Killifish (*Heterandria formosa*)
Sailfin Molly (*Poecilia latipinna*)

Siiversides

Rough Silverside (*Membras martinica*)
Tidewater Silverside (*Menidia beryllina*)
Atlantic Silverside (*Menidia menidia*)

Pipefish

Key Dusky Pipefish (*Syngnathus floridae mckayi*)
Chesapeake Dusky Pipefish (*Syngnathus floridae hubbsi*)
Northern Pipefish (*Syngnathus fuscus*)
Chain Pipefish (*Syngnathus louisianae*)
Bull Pipefish (*Syngnathus springeri*)
Whitenose Pipefish (*Corythoichthys albirostris*)

Sea Bass

Rock Sea Bass (*Centropristis philadelphica*)
Black Sea Bass (*Centropristis striata*)
Sand Perch (*Diplectrum formosum*)
Aguavina (*Diplectrum radiale*)
Striped bass (*Morone saxatilis*)

Sunfish

Flier (*Centrarchus macropterus*)
Warmouth (*Lepomis gulosus*)
Bluegill (*Lepomis macrochirus*)
Largemouth bass (*Micropterus salmoides*)

Snappers

Red Snapper (*Lutfanus campechanus*)
mangrove snapper (*Lutfanus griseus*)

Snook

Snook (*Centropomus undecimalls*)

Mojarras

Irish pompano (*Diapterus olisthostomus*)
*S*potfin Mojarra (*Eucinostomus argenteus*)
Silver Jenny (*Eucinostomus gula*)

Grunts

Tomtate (*Haemulon aurolineatum*)
Pigfish (*Orthopristis chrysoptera*)

Drums

*S*ilver Perch (*Bairdiella chrysura*)
Spotted Seatrout (*Cynoscion nebulosus*)
Silver Seatrout (*Cynoscion nothus*)

Weakfish (*Cynoscion regalis*)
Banded Drum (*Larimus fasciatus*)
Spot (*Leiostomus xanthurus*)
Southern Kingfish (*Menticirrhus americanus)*
Gulf Kingfish (*Menticirrhus littoralis*)
Northern Kingfish (*Menticirrhus saxatilis*)
Atlantic Croaker (*Micropogon undulates*)
Black Drum (*Pogonias cromis*)
Red Drum (*Sciaenops ocellata*)
Star Drum (*Stellifer lanceolatus*)

Porgies

Sheepshead (*Archosargus probatocephalus*)
Whitebone Porgy (*Calamus leucosteus*)
Pinfish (*Lagodon rhomboids*)
Northern Porgy (*Stenotomus chrysops*)

Sea Chubs

Yellow Chub *(Kyphosis incisor*)
Bermuda Chub (*Kyphosis sectatrix*)

Spadefish and Butterflyfish

Atlantic Spadefish (*Chaetodipterus faber*t)
Spotfin Butterflyfish (*Chaetodon ocellatus*)

Damselfish

Sergeant Major (*Abudefduf saxatilis*)

Mullets

Striped Mullet (*Mugil cephalus*)
White mullet (*Mugil curema valenciennes*)

Wrasses

Slippery Dick (*Halichoeres bivittatus*)
Pearly Razorfish (*Hemipteronotus novacula*)

Stargazers

Southern Stargazer (*Astroscopus y-graecum*)
Sand Stargazers (*Dactyloscopus tridigitalus*)

Combtooth Blennies

Striped Blenny (*Chasmodes bosquianus*)
Crested Blenny (*Hypleurochilus geminatus*)
Feather Blenny (*Hypsoblennius hentzi*)
Freckled Blenny (*Hypsoblennius ionthas*)

Sleeper

Fat Sleeper (*Dormitator maculatus*)

Gobies

Lyre Goby (*Evorthodus lyricus*)
Violet Goby (*Gobioides broussonneti*)
Darter Goby (*Gobionellus boleosoma*)
Sharp Tail Goby (*Gobionellus hastatus*)
Freshwater Goby (*Gobionellus shufeldti*)
Emerald Goby (*Gobionellus smaragdus*)
Naked Goby (*Gobiosoma bosci*)
Seaboard Goby (*Gobiosoma ginsburgi*)
Green Goby (*Microgobius thalassinus*)

Cutlassfish

Atlantic Cutlassfish (*Trichiurus lepturus*)

Butterfish

Southern Harvestfish (*Peprilus alepidotus*)
Butterfish (*Peprilus triacanthus*)

Searobins

Northern Searobin (*Prionotus carolinus*)
Leopard Searobin (*Prionotus scitulus*)
Striped Searobin (*Prionotus evolans*)
Bighead Searobin (*Prionotus tribulus*)

Lefteye Flounders

Ocellated Flounder (*Ancylopsetta quadrocellata*)
Spotted Whiff (*Citharichthys macrops*)
Bay Whiff (*Citharichthys spilopterus*)
Fringed Flounder (*Etropus crossotus*)
Smallmouth Flounder (*Etropus microstomus*)
Gray Flounder (*Etropus rimosus*)
Gulf Flounder (*Paralichthys albigutta*)
Summer Flounder (*Paralichthys dentatus*)
Southern Flounder (*Paralichthys lethostigma*)
Broad Flounder (*Paralichthys squamilentus*)
Windowpane (*Scophthalmus aquosus*)

Soles

Hogchoker (*Trinectes maculatus*)

Tonguefish

Backcheek Tonguefish (*Symphurus plagiusa*)
Spottail Tonguefish (*Symphurus urospilus*)

Filefish

Orange Filefish (*Aluterus schoepfi*)
Planehead Filefish (*Monacanthus hispidus*)

Trunkfish

Scrawled Cowfish (*Lactophrys quadricornis*)

Puffers

Smooth Puffer (*Lagocephalus laevigatus*)
Northern Puffer (*Sphoeroides maculatus*)
Florida Puffer (*Sphoeroides nephelus*)

PLANTS

This list contains those species of plants thought to occur on lands owned by the Wolf Island NWR according to various literature sources, surveys, and observations.

Trees

Red Maple (*Acer rubrum*)
Loblolly Pine (*Pinus taeda*)
Slash Pine (*Pinus elliotti*)
Longleaf Pine (*Pinus palustris*)
Pond Pine (*Pinus serotina*)
Juniper (*Juniperus virginiana*)
Wax Myrtle (*Myrica cerifera*)
Live Oak (*Quercus virginiana*)
Water Oak (*Quercus nigra*)
Laurel Oak (*Quercus laurifolia*)
Sweet Bay (*Magnolia virginiana*)
Southern Magnolia (*Magnolia grandiflora*)
Red Bay (*Persea borbonia*)
Willow (*Salix* spp.)
Gum (*Nyssa* spp.)
Ash (*Fraxinus* spp.)
Cypress (Taxodium ascendens)
Loblolly Bay (*Gordonia lasianthus*)

Bushes

Hercules'-club (*Zanthoxylum clava-herculis*)
Red buckeye (*Aesculus pavia*)
Sparkleberry (*Vaccinium arboretum*)
Devilwood (*Osmanthus americana*)
Beauty-berry (*Callicarpa americana*)
Groundselbush (*Baccharis halimifolia*)
Buttonbush (*Cephalanthus occidentalis*)

Woody vines

Smilax (*Smilax* spp.)
Virginia creeper (*Parthenocissus quinquefolia*)
Grape (*Vitis* spp.)
Pepper-vine (*Ampelopsis arborea*)
Rattanvine (*Berchemia scandens*)
Yellow Jessamine (*Gelsemium sempervirens*)
Coral honeysuckle (*Lonicera sempervirens*)
Railroad vine (*Ipomoea stolonifera*)

Shrubs and Sea Grasses

Switchcane (*Arundinaria tecta*)
Sea Rocket (*Cakile* spp.)
Beach Hogwort (*Croton punctatus*)
Beach Sandspur (*Cenchrus tribuloides*)
Saltmeadow Cordgrass (*Spartina patens*)
Salt Wort (*Salsola kali*)
Sea-purslane (*Sesuvium* spp.)
Beach-spurge (*Euphorbia polygonifolia*)
Seahourse-elder (*Iva imbricate*)
Beach Pennywort (*Hydrocotyle bonariensus*)
Camphorweed (*Herotheca subaxillaris*)
Little Bluestem (*Andropogon scoparius*)
Prickley Pear (*Opuntia* spp.)
Seaside Goldenrod (*Solidago humifusa*)

Submerged Vegetation

Bushy-pondweed (*Najas* spp.)
Fanwort (*Cabomba caroliniana*)
Coontail (*Ceratophyllum demersum*)
Parrot's-feather (*Myriophyllum brasiliense*)

Floating-leaved, rooted vegetation

Pondweed (*Potamogeton* spp.)
Water-shield (*Brasenia schreberi*)
Banana water-lily (*Nymphaea mexicana*)
White water-lily (*Nymphaea odorata*)
Yellow cow-lily (*Nuphar luteum*)

Floating, not rooted vegetation

Mosquito fern (*Azolla caroliniana*)
Duckweed (*Lemna* spp.)
Duckweed (*Spirodela* spp.)
Water-meal (*Wolffia* spp.)
Wolffiella (*Wolffiella floridana*)
Bladderwort (*Utricularia* spp.)

Emergent vegetation

Cat-tail (*Typha* spp.)
Bulrush (*Scirpus* spp.)
Rush (*Juncus* spp.)
Sawgrass (*Cladium* spp.)
Pickerelweed (*Pontederia cordata*)
Arrow arum (*Peltandra virginica*)
Alligator-weed (*Alternanthera philoxeroides*)
Arrowhead (*Sagittaria latifolia*)

Appendix I. List of Preparers

- Jane Griess, Project Leader, Savannah Coastal Refuges Complex, U.S. Fish and Wildlife Service
- W. Shaw Davis, Deputy Project Leader, Savannah Coastal Refuges Complex, U.S. Fish and Wildlife Service
- John Robinette, Biologist, Savannah Coastal Refuges Complex, U.S. Fish and Wildlife Service
- Debra Barnard, Biologist, Savannah Coastal Refuges Complex, U.S. Fish and Wildlife Service
- Stefani Melvin, Biologist, Migratory Bird Program, U.S. Fish and Wildlife Service
- Scott Gilje, Refuge Operations Specialist, Harris Neck National Wildlife Refuge, U.S. Fish and Wildlife Service
- Robert Brooks, Biologist, Georgia Ecological Services Office, U.S. Fish and Wildlife Service
- Pat Metz, Visitor Services Manager, Savannah Coastal Refuges Complex, U.S. Fish and Wildlife Service
- Brad Winn, Senior Wildlife Biologist, Georgia Department of Natural Resources
- Fred Hay, Sapelo Island Research Manager, Georgia Department of Natural Resources
- Aimee Gaddis, Stewardship Coordinator, Sapelo Island National Estuarine Research Reserve
- Jeff Spratt, Georgia Conservation Office, The Nature Conservancy
- Randy Williams, Consultant, Mangi Environmental Group (Service contractor)
- Meghan Morse, Consultant, Mangi Environmental Group (Service contractor)
- Jim Wood, U.S. Fish and Wildlife Writer/Editor (Service contractor)